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Research Paper

PANEL DATA ANALYSIS ON LABOR PRODUCTIVITY AND FEMALE LABOR FORCE PARTICIPATION: EVIDENCE FROM SOUTH ASIAN COUNTRIES

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Abstract

The gender discrepancy has been the focus of many studies over decades. The gap in the wage level can be triggered by different reasons. But difference in productivity or discrimination are to be key factors here. Therefore, participation of women can have significant impact in the output of the economy and may influence in reducing wage gap as well as this is related to the reasons we mentioned before. This article examines on female labor force participation, its indicators and the impact of it over the labor productivity of the whole labor force. This paper examines this in scenario of four countries, Bangladesh, Pakistan, India and Sri Lanka in years between 2000-2016 utilizing panel data to evaluate if the female participation in labor force impacts overall output or not.

Keywords: Gender, wage gap, labor force participation, labor productivity

1. Introduction

Almost every industrialized and developed nation has implemented legislative regulations in order to ensure minimal pay gap within gender. The women are significantly deprived of equal wage and facilities in developing countries specially. Participation of women increased after second world war, still insignificant. The scenario has been worse in the developing countries from the very beginning. Even in developed countries women earn 10-15% less (Dixon-Mueller, 2013). There are different reasons behind this. A prominent reason is the prejudice about the women. This prejudice can be defined with two theories, the overcrowding theory and the human capital theory. In the overcrowding theory the women are accountable for their duties in the family and then inputs their time in workforce which than creates surplus of the supply of same type labor supply. So, women are taken in workforce only in the lower wage sectional of the economy which creates an inefficient structure to join workforce thus they don't push to join workforce effectively and employers keep their mindset same (O'Neil, 2003). With the human capital theory, they estimate that the women can invest less in the training or experience-based education for market as they have other role to fulfil in the family. As a result, women always lagged in terms of skills and qualifications. Because of this the employers also set the mindset that women are most likely to be less efficient than men in the market which reduced their chances to participate in the market and victim of selection bias later. (Solberg,2005). In this paper we will examine if the scenarios with various variables and will evaluate how the female participation impacts in labor force accordingly.

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2. Literature Review

According to studies the change of socio-economic situation and accumulation of human capital by women has impacted a lot in narrowing the wage gap. As the society progressed the average year of marriage for women increased and that helped them to avoid family responsibilities. Thus, they invested more in the human capital. In last few decades women have higher degrees with better marks in various sections such as law, business medical etc. (Mulligan & Rubinstein, 2005). In the post-World War 2 scenario, the job sector moved to segregated service sector where women could specialize and brought efficient outcome along with other factors because of specialization. (Steiger & Wardell, 1995). Besides these, collective approach from the society like salary setting procedures or collective bargaining system has helped to reduce the gap (Blau & Kahn, 2003 & 2007). Because of this integration of women, more women came into the workforce. Any employer discriminating with women in that situation would get market out because of inefficiency and this was found truth in many scenarios of USA (Boheim, Hofer & Zuleika, 2007).

Because of the transition of economic development in the developing countries many women lost their chance to participate in workforce. Modernization theorists believe as society progresses, women can avail education, thus helps women to integrate in the workforce, pursue goals in the economy, higher social acceptability thus increased participation in labor force and decreased fertility (Heckman, 1980). Theoretical and empirical studies show that female labor force participation boosts economic growth (Tansel (2002) and Fatima and Sultan (2009). Even in the 19th century women were recruited in the service and industry so that male workers cannot leave the agriculture sector in the US economy (Kessler-Haris, 2003). Female workforce participation increased from 17% to 42.7% from 1890 to 1982. (Blau et., 1998). The U-shaped hypothesis suggested by Boserup (1970 and Goldin (1995) for the long-term association between economic development and women participation in labor force was tasted which was built on the argument of Kuznets that the relation between this two is curvilinear.

3. Methodology

In this hypothesis testing we are utilizing panel data across four countries- Bangladesh, India, Pakistan and Sri Lanka in the frame from 2000 to 2016, using balanced panel data for estimating linear fixed effects and random effect models. For this hypothesis testing we took two dependent variables, FEMALE and FEMALETOT. FEMALE is the logarithmic value of ratio of male and female participation in workforce respectively and FEMALETOT is the logarithmic value of female participation in workforce to male participation. Other determinants such as logarithmic values of gross capital formation, annual hours worked, ratio of imports and exports and domestic credit to private sector.

4. Empirical Framework

Using two indicators of labor productivity and two female labor force participation indicators, this study examined the effect of female labor participation on labor productivity.

By using balanced panel data, we estimate the following fixed effect models (FEM):

$$\boldsymbol{LP_{it} = \beta_{1i} + \beta_2 FEMALE_{it} + u_{it}}$$

$$lnLP_{it} = \beta_{it} + ln\beta_2 FEMALE_{it} + ln\beta_3 FEMANLETOMALE_{it} + ln\beta_4 GDPPERPERSON_{it} + ln\beta_5 GROSSCAPFOR_{it} + ln\beta_6 ANNUALHOUR_{it} + ln\beta_7 ANNUALHOUR\text{^}2_{it} + \beta_8 DOMESTICCREDIT_{it} + \beta_9 OPENNESS_{it} + u_{it}$$

By using balanced panel data, we estimate the following fixed effect models (REM):

$$\boldsymbol{LP_{it} = \beta_1 + \beta_2 FEMALE_{it} + u_{it}}$$

$$lnLP_{it} = \beta_{it} + ln\beta_2 FEMALE_{it} + ln\beta_3 FEMANLETOMALE_{it} + ln\beta_4 GDPPERPERSON_{it} + ln\beta_5 GROSSCAPFOR_{it} + ln\beta_6 ANNUALHOUR_{it} + ln\beta_7 ANNUALHOUR\text{^}2_{it} + \beta_8 DOMESTICCREDIT_{it} + \beta_9 OPENNESS_{it} + \varepsilon_{it} + u_{it}$$

In this model the above variables define as:

Gross capital formation: Indicates the total value of the capital in the economy along with the net changes in the inventory.

Annual hour worked: Calculated by estimating yearly hours of work of a worker and dividing it by the basic payments of the workers.

Openness: Proportion of imports to exports of goods and services of a country.

Domestic credit to private sector: Proportion of resources invest led in the private sector from public sector in forms of loans or trade credits.

Gross Value Added (GVA) Vs. GDP: GVA vs GDP is the proportion of additional value added to a country's economy over the year vs the total value of the resources it has at the end of a year.

Here the measurements of labor productivity from the Conference Board, providing two metrics, GDP per hour and GDP per person employed. GDP per hour is the proportion of GDP and the total hours workers work in a year and GDP per worker is the proportion of GDP and total workers employed in the labor force. GPD per hour depicts a better picture of intensity of work but the data available in the database is limited for full scenario.

The variables evaluated in this study were chosen based on prior research findings and our primary hypothesis. ILO gives data for the FEMALEMALE and FEMALETOT variables. Since human and fixed capital investment boosts labor productivity, the GROS coefficient should be positive. AWWH is the country's logarithmic annual hours worked. Conference Board Total Economy Database. After a threshold, increasing a worker's average weekly working hours diminishes productivity. Thus, we applied AWWH and AWWH squared (AWWH2) to test the aforementioned hypothesis. It is anticipated that the coefficient on AWWH will be positive whereas the coefficient on AWWH2 will be negative. The logarithmic value of a country's openness is denoted by OPENNESS. The information is derived from the World Bank's World Development Indicators. We anticipate a positive correlation between OPENNESS and labor output. Increased trade openness may increase worker productivity through boosting investment in human capital, market expansion, and the spread of more efficient manufacturing processes. DOMCREDIT is the logarithmic value of domestic credit to the private sector (percent of GDP) for the specified country. The information is from the World Bank's World Development Indicators. Labor productivity is significantly influenced by the financial depth exemplified by the domestic credit to the private sector's share of GDP. When banks provide capital for investment projects, they strive to allocate resources efficiently and select the most productive and innovative ones, despite incomplete information and adverse selection issues. In this model, we predict the coefficient on the DOMCREDIT to be positive.

5. Results and Analyses

Two distinct labor productivity metrics are estimated, and their results are provided below. Two indicators of labor force participation. Tables also include Hausman test statistics for selecting between Fixed Effect and Random Effect models at a 5% significance level and Hausman test statistics for proposed models.

$$LP_{it} = \beta_{it} + .902226989\ \widehat{lff}_{it} + 1.039528\ \widehat{gpp}_{it} + .4373329\ \widehat{gcf}_{it} + 258.02454\widehat{ahw}_{it} - .3902454\widehat{ahw\hat{}}2_{it} - .382424\widehat{dctps}_{it} + .0721912\ \widehat{opp}_{it} + u_{it}$$

Table 1. Labor productivity indicator: Gross value-added factor cost

Fixed Effect model **Labor productivity indicator: Gross value-added factor cost**	**Random effect model** **Labor productivity indicator: Gross value-added factor cost**
Dependent Variable: Gross value-added factor cost Method: Fixed-effects (within) regression Panel variable: id (strongly balanced) Time variable: year, 2000 to 2016 Observations per group: min = 17 Number of groups = 4 Total number of observations =68	Dependent Variable: GDP per person Method: Random-effects (GLS) regression Panel variable: id (strongly balanced) Time variable: year, 2000 to 2016 Observations per group: min = 17 Number of groups = 4 Total number of observations = 68
Coefficient Std. Err. t -statistics P>|t|	Coefficient Std. Err. t -statistics P>|t|

gpp	1.039528	.1853138	5.61	0.000		gpp	.0007807	.0670734	0.01	0.991		
roftm	-.9226989	.3206449	-2.88	0.006		roftm	-.5468308	.2580946	-2.12	0.034		
lff	.9008018	.2169554	4.15	0.000		lff	.4054004	.2415019	1.68	0.093		
gcf	.4373329	.0732872	5.97	0.000		gcf	.6768467	.0757585	8.93	0.000		
dctps	-.3824243	.1077122	-3.55	0.001		dctps	-.5150121	.0887515	-5.80	0.000		
opp	.0721912	.0766163	0.94	0.350		opp	.2703956	.0836966	3.23	0.001		
ahwl	258.4706	103.8233	2.49	0.016		ahwl	.3760813	.7319677	0.51	0.607		
ahwl2	-39.02454	15.6758	-2.49	0.016		ahwl2	(omitted)					
cons	-422.5088	171.8524	-2.46	0.017		_ cons	.9274138	2.486848	0.37	0.709	-3.946718	5.801546
F- statistics (8,56)		130.65	R-squared: Within		0.9491	Wald chi2(7)	=	7580.54	R-squared:		Within	0.9040
Prob. (F- statistics)		0.0000		Between	0.4156	Prob > chi2	=	0.0000			Between	1.0000
Sigma-u		.50776331		Overall	0.4534	Sigma-u		0			Overall	0.9921
Sigma-e		.04152839				Sigma-e		.04338045				
rho		.99335535				rho		0				

Estimation results reveal that all coefficients of female labor force participation indicators in fixed effect models are statistically significant and have the predicted signs. The coefficient of the female total labor participation variable is continuously positive and significant. In addition to being a significant variable, the ratio of female to male labor force participation has a negative correlation with labor productivity. In south Asian countries, female labor is not well educated, has less developed skills, and faces a substantial wage gap; hence, the ratio of female to male labor participation is negatively related to labor productivity. However, overall female labor force participation has a favorable correlation with labor productivity.

Regarding other variables, the GDP per person (gpp) variable's coefficient is positive and statistically significant. The variable measuring gross capital formation (gcf) is positive and statistically significant. Thus, it appears that investment increases labor productivity in transition economies. The variable gross domestic credit of the private sector is negative and statistically significant. Contrary to expectations, this variable has a negative connection with labor productivity. In south Asian nations, the efficient allocation of domestic credit to the private sector presents significant challenges. Several superfluous regulations prevent the distribution of loans properly. Women cannot obtain loans from reputable lenders. They depend on the bank account of their husband. Rich people obtain loans without adequate investigations and then default on them due to significant corruption, but a small business owner may have to contend with several obstacles to obtain financing. These are the primary reasons why private sector domestic credit has a negative relationship with labor productivity. In this model, the estimation coefficient of trade openness is negligible. Although these variables influence labor productivity and is assumed to be important, the trade openness variables in this article are not significant. Significant coefficients exist for Annual hours of labor (ahl) and Annual hours of labor2 (ahl2). It indicates that annual hours worked are positively connected with a worker's productivity up to a certain threshold.

Results reveal that female labor force participation contributed to labor productivity growth in south Asia between 2000 and 2016

Hausman.Test				
Test Summary	Chi-Sq. Statistics	Chi-Sq. d. f.	Prob.	
	59.15	7	.000	
Cross-section random effects test comparisons:				
Variable	fixed	random	Difference	S.E.
gpp	1.039528	.0007807	1.038747	.1727495
roftm	-.9226989	-.5468308	-.3758681	.1902637
lff	.9008018	.4054004	.4954014	.
gcf	.4373329	.6768467	-.2395137	.
dctps	-.3824243	-.5150121	.1325878	.0610335
opp	.0721912	.2703956	-.1982044	.
ahwl	258.4706	.3760813	258.0945	103.8207

These tables also present the Hausman test statistics for the data utilized here to choose between Fixed Effect and Random Effect models at the significance level of 5% by the Hausman Test Statistics.

Table 2. Labor productivity indicator: GDP per person

Random Effect model **Labour productivity indicator: GDP per person**	**Fixed Effect model** **Labour productivity indicator: GDP per person**
Dependent Variable: Gross valu added factor cost Method: Random-effects (GLS) regression Panel variable: id (strongly balanced) Time variable: year, 2000 to 2016 Observations per group: min = 17 Number of groups = 4 Total number of observations =68	Dependent Variable: GDP per person Method: fixed-effects (within) regression Panel variable: id (strongly balanced) Time variable: year, 2000 to 2016 Observations per group: min = 17 Number of groups = 4 Total number of observations = 68
Coefficient Std. Err. t -statistics P>|t|	**Coefficient Std. Err. t -statistics P>|t|**
gva | .0028924 .2484836 0.01 0.991 roftm | -.4708051 .511416 -0.92 0.357 lff | -.3134025 .4738965 -0.66 0.508 gcf | .1522998 .2217253 0.69 0.492 dctps | .3043206 .2097959 1.45 0.147 opp | -.1194584 .1738622 -0.69 0.492 ahwl | -8.178003 .9375172 -8.72 0.000 ahwl2 | (omitted) cons | 28.73384 3.033753 9.47 0.000	gva | .3460794 .0616947 5.61 0.000 roftm | .4464324 .1890264 2.36 0.022 lff | -.5817147 .1202154 -4.84 0.000 gcf | -.0148067 .0540485 -0.27 0.785 dctps | .1098698 .0672041 1.63 0.108 opp | .0627726 .0437593 1.43 0.157 ahwl | -1.365379 63.13296 -0.02 0.983 ahwl2 | .1657372 9.532151 0.02 0.986 cons | -.6522223 104.3718 -0.01 0.995
Wald chi2(7) = 246.39 R-squared: Within 0.1512 Prob > chi2 = 0.0000 Between 0.9948 Sigma-u 0 Overall 0.8042 Sigma-e .0237505 rho 0	F- statistics (8, 56) 106.39 R-squared: Within 0.9383 Prob. (F- statistics) 0.0000 Between 0.0846 Sigma-u .4256340 Overall 0.0178 Sigma-e .02396155 rho .99684076

In this estimation GDP per person is not a good indicator of labor productivity in south Asia. Here in this model the gross value add factor cost is significant and positively related to labor productivity. Ratio of female to male labor is significant and positive coefficient. And total female labor in labor force is significant but not positively related with labor productivity. And other influential variables are insignificant which is not the expected result of this model. So that GDP per person is not a good indicator to measure labor productivity. And this is also happened for the limitation of this paper, that if this paper considers much observation and more diverse variables it. In addition, the tables include Hausman test statistics for choosing between Fixed Effect and Random Effect models at the 5% significant level and Hausman test statistics for proposed models.

6. Scenario of Few Countries among the Analysis:

For these four south Asian countries Gross values added at factor of production is increasing over the year. Now female labor participation of this countries is every influential for labor productivity. In this case gross capital formation is also increasing by the growth of GDP.

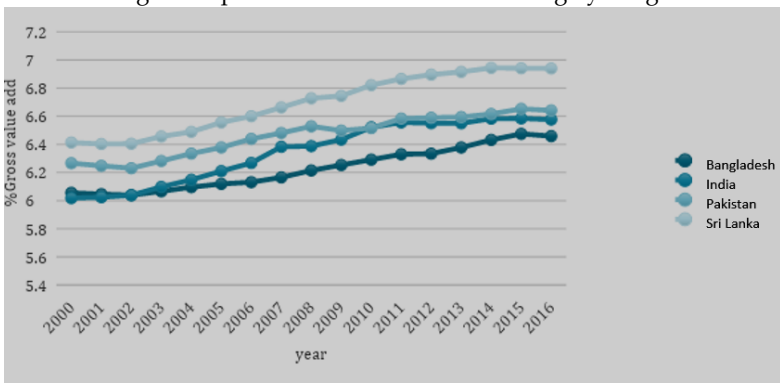


Figure 1. % Gross value adds at factor of production.

Gross value added at factor cost has upward trend that these countries are labor productivity is increasing. Here vertical axis shows the % of gross value added at factor cost over the year (2000-2016) in four countries.

6.1. Bangladesh

Women's employment is the lowest in the South Asia though it increased almost 1.5 times between 1995 to 2003. Only 26% of women between 15-59 years age is quite low. Though the female participation rate increased in Bangladesh. In Bangladesh women of Urban area engage more in formal sectors compared to women of rural area who give time mostly in agriculture. As agricultural sector declined recently, the gap between urban and rural women increased. Big reason of wage gap in Bangladesh is the work women do are unrecognized. Bangladesh had an average women participation in labor force of 36.39%, while the peak was 40% in 1991 and lowest being 33.47% in the 2010

6.2. India

India has the biggest workforce in South Asia. Various variables make the scenario complicated for women. Education, social structure, family role, fertility, marriage age, living place- every single of these variables influences the engagement of women in labor force in India. But the most impactful variable here is the position of women defined by the society.India had average labor participation rate of 27.12%, while peak was 29.46% in 2005 and 24.12% was lowest in 2012.

6.3. Pakistan

In the last two decades Pakistan had the biggest boost in the women participation rate in labor force, more than 50% of increase but still Pakistan is behind in the rate as Pakistan barely had suitable social scenario for women to join workforce. Biggest reason of women's failure to participate in the workforce is the social scenario of Pakistan. Culture and religious structure of Pakistan restrict women to join workforce freely. Only 25% of women with university degree can manage to join workforce in Pakistan.Pakistan had an average of 17.18% of women participation in labor force, where the peak was 22.22% in 2016 and lowest being 12.23% in 1995.

6.4. Sri Lanka

In Sri Lanka the female labor force participation rate is significantly lower in absolute and relative terms if compared with other countries. Only 35% of working aged women tend to find job in the workforce which is significantly lower for a country. Sri Lanka is the 28th biggest country in case of gender disparity. This happened for poor allocation of resources which causes women less engaging in the workforce, as the male labor force participation is still comparable with other nations. (Population and Development Review on JSTOR, n.d.) The average women labor force participation was 32.81% in this period while the peak being 36.19% in 1990 and 30.44% being the lowest in 2014.

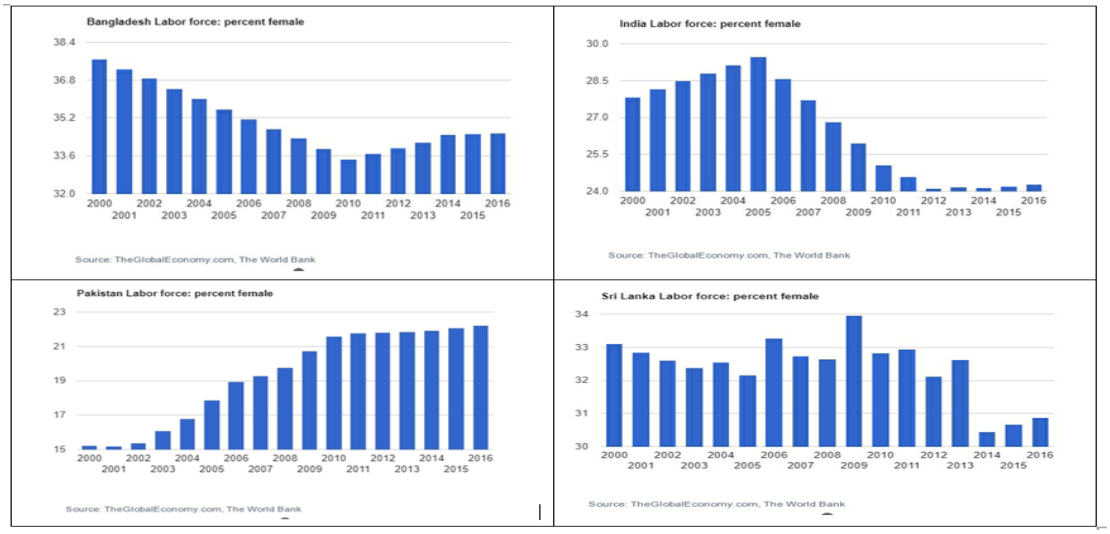
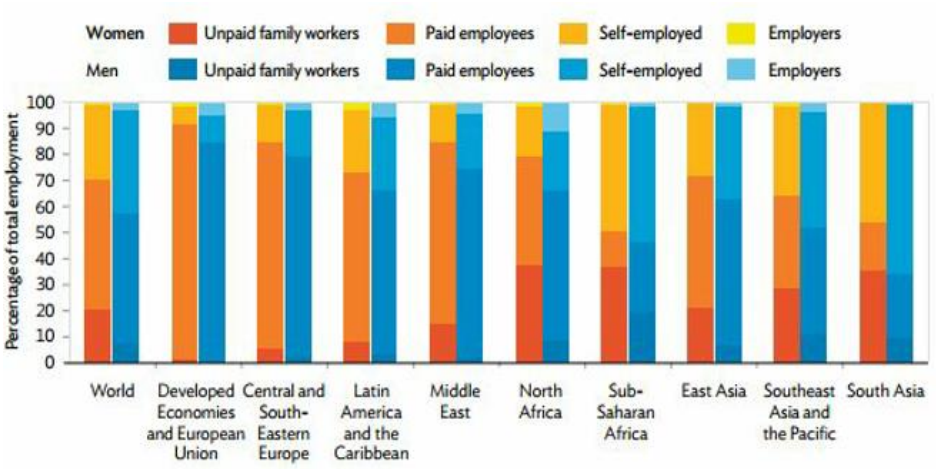


Figure 2. Female labor participation rate in Bangladesh, India, Pakistan and Sri Lanka

7. The Rise of Gender Wage Gaps: Female-Dominated Jobs and Sectors Tend to Command Lower Wages

There is substantial evidence from around the world that the wage pattern changes according to the composition of the gender. Often there are specific specialization where women are paid low. In the service sector women are often deprived of equal facilities. In Asian countries women earn half or two third of the total earning men do. Even in Pakistan women earn 30% less in education sector where it is completely a service sector. Even in recruitment women are neglected. Women are disproportionately represented in the unemployed sectors of these economies or in the informal economies where the payment is very low. In Asia, women consist only 33% of the total labor force but around 76% of the unpaid workers, other statistics with 46% of wage employment and 43% of the informal work sectors. This pattern is true for the global as well.



Source: International Labor Organization 2013

Figure 3. Share of Women Employment by Status: Women are overrepresented in unpaid jobs.

8. Conclusion

This research assessed that in the contrary to other labor productivity variables, the explanatory value depicts the picture of female labor force participations impact. We assess the hypothesis that female labor force participation indicators contributed to the growth in labor productivity from 2000 to 2016 using two measures of labor productivity and two indicators of female labor force participation. The sample contains four nations. A correlation is identified between female participation in the labor force. From the testing we find that the impact is statistically significant and is also valid to proof the two distinctive metrics that were given. Even after restricting and controlling variables that can have impact and after running tests accordingly, we find that the participation of female in the labor force has a positive and statistically significant effect on labor productivity which states that increase of female participation in the labor force increases the overall productivity of economy and thus justify our hypothesis.

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