International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 163 September, 2017
http://www.internationalresearchjournaloffinanceandeconomics.com

The Effects of Sectoral Trade Composition on Female Labor Market - Evidence from Emerging Economies

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Abstract

The study empirically identifies the effect of sectoral trade composition on gender inequality in labor force participation and wage in the emerging economies. We divide export and import into four broad sectors namely labor-intensive manufacturing, capital-intensive manufacturing, agriculture, and service. The results of the study suggest that growing export and comparative advantage in capital-intensive manufacturing sector reduce gender inequality in labor force participation whereas labor force participation inequality increases with higher export and comparative advantage in all other three sectors. Higher export and comparative advantage in labor-intensive and capital-intensive sectors increase gender wage inequality whereas this inequality decreases with growing export and comparative advantage in agriculture and service sectors. Technological advancement significantly reduces labor force participation of both male and female but increases labor force participation gap between them whereas gender wage inequality significantly falls with technological advancement.

Keywords: Sectoral trade composition; gender inequality; labor market.
JEL Classification: O50; F63; F14

1. Introduction

The effect of trade on the female labor market has recently attracted the attention of academic researchers and policy makers. The majority of the studies that focused on trade and female labor force participation nexus are based on the Stolper–Samuelson theory of international trade which suggests that the owners of the abundant factor used to produce the goods exported are benefitted from free

trade. According to the Heckscher-Ohlin theory, countries should specialize in the production of goods for which it has abundant factors of production. As developing countries are endowed with abundant unskilled labor, they will produce labor-intensive products due to their comparative advantage in cheap labor. Moreover, female workers constitute a large segment of the unskilled labor force in the developing countries. So, growing export of labor-intensive products will benefit female more in the labor abundant developing countries, and the gap between male and female will fall. For example, the World Bank's World Development Report 2012 observed that " trade openness and economic integration have led to significant growth of export-oriented sectors such as garments and light manufacturing in many countries and result in employment of a vast number of women."

The generalized assumption based on trade theories is that growing trade should increase the demand for unskilled labor in the developing countries due to their comparative advantage in producing labor-intensive products. It is expected that more women will join the workforce in the developing countries with growing economic integration as a major share of the female labor force in these economies is unskilled, and they will be employed in the labor-intensive sectors. Consequently the inequality between male and female in labor force participation will fall.

It is also anticipated that in the developing countries women are predominantly employed in the agricultural and industrial sectors that usually require unskilled labor (Bussmann, 2009). Globalization skeptics argue that trade liberalization increases female labor force participation in the low-paying jobs, particularly in the agricultural and industrial sectors to meet the demand for cheap labor and flexible work.

However, trade structure and labor force participation data show that both trade and employment structure differs drastically in the emerging economies. Although a significant percentage of male and female are employed in the service sector, this sector constitutes around 30 percent of total export in the emerging economies. Around 60% of export of emerging economies is in the industrial sector (both labor- and capital-intensive manufacturing), and capital-intensive manufacturing export is around 50% of total export with an upward trend till 2013 where only around 30 percent of male and 15 percent of the female are employed in industrial sector respectively. Both employment and export shares of the agricultural sector are low. As both trade and female labor force participation drastically varies across sectors the effect of trade in different sectors on the female labor market will differ drastically.

Figure 1: Sector Wise Female Labor Force Participation (as % of total female employment)

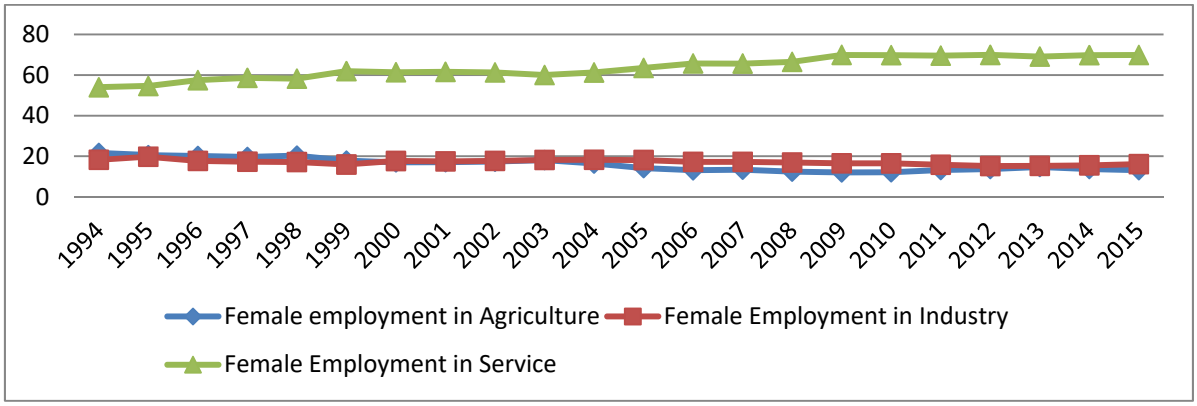


Figure 2: Sector Wise Male Labor Force Participation (as % of total male employment)

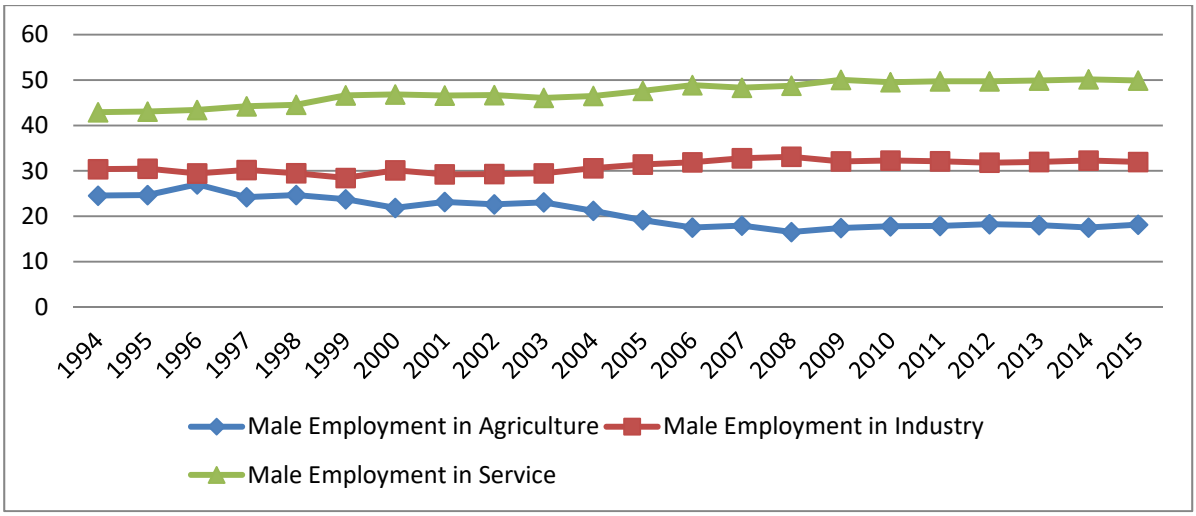
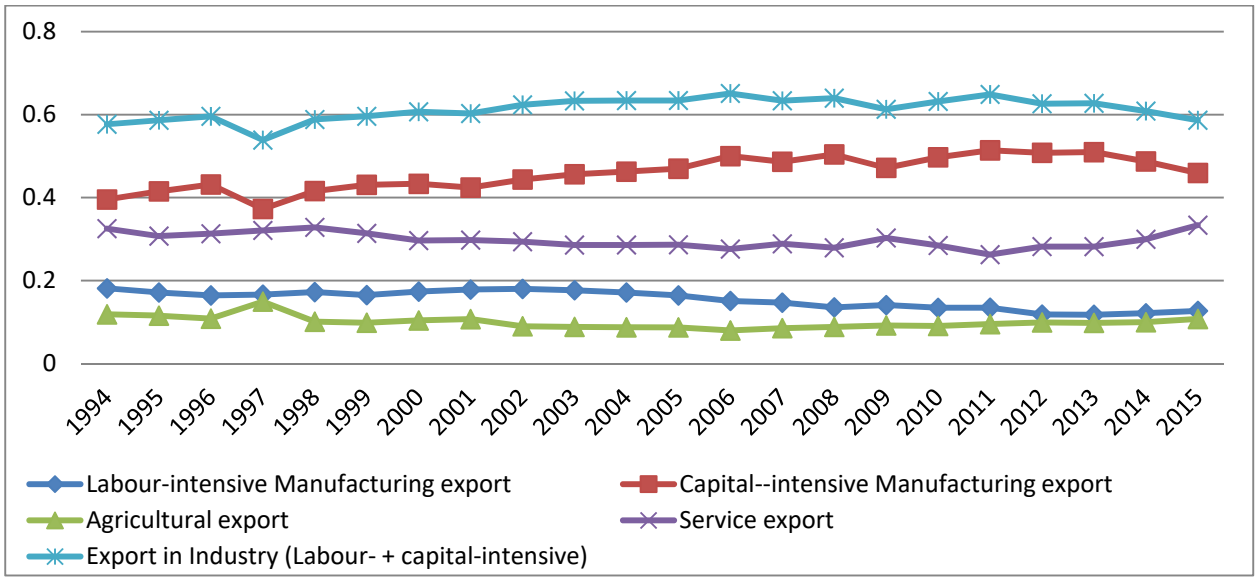


Figure 3: Sector-wise Export (as % of total Export)



Another important issue is technological advancement. The impact of technological progress is visible both in employment dynamics and wage dynamics (Hamermesh, 1996; Petit & Vivarelli, 1997). Technological advancement in a country or industry increases the demand for skilled workers which subsequently changes the wage structures and increases the wage gap between unskilled and skilled workers (Allen, 2001; Berman, Bound, & Griliches, 1994; John & George, 1992; Juhn, Murphy, & Pierce, 1993; Katz & Murphy, 1992; Levy & Murnane, 1996). As a significant portion of female labor is unskilled in the developing countries, technological advancement should reduce the female labor force participation and wage and subsequently increase the gender gap in labor force participation and wage.

The critical research question addressed in this paper is that as trade and employment structure significantly varies across sectors in the emerging economies, the composition of trade in different sectors should have a differential effect on the female labor market. The purpose of this study is to identify the effects of sectoral composition of trade on women's participation in labor force as well as on gender inequality in labor force participation and wage.

For this purpose, we divide total export and import into four sectors such as labor-intensive manufacturing; capital intensive manufacturing; agriculture; and service. We introduce two trade composition variables namely Compo-expratio and Compo-rca. Compo-expratio is the ratio of export of each sector to total export and Compo-rca indicates the comparative advantage of each sector. We the identify the effect of growing export and comparative advantage of each sector on female participation in the workforce as well as gender inequality in labor force participation and wage. Technology is considered as a significant variable in identifying the effect. This study takes emerging economies as the research focus due to their significance in the world economy and diversifying role in the world trade emerging economies. Moreover, these economies are characterized by high economic openness and economic growth, and they constitute 80% of global population and 50% of world trade. They are also in the transitional phase of economic development.

The remainder of the paper is structured as follows: the next section discusses the variables and data whereas section 3 explains the empirical model used. The results of the empirical analysis are presented and discussed in section 4 followed by concluding remarks and policy suggestions in section 5.

2. Literature Review

Based on Heckscher-Ohlin and Stolper–Samuelson theorem it is assumed that developing countries should export labor-intensive products due to their comparative advantage in cheap labor. Thus growing trade of developing countries will raise female participation in the workforce in labor-intensive sectors due to the availability of huge unskilled cheap female labor. Several empirical studies supported the theoretical perspective. In a plant level study of the manufacturing industries in Turkey (Ozler, 2000) identified that high-skilled positions are occupied mostly by men and female participation is greater in the plants that are labor intensive and have a higher ratio of unskilled workers who are paid lower wages. According to (Tzannatos, 1999) in manufacturing sectors, almost 2/3 of women are employed as operators and production workers whereas men occupy most of the managerial or administrative posts. Bhattacharya and Rahman (1999) also identified that, in Bangladesh, women are employed in ready- made garments industry due to low skill and a low wage which is the key factor for the export success of Bangladesh in this low-cost, labor-intensive sector.

Moreover, developing countries have a comparative advantage in agricultural and industrial sectors which usually require unskilled labor. So, economic integration will increase trade in agricultural and labor-intensive industrial sectors in the developing countries and consequently female participation in the workforce will increase in these sectors due to the availability of large unskilled and cheap female labor. Hyder and Behrman (2012) showed that growing international trade substantially reduces the gender gap in labor force participation across all occupations in Pakistan, but significant increase in female labor force participation are concentrated in agriculture and other primary professions. Bussmann (2009) also identified that trade openness expands women's employment in the service sectors in developed countries while it raises the share of women employment in industrial and agricultural sectors in developing countries.

According to Joekes (1995), the percentage of female participation in labor force reaches the peak at a certain level and falls subsequently over time as the trade structure of the country moves to technology based skilled products where skilled males outweigh females and thus labor force participation gap between male and female increases. Saure and Zoabi (2014) identified that female labor force participation actually falls when trade expands in female-intensive sectors. The results of their study suggest that when female intensive sectors are capital intensive trade integration expands female intensive sectors in the capital abundant economies and contracts male intensive sectors which induces male to migrate from male intensive sectors to female intensive sectors. Due to higher productivity of male than that of female gender wage gap widens and female participation in the labor force drops and thus gender inequality in labor force participation as well as wage increases.

The important factor in the field of trade and female labor market nexus analysis is that both trade structure and women's employment drastically differs across sectors. So, growing trade of different sectors should have a differential effect on women's employment. Although a vast study has been done in the last decades to identify the effect of trade liberalisation on female labor market , for example but not limited to (Aguayotellez, Airola, & Juhn, 2010; Chen, Ge, Lai, & Wan, 2013; Maurerfazio, Hughes, & Zhang, 2007; Meyer, 2003; Nordas, 2003; Tzannatos, 1999) none of them focused on how changes in sectoral composition of trade affect female labor market and gender inequality in labor force participation.This study will concentrate on the issue that how trade in various sectors affect women's employment and gender inequality in labor force participation in the emerging economies.

The standard international trade theories do not address the issue of wage inequalities since the theories assume that wage inequality does not exist in the long run in the highly competitive market. According to Becker (2010), discriminatory behavior can be sustained in the less competitive environment. Trade increases competition in the market and thus reduces firms' ability to discriminate. However, gender inequality in wage is still observed widely in closed as well as open economies which question about the fundamental assumption of neoclassical trade models and raises the significance of exploring the linkage between gender wage gap and international trade. Busse and Spielmann (2006) identified that gender inequality in wage is positively associated with the comparative advantage in the labor-intensive sector and countries with higher gender wage inequality enjoy a higher comparative advantage in exporting labor-intensive products.

Seguino (1997, 2000, 2010) analyzed the linkage between gender pay gap and growth and export performance in a set of semi-industrialized export-oriented economies and found that lower wage paid to female employees is the key determinant of the export success of several countries.

Moreover, technology significantly affects both employment and wage dynamics through several mechanisms which shape degree of inequality in the labor market (Hornstein, Krusell, & Violante, 2005). The skill-based technological change increases the demand for skilled workers and thus increases wage inequality as well as inequality in labor force participation between skilled and unskilled workers (Allen, 2001; Berman et al., 1994; Brown & Campbell, 2002). As women comprise a significant portion of unskilled labor in the developing countries, technological advancement should raise gender inequality in wage and labor force participation. Artecona and Cunningham (2002) identified that trade liberalization increases gender wage inequality in manufacturing sectors in Mexico due to a higher premium paid for higher experiences/skill of the male. According to the study made by Chengze and Lui (2003), in Hong Kong, the gender gap is related to the changing comparative advantage of the female in the labor force and this gap is lower in less physical intensive occupations. They found that relative productivity of women increases with the country's transformation from manufacturing-oriented economy to the service-oriented economy which subsequently narrows the gender gap.

Both labor-intensity and technology-intensity vary over different economic sectors and export and import of these sectors should affect gender inequality in wage and labor force participation differently. This study will focus on the issue that how gender-based wage inequality changes with growing export and comparative advantage in the four broad sectors such as labor-intensive manufacturing, capital-intensive manufacturing, agriculture, and service, and with technology change in the emerging countries.

3. Variable Specification and Data Description

There are several measures of gender inequality across countries such as the UNDP's gender-related development index (GDI) and the Gender Empowerment Measure (GEM). The GDI consists of three variables i.e. life expectancy at birth, educational attainment and GDP per capita. The GEM combines income shares; professional opportunities and participation in economic decision-making; and

parliamentary participation as shares of parliamentary seats for both males and females. Several studies, for example, (Bardhan & Klasen, 1999; Dijkstra, 2002; Oudhof, 2001) criticized the composition of these two indices of gender inequality due to overweight of income variables. That is why instead of these indices of gender inequality this study uses disaggregated measures of gender inequality in labor market in two dimensions such as gender inequality in labor force participation and wage.

$$\text{Labor-inequality} = \frac{\text{Female labor force participation rate (\% female ages between 15–64)}}{\text{Male labor force participation rate (\% male ages between 15–64)}}$$

$$\text{Wage-inequality} = 1 - \frac{\text{Average wage of female}}{\text{Average wage of male}}$$

Note that higher value of labor inequality indicates lower gender inequality in labor force participation whereas a larger value of wage inequality implies higher gender inequality in wage.

As the percentage of female employment in different sectors significantly differs, and trade composition of developing countries changes over time especially due to technological development the study divides the export and import into four broad sectors such as labor-intensive manufacturing; capital intensive manufacturing; agriculture; and services. Identifying agriculture and service trade data is comparatively easy, but it 's hard to distinguish between labor-intensive manufacturing and capital intensive manufacturing trade. The distinction between labor-intensive manufacturing and capital-intensive manufacturing products is made based on the value addition per employee and involvement of fast-changing advanced technologies in the production process. Labor-intensive manufacturing products are characterized by high employee value addition and use of stable and well-diffused technology. Capital-intensive manufacturing products require advanced and updated technology with high R&D investment, but labor requirement is very low. We divide capital-intensive manufacturing and labor-intensive manufacturing trade data following the previous studies such as (Busse & Spielmann, 2006; Lall, 2000; Lary, 1968; Thorbecke & Zhang, 2009; Tyers, Phillips, & Findlay, 1987), The data collected from UN Comtrade database based on SITC-4.[1]

In order to identify trade's effect on female labor market we introduce two trade composition variables calculated as follows:

$$\text{Comp-expratio} = \frac{\text{Export of labor intensive / capital intensive / agriculture /service sector}}{\text{Total export}}$$

Compo-expratio will be denoted as LIM- expratio; CIM- expratio; Argi- expratio; and Service-expratio for labor-intensive manufacturing; capital-intensive manufacturing; agriculture and service sector respectively.

However, according to international trade theory factors of production that are used intensively in exporting sectors are benefitted from trade whereas the free trade hurts factors of production that are used intensively by the import-competing sectors. Considering the effect of both export and import on factors of production we use another trade composition variable named Compo-rca defined as follows:

$$\text{Compo- rca} = \frac{\frac{Export\ of\ labor-intensive\ /capital-intensive\ /agriculture\ /\ service\ sector}{Total\ Export}}{\frac{Import\ of\ labor-intensive\ /\ capital-intensive\ /agriculture\ /\ service\ sector}{Total\ Import}}$$

Compo-rca actually defines country's comparative advantage in international trade in the specific sector. The value of Compo-rca greater than 1 (Compo-rca >1) indicates country's comparative advantage in the specific sector whereas Compo-rca value lower than 1 (Compo-rca <1) indicates country's comparative disadvantage in that sector. Compo-rca for labor-intensive manufacturing; capital-intensive manufacturing; agriculture and service sector will be symbolized as LIM-rca; CIM-rca; Argi-rca; and Service-rca respectively.

As, according to international economists, technological change and resulting premium paid on education are the two primary factors that affect employment structures as well as wage dynamics. We

[1] The detail list of labor intensive and capital intensive products with their SITC number is given in Appendix B.

use technological deepening and upgrading index value developed by UNIDO as the proxy to the technological development of a country. Technological dimension comprises industrial intensity and export quality of a country. The calculation procedure is as follows:

$$\text{Technology Index} = \frac{Industrial\ Intensity + Export\ Quality}{2}$$

Where, the degree of industrialization intensity is computed as a linear aggregation of the Medium- and High-tech Manufacturing Value Added share in total Manufacturing Value Added and the Manufacturing Value Added share in total GDP, and Countries' export quality is obtained as a linear aggregation of the Medium- and High-tech Manufactured Exports share in total manufactured exports and the Manufactured Exports share in total exports. The value of technology variable ranges from 0 to 1 where a higher value indicates higher technological advancement.

Different other control variables are used in the in the regression model to strengthen the linkage between trade composition and female labor market. We control female secondary school enrollment rate as resulting premium paid on education affects employment and wages (Artecona & Cunningham, 2002; Bishop, Luo, & Wang, 2005; Bussmann, 2009; Mcnabb & Said, 2013); total labor force of the country which implies country's labor intensity (Busse & Spielmann, 2006); GDP growth to take into account the effect of economic growth on labor market as a number of studies identified significant association between gender inequality and economic growth, for example but not limited to (Forsythe, Korzeniewicz, & Durrant, 2000; Stephan Klasen, 1999; Stephan Klasen & Lamanna, 2009; Matthews & Nee, 2000; Morrison, Raju, & Sinha, 2007; Schober & Winterebmer, 2011; Seguino, 2000).

4. Data Sources

Consistency and validity of the data set is important in analyzing gender inequality in labor force participation and wage. Data on labor force participation is collected from ILO stat database, but comprehensive gender wage data for all the emerging countries is difficult to accumulate. Aggregate gender wage inequality has been calculated based on data collected from the ilostat database to ensure consistency of the data set. It is not possible to calculate sector wise wage inequality due to lack of sector wise wage data. However, for a substantial number of emerging countries, no consistent wage data is available more specifically wage data by sex. The gender-based wage data is available for 25 emerging economies for the period of 1994-2015 whereas labor force participation data is collected for almost all countries for the period of 1994-2015.[2]

Product-wise classified trade data has been collected from UN Comtrade database according to SITC- 4. The trade data are further classified into labor-intensive manufacturing; capital-intensive manufacturing; and agriculture sectors according to definition and characteristics. The data on service trade are collected from WTO trade database. Technology deepening and upgrading index value developed by UNIDO is used as a proxy to the technological advancement of the country, and this data is collected from INDSTATS of UNIDO. The data on female secondary school enrollment rate; total labor force; and GDP growth are collected from World Bank Development Indicators.[3]

5. Model Specification

The panel dataset of the study consists of 39 countries for labor force participation inequality and 25 countries for wage inequality out of 45 emerging countries due to unavailability of data, and the data covers the period of 1994-2015. As the period covered in data sets is 22 years GMM approach cannot be used because the number of instruments of the GMM approach will be overidentified due to a large

[2] Country samples are mentioned in Appendix A

[3] The definition of the variables with their data sources is given in Appendix C

time period. Hausman specification test has been applied to identify whether random effect or fixed effect model is appropriate. The test result has a p-value of 0.000 which infers that fixed effect model is suitable for the datasets. We apply Durbin-Wu-Hausman (DWH) approach to test the endogeneity of the variables. The results of the test show that there is no endogeneity problem among the independent variables. The basic regression model of the study is as follows:

$$y_{it} = \beta_0 + \beta_1 \text{ Compo} + \beta_2 \text{ Technology} + \beta_3 \text{logTLF} + \beta_4 \log \text{FSSER} + \beta_5 \text{GDP Growth} + \varepsilon_{it} \quad (1)$$

Here, Comp represents two composition variables such as Compo-expratio and Compo-rca defined before. Compo-expratio defines the shares of labor-intensive manufacturing/capital intensive manufacturing/ agriculture/service export to total export, and Compo-rca indicates the comparative advantage of four broad sectors such as labor intensive manufacturing, capital-intensive manufacturing, agriculture, and service. Technology, TLF, FSSER indicate technological advancement index value, total labor force, and female secondary school enrollment rate respectively. ε_{it} indicates the error term.

6. Regression Report and Analysis

Although the purpose of the study is to identify the effect of sectoral trade composition on female labor market we report the regression analysis for male labor force participation rate along with female labor force participation rate and labor force participation inequality for side by side comparison.

Table 1: Labor-intensive Manufacturing (LIM) export and Labor Force Participation (LFP) inequality (Fixed Effects Regression Results)

	Dependent Variables					
Independent Variables	**Female LFP (1)**	**LFP Inequality (2)**	**Male LFP (3)**	**Female LFP (4)**	**LFP Inequality (5)**	**Male LFP (6)**
LIM-expratio	-.02321	-.08475	.03541			
	(.02596)	(.02681)***	(.00971)***			
LIM-rca				-.00266	-.00096	-.00028
				(.00054)***	(.00057)*	(.00021)
Technology	-.13655	-.19782	-.00755	-.13451	-.18714	-.01273
	(.02493)***	(.02575)***	(.00933)	(.02404)***	(.02532)***	(.00932)
Total Labor Force	.32789	.31611	.02275	.33118	.32225	.02181
	(.01504)***	(.01553)***	(.00563)***	(.01497)***	(.01577)***	(.00580)***
Female Secondary School	-.00819	.03782	-.06280	-.00477	.05722	-.07017
Enrollment Rate	(.01756)	(.01814)**	(.00657)***	(.01655)	(.01743)***	(.00641)***
GDP Growth	-.00031	-.00012	-.0002	-.00026	-.00012	-.00019
	(.00025)	(.00026)	(.00009)**	(.00025)	(.00026)	(.00009)**
Constant	-.60783	-1.5984	1.8318	-.63902	-1.6952	1.8602
	(.09800)***	(.10122)***	(.03668)***	(.09584)***	(.10094)***	(.03714)***
R-squared	0.4371	0.4432	0.1778	0.4432	0.4471	0.1626
No. of Observations	756	756	756	753	753	753
No. of Groups	39	39	39	39	39	39
F-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: The table presents the results for the estimated coefficients and their standard errors in parenthesis. R-squared, Number of observations, No. of Groups, p- value are also reported. *, **, and *** denote statistically significant coefficient at the 10%, 5% and 1% levels, respectively. expratio and rca denote export ratio and revealed comparative advantage of Labor-intensive Manufacturing (LIM) sector respectively.

The regression results summarized in table 1 show that higher ratio of labor-intensive manufacturing export to total export reduces the female labor force participation rate but increases male labor force participation rate significantly and consequently increases the labor force participation inequality between male and female. The results also suggest that higher comparative advantage in labor-intensive manufacturing sector reduces the participation of female more than that of the male in labor force which subsequently increases gender inequality in labor force participation. According to the regression result, higher technological development reduces both female and male labor force participation rate significantly, but its impact is low on male labor force participation. Thus, the higher

technological advancement increases the labor force participation gap significantly. However, growing labor force and female secondary school enrollment rate reduce the labor force participation gap whereas higher GDP growth increases the gender gap in labor force participation.

Table 2: Capital-intensive Manufacturing (CIM) export and Labor Force Participation (LFP) inequality (Fixed Effects Regression Results)

	Dependent Variables					
Independent Variables	**Female LFP (1)**	**LFP Inequality (2)**	**Male LFP (3)**	**Female LFP (4)**	**LFP Inequality (5)**	**Male LFP (6)**
CIM-expratio	.03892	.08079	.00138			
	(.01314)***	(.013410***	(.00499)			
CIM-rca				.00188	.00668	.00015
				(.00369)	(.00383)*	(.00141)
Technology	-.14670	-.21334	-.01342	-.13685	-.19095	-.01296
	(.02491)***	(.02541)***	(.00946)	(.02451)***	(.02538)***	(.00935)
Total Labor Force	.32211	.30476	.02192	.33407	.32161	.02214
	(.01509)***	(.01539)***	(.00573)***	(.01524)***	(.01578)***	(.00581)***
Female Secondary School	-.01752	.02563	-.07023	-.00111	.057485	-.06977
Enrollment Rate	(.01736)	(.01771)	(.00659)***	(.01681)	(.01742)***	(.00642)***
GDP Growth	-.00037	-.00024	-.00019	-.00033	-.00012	-.00019
	(.00025)	(.00026)	(.00009)**	(.00025)	(.00026)	(.00009)**
Constant	-.56595	-1.537672	1.8592	-.67123	-1.6978	1.8567
	(.09771)***	(.09968)***	(.03711)***	(.09732)***	(.10081)***	(.03715)***
R-squared	0.4433	0.4628	0.1626	0.4443	0.4472	0.1605
No. of Observations	756	756	756	753	753	753
No. of Groups	39	39	39	39	39	39
F-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: The table presents the results for the estimated coefficients and their standard errors in parenthesis. R-squared, Number of observations, No. of Groups, p- value are also reported. *, **, and *** denote statistically significant coefficient at the 10%, 5% and 1% levels, respectively. expratio and rca denote export ratio and revealed comparative advantage of Capital-intensive Manufacturing (CIM) sector respectively.

The results of table 2 suggest that higher export of capital-intensive manufacturing products, as well as a higher comparative advantage in the capital -intensive manufacturing sector, increases labor force participation of both female and male but its impact is greater on the female labor force participation rate. So, higher export in the capital-intensive manufacturing sector, as well as a higher comparative advantage in capital-intensive sectors, reduces the labor force participation gap between male and female. As expected, technology has a higher effect on reducing female labor force participation rate and thus raises gender inequality in labor force participation. As before, increasing labor force and higher human capital accumulation of female minimize the gap between male and female in labor force participation whereas higher economic growth increases the gap.

Table 3: Agriculture Export and Labor Force Participation (LFP) inequality (Fixed Effects Regression Results)

	Dependent Variables					
Independent Variables	**Female LFP (1)**	**LFP Inequality (2)**	**Male LFP (3)**	**Female LFP (4)**	**LFP Inequality (5)**	**Male LFP (6)**
Agri-expratio	-.00943	-.07687	.01536			
	(.01786)	(.01834)***	(.00672)**			
Agri-rca				.00034	-.00001	.00015
				(.00062)	(.00064)	(.00023)
Technology	-.13350	-.18889	-.01215	-.13546	-.18767	-.01268
	(.02464)***	(.02531)***	(.00927)	(.02445)***	(.02538)***	(.00933)
Total Labor Force	.32761	.31202	.02325	.33437	.32349	.02208
	(.01509)***	(.01550)***	(.00568)***	(.01521)***	(.01579)***	(.0058)***
Female Secondary	-.00414	.05031	-.06891	-.00013	.05864	-.06945
School Enrollment Rate	(.01684)	(.01730)***	(.00633)***	(.01685)	(.01749)***	(.00643)***
GDP Growth	-.00034	-.00023	-.00017	-.00033	-.00015	-.00019

Independent Variables	Dependent Variables					
	Female LFP (1)	**LFP Inequality (2)**	**Male LFP (3)**	**Female LFP (4)**	**LFP Inequality (5)**	**Male LFP (6)**
	(.00025)	(.00026)	(.00009)*	(.00025)	(.00026)	(.00010)**
Constant	-.61749	-1.6024	1.8458	-.67446	-1.70794	1.8563
	(.09716)***	(.09978)***	(.03655)***	(.09716)***	(.10086)***	(.03708)***
R-squared	0.4367	0.4490	0.1686	0.4444	0.4449	0.1610
No. of Observations	756	756	756	753	753	753
No. of Groups	39	39	39	39	39	39
F-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: The table presents the results for the estimated coefficients and their standard errors in parenthesis. R-squared, Number of observations, No. of Groups, p- value are also reported. *, **, and *** denote statistically significant coefficient at the 10%, 5% and 1% levels, respectively. expratio and rca denote export ratio and revealed comparative advantage of Agriculture sector respectively.

Higher agricultural export reduces female labor force participation whereas its effect is positive on male labor force participation and thus increases the gender inequality in labor force participation. However, the comparative advantage of the agricultural sector does not highly affect gender inequality in labor force participation. Technological upgrading significantly raises gender inequality in labor force participation since technology reduces the participation of female more than that of the male in labor force. The result also supports the view that higher female human capital accumulation reduces the gap between female and male in the labor force participation. However, the female labor force participation rate significantly increases compared to the labor force participation rate of the male with the growth of total labor force, and thus gender inequality in labor force participation decreases. Higher economic growth increases gender inequality.

Table 4: Service Export and Labor Force Participation (LFP) inequality (Fixed Effects Regression Results)

Independent Variables	Dependent Variables					
	Female LFP (1)	**LFP Inequality (2)**	**Male LFP (3)**	**Female LFP (4)**	**LFP Inequality (5)**	**Male LFP (6)**
Service-expratio	-.03701	-.03553	-.02691			
	(.01759)**	(.01841)**	(.00672)***			
Service-rca				-.01587	-.01745	-.00563
				(.00412)***	(.00441)***	(.00158)***
Technology	-.14801	-.21467	-.01566	-.13488	-.19345	-.01005
	(.02589)***	(.02710)***	(.00989)	(.02501)***	(.02673)***	(.00958)
Total Labor Force	.37679	.35524	.02157	.37651	.35789	.02425
	(.01734)***	(.01814)***	(.00662)***	(.01675)***	(.01791)***	(.00642)***
Female Secondary School	-.02920	.03541	-.07344	-.02893	.03471	-.07369
Enrollment Rate	(.01707)*	(.01786)**	(.00651)***	(.01668)*	(.01783)**	(.00639)***
GDP Growth	-.00037	-.00017	-.00022	-.00013	.00034	-.00029
	(.00026)	(.00027)	(.0001)**	(.00024)	(.00025)	(.00009)***
Constant	-.90737	-1.8678	1.87489	-.90898	-1.8915	1.8516
	(.11255)***	(.11778)***	(.04297)***	(.10636)***	(.11369)***	(.04075)***
R-squared	0.4540	0.4424	0.1813	0.4495	0.4320	0.1929
No. of Observations	737	737	737	765	765	765
No. of Groups	38	38	38	38	38	38
F-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: The table presents the results for the estimated coefficients and their standard errors in parenthesis. R-squared, Number of observations, No. of Groups, p- value are also reported. *, **, and *** denote statistically significant coefficient at the 10%, 5% and 1% levels, respectively. expratio and rca denote export ratio and revealed comparative advantage of service sector respectively.

In the case of the service sector, higher service export relative to total export as well as a higher comparative advantage in service sector increases gender inequality in labor force since they reduce female participation in labor participation more than male participation. Technological advancement exerts a higher adverse impact on female labor force participation than that on male labor force participation and consequently raises gender inequality in labor force significantly.

The following tables report the regression results the effect of different sector's export on gender wage inequality in emerging economies. Here, a higher value of wage inequality variable indicates higher gender wage inequality.

Table 5: Labor-intensive Manufacturing (LIM) export, Capital-intensive Manufacturing (CIM) export and Gender Wage Inequality (Fixed Effects Regression Results)

	Dependent Variables			**Dependent Variables**	
	Wage Inequality	**Wage Inequality**		**Wage Inequality**	**Wage Inequality**
LIM-expratio	.22109 (.12415)*		CIM-expratio	.06698 (.05716)	
LIM-rca		.00608 (.00290)**	CIM-rca		.07856 9.02101)***
Technology	-.41835 (.08963)***	-.44832 (.08635)***	Technology	-.48086 (.08976)***	-.44405 9.085390***
Total Labor Force	-.30074 (.05265)***	-.33849 (.05315)***	Total Labor Force	-.32359 (.05340)***	-.35588 (.05258)***
Female Secondary School Enrollment Rate	.20842 (.07281)***	.21223 (.07078)***	Female Secondary School Enrollment Rate	.14309 (.07558)**	.13575 9.070260**
GDP Growth	.00123 (.00085)	.00118 (.00084)	GDP Growth	.00122 (.00085)	.00155 (.000830*
Constant	1.9973 (.35928)***	2.2895 (.35068)***	Constant	2.31234 (.36058)***	2.49545 (.34474)***
R-squared	0.1459	0.1593	R-squared	0.1425	0.1769
No. of Observations	477	476	No. of Observations	477	476
No. of Groups	25	25	No. of Groups	25	25
F-value	0.0000	0.0000	F-value	0.0000	0.0000

Note: The table presents the results for the estimated coefficients and their standard errors in parenthesis. R-squared, Number of observations, No. of Groups, p- value are also reported. *, **, and *** denote statistically significant coefficient at the 10%, 5% and 1% levels, respectively. expratio and rca denote export ratio and revealed comparative advantage respectively.

The regression results of table 5 show that higher export ratio and higher comparative advantage in labor intensive sector increases gender wage gap significantly whereas a higher level of technological advancement significantly reduces gender pay gap. This result supports the theoretical implication that technological progress demands skilled labor within industries which subsequently reduces gender wage gap in these sectors. On the other hand, labor-intensive sectors use cheap labor to have a comparative advantage in the international market. As female labor force constitutes a major portion of unskilled and cheap labor in the emerging economies growing export in labor-intensive sector increases the gender wage gap. However, the results also suggest that wage inequality decreases with increasing labor force whereas female secondary school enrollment rate increases wage inequality significantly. Economic growth has little as well as the insignificant effect on gender wage gap. For the case of the capital intensive sector, high export and comparative advantage increase gender inequality in wage.

Table 6: Agriculture export, Service export, and Gender Wage Inequality (Fixed Effects Regression Results)

	Dependent Variables			**Dependent Variables**	
	Wage Inequality	**Wage Inequality**		**Wage Inequality**	**Wage Inequality**
Agri-expratio	-.53168 (.14419)***		Service-expratio	-.15728 (.05850)***	
Agri-rca		-.00308 (.00443)	Service-rca		-.05694 (.01273)***
Technology	-.47108 (.08618)***	-.44086 9.08671)***	Technology	-.60777 (.08936)***	-.52674 (.08462)***
Total Labor Force	-.33461	-.34015	Total Labor Force	-.71940	-.67664

	Dependent Variables			Dependent Variables	
	Wage Inequality	**Wage Inequality**		**Wage Inequality**	**Wage Inequality**
	(.05208)***	(.053770***		(.062677)***	(.05911)***
Female Secondary School Enrollment Rate	.12944 (.07064)*	.17944 9.07067)**	Female Secondary School Enrollment Rate	.29948 (.06723)***	.30575 (.06473)***
GDP Growth	.00083 (.00085)	.00127 (.00084)	GDP Growth	.00094 (.00081)	.00094 (.00078)
Constant	2.50074 (.35002)***	2.3752 (.34959)***	Constant	4.9177 (.42105)***	4.57804 (.38031)***
R-squared	0.1653	0.1520	R-squared	0.2925	0.3197
No. of Observations	477	476	No. of Observations	458	472
No. of Groups	25	25	No. of Groups	25	24
F-value	0.0000	0.0000	F-value	0.0000	0.0000

Note: The table presents the results for the estimated coefficients and their standard errors in parenthesis. R-squared, Number of observations, No. of Groups, p- value are also reported. *, **, and *** denote statistically significant coefficient at the 10%, 5% and 1% levels, respectively. expratio and rca denote export ratio and revealed comparative advantage respectively.

However, increasing agricultural export and comparative advantage in agricultural sector reduce gender wage gap in the emerging economies. As per the regression report increasing export and comparative advantage of service sector also significantly reduces gender wage inequality in the labor market.

The analysis of the effect of sectoral trade composition on gender wage gap would be more robust if sector wise wage data by sex could be available. Moreover, the analysis of regression model on sectoral trade and gender wage inequality consists of 25 countries out of 39 emerging economies due to unavailability of gender-based wage data.

7. Concluding Remarks and Policy Implications

This study addresses two significant issues in analyzing the effect of trade on the female labor market. Firstly, as sectoral trade composition and employment structure of both male and female significantly differ across sectors export of different sectors should have a differential effect on female labor force participation and wage. Secondly, technological change shifts the demand for skilled and unskilled labor which consequently affects employment and wage dynamics. This study aims at identifying the effect of trade composition on gender inequality in labor force participation and wage in the emerging economies. It considers emerging economies as research focus due to their significance in the world economy, high level of economic openness and significant contribution in the world trade. They are also in a transitional phase in economic development. Two trade composition variables namely compo-expratio and compo-rca were introduced to identify the effect of trade of sectors on gender inequality in the labor market. Compo-expratio measures the share of export of specific sector in total export and compo-rca measures the comparative advantage of the specific sector in international trade. The export and import of a country were divided into four broad sectors namely labor-intensive manufacturing, capital-intensive manufacturing, agriculture, and service. The study identifies the effect of growing export and comparative advantage in these sectors on the female labor market, more specifically gender inequality in labor force participation and wage.

The results of the regression suggest that higher export of capital-intensive manufacturing sectors increase female labor force participation rate and thus reduces gender inequality in labor force participation, whereas growing export and comparative advantage of all other three sectors namely labor-intensive manufacturing, agriculture, and service reduce female labor force participation rate and subsequently increase labor force participation gap between male and female. The effect of technological advancement on both male and female labor force participation is significantly negative, but its effect is larger on female labor force participation compared to male labor force participation

which infers that higher technological progress significantly increases the gap between male and female in labor force participation. Both growing labor force and female secondary school enrollment rate reduce labor force participation inequality whereas GDP growth is positively related to labor force participation inequality.

In the case of gender wage gap, increasing export and higher comparative advantage in labor-intensive and capital-intensive sectors significantly increase gender-based wage inequality in the labor market whereas export of agricultural and service sectors reduces the gender gap in wage. Higher technological progress greatly reduces gender wage gap as technological change demand for skilled labor and thus reduces the gender-based gap in remuneration. Increasing labor force significantly reduces gender pay gap whereas female secondary school enrolment enhances the difference in wage between male and female. Economic growth exerts little effect on gender wage gap in the labor market.

The study has significant policy implications. The study results suggest that female labor force participation is increasing in capital-intensive manufacturing sector rather than labor-intensive manufacturing sectors and gender inequality in labor force participation is decreasing in the capital-intensive manufacturing sector. This result contradicts with the generalized assumption that female are usually employed in the labor-intensive sector due to a lower wage. The wage inequality in both labor-intensive and capital- intensive sectors is increasing whereas it shows a decreasing trend for agriculture and service industries. According to the study result, the factor that significantly affects gender inequality in labor force participation and wage is technology. Technological advancement significantly reduces female labor force participation and thus increases labor force participation inequality between male and female. On the contrary, technology greatly reduces gender wage gap in all sectors. So, female labor force should be well trained to cope with technological change which can reduce labor force participation inequality and the wage gap between male and female. Moreover, higher human capital accumulation of female also plays a major role in reducing the gender gap in the labor market.

This study has several drawbacks. Due to unavailability of the consistent dataset, we could not measure gender inequality in labor force participation rate for different sectors. For a substantial number of emerging countries comprises gender-based wage data is not available and we could not determine sector-wise gender pay gap for lack of data. Moreover, it is also difficult to exactly differentiate between labor intensive and capital intensive products. We use the generalized rule to distinguish between labor intensive and capital intensive sectors following previous studies. The availability of consistent data on labor force participation and wage as well as trade composition will open the door for more comprehensive research in this field.

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Appendices

Appendix A: List of Country Samples

EAGLEs:
Brazil, China, India, Indonesia, Mexico, Russia, Turkey

NEST:
Argentina,Bangladesh, Chile, Colombia, Egypt, *Iran, Iraq*, Kazakhstan, Malaysia,Nigeria, Pakistan, Peru, Philippines, Poland, Qatar, Saudi Arabia, *South Africa*, Thailand, Vietnam

Other emerging markets:
Bahrain, Bulgaria, *CzechRepublic*,Estonia, Hungary, Jordan, Kuwait, Latvia, Lithuania, Mauritius, Oman, Romania, Slovakia, Sri Lanka, *Sudan,* Tunisia, *United Arab Emirates*, Ukraine, Venezuela

Note: The countries in italics are excluded from regression analysis of labor force participation inequality and wage inequality due to unavailability of trade data. The countries underlined are excluded from regression analysis wage inequality due to unavailability of gender based wage data. The list of emerging economies and their classification was given as per BBVA Research list as of March 2014. Source: Wikipedia access date November 22, 2016

Appendix B: Sectoral composition of trade as per SITC rev. 4

Labour-Intensive Manufacturing products with their SITC number as per SITC rev. 4

61. Leather, leather manufactures, n.e.s., and dressed furskins	62. Rubber manufactures, n.e.s.
63. Cork and wood manufactures (excluding furniture)	64. Paper, paperboard and articles of paper pulp, of paper or of paperboard
65. Textile yarn, fabrics, made-up articles, n.e.s., and related products	66. Non-metallic mineral manufactures, n.e.s.
69. Manufactures of metals, n.e.s.	81. Prefabricated buildings; sanitary, plumbing, heating and lighting fixtures and fittings, n.e.s.
82. Furniture and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings	83. Travel goods, handbags and similar containers
84. Articles of apparel and clothing accessories	85. Footwear
88. Photographic apparatus, equipment and supplies and optical goods, n.e.s.; watches and clocks	89. Miscellaneous manufactured articles, n.e.s. (excluding 891 Arms and ammunition)

Capital Intensive Manufacturing products with their SITC number as per SITC rev. 4

3. Mineral fuels, lubricants and related materials	32. Coal, coke and briquettes
33. Petroleum, petroleum products and related materials	34. Gas, natural and manufactured
35. Electric current	51. Organic chemicals
52. Inorganic chemicals	53. Dyeing, tanning and colouring materials
54. Medicinal and pharmaceutical products	55. Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations
56. Fertilizers (other than those of group 272)	57. Plastics in primary forms
58. Plastics in non-primary forms	59. Chemical materials and products, n.e.s.
71. Power-generating machinery and equipment	72. Machinery specialized for particular industries
73. Metalworking machinery	74. General industrial machinery and equipment,

	n.e.s., and machine parts, n.e.s.
75. Office machines and automatic data-processing machines	76. Telecommunications and sound-recording and reproducing apparatus and equipment
77. Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)	78. Road vehicles (including air-cushion vehicles)
79. Other transport equipment	67. Non-ferrous metals
68. Iron and steel	87. Professional, scientific and controlling instruments and apparatus, n.e.s.
891. Arms and ammunition	27. Crude fertilizers, other than those of Division 56, and crude minerals (excluding coal, petroleum and precious stones)
28. Metalliferous ores and metal scrap	

Agriculture: products with their SITC number as per SITC rev. 4
0. Food and live animals
1. Beverages and tobacco
2. Crude materials, inedible, except fuels (excluding 27 and 28)
4. Animal and vegetable oils, fats and waxes

Note: the classification of agricultural products was based on technical notes of WTO trade database. And the labor-intensive and capital-intensive products were classified with reference to WTO trade database , Lary (1968), Tyers et al. (1987), (Lall (2000)).

Appendix C: The definition of the variables with their data sources

Variables	**Definition**	**Data Source**
Labor-inequality	Female divided by male labor force participation rate, ages 15-64	World Bank (2017)
Wage-inequality	Gender wage gap (1 minus (female divided by male wage rate))	ILO(ilostat database)
Comp-expratio	Share of labor-intensive manufacturing/ capital-intensive manufacturing/ agriculture/ service export in total export	UN Comtrade database
Compo- rca	comparative advantage in labor-intensive manufacturing/capital-intensive manufacturing/ agriculture/ service sector	UN Comtrade database (2017)
Technology	Technological deepening and upgrading index value developed by UNIDO	UNIDO (2017)
Female Secondary School Enrollment Rate	Percentage of females enrolled in secondary level	World Bank (2017)
Total Labor Force	Labor force comprises people ages 15 and older who supply labor for the production of goods and services during a specified period	World Bank (2017)
GDP growth	Annual percentage growth rate of GDP at market prices	World Bank (2017)