BUFT Journal of Business & Economics (BJBE)
ISSN 2664-9942 (Print)
2021 Volume 2, Pg:97-114

Technology-intensive Trade and Gender Inequality-Emerging Country Perspective

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ARTICLE INFO

Article History:
Received: 22nd December 2020
Accepted: 13th April 2021

Keywords:
Technology Intensity
Gender Inequality
Labor Force Participation
Gender Wage Gap
Emerging Economies.

JEL Classification:
O50,
F63,
F14

ABSTRACT

Purpose: This study examines how technology intensity in international trade affects gender inequality in labor force participation and wage in emerging economies.
Methodology: The study decomposes the export and import into four sectors as High tech (HT), Medium tech (MT), low tech (LT), and primary products (PP) based on technology intensity. It then examines the long-run and short-run relationship using panel ARDL method and direction of casualty between the trade of these sectors and gender inequality in labor market using vector error correction model (VECM) based Granger causality test.
Findings: The analysis results suggest that export and import in any sectors classified based on technology intensity such as high tech, low tech, medium-tech, and PP reduces gender inequality in labor force participation and wage. The results also suggest significant long-run bidirectional causality between TC and FLFPR and LFP inequality except for very few cases. On the other hand, trade-in any sector causes gender wage inequality in the short-run only, whereas, in the long run, gender wage inequality results in trade in different sectors.
Limitations: The study has some limitations. Firstly, the unavailability of trade data for several emerging countries makes the analysis a little bit weak. Secondly, the female labor force participation data is not also totally structured. Thirdly, there is a considerable lack of structured and consistent gender wage gap data that makes the analysis questionable. Finally, the availability of consistent data in all aspects will make the study more reliable and robust.
Practical Implication: This study will open a new window in the trade-gender inequality research field and help formulate policies in this field to use trade as an instrument to reduce gender inequality.
Originality: This study analyses trade and gender inequality in labor force participation linkage from a different perspective. The study identifies the effects of trade classified based on technology intensity on female labor force participation and wage, which is a unique approach in this research field of trade-gender nexus.

1. Introduction

Women are one-half of the world's population, so achieving sustainable development and proper use of this human resource has a vast relation to how competitive a country may become. And in this case, international trade can play a vital role in ensuring equal access of women to economic participation, health, education, and political decision-making. Thus this analysis helps to find out whether trade can reduce gender inequality in different aspects.

With the expansion of international trade worldwide, technology becomes a powerful instrument to run the business globally very fast, effectively, and efficiently. As a result, it dramatically impacts human society in both developed and developing countries. Due to technological changes, there is also obvious change in the lifestyle of

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people; conducting business operation; production process; employment practices; compensation dynamics; communication system; information system; and also in other aspects of human society. As a result, it can be asked that if a sector introduces new technology, then in case of employment practices which is going to lose either male worker or female worker through the employment dynamics and wage dynamics. There is also a crucial issue in trade and gender inequality nexus research. Thus this study aims to find out how technology intensity in international trade affects gender inequality in different aspects. It decomposes the export and import into four sectors as High tech (HT), Medium tech (MT), low tech (LT), and primary products (PP) based on technology intensity. It then examines the long-run and short-run relationship and direction of casualty between these sectors' trade and gender inequality in different aspects.

International trade theory suggests that free trade benefits extensively used the factor of production because of the growing demand for abundant factor and increase of the relative price of the goods produced using abundant factor. In the low-cost labor-intensive countries, women consist of a significant slice of the unskilled labor force. So, the labor-intensive emerging countries will abundantly use the unskilled labor force in producing exported goods, which will benefit the unskilled or semi-skilled female labor force in these countries. In contrast, the benefits of skilled labor will be higher in industrialized nations.

Moreover, discrimination theory indicates that racist actions can occur in less efficient contexts. Growing exchange enhances competitiveness in the sector, diminishing the right of companies to differentiate amongst genders. However, a variety of studies have shown that the increasing advantage of decreasing gender disparity in the labor sector would not contribute to expanded trade transparency, for example (Anyanwu, 2016; Gunseli Berik, 2010; Buchmann, Kriesi, & Sacchi, 2010; Chen, Ge, Lai, & Wan, 2013; Dominguezvillalobos & Browngrossman, 2010; Meyer, 2003; Oostendorp, 2009; Saure & Zoabi, 2014; Zhang & Dong, 2007).

Innovations require computerized manufacturing systems which lower the requirement for physical expertise. As a consequence, women's relative wages and jobs enhance blue-collar activities, but not white-collar jobs. (Juhn, Ujhelyi, & Villegas-Sanchez, 2014).Kis-Katos, Pieters, and Sparrow (2018) found thatin regions where import tariff cuts were more prevalent, female workforce participation increased while participation in domestic duties decreased.In a recent study, Besedeš, Lee, and Yang (2021) claimed that gender disparities in local labor markets in the United States have narrowed as a result of trade liberalization with China. Higher entry of women, especially more educated women, and lower exit of less-educated men accounted for the narrowing of the gender labor force participation gap.Brussevich (2018) found that male jobs and salaries are negatively affected by an import competition shock in the automotive sector. Since production is dominated by men and men experience higher exit costs, income and welfare benefits from trading are greater for women than men.

This study has several novelties that considerably differ it from other researches in the related field and compel to recognize its significant contribution in the field of trade-gender inequality nexus research. This study looks at the trade and gender inequality nexus from a different point of view. The study classifies trade in various sectors based on their technology intensity. It also identifies whether the trade of different sectors has differential effects on gender inequality in labor force participation and wage. Identifying the effects of technology intensity in trade on gender inequality in different aspects is a new dimension in this area of research. And to do this the study decomposes the export and import of a country into four sectors such as high tech; medium-tech; low tech; and primary products based on technology intensity and identifies the differential effects of each of these sectors on gender inequality in different aspects. This issue entirely was not addressed by the previous studies in the related field. This analysis has originality in the sense that the panel data set of the sample of the study consists of emerging economies considered from the list of emerging economies. It groups the countries on specific economic characteristics such as economic growth, trade openness. Moreover, there is no such study till now which has been conducted based on such robust classification of emerging economies in this area. This study also has novelties regarding the application of the econometric methodology. The previous studies applied dynamic panel data and time-series data model whereas this study applied panel ARDL model developed by Pearson (1999) to identify the short-run and long-run relationship as well as unrestricted vector error correction model (UVECM) that was not used by any of the previous studies.

2. Literature Review

Globalization is often expected to give certain benefits while leaving others as losers and women suffering the cost of trade liberalization directly by work shortages or lower-paid work (Bussmann, 2009). Although most economic theories do not study globalization's effect through a gender lens on welfare and economic growth, conventional trade theories generally say that economic inclusion benefits women in developing countries because of their key expertise in unskilled labor. Many research endorses trade openings' beneficial effect on economic growth (Klasen, 2002; Sachs, Warner, Aslund, & Fischer, 1995). Free exchange of merchandise, commodities, and capital enables countries to specialize in exporting goods and services at a reduced cost where they have a market advantage and import those goods that other countries can effectively manufacture. Trade liberalization opens a broad market and encourages products and services output at lower average prices due to consolidation and economies of scale resulting in higher quality and competitiveness, higher national results, and higher real income. Trade transparency also brings new technologies to developing markets, encouraging consumers to import goods and services at cheaper costs. However, in this situation, the issue is whether anyone in society, particularly women, will profit from economic growth resulting from increased trade. Many analysts say that rising national growth rates seldom raise poor incomes (Dollar & Kraay, 2002; Kraay, 2006) in comparison to other research (Amann, Aslanidis, Nixson, & Walters, 2006; Lubker, Smith, & Weeks, 2002; Dollar & Kraay, 2002; Kraay, 2006) whereas other studies identified contrasting results (Amann, Aslanidis, Nixson, & Walters, 2006; Lubker, Smith, & Weeks, 2002).

The effect of technological innovation is evident in both work and pay patterns (Hamermesh, 1996; Petit & Vivarelli, 1997). Technological development in a country or market stimulates the need for skilled labor, which alters wage dynamics and widens the wage difference between unskilled and skilled workers (Allen, 2001; Berman, Bound, & Griliches, 1994; John & George, 1992; Juhn, Murphy, & Pierce, 1993; Katz & Murphy, 1992; Levy & Murnane, 1996). Since a substantial proportion of the female workforce in developing countries is unskilled, technical advancement will reduce participation and wages, thus increasing the gender gap in workforce participation and pay.

Trade liberalization results in a technological change in a country in two ways, such as through creating incentives for the firms in adopting advanced technologies (Thoenig & Verdier, 2003; Wood, 1995) or through importing technologies from the developed countries that have advanced technologies (Acemoglu, 2003). However, some studies argued that the effects of this technology-based capital investment on the labor market are subject to their characteristics. If this technological advancement is complementary to female labor, it will increase female participation in the labor market and consequently reduce gender inequality in the labor market (Galor & Weil, 1996; Sauré & Zoabi, 2009). On the other hand, if this technological change is complementary to male labor, such as it requires a high educational background of high skill, it will bring the women in a disadvantageous position in the labor market due to their low education and skill (Günseli Berik, 2000).

According to Juhn, Ujhelyi, and Villegas-Sanchez (2013), reducing tariffs leads more profitable enterprises to modernize technology and access the export sector. Innovations require computerized manufacturing systems which lower the requirement for physical expertise. As a consequence, women's relative wages and jobs enhance blue-collar activities, but not white-collar jobs (Juhn et al., 2014). Busse and Spielmann (2006) argued that gender wage disparity is linked to the competitive advantage of labor-intensive commodities, meaning that countries with a greater wage difference export more of these goods. Kis-Katos et al. (2018) found that in regions where import tariff cuts were more prevalent, female workforce participation increased while participation in domestic duties decreased. In a recent study, Besedeš et al. (2021) claimed that gender disparities in local labor markets in the United States have narrowed as a result of trade liberalization with China. Higher entry of women, especially more educated women, and lower exit of less-educated men accounted for the narrowing of the gender labor force participation gap. According to, Benguria and Ederington (2017), the wage inequality was better reflected by disparities in female and male workforce' occupational jobs, with trade raising the female share of the workforce in higher-paying professions while also boosting the (relative) returns to predominantly female jobs. Pieters (2015) argued that in developed countries, there is no proof that trade-induced technical transition decreases gender disparities. male The dilution of capital per worker will affect females more than males if capital-intensive exporters recruit jobs from labor-intensive industries. According to Fatema, Li, and Islam (2018), trade openness and gender pay gap are highly correlated, and there is unidirectional causality from trade openness to the gender wage gap in both the short and long term, implying that trade openness substantially increases wage disparity between men and women in developing countries. Brussevich (2018) found that male jobs and salaries are negatively affected by an import competition shock in the automotive sector. Since production is dominated by men and men experience higher exit costs, income and welfare benefits from trading are greater for women than men. This study looks at the trade and gender inequality nexus from a different point of view. The study classifies trade in various sectors based on their technology intensity. It also identifies whether the trade of different sectors has differential effects on gender inequality in labor force participation and wage.

3. Data and Methodology

3.1 Data Description and Sources

This study measures gender inequality in labor force participation and wage on the disaggregated basis as follows:

$$\text{Labor-inequality} = \frac{\text{Female labor force participation rate (\% female ages between 15-64)}}{\text{male labor force participation rate (\% male ages between 15-64)}} \quad (1)$$

$$\text{Wage-inequality} = 1- \frac{\text{ÁAverage wage of the female}}{\text{average wage of male}} \quad (2)$$

Note that the higher the value of labor inequality the lower the gender inequality in labor force participation and vice versa for the gender wage gap which is described in the ILO stat database. Considering the difficulties of technology-based product classification, the study adopts the product classification based on technology intensity proposed by Lall (2000) and implemented by UNIDO (2014) as it incorporates both methods to categorize products according to technology intensity by Pavitt (1984) and Hatzichronoglou (1996). Lall's product categorization system considers developed countries' export strength and manufactures manufacturing technology rankings for product clusters. He divided the commodity into four categories based on manufacturing process technology such as high technology, medium technology, low technology, and primary products.

The study collects labor force participation data from the World Bank database and aggregates gender wage inequality data from the lost database. Due to the unavailability of consistent gender wage gap data for some emerging countries, the study analyzes 16 emerging economies for gender wage data. The statistical analysis covers the period of 1994-2015. The study collects the classified trade data from the UNcomtrade database.

This analysis divided the country samples into two groups. Group 1 includes high-growth emerging countries called EAGLE, and group 2 includes medium and low growth emerging countries called NEST and other emerging countries. The most crucial channel through which trade affects the economy is economic growth. So, separating countries based on their economic growth will provide a more in-depth analysis. However, for a substantial number of countries data on the gender wage gap is not available. So, the country sample for the gender wage gap was not grouped. So this chapter considers 39 emerging countries for labor force participation inequality and 16 countries for gender wage inequality due to unavailability of data for 1994-2015. The data for labor force participation is assembled from the World Bank database, and the data source of the gender wage gap is the ILO database.

3.2 Econometric Methodology

To examine the long-run and short-run relationship as well as casualty between trade composition and gender inequality in female labor force participation and wage the study employed the Panel ARDL approach developed by Pesaran, Shin, and Smith (2001). The standard framework to apply ARDL model panel data is a two-step process. Firstly, the study needs to investigate whether there exists any long-run relationship between the variables. Secondly, the study has to examine the direction and magnitude of the relationship as well as the direction of casualty between the variables. To identify the order of cointegration of the variables, the study applied several panel unit root tests to make sure that whether the variables are stationary at the level (O) or first difference I (1). If any variable is stationary at I (2), the studycannot apply the ARDL model. To avoid the loss of power of different unit root tests,the studyuses both the first and second-generation unit root test approaches. Two approaches are popular for panel ARDL such as Mean Group (MG) Proposed by Pasaran and Smith (1995) and the pooled mean group proposed by Pesaran et al. (1999). The study applied the Hausman test to examine whether MG or PMG method is appropriate.

The ARDL model (p,q) as proposed by (Pesaran et al., 2001) and the standard form of log-linear specification of this model for a long-run relationship between the variables can be constructed as follows:

$$\Delta GI_{i,t} = a_{i,t} + \sum_{j=1}^{m-1} \beta_{i,j} \Delta GI_{i,t-j} + \sum_{l=0}^{n-1} y_{i,l} \Delta TC_{i,t-l} + \varphi_1 GI_{i,t-1} + \varphi_2 TC_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

Where, GI gender inequality measures in LFP/wage, whereas TC stands for trade composition variables such as HT/MT/LT/PP export and import. Δ indicates the first difference operator and εi,tis the white noise term. α is the country-specific intercept and I, and t denotes group and time respectively, and they vary from 1 to N and 1 to T respectively. The optimal lag length has been selected using Akaike information criteria (AIC).

In the above equation, the null hypothesis of no cointegration is as Ho: φ1= φ2=0 where the alternative hypothesis is at least one φk ≠ o (k=1,2). However, as there is no literature in determining the critical values of the above generalization of cointegration test, the study applies (Pedroni, 2004) test of cointegration following several previous studies for example(Asongu, El Montasser, & Toumi, 2016; M. E. Bildirici, 2014). When the cointegration between the variables is identified, and the null hypothesis of no cointegration is rejected,the studycan estimate the long-run relationship for the ARDL model as follows:

$$GI_{i,t} = a_{i,t} + \sum_{j=1}^{m-1} \beta_{1,j} GI_{i,t-j} + \sum_{l=0}^{n-1} \beta_{2j} TC_{i,t-l} + \varepsilon_{i,t} \quad (4)$$

In the above equation, the coefficient is some for the variables as the PMG approach assumes long-run homogeneous long-run relationships across countries. The optimal log of ARDL (p,q) is selected based on AIC. Now the short-run relationship between the variables can be constructed using the Error correction term in the above equation as follows:

$$\Delta GI_{i,t} = a_{i,t} + \sum_{j=1}^{m-1} \beta_{i,j} \Delta GI_{i,t-j} + \sum_{l=0}^{n-1} y_{i,l} \Delta TC_{i,t-l} + \omega_i EGT_{t-1} + \varepsilon_{i,t} \quad (5)$$

Where white noise from εi,t is independently and normally distributed with mean zero and constant variables. ECTt-1 is the error correction term originated from long-run equilibrium, and w is the coefficient that indicates the speed of restoration to equilibrium point after any shock. It is expected that the coefficient has a negative sign as well as a significant coefficient.

Finally, the causality between the trade composition and gender inequality is determined using Engle and Granger's (1987)causality test. The study applies vector error correction model (VECM) based Granger causality test to identify the causality directions determined as follows:

$$\Delta GI_{i,t} = a_0 + \sum_{i=1}^{m} \beta_{ik} \Delta GI_{j,t-i} + \sum_{i=1}^{n} \phi_{ik} \Delta TC_{j,t-i} + \psi_1 EC_{t-1} + \varepsilon_{1t} \quad (6)$$

$$\Delta TC_{it} = a_0 + \sum_{i=1}^{p} \theta_{ik} \Delta GI_{j,t-i} + \sum_{i=1}^{q} \eta_{ik} \Delta GI_{j,t-i} + \psi_2 EC_{t-1} + \varepsilon_{2t} \quad (7)$$

Where εtis residual that is supposed to be normally and independently distributed and has a mean value of zero and constant variance. EC_{t-1} stands for the error correction term, and the parameter ψ indicates the speed of adjustment after any shock. If the null hypothesis is rejected, there is causality between the variables.

Based on equations (6) and (7) the study identifies Grangercausality in three different ways (M. Bildirici, 2014; Lee & Chang, 2008; Ozturk & Acaravci, 2011). Short-run (weak) causality is calculated by testing the hypothesis Ho: ϕ_i=0 and H0: η_i=0; long-run causality is determined the hypothesis Ho: ψ_1=0 and H0: ψ_2=0; and strong causality is found out by the hypothesis Ho: $\phi_i = \psi_1$ =0 and Ho: ηi = ψ_2=0 for all i and k for equation (6) and (7) respectively. The study applies a vector error correction model-based granger causality test to define the direction of causalities between variables as it measures both short-term and long-term causalities by the first difference of explanatory variables and error correction terms.

3.3 Summary Statistics and Data Description

The descriptive statistics show that the high growth emerging economies of group 1 has the highest quantity of average export in primary products followed by low tech and medium-tech sector. In the case of import, the amount of PP stands top. The high value of standard deviation indicates that the value of export and import fluctuates substantially over time. For group 2, primary products stand at the top among all four sectors in both export and import with significant fluctuations in the value in trade. Jarque-Bera test shows that there is no abnormality in the data sets.

Table 1. Summary Statistics of Group 1

	HT_EXPORT	HT_IMPORT	LT_EXPORT	LT_IMPORT	MT_EXPORT	MT_IMPORT	PP_EXP	PP_IMPORT
Mean	5.06Л	4.98Л	6.21Л	2.10Л	5.83 Л	6.76 Л	9.70 Л	10.4 Л
Median	6.18Ђ	1.85 Л	1.70 Л 10	1.71 Л	2.87Л	4.87 Л	5.55 Л	4.89 Л
Maximum	6.90Љ	5.25 Љ	7.58 Љ	8.79 Љ	5.27 Љ	4.21 Љ	4.66 Љ	9.43 Љ
Minimum	.347Ђ	1.19Ђ	4.86 Ђ	1.66 Ђ	2.89 Ђ	6.02 Ђ	6.03 Ђ	1.06Л
Std. Dev.	1.35 Љ	1.02 Љ	1.36 Љ	1.98Л	9.92Л	8.15Л	1.03Љ	1.67Љ
Skewness	3.62	3.411	3.67	1.431	3.31	2.732	1.88	3.493
Kurtosis	15.414	14.10	16.153	4.795	13.98	10.927	6.195	15.719
Jarque-Bera	1308.346	1076.463	1428.199	71.88189	1042.407	587.1310	154.7583	1333.849
Probability	0.000	0.000	0.00	0.00	0.000	0.000	0.00	0.000
Sum	76.9 Љ	75.8 Љ	93.8 Љ	31.7 Љ	88.6 Љ	10.3 Љ	14.7 Љ	159 Љ
Sum Sq. Dev.	2.75E+24	1.56E+24	2.79E+24	5.87E+22	1.49E+24	1.00E+24	1.60E+24	4.20E+24
Observations	152	152	151	151	152	152	152	152

Source: Authors Calculation

Note: Ђ; Л; and Љ indicate that the figures are multiples of 10^9; 10^{10}; and 10^{11} respectively.

Table 2. Summary Statistics of Group 2

	HT_EXPORT	HT_IMPORT	LT_EXPORT	LT_IMPORT	MT_EXPORT	MT_IMPORT	PP_EXP	PP_IMPORT
Mean	4.95 Ђ	6.15 Ђ	5.24 Ђ	5.04 Ђ	7.65 Ђ	1.22 Ђ	2.53 Л	1.47 Л
Median	.313 Ђ	2.12 Ђ	2.70 Ђ	3.12 Ђ	2.34 Ђ	7.59 Ђ	1.22 Л	8.70E+09
Maximum	7.16 Л	5.91 Л	5.69 Л	3.76 Л	8.01 Л	7.38 Л	3.52 Љ	1.15 Љ
Minimum	1250.000	56309.00	2698800.	0.000000	3195100.	0.000000	4.16E+08	-5.53 Л
Std. Dev.	1.20 Л	9.73 Ђ	7.37 Ђ	5.77 Ђ	1.32 Л	1.35 Л	3.94 Л	1.74 Л
Skewness	3.318577	2.832574	3.011902	2.643474	2.989416	2.209043	4.353754	2.356002
Kurtosis	14.78638	12.02118	14.59533	11.36353	13.06657	8.577646	29.26440	10.92122
Jarque-Bera	5077.436	3130.034	4737.976	2704.501	3804.036	1398.643	21246.49	2346.708
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	3.30E+12	4.07E+12	3.49E+12	3.34E+12	5.09E+12	8.12E+12	1.68E+13	9.73E+12
Sum Sq. Dev.	9.59E+22	6.26E+22	3.61E+22	2.20E+22	1.15E+23	1.21E+23	1.03E+24	2.00E+23
Observations	666	662	666	663	666	663	666	663

Source: Authors Calculation

Note: Ђ; Л; and Љ indicate that the figures are multiples of 10^9; 10^{10}; and 10^{11} respectively.

4. Results and Analysis

From the unit root tests results summarized in the tables with study can conclude that LFP inequality and HT export are stationary, which means they don't have a unit root either in level or first difference, whereas all other variables are integrated that has a unit root in level I (0) and stationary at the first difference I (1). None of the variables are at I (2). This conclusion has been drawn based on the majority of panel unit test results. When the order of the integration of the variables is established the study needs to identify whether there is long-run cointegration between the variables. The study applied Pedroni (2004) cointegration test.

4.1 Technology-Intensive Trade and Female labor Force Participation (LFPR)

The cointegration results show that there exist a long-run relationship of TC variables with FLFPR and LFP inequality for group 2 as the null hypothesis of no cointegration is rejected at 1%, 5%, and 10% level in most cross especially in the case of panel PP, panel ADF, group PP, and group ADF statistics. These statistics are considered more reliable statistics by Pedroni (Asongu et al., 2016). However, in the case of group 1, the study can not reject the null hypothesis of no cointegration either in the case of Trade composition (TC) and female labor force participation rate (FLFPR) or TC and LFP inequality. So it can be decided that there is no long-run relationship of TC variables with FLFPR and LFP inequality for high growth emerging countries of group 1.[2]

Table 3. PMG Long-Run Estimates

Group 1		
Independent Variable	FLFPR	LFP Inequality
HT Export	0.043133* (0.0127)	-0.025974* (0.0018)
HT Impo	0.142453* (0.0520)	0.294320** (0.1323)
MT Export	0.128574* (0.0264)	-0.030803* (0.0007)
MT Import	0.178479* (0.0500)	0.264757* (0.0662)
LT Export	0.037842* (0.0141)	-0.040718* (0.0017)
LT Import	0.217974* (0.0749)	0.164213* (0.0583)
PP Export	0.113350* (0.0114)	0.171416* (0.0143)
PP Import	0.120764* (0.0165)	0.013560* (.0118)
Group 2		
Independent Variable	FLFPR	LFP Inequality
HT Export	0.024630* (0.0018)	0.028165* (0.0037)
HT Impo	0.046799* (0.0044)	0.040168* (0.0051)
MT Export	0.031605* (0.0029)	0.042920* (0.00289)
MT Import	0.060276* (0.0049)	0.050735* (0.0043)
LT Export	0.059398* (0.0083)	-0.029959* (0.0042)
LT Import	0.067415* (0.0078)	0.050665* (0.0056)
PP Export	0.050380* (0.0046)	0.033419* (0.0048)
PP Import	0.112749* (0.0046)	-0.016249* (0.0033)

Source: Authors Clculation

Note: The table presents the results of the estimated coefficients of the panel pooled mean group (PMG) and their standard errors are provided in the parenthesis.*; ** and *** indicates significance level at 1%; 5% and 10% respectively. The number of optimal lags is selected based on the Akaike Information Criterion (AIC). The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in the standard format appropriate for the document.

The PMG estimation results evidence a significant long-run positive relationship between TC variables with FLFPR and LFP inequality except for LT; HT; MT export and primary product (PP) import, which negatively associates with LFP inequality. The results thus infer that in the long run export and import in all four sectors such as HT, MT, LT, and PP increases the participation of females in labor as well as reduces the inequality between males and females in labor force participation. The results also evidence that LT; HT; MT export and PP import raise female participation rate but increases the inequality between genders in the labor market participation.

The results of this study do not support the general hypothesis of trade theory. In the primary trade theory, more specifically HO and SS theories, it is assumed that export of low tech labor-intensive products increases female participation in the LF and consequently reduces LFP inequality, whereas trade in HT products reduces female participation in the labor force, and thus LFP inequality rises as women constitute a dominant share of the unskilled and semi-skilled labor force of the developing countries. Thus evidence shows that in the long run, women can adjust to technological changes and trade in all sectors increases FLFPR as well as reduces gender inequality in LFP whereas export in LT; HT; MT sectors and import in PP sector increase FLFPR and also increases LFP inequality between male and female. That means, in this case, the rate of male labor force participation is higher than the FLFPR. As a result, the inequality in LFP is also greater.

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2 The study does not report the unit root and Pedronicointegration test results to reduce the length of the paper. The results are available on request.

This section reports the short-run PMG estimates along with the error correction term that corresponds to the long-run equilibrium. At the equilibrium point, ECT has a value of zero, and except zero indicates deviations from the equilibrium point in the long run. It infers the speed of adjustment that means how long it requires restoring to the equilibrium level after any shock. It is assumed that ECT should have a statistically significant negative sign for adjustment to the equilibrium point after a long exogenous shock in the economy. The higher value of ECT, the higher the speed of adjustment, and 0 indicates no adjustment, whereas 1 indicates full adjustment after any shocks.

Table 4. PMG Long-Run Estimates

Independent Variable	FLFPR	Coefficient (std. error)	LFPI	Coefficient (Std. error)
Ht Export	Cointeq01	-0.143643** (0.0704)	Cointeq01	-0.127312* (0.030946)
	D(Flfpr(-1)	0.210580 (0.175022)	D(Lfp_Ineq(-1)	0.178938 (0.15415)
	D(Ht_Export)	-0.020687 (0.030634)	D(Ht_Export)	-0.015734 (0.020860)
	C	0.191638** (0.092376)	C	0.118594* (0.032985)
HtImpo	Cointeq01	-0.024110 (0.038424)	Cointeq01	0.003279 (0.022883)
	D(Flfpr(-1)	0.235581 (0.176153)	D(Lfp_Ineq(-1)	0.113413 (0.177758)
	D(Ht_Import)	-0.024267 (0.023923)	D(Ht_Import)	-0.018656 (0.019351)
	C	-0.001853 (0.006167)	C	0.004993 (0.054886)
Mt Export	Cointeq01	-0.055914 (0.050105)	Cointeq01	-0.169873* (0.06111)
	D(Flfpr(-1)	0.135685 (0.182233)	D(Lfp_Ineq(-1)	0.176048 (0.152698)
	D(Mt_Export)	-0.005324 (0.021302)	D(Mt_Export)	-0.002350 (0.016859)
	C	0.009568 (0.011876)	D(Mt_Export(-1)	-0.009698 (0.013891)
			C	0.173505** (0.072262)
Mt Import	Cointeq01	-0.038341 (0.041437)	Cointeq01	-0.014255 (0.032665)
	D(Flfpr(-1))	0.15249 (0.178178)	D(Lfp_Ineq(-1))	0.034723 (0.18146)
	D(Mt_Import)	-0.00418 (0.012075)	D(Mt_Import)	-0.011620 (0.010927)
	C	-0.01718 (0.013609)	C	-0.038254 (0.074022)
Lt Export	Cointeq01	-0.17115* (0.057435)	Cointeq01	-0.138440* (0.039735)
	D(Flfpr(-1)	0.240009 (0.175484)	D(Lfp_Ineq(-1))	0.188103 (0.17280)
	D(Lt_Export)	0.011709 (0.029765)	D(Lt_Export)	0.007928 (0.022428)
	D(Lt_Export(-1)	-0.02762** (0.014173)	C	0.153608* (0.050622)
	C	0.221749* (0.077155)		
Lt Import	Cointeq01	-0.031795 (0.031699)	Cointeq01	0.010564 (0.030267)
	D(Flfpr(-1)	0.17697 (0.175882)	D(Lfp_Ineq(-1))	0.080454 (0.182951)
	D(Lt_Import)	-0.01650 (0.023139)	D(Lt_Import)	-0.019633 (0.018187)
	C	-0.02402 (0.020711)	C	0.006200 (0.032319)
Pp Export	Cointeq01	-0.102545 (0.088629)	Cointeq01	-0.047062 (0.073848)
	D(Flfpr(-1)	0.152076 (0.180898)	D(Lfp_Ineq(-1))	0.037829 (0.184231)
	D(Pp_Exp)	-0.024604 (0.018388)	D(Pp_Exp)	-0.024908 (0.013866)
	C	0.036720 (0.035674)	C	-0.068058 (0.094841)
Pp Import	Cointeq01	-0.053676 (0.069188)	Cointeq01	-0.130790* (0.056497)
	D(Flfpr(-1)	0.170585 (0.190715)	D(Lfp_Ineq(-1))	0.284209 (0.167699)
	D(Pp_Import)	-0.008625 (0.011830)	D(Pp_Import)	-0.005719 (0.011676)
	C	0.010825 (0.023214)	C	0.05828** (0.024734)

Source: Authors Clculation

Note: The table presents the results of the estimated coefficients of the panel pooled mean group (PMG) and their standard errors are provided in the parenthesis.*; ** and *** indicates significance level at 1%; 5% and 10% respectively. The difference operator is symbolized by "D" and "(-)" which indicates the lag of the differenced operator. The number of optimal lag is selected based on the Akaike Information Criterion (AIC) and "Cointeq01" indicates the error correction term (ECT). The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

Table 5. PMG Short-Run Estimates Group 2

Independent Variable	FLFPR	Coefficient (std. error)		LFP Inequality	Coefficient (std. error)	
HT Export	Cointeq01	-0.167326*	(0.031299)	Cointeq01	-0.173424*	(0.034780)
	D(Flfpr(-1))	0.189030*	(0.050580)	D(Lfp_Ineq(-1))	0.224039*	(0.054588)
	D(Ht_Export)	-0.005852	(0.003624)	D(Ht_Export)	-0.005177	(0.004460)
	C	0.235223*	(0.044527)	C	0.070545*	(0.017850)
HT Impo	Cointeq01	-0.141898*	(0.027198)	Cointeq01	-0.169891*	(0.035901)
	D(Flfpr(-1))	0.168408*	(0.055208)	D(Lfp_Ineq(-1))	0.221083*	(0.062682)
	D(Ht_Import)	-0.003805	(0.005148)	D(Ht_Import)	-0.006529	(0.005714)
	C	0.163877*	(0.032172)	C	0.039391*	(0.013885)
MT Export	Cointeq01	-0.171648*	(0.034231)	Cointeq01	-0.202791*	(0.046208)
	D(Flfpr(-1))	0.185142*	(0.051381)	D(Lfp_Ineq(-1))	0.249697*	(0.058189)
	D(Mt_Export)	-0.010543**	(0.005086)	D(Mt_Export)	-0.012993**	(0.005231)
	C	0.227725*	(0.047366)	C	0.043778**	(0.017846)
MT Import	Cointeq01	-0.145427*	(0.029441)	Cointeq01	-0.166296*	(0.037043)
	D(Flfpr(-1))	0.165616*	(0.055758)	D(Lfp_Ineq(-1))	0.230751*	(0.063134)
	D(Mt_Import)	-0.005688	(0.005717)	D(Mt_Import)	-0.008427	(0.005318)
	C	0.142235*	(0.029572)	C	0.011113	(0.012862)
LT Export	Cointeq01	-0.148375*	(0.029308)	Cointeq01	-0.198579*	(0.049172)
	D(Flfpr(-1))	0.187617*	(0.053299)	D(Lfp_Ineq(-1))	0.210947*	(0.057204)
	D(Lt_Export)	-0.019808**	(0.008891)	D(Lt_Export)	-0.014874	(0.009222)
	C	0.154599*	(0.03184)	C	0.199938*	(0.053437)
LT Import	Cointeq01	-0.143278*	(0.028497)	Cointeq01	-0.158472*	(0.034253)
	D(Flfpr(-1))	0.176482*	(0.053938)	D(Lfp_Ineq(-1))	0.228688*	(0.061800)
	D(Lt_Import)	-0.015263	(0.010288)	D(Lt_Import)	-0.012983	(0.008059)
	C	0.133778*	(0.027591)	C	0.017980	(0.012108)
PP Export	Cointeq01	-0.151857*	(0.029712)	Cointeq01	- 0.174925*	(0.034095)
	D(Flfpr(-1))	0.166391*	(0.053471)	D(Lfp_Ineq(-1))	0.213512*	(0.057010)
	D(Pp_Exp)	-0.009920***	(0.005620)	D(Pp_Exp)	- 0.010778***	(0.005876)
	C	0.167411*	(0.033606)	C	0.051906*	(0.014872)
PP Import	Cointeq01	-0.126307*	(0.033015)	Cointeq01	-0.180129*	(0.045045)
	D(Flfpr(-1))	0.180930*	(0.055438)	D(Lfp_Ineq(-1))	0.200222*	(0.059108)
	D(Pp_Import)	-0.010185***	(0.005474)	D(Pp_Import)	-0.005134	(0.004808)
	C	0.051265*	(0.016153)	C	0.161619*	(0.043382)

Source: Authors Clculation

Note: The table presents the results of the estimated coefficients of the panel pooled mean group (PMG) and their standard errors are provided in the parenthesis.*; ** and *** indicates significance level at 1%; 5% and 10% respectively. The difference operator is symbolized by "D" and "(-)" which indicates the lag of the differenced operator. The number of optimal lag is selected based on the Akaike Information Criterion (AIC) and "Cointeq01" indicates the error correction term (ECT). The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

The above table summarizes the short-run estimation results of the ARDL model with FLFPR and LFP inequality as dependent variables. The study result shows that ECT has a statistically significant negative sign and intervals that are consistent with the theoretical view in almost all cases. This result indicates a long-run relationship between TC variables and FLFPR and LFP inequality, and after any exogenous shocks, ECT can be adjusted significantly in the long-run equilibrium. The speed of adjustments is around 15% for LFPR and 18% for LFP inequality on average in both groups of countries which implies that after any shock, it requires 6.67 and 5.5 years respectively, to come back to its equilibrium point. However, the speed of adjustment for LFPR and LFP inequality is highest for MT export and MT import, respectively, in the countries of group 2. The study results also show that all TC variables do not have a significant effect on the restoration of the variables to equilibrium point in all cases except a few variables in both groups of countries. In group 2, in case FLFPR MT export and LT export have significant contribution at 5% level, and PP export and OPP import have significant contribution at 10% level in the restoration of underlying imbalances to cointegration whereas other TC does not contribute significantly. Also, in the case of LFP inequality, only MT export and PP export significantly contribute to adjustment to the equilibrium level.

The short-run ARDL also supports this view that when there are any sudden imbalances in the labor market due to exogenous shock, for example, technological change, the labor market can restore to the equilibrium level with the significant speed of adjustment of 15% and 18% on average for FLFPR and LFP inequality respectively. Trade-in in different sectors does not affect the female labor market is significant in the short run. In the short run estimation, the study results support that medium-tech export cause female LFPR to fall. The results show that export in LT, MT, and PP sectors and imports in PP sectors significantly reduces female LFPR. At the same time, HT, MT, and PP export sectors and PP import sectors significantly increase the labor force inequality in the emerging economies. And trade in other different sectors does not affect the female labor market significantly in these countries.

In the causality results of group 2 countries, the study results in evidence that there exist bidirectional long-run casualty between TC variables and FLFPR as well as between TC variables and LFP inequality except for causality from FLFPR to MT and LT export, HT import to LFP inequality, MT import to LFPI and LFPI to PPand LT export. It is also clear that there is no bi-directional short-run causality between trade-in sectors and FLFPR as well as TC and LFP inequality in both of the groups of countries. This finding does not support the view that FLFPR and LFI do not have a long-run causality with MT export and LT, PP export sectors respectively. But the findings support the view for the long run where it shows that there exists causality from LFPI to HT and MT import sectors and from FLFPR to HT and MT import.

Table 6. Long-Run Causality Results

Group 1: TC and FLFPR				Group 2: TC and FLFPR			
Direction of Causality	Wald Statistics	FLFPR→	Wald Statistics	Direction of Causality	Wald Statistics	FLFPR→	Wald Statistics
HT Export→ FLFPR	0.004073	HT Export	1.905	HT Export → FLFPR	4.8601**	HT Export	11.183*
HT Impo→ FLFPR	0.181092	HT Import	1.372	HT Impo → FLFPR	4.2704**	HT Import	13.698*
MT Export→	0.616095	MT Export	1.4085	MT Export→	12.3632*	MT Export	0.057163
MT Import→	0.000132	MT Impo	2.984***	MT Import→	3.3257***	MT Impo	12.75794*
LT Export→	0.393446	LT Export	0.889	LT Export→	15.577*	LT Export	1.249093
LT Import→	0.023281	LT Impo	4.359**	LT Import→	5.9338**	LT Impo	9.892126*
PP Export→	0.122873	PP Export	4.897**	PP Export→	15.16452*	PP Export	10.79545*
PP Import→	0.004522	PP Impo	0.6373	PP Import→	7.145542*	PP Impo	5.8283**
Group 1 TC and LFP Inequality				Group 2 TC and LFP Inequality			
Direction of Causality	Wald Statistics	LFPI→	Wald Statistics	Direction of Causality	Wald Statistics	LFPI →	Wald Statistics
HTExport→ LFPI	0.059583	HT Export	1.461778	HT Export→ LFPI	5.7749**	HT Export	14.202*
HT Imp→ LFPI	0.178417	HT Import	1.517698	HT Impo → LFPI	0.063170	HT Import	16.628*
MT Expor→	0.315275	MT Export	1.727989	MT Export→	4.5841**	MT Export	7.1694*
MT Import→	0.038264	MT Impo	3.064998	MT Import→	1.295724	MT Impo	15.747*
LT Export→	0.799840	LT Export	1.329265	LT Export→	21.021*	LT Export	0.375385
LT Import→	0.041133	LT Impo	3.9768**	LT Import→	6.9457*	LT Impo	14.04415*
PP Export→	0.173479	PP Export	6.0803**	PP Export→	5.4587**	PP Export	13.57168
PP Import→	0.382774	PP Impo	0.423120	PP Import→	5.3140**	PP Impo	10.93502*
HTExport→ LFPI	0.059583	HT Export	1.461778	HT Export→ LFPI	5.7749**	HT Export	14.20221*

Source: Authors Calculation

Note: The table summarises the results of causality tests and F-statistics. *; ** and *** indicates that the null hypothesis of no causality is rejected at the significance level of 1%; 5% and 10% respectively. The direction of causality is indicated by the sign "→". The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

Table 7. Short-Run Causality Results

Group 1: TC and FLFPR				Group 2: TC and FLFPR			
Direction of causality	Wald Statistics	FLFPR→	Wald Statistics	Direction of causality	Wald Statistics	FLFPR→	Wald Statistics
HT Export → FLFPR	3.8273**	HT Export	0.669401	HT Export → FLFPR	0.83768	HT Export	0.018673
HT Impo → FLFPR	1.088005	HT Import	4.1321**	HT Impo → FLFPR	0.01426	HT Import	0.052871
MT Export→	2.110564	MT Export	0.260479	MT Export→	0.58926	MT Export	0.208959
MT Import→	0.302196	MT Impo	3.0711**	MT Import→	0.21668	MT Impo	0.403976
LT Export→	1.739718	LT Export	0.358640	LT Export→	1.51689	LT Export	0.906516
LT Import→	0.656923	LT Impo	1.596035	LT Import→	0.86157	LT Impo	0.686901
PP Export→	0.423322	PP Export	0.208195	PP Export→	0.42404	PP Export	1.358787
PP Import→	1.409517	PP Impo	0.796147	PP Import→	1.57027	PP Impo	0.605335
Group 1 TC and LFP Inequality				Group 2 TC and LFP Inequality			
Direction of causality	Wald Statistics	LFPI→	Wald Statistics	Direction of causality	Wald Statistics	LFPI→	Wald Statistics
HT Export → LFPI	2.725***	HT Export	0.217288	HT Export → LFPI	0.46445	HT Export	0.023864
HT Impo → LFPI	1.2606	HT Import	2.198104	HT Impo → LFPI	0.07125	HT Import	0.314352
MT Export→	1.060646	MT Export	0.523636	MT Export→	0.13637	MT Export	0.661513
MT Import→	0.023827	MT Impo	5.4863*	MT Import→	0.20543	MT Impo	0.301418
LT Export→	2.6535***	LT Export	0.304231	LT Export→	1.94740	LT Export	0.542646
LT Import→	0.897799	LT Impo	1.717272	LT Import→	0.02068	LT Impo	0.944237
PP Export→	0.001394	PP Export	1.270882	PP Export→	0.13961	PP Export	1.376280
PP Import→	0.960252	PP Impo	0.665491	PP Import→	0.32304	PP Impo	1.141938

Source: Authors Caclculation

Note: The table summarises the results of causality tests and F-statistics. *; ** and *** indicates that the null hypothesis of no causality is rejected at the significance level of 1%; 5% and 10% respectively. The direction of causality is indicated by the sign "→". The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

Table 8. Strong Causality Results

Group 1: TC and FLFPR				Group 2: TC and FLFPR			
Direction of causality	Wald Statistics	FLFPR→	Wald Statistics	FLFPR→	Wald Statistics	FLFPR→	Wald Statistics
HTExport→ FLFPR	2.5529***	HT Export	1.0374	HTExport	1.9558	HT Export	3.8564*
HTImp→ FLFPR	0.7896	HT Import	3.3501**	HTImpo	1.4514	HT Import	4.7251*
MT Expor→	1.4786	MT Export	0.6816	MT Export	4.4963*	MT Export	0.1612
MT Import→	0.2028	MT Impo	3.1078*	MT Import	1.3399	MT Impo	4.7346*
LT Export→	1.6625	LT Export	0.6066	LT Export	5.7180*	LT Export	0.8433
LT Import→	0.4382	LT Impo	2.4510***	LT Import	2.3442***	LT Impo	3.5198**
PP Export→	0.3173	PP Export	1.8036	PP Expo	5.5307*	PP Export	4.3609*
PP Import→	1.0259	PP Impo	0.7531	PP Import	3.2161**	PP Impo	2.2037***

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Group 1 TC and LFP Inequality				Group 2 TC and LFP Inequality			
	Wald Statistics	LFPI→	Wald Statistics		Wald Statistics	LFPI→	Wald Statistics
HT Export → LFPI	1.8393	HT Export	0.650082	HT Export → LFPI	2.0569	HT Export	5.0556*
HT Impo → LFPI	0.9036	HT Import	2.096429	HT Impo → LFPI	0.0865	HT Import	5.6853*
MT Export→	0.7449	MT Export	0.913811	MT Export→	1.5384	MT Export	2.8237**
MT Import→	0.0341	MT Impo	4.8797*	MT Import→	0.6610	MT Impo	5.3720*
LT Export→	2.515***	LT Export	0.56903	LT Export→	7.2116*	LT Export	0.3989
LT Import→	0.6388	LT Impo	2.6044***	LT Import→	2.3594***	LT Impo	4.9459*
PP Export→	0.06354	PP Export	3.0518**	PP Export→	1.932885	PP Export	5.2690*
PP Import→	0.9935	PP Impo	0.6144	PP Import→	2.075699	PP Impo	4.2893*

Source: Authors Calculation

Note: The table summarises the results of causality tests and F-statistics. *; ** and *** indicates that the null hypothesis of no causality is rejected at the significance level of 1%; 5% and 10% respectively. The direction of causality is indicated by the sign "→". The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

In the case of strong causality that combines both long-term and short-term causality, the number of causality directions falls compared to many long-run causality directions. Strong causality can be found from MT export, LT export, LT import, PP export, and PP import to FLFPR in group 2. In contrast, strong causality is evidenced from FLFPR to all TC variables except LT export. In both groups of emerging economies LT import causes LFP inequality. On the contrary, LFP inequality causes all TC variables except LT export in group 2 countries. Inconsistent with the PMG estimation results, granger causality results in evidence that there exists significant long-run bidirectional causality between TC and FLFPR and LFP inequality except for very few cases, but they do not have short-run causality at all. So, trade causes FLFPR and inequality between males and females in the long run only and vice versa. However, when the study considers strong causality combined with both the long run and the short run, some of the causality can no longer be found

4.2 Technology-Intensive Trade and Gender Inequality in Wage

In this section, the study applied the Pedroni (2004) panel cointegration test to examine whether there is any long-run cointegration between TC variables and gender wage inequality. Most of the statistics provided by Pedronicointegration tests, more especially panel ADF and group ADF statistics, which are considered as more reliable of Pedroni (2004) test, which rejects the null hypothesis of no cointegration at 1%, 5%, and 10% level (in respective cases). So based on the cointegration test,it can be concluded that there is a long-run relationship between Trade composition (TC) variables and gender wage inequality in emerging countries.[3]

The PMG estimation results show that TC variables have a long-run significant negative effect on the gender wage gap. It infers that in the long run trade in any of the sectors such as HT, MT, LT, and PP reduces the wage gap between genders in the emerging countries. However, although the direction of effect is the same in all cases, the effect of different TC variables on gender wage inequality varies. According to the estimation results, LT import has the highest effect in reducing gender wage inequality. In contrast, HT export and HT import, and MT import exert an almost similar level of effect on reaching the wage gap. Import of PP has the lowest impact on wage gap reduction.

[3] To reduce the length of the paper Pedronicointegration test results are not reported. The results are available at request.

Table 9. PMG Long-Run Estimates

Independent Variable	GWG
HT Export	-4.770199* (0.653310)
HT Import	-4.427556* (0.993322)
MT Export	-2.966791* (0.866778)
MT Import	-4.765321* (1.075017)
LT Export	-3.888017** (1.884726)
LT Import	-6.137287* (1.212191)
PP Export	-2.107979* (1.053450)
PP Import	-1.724295* (1.035074)

Source: Authors Calculation

Note: The table presents the results of the estimated coefficients of the panel pooled mean group (PMG) and their standard errors are provided in the parenthesis.*; ** and *** indicates significance level at 1%; 5% and 10% respectively. The number of optimal lag is selected based on the Akaike Information Criterion (AIC). The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

The short-run results summarized in table 10 suggest that the Error correction term has a negative sign with the precise intervals with statistically significant probability value in all cases as required by the theoretical views as discussed in the earlier section of this study. It shows that gender wage inequality can be restored to the equilibrium point after any exogenous shock in the economy. The speed of adjustment is very high around 60% on average. It infers that gender wage inequality is restricted to the original equilibrium with 1.67 years after any distortion from the equilibrium point. However, TC variables do not significantly affect restoring the dependent variable to its equilibrium point except for the case of HT import and MT import that has a significant effect at 10% and 5% level in the adjustment of wage gap to the equilibrium.

The study result goes against the generalized assumption that growing trade in the high technology sector increases gender wage inequality in the developing countries, whereas export in the low tech sector reduces the gap as the majority of female workers of developing countries are unskilled and semi-skilled. On the contrary, this study shows that trade in any sector either high tech or low tech significantly reduces the wage gap between males and females in developing countries. The study also finds that if there is any distortion from the equilibrium level of gender wage inequality, it comes back to the equilibrium point within 1.67 years. Causality tests identify the causality direction for both short-run and long-run.

Table 10. PMG Short-Run Estimates

Independent Variable	Model (p. q)	Coefficient (std. error)
HT Export	COINTEQ01 D(HT_EXPORT) C	-0.603852* (0.111067) 2.944991 (1.813610) 35.83562* (7.486545)
HT Import	COINTEQ01 D(HT_IMPORT) C	-0.570136* (0.101642) 5.029291*** (2.720349) 33.54575* (6.549819)
MT Export	COINTEQ01 D(MT_EXPORT) C	-0.516189* (0.133695) 3.823419 (2.803625) 23.00365* (6.559840)
MT Import	COINTEQ01 D(MT_IMPORT) C	-0.527039* (0.113706) 6.179972** (2.938279) 33.85723* (7.741527)
LT Export	COINTEQ01 D(LT_EXPORT) C	-0.513231* (0.112628) 6.573763 (4.409125) 26.92281* (6.212692)

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LT Import	COINTEQ01 D(LT_IMPORT) C	-0.538092* (0.111580) 6.528355 (4.275506) 40.55206* (8.998760)
PP Export	COINTEQ01 D(PP_EXP) C	-0.476156* (0.116887) 3.647730 (6.782618) 17.99538* (4.962323)
PP Import	COINTEQ01 D(PP_IMPORT) C	-0.611222* (0.157046) -6.730351 (8.589218) 21.13738* (6.190294)

Source: Authors Caclculation

Note: The table presents the results of the estimated coefficients of the panel pooled mean group (PMG) and their standard errors are provided in the parenthesis.*; ** and *** indicates significance level at 1%; 5% and 10% respectively. The difference operator is symbolized by "D" and "(-)" which indicates the lag of the differenced operator. The number of optimal lag is selected based on the Akaike Information Criterion (AIC) and "Cointeq01" indicates the error correction term (ECT). The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

Granger Causality test results suggest that the export and import of different sectors cause gender wage inequality in the short run except for PP export whereas in the long-run trade in most sectors does not cause gender wage inequality. However, LT export, pp export, and import cause gender wage inequality in the long run. There exist strong causality directed from TC variables to gender wage inequality. On the other hand, there is no short-run causality from gender wage inequality to trade in different sectors, but gender wage inequality causes export and import of these sectors significantly in the long run. With PP import as except to this case. Except for export and import, a strong causality still exists that directs from gender wage inequality to trade.

Table 11. Long-Run Causality Results GWG

Direction of causality	Wald Statistics	GWG →	Wald Statistics
HT Export → GWG	2.193014	HT Export	10.66272*
HT Impo→ GWG	1.059339	HT Import	20.14874*
MT Export→ GWG	2.230309	MT Export	18.01184*
MT Import→ GWG	1.014822	MT Impo	23.73391*
LT Export→ GWG	7.513412*	LT Export	4.341905*
LT Import→ GWG	0.378517	LT Impo	29.63064*
PP Export→ GWG	7.087326*	PP Export	4.861082**
PP Import→ GWG	7.421680*	PP Impo	0.002510

Source: Authors Caclculation

Note: The table summarises the results of causality tests and F-statistics. *; ** and *** indicates that the null hypothesis of no causality is rejected at the significance level of 1%; 5% and 10% respectively. The direction of causality is indicated by the sign "→". The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

Table 12. Short-Run Causality Results GWG

Direction of Causality	Wald Statistics	GWG →	Wald Statistics
HT Export → GWG	80.96491*	HT Export	1.049744
HT Impo → GWG	56.24664*	HT Import	3.428952
MT Export→ GWG	68.72870*	MT Export	1.876682
MT Import→ GWG	45.72546*	MT Impo	1.582221
LT Export→ GWG	82.23585*	LT Export	0.711990
LT Import→ GWG	41.47219*	LT Impo	1.677254
PP Export→ GWG	1.690855	PP Export	0.822118
PP Import→GWG	15.60940*	PP Impo	0.759893

Source: Authors Caclculation

Note: The table summarises the results of causality tests and F-statistics. *; ** and *** indicates that the null hypothesis of no causality is rejected at the significance level of 1%; 5% and 10% respectively. The direction of causality is indicated by the sign "→". The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

Table 13. Long-Run Causality Results GWG

Direction of causality	Wald Statistics	GWG →	Wald Statistics
HT Export → GWG	57.79208*	HT Export	5.684135*
HT Impo → GWG	38.23702*	HT Import	11.23965*
MT Export→ GWG	46.59971*	MT Export	9.637158*
MT Import→ GWG	31.05244*	MT Impo	9.927455*
LT Export→ GWG	59.51269*	LT Export	2.625290**
LT Import→ GWG	28.29985*	LT Impo	11.05596*
PP Export→ GWG	3.267780**	PP Export	1.680623
PP Import→ GWG	13.07230*	PP Impo	0.562507

Source: Authors Calculation

Note: The table summarises the results of causality tests and F-statistics. *; ** and *** indicates that the null hypothesis of no causality is rejected at the significance level of 1%; 5% and 10% respectively. The direction of causality is indicated by the sign "→". The abbreviations of the variables in the results table are elaborated in the list of abbreviations section of this study. The values of the F-statistics are provided in different decimal points to adjust the size and format of the table in a standard format appropriate for the document.

This study's results do not support the theoretical view that trade in tech-intensive sectors causes gender wage inequality to rise where trade in low-tech sectors reduces the gap. This study suggests that trade is any sector that causes gender wage inequality in the short run only whereas in the long run gender wage inequality results in trade in different sectors.

5. Conclusion

The purpose of this study is to identify how technology intensity in international trade affects gender inequality in the labor market. The study takes emerging economies as the research focus due to their significance in the world economy and contribution to world trade. The study divides emerging economies into two groups based on their level of economic growth.

The effect of trade of different sectors classified based on the technology on gender inequality shows a different scenario. The results of the analysis export and import in any sectors classified based on technology intensity such as high tech, low tech, medium-tech, and PP reduce gender inequality in labor force participation and wage. The study found that export in all the sectors like HT; MT; LT; PP increase the FLFPR in both of the group of countries in the long run. Moreover, importing all sectors except the PP import sector increases the FLFPR and decreases LFP inequality between males and females. Inconsistent with the PMG estimation results, granger causality results in evidence that there exists significant long-run bidirectional causality between TC and FLFPR and LFP inequality except for very few cases, but they do not have short-run causality at all.

The study provides several research implications. This study shows that trade in any sector, either high tech or low tech, significantly reduces the wage gap between males and females in emerging countries. Casualty analysis suggests that trade and gender wage gap have casualty from the gender wage gap in the long run, but trade to the gender wage gap in the short run, whereas strong casualty exists in both directions. This study's results do not support the theoretical view that trade in tech-intensive sectors causes gender wage inequality to rise where trade in the low tech sector reduces the gap. This study suggests that trade in any sector causes gender wage inequality in the short-run only, whereas, in the long run, gender wage inequality results in trade in different sectors.

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Appendix

Country Samples

Group 1: Brazil, Chaina, India, Indonesia, Mexico, Russia, and Turkey

Group 2: Argentina, Bangladesh, Chile, Colombia, Egypt, Iran, Iraq, Kazakhstan, Malaysia, Nigeria, Pakistan, Peru, Philippines, Poland, Qatar, Saudi Arabia, South Africa, Thailand, Vietnam, Bahrain, Bulgaria, Czech Republic, Estonia, Hungary, Jordan, Kuwait, Latvia, Lithuania, Mauritius, Oman, Romania, Slovakia, Sri Lanka, Sudan, Tunisia, United Arab Emirates, Ukraine, Venezuela

Country sample for Gender wage gap: Argentina; Brazil; Bulgaria; Chile; Egypt; Hungary; Kazakhstan; Latvia; Mexico; Peru; Philippines; Poland; Slovakia; Sri Lanka; Ukraine; Venezuela