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Trade and Female Labor Participation

Stylized Facts Using a Global Dataset

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Abstract

Using a cross-section of more than 29,000 manufacturing firms in 64 developing and emerging countries from the World Bank's Enterprise Surveys, this paper assesses whether trading firms have a female labor share premium relative to non-trading firms. It focuses on four types of trading firms: exporters, importers, global value chain participants, and foreign firms. The study finds a female labor share premium for all four trading types, controlling for firm output, capital intensity, total factor productivity, and fixed effects. The findings also hold after controlling for differences in relative wages between men and women and excluding traditional export sectors (apparel and electronics) from the sample. The female labor share premium is much higher for production workers compared with non-production workers, implying that women specialize in low-skill production. In line with these findings, the study finds that the female labor share premium for exporters and global value chain participants is highest in low-tech sectors. And female ownership and management expand the female labor share premium for trading firms. Finally, the results suggest that although average wage rates are lower for firms with higher female labor shares, this negative correlation is smaller for trading firms.

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Trade and Female Labor Participation:

Stylized Facts Using a Global Dataset[1]

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Key words: Trade, GVC, women, female labor force participation, labor share, wage gap

JEL codes: F1, F2, F6

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1. Introduction

The ready-made garment in sector in Bangladesh showcases how trade has increased female labor participation over the past 30 years. The sector has expanded on average by 17 percent per year since 1980 and represents over three-quarters of Bangladesh's export earnings. The sector also offered formal job opportunities to women and now employs 4 million workers, an estimated 90 percent of them women, representing a 100-fold increase in workers within just three decades (Heath and Mobarak 2015). Similarly, recent evidence from Indonesia suggests that women benefit from trade liberalization. Input tariff reduction has been linked to higher female labor participation through a relative expansion of female-intensive sectors in a region (Kis-Katos et al. 2018).

Can the positive link between trade and female labor participation in Bangladesh and Indonesia be confirmed for other developing and emerging countries in general? Using a cross-section of more than 29,000 manufacturing firms in 64 countries from the World Bank's Enterprise Surveys, this paper assesses whether trading firms have a female labor share premium relative to non-trading firms. It focuses on four types of trading firms: exporters, importers, global value chain (GVC) participants and foreign firms. We find a female labor share premium for all four types of trading firms, controlling for firm output, capital intensity, total factor productivity and fixed effects. The results also hold controlling for differences in relative wages between men and women, and excluding traditional export sectors (apparel and electronics) from the sample.

Interestingly, the female labor share premium is much higher for production workers compared to non-production workers (i.e. managers, sales, administration), implying that women in our country sample specialize in low-skill production. In line with these findings, the female labor share premium for exporters and GVC participants is highest in low-tech sectors, suggesting the largest benefits for women in low-skill intensive sectors. The paper also analyzes the role of female firm ownership and female top management for the relationship between trading and the female labor share and finds that both expand the female labor share premium of trading firms. Finally, additional analysis explores the link between a firm's female labor share and average wage rates and in particular the mediating role of the firm's trading status. The results suggest that while average wage rates are lower for firms with higher female labor shares, this negative correlation is smaller for trading firms.

The literature has proposed at least four channels through which trade can affect female labor participation, namely (i) sectoral reallocation of labor, (ii) increased competition, (iii) technological upgrading, and (iv) changes in discriminatory behavior. While the last three channels can explain differences across types of firms within a given sector, the literature on sectoral reallocation only captures differences across (rather than within) sectors and is thus not the focus here.[4]

First, trading firms face stronger competition in export markets and thus are incentivized to reduce costs. Hiring more women who earn lower wages relative to men could be part of a firm's cost minimization strategy. The theory of competitive (rather than comparative) advantage postulates that firms compete for export market share on the basis of absolute (rather than relative) costs of production. Trading stimulates the search for lower cost of labor, as firms compete to reduce absolute unit costs. Firms might then take advantage of gender inequalities and hire women (considered a cheap and flexible labor force) to reduce costs. Wages in this theory are determined by the relative bargaining power of groups of workers. As a result, even if female employment increases, women's pay might not necessarily improve. Evidence supporting this channel through which trade can impact female labor participation is nonexistent.

Second, trading firms adopt new technologies that replace physically-demanding tasks in reaction to increased competition which, in turn, could affect men and women in the workplace differently. The effect depends on the tasks they perform (e.g. blue-collar or white-collar) and if these tasks have a complementary relationship with new technologies. Women with a comparative advantage in non-physically demanding tasks become more productive when these new technologies are adopted. For example, Junh et al. (2013, 2014) show that North American Free Trade Agreement-induced export entry by firms that imported computerized equipment (a measure for technological upgrading) led to higher female employment and wages relative to men in blue-collar jobs.

Third, trade-induced competition also changes discriminatory practices. Employers are assumed to have a taste for discrimination against women for which they "are willing to pay" a price (Becker 1957),

[4] The Heckscher-Ohlin traditional trade model highlights how sectoral reallocation, induced by trade, could potentially affect female workers. The principle of comparative advantage suggests that in developing countries with relative abundance of low-skill labor, trade can increase female labor participation. This is because female workers tend to be concentrated in low value-added, low wage and labor-intensive export industries such as apparel where developing countries have comparative advantage. Empirical findings confirm that the growth in exports that took place in developing countries during the early 1960s and the mid-1980s was positively correlated with increases in female labor participation (e.g., Wood 1991). The sectoral reallocation mechanism of the impact of trade on gender is also mentioned in other studies such as Aguayo-Tellez et al. (2013), Busse et al. (2006), and Sauré et al. (2014).

especially in markets characterized by low competition among firms in which monopolistic employers can afford to pay male workers higher wages than their productivity would suggest. Trade-induced competition, however, makes taste-based discrimination more costly. Oostendorp (2009) studies the role of globalization on the gender wage gap for a large cross-section of countries and finds that gender wage discrimination falls with more economic development and trade. Evidence for a positive role of trade liberalization in lowering the gender wage gap and increasing female labor demand via reduced discrimination has also been found for Uruguay (Ben Yahmed 2017) and Colombia (Ederington et al. 2009).

But trading could also re-enforce female discrimination through at least three channels: (i) Trading can increase firm profits through better access to inputs and markets or higher productivity and allows firms to maintain their discriminatory practices (see, e.g., Bernard and Jensen 1999; Ben Yahmed 2017). (ii) Trade-induced competition could also reduce women's bargaining power in the labor market (Darity and Williams 1985, and Williams 1987), adding further downward pressure on their wages. Support for this theory has been found in Chinese Taipei, the Republic of Korea, India and China (Berik 2000, Berik et al. 2004, Menon and Van der Meulen Rodgers 2008, and Chen et al. 2012). (iii) A recent study suggests that exporting firms demand highly flexible employees (for working peculiar hours, taking late night phone calls and engaging in international travel arranged at short notice) and therefore discriminate against women as they are perceived to be less flexible. This theory is confirmed in a study on Norway using matched employer-employee data where the gender wage gap is higher in exporting compared to non-exporting firms, but only for higher-skilled jobs (Bøler et al. 2018). It is not clear if this channel also applies to a developing country context abundant in unskilled workers.

Our paper contributes to the strand of literature linking trade and labor in the following ways: (i) We modify the cost share functions that have been introduced by Feenstra and Hanson (1996) to assess the impacts of trade on different worker types. Rather than focusing on high- versus low-skill workers, our emphasis is on female versus male workers. (ii) We use a rich harmonized micro-level dataset that covers a large number of developing and emerging countries, while many studies on trade and female labor participation in a developing country context are performed at a more aggregate level.[5] (iii) Finally, we also assess the role of female entrepreneurship, specifically female ownership and management, for the female labor share premium of trading firms.[6] Our paper is closest in spirit to Juhn et al. (2013, 2014) who focus on the relationship between trade liberalization, rather than trading status, and female labor

[5] Exceptions include Ederington et al. (2009) for Colombia, Chen et al. (2012) for China, and Juhn et al. (2013, 2014) for Mexico.
[6] For an overview of female entrepreneurship and a discussion of different drivers, see, e.g., Carranza et al. (2018).

participation and Shepherd (2018) who studies the link between GVC participation and the absolute and relative demand for female production and non-production workers.

This paper is organized as follows. In Section 2, we describe the econometric model, data and measures. We present descriptive statistics of the female labor share in Section 3, focusing on differences by a firm's trading status, across sectors and across countries. The regression results of the female labor share premium are shown in Section 4, also including some robustness checks and assessing the roles of female ownership and management and sectoral technology intensity. Section 5 concludes.

2. Model and Data Description

2.1 Econometric Model

A variable unit cost function CV is specified as follows[7]:

CV=CV(Y, w^F, w^M, k, T)

where *Y* denotes the output and w^F and w^M are the exogenous wages for the variable input factors female labor L^F and male labor L^M. Capital is considered a quasi-fixed input factor in the form of capital intensity *k*. The technology shifter *T=T*(*tfp, trade*) is defined as a function of total factor productivity and trade.

Using the transcendental logarithmic (translog) form of the variable unit cost function as introduced by Brown and Christensen (1981) and applying Shephard's Lemma,[8] the following factor demand function can be derived: $\boldsymbol{S^F = \alpha + \beta_1 \ln Y + \beta_2 \ln(w^M/w^F) + \beta_3 \ln k + \gamma_1 \ln tfp + \gamma_2 trade}$

S^F is the cost share of L^F in variable costs *CV*. Since w^F and w^M are the only variable costs, *CV* is determined by the sum of the products of the variable factor costs with their respective factors, $CV = w^F L^F + w^M L^M = wL$, where *w* designates the average wage per labor input *L*, regardless of the gender. We refer to the composite term $S^F = w^F L^F / wL$ as the female wage share. A decrease of S^F can reflect both a fall in L^F and/or a fall in w^F, which implies a rise in $S^M$and thus an increase in L^M and/or in w^M.

[7] This is a modified version of the unit cost functions by Feenstra and Hanson (1996), Geishecker (2006) and others that differentiate between skilled and unskilled labor.

[8] According to Shephard's Lemma (1953), factor demand is determined by the first partial derivative of the cost function with respect to the corresponding factor price, regardless of the kind of production function.

Other control variables include output, *Y.* The coefficient sign of output *Y*, $ß_1$, is not unambiguously predictable. An increase in *Y* normally leads to a higher total wage bill. If the cost increase is equally distributed between female and male labor, there should be no influence on S^F. If the wage bill of male labor increases more than proportionally, e.g. due to better bargaining power, this results in a higher L^M and/or w^M, and S^F is expected to fall ($ß_1 < 0$).

One expects a lower S^F and thus a lower cost share of L^F in total wages when relative wages for male labor, w^M/w^F, as part of *CV* rise ($ß_2 < 0$). An increase in the capital intensity, *k*, will increase S^F, if capital is a substitute for male labor ($ß_3 > 0$), but reduce S^F, if capital is a substitute for female labor ($ß_3 < 0$). A higher *tfp* could increase labor demand in favor of female ($\gamma_2 > 0$) or male workers ($\gamma_2 < 0$). The influence of *trade* on S_{HS} is not easily predictable, as trade could increase the relative demand for female ($\gamma_1 > 0$) or male labor ($\gamma_1 < 0$).

In the absence of gender-specific wage data at the firm-level, the model is modified in two ways:

First, the analysis on trade and the female wage share combines the Enterprise Survey dataset with sectoral wage data by gender, available from Household Surveys. This assumes equal relative wages across all firms in a sector. Such wage data are available for 30 countries in the Enterprise Surveys, allowing to estimate the following female wage share equation:

$$\boldsymbol{S^F_{isrt} = \alpha + \beta_1 \ln Y_{isrt} + \beta_2 \ln\left(w^M/w^F\right)_{st} + \beta_3 \ln k_{isrt} + \gamma_1 \ln tfp_{isrt} + \gamma_2 trade_{isrt}} \\ \boldsymbol{+ D_{cs} + D_r + D_t + \varepsilon_{isrt}} \quad \textbf{(1)}$$

Second, the analysis assumes equal wage rates for female and male workers, $w^F = w^M = w$. Since $S^F = w^F L^F / wL$, the dependent variable becomes the female labor share in total employment, $femsh = L^F / L$. Similarly, the model no longer controls for relative wages, since we assume $\ln(w^M/w^F) = \ln 1 = 0$. While assuming equal wage rates between female and male workers is a strong assumption, we argue that the fixed country-sector effects included in the model partially correct for this. The female labor share equation takes the following form:

$$\boldsymbol{fem_{sh_{isrt}} = \alpha + \beta_1 \ln Y_{isrt} + \beta_2 \ln k_{isrt} + \gamma_1 \ln tfp_{isrt} + \gamma_2 trade_{isrt}} \\ \boldsymbol{+ D_{cs} + D_r + D_t + \varepsilon_{isrt}} \quad \textbf{(2)}$$

Equation (2) becomes our baseline specification, allowing us to include all 64 countries in the analysis, while equation (1) serves as a robustness test. Both models consider four types of trading firms: (1)

Exporters are firms with an export share (direct or indirect) of at least 10% of total sales. (2) Importers are firms with an imported input share of at least 10% of total inputs. (3) GVC participants are firms that are classified as both exporters and importers. (4) FDI refers to firms with a foreign ownership share of at least 10%. The trade variables are dummies taking a value of 1 if the firm trades, and 0 if it does not. The model also controls for country-sector, subnational region and year fixed effects.

2.2 Data

Our dataset draws on two underlying datasets, published by the World Bank Enterprise Analysis Unit, namely the Enterprise Surveys Global Database and the Firm-level TFP Estimates and Factor Ratios. The Enterprise Surveys Global Database covers 242 surveys in 140 countries over the period 2006 to 2017.

The Enterprise Surveys represent a comprehensive source of firm-level data in emerging markets and developing economies. One major advantage of the Enterprise Surveys is that the survey questions are the same across all countries. Moreover, the Enterprise Surveys represent a stratified random sample of firms using three levels of stratification: sector, firm size, and region. Sectors are determined based on the ISIC Rev. 3.1 classification of the main product or service.

The Enterprise Surveys Global Database covers a wide range of indicators on firm characteristics, the business environment, innovation and technology, and workforce and skills among others. We merged this dataset with data on firm-level output, value added, and capital stock obtained from the Firm-level TFP Estimates and Factor Ratios dataset. All local currencies have been converted into US dollars and deflated using a GDP deflator in USD (base year 2009). Exchange rates and GDP deflators have been obtained from the World Development Indicators.

We apply the following rules to the dataset: (i) We include only the most recent Enterprise Surveys for each country. (ii) We only cover the years 2010 to 2017, to account for the shock of the global economic crisis of 2008. (iii) We exclude services firms from the sample, i.e. for which the ISIC Rev. 3 classification of the main product or service is higher than 36 and those that have been classified as services firm by the Enterprise Surveys, as information on female employment is hardly available. (iv) We drop countries for which female employment data were spotty[9] and firms with missing observations for

[9] These include Lao PDR, Madagascar, Malaysia, the Philippines, Turkey, and Thailand.

female employment or total employment. (v) Finally, we exclude countries with fewer than 100 manufacturing firms after applying the previous steps.

The procedure above results in more than 29,000 manufacturing firms in 64 countries. The list of countries, year of the most recent survey and number of firms by country can be found in Appendix 1. The distribution of firms across ISIC sectors is shown in Appendix 2.

We combine the firm-level data with Global Employment Sex-disaggregated Statistics (GESS) at the sector level from the World Bank Household Surveys and other public resources. GESS uses harmonized classifications of economic activities and occupation categories. It fills an important information gap in global sex statistics by providing more detailed accounts on education, employment levels, wages, labor income, and employment status at very disaggregated economic activity levels and occupation categories than is usually available. The data are available for 50 countries at the ISIC Rev. 3.1 level, but only 30 countries overlap with the Enterprise Survey data sample. These 30 countries are highlighted bold in the country list of Appendix 1.

2.3 Measures

This study focuses on two measures of *female labor participation*:

- Female labor share, *fem_sh* = number of permanent full-time female employees as % of total number of permanent full-time employees. The variable is computed for permanent production workers, non-production workers and total workers (sum of both). Non-production workers include managers, administration and sales.
- Female wage share, S^F = total compensation of female employees as % of total compensation of all employees. Since the Enterprise Survey dataset has only information on average wage rates,[10] we approximate female wage rates at the firm level by assuming the same ratio of female-to-average wages in a given sector as in the gender-disaggregated wage data from the World Bank Household Surveys. Total female compensation is then obtained by multiplying the female wage rate with the number of female employees from the Enterprise Surveys.

The analysis examines two measures of *trade participation:*

[10] These are obtained dividing a firm's total compensation by its total number of employees.

- Exporter, *exp* = 1 if direct plus indirect export share as % of sales >= 10%, and 0 otherwise.
- Importer, *imp* = 1 if share of imported inputs as % of total inputs >= 10%, and 0 otherwise.

We additionally include two measures that describe *global firms:*

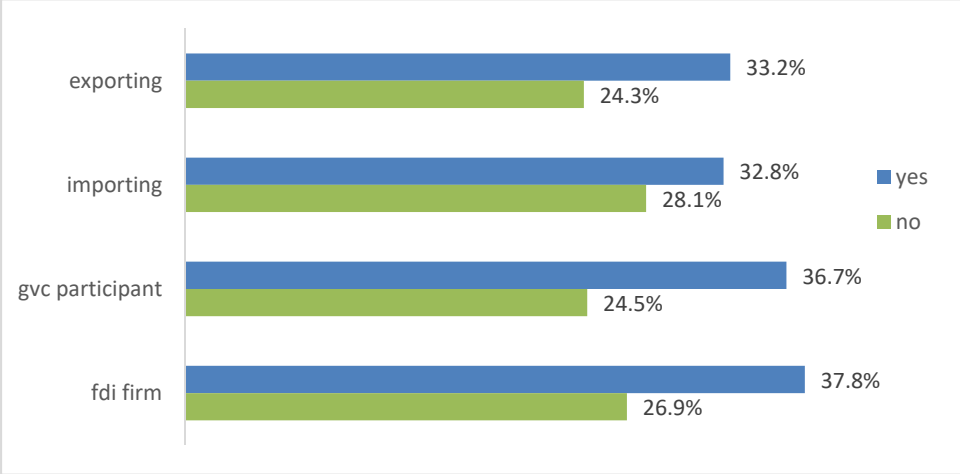
- GVC participant, *gvc* = 1 if both *exp* = 1 and *imp* = 1, and 0 otherwise.
- Foreign ownership*, fdi* = 1 if foreign private ownership >= 10% and 0 otherwise.

3. Descriptive Statistics

3.1 Differences by Trading Status

To get a first idea on the relationship between the female labor share and trading/global firms, this section first describes the average share of female workers in a firm's total workforce across different types of trading firms. This does not control for any other factors yet that could influence the female worker share, as derived from theory (section 2.1). Figure 1 suggests that trading and global firms show a higher average share of female permanent workers than non-trading and non-global firms. Specifically, the share of women in a firm's average permanent workforce is 33.2% for exporters versus 24.3% for non-exporters. While importers employ on average a similar share of women as exporters (32.8%), the gap between importers and non-importers is smaller with non-importers employing on average 28.1% of female workers. Note that 45.7% of firms in the sample import, while the share of exporting firms drops to half (23%) (see Appendix 3).

Figure 1: Female labor share, by trading status

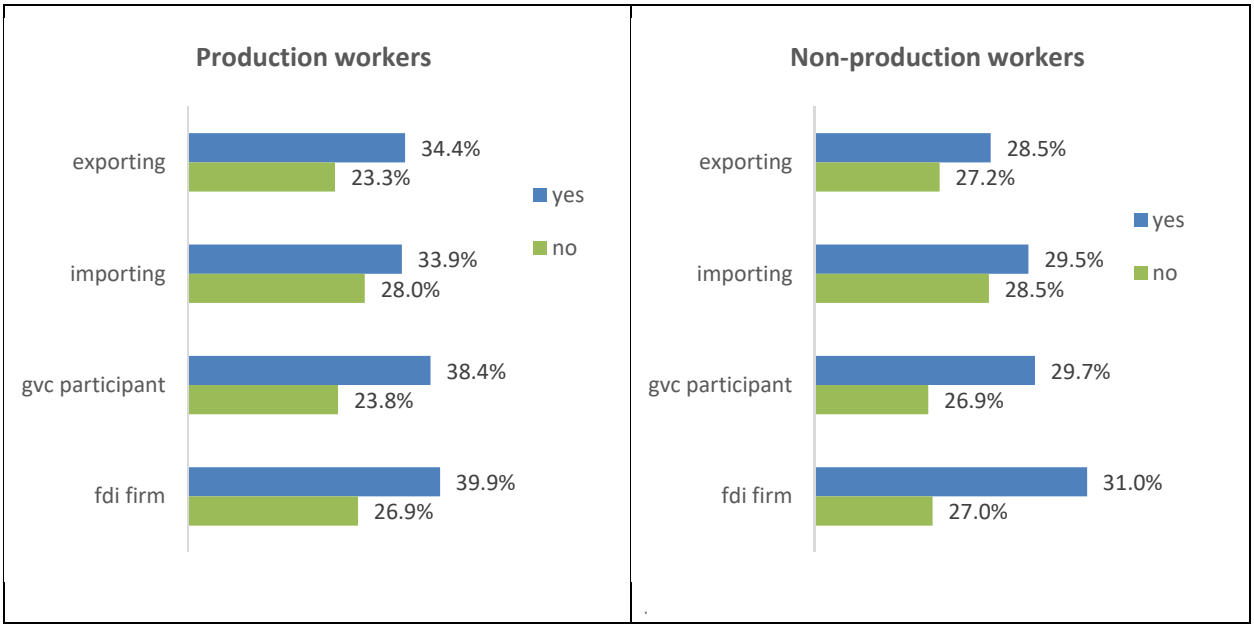


Note: The female labor shares are averages using firm employment as weights.

Shifting the focus to GVC participants and foreign-owned firms, suggests an even larger difference in the female labor participation between global and non-global firms. While less than a quarter of the workforce of non-GVC participants is female (which is on par with exporting firms), the average female labor share increases to 36.7% for GVC participants. Similarly, the share of women in foreign-owned firms in the workforce is 37.8%, compared to only 26.9% in domestically-owned firms. Note that only 14% of all firms in the sample are considered GVC participants, while the share foreign-owned firms is only 7.3% (see Appendix 3). In summary, we hypothesize that the female labor share is higher for trading firms, i.e. that export or import, and even more so for global firms, i.e. that participate in GVCs and are foreign-owned.

Since our dataset allows us to distinguish between production and non-production workers, we analyze in a next step whether the hypothesis above differs by worker type. Figure 2 suggests that the difference between trading (global, resp.) and non-trading (non-global, resp.) firms is larger among production workers (Figure 2, left panel) compared to non-production workers (Figure 2, right panel). The difference between exporters and non-exporters is 11 percentage points among production workers, as opposed to only 1.3 percentage points among non-production workers. Similarly, the difference between importers and non-importers is around 6 percentage points among production workers, but only 1 percentage point among non-production workers.

Figure 2: Female labor share, production vs. non-production workers, by trading status



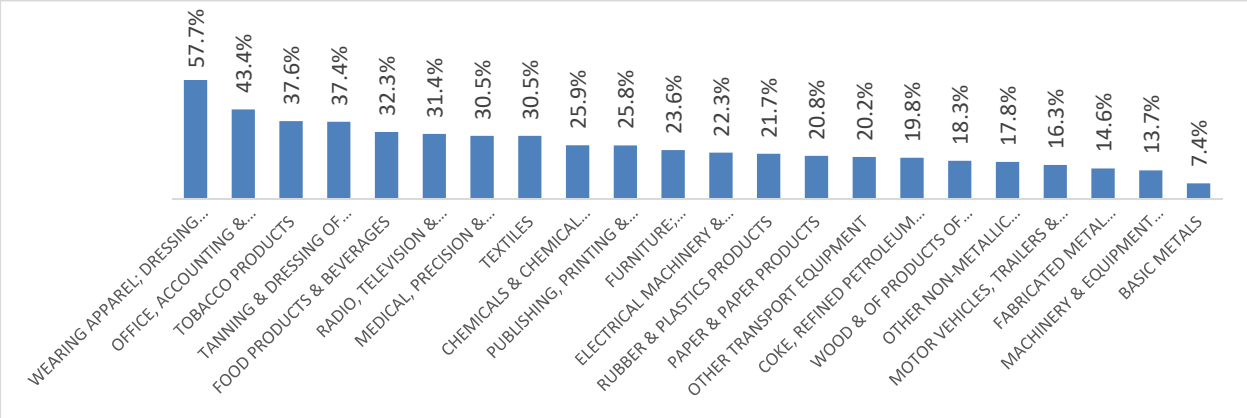
Note: Non-production workers include managers, administration and sales. The female labor shares are averages using firm employment as weights.

And while the difference in the female labor share is larger between global and non-global firms among non-production workers, the gap is much higher for production workers. The difference between GVC participants and non-participants is less than 3 percentage points among non-production workers, as opposed to 14.5 percentage points among production workers. Similarly, the difference between foreign and non-foreign firms is only 4 percentage points among non-production workers, as opposed to 13 percentage points among production workers. We therefore hypothesize that the difference in the female labor share between trading (global, resp.) firms and non-trading (non-global, resp.) firms is driven by production workers.

3.2 Sectoral Differences

This section describes the average female labor share by sector. As can be expected, the share of female permanent workers exceeds half the workforce (57.7%) in wearing apparel which is known to be very female-intensive (Figure 3). This is followed by office, accounting and computing machinery (43.4%), although this average has to be considered with caution due to the low number of firms in this sector. Other sectors with a female labor share exceeding 30% are either related to apparel (leather and footwear; textiles) and electronics (radio, television, and communication equipment; medical, precision and optical instruments), or tobacco products and food and beverages. Natural-resources intensive sectors, like oil, wood and metal products, but also transport equipment, by contrast, tend to show the lowest female labor share.[11]

Figure 3: Female labor share, by sector

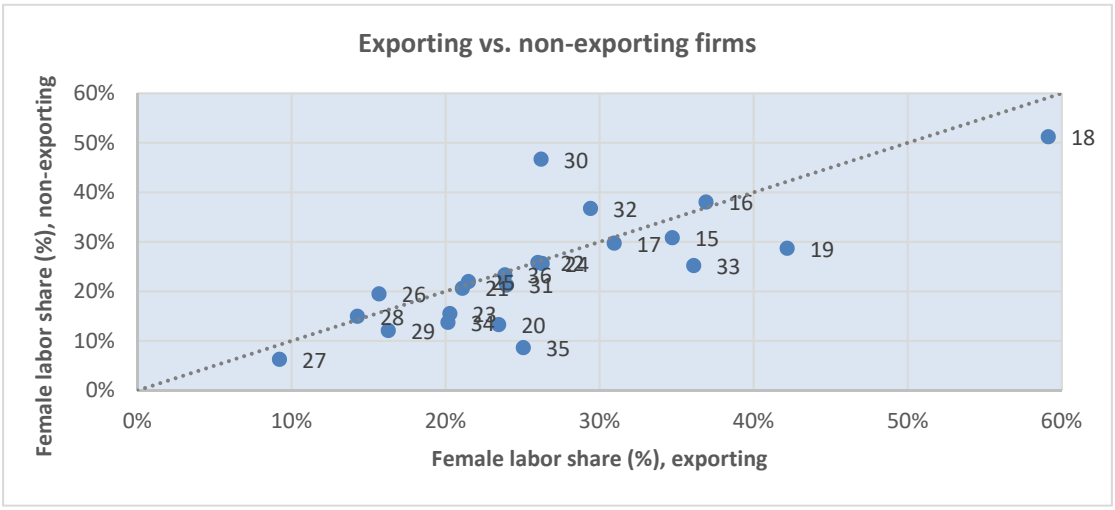


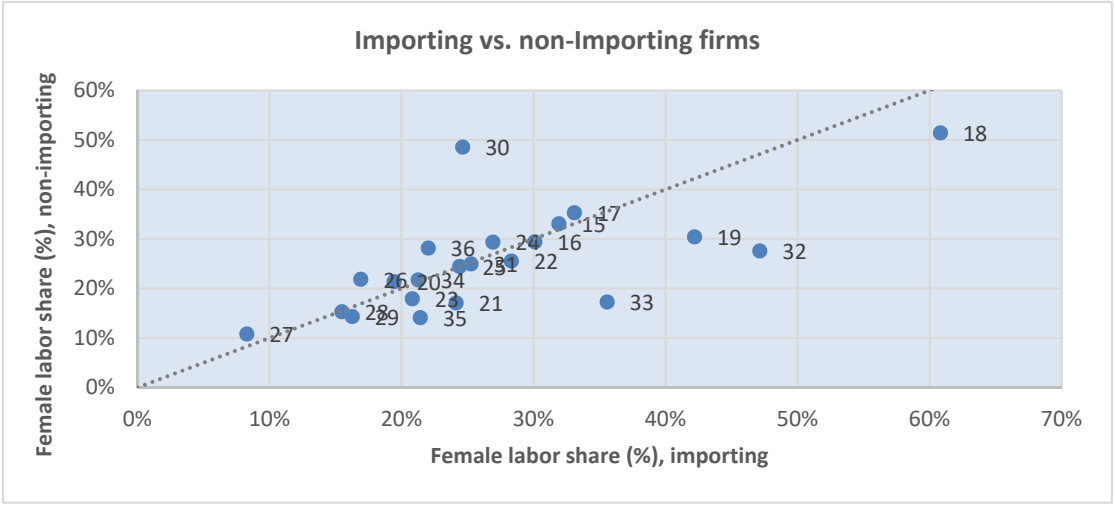
Note: For the sectoral distribution of firms, see Appendix 2. The female labor shares are averages using firm employment as weights.

[11] For the averages by sector overall, and also for trading and global versus non-trading and global firms, see Appendix 4. The data for production workers are shown in Appendix 5 and those for non-production workers in Appendix 6.

The previous graph does not differentiate between trading and non-trading firms. Figure 4 (top panel) therefore plots the average female labor share of permanent workers for exporters on the x-axis versus non-exporters on the y-axis by sector. Most sectors are located below the dotted y = x line which suggests higher female labor shares for exporting compared to non-exporting firms. The gap between exporters and non-exporters is especially high in wearing apparel (ISIC 18) and leather and footwear (ISIC 19), but also medical, precision and optical instruments (ISIC 33). Interestingly, the female labor share seems to be lower for exporting firms in office, accounting and computing machinery (ISIC 30) and radio, television, and communication equipment (ISIC 32).

Figure 4: Female labor share, trade participants vs. non-participants, by sector





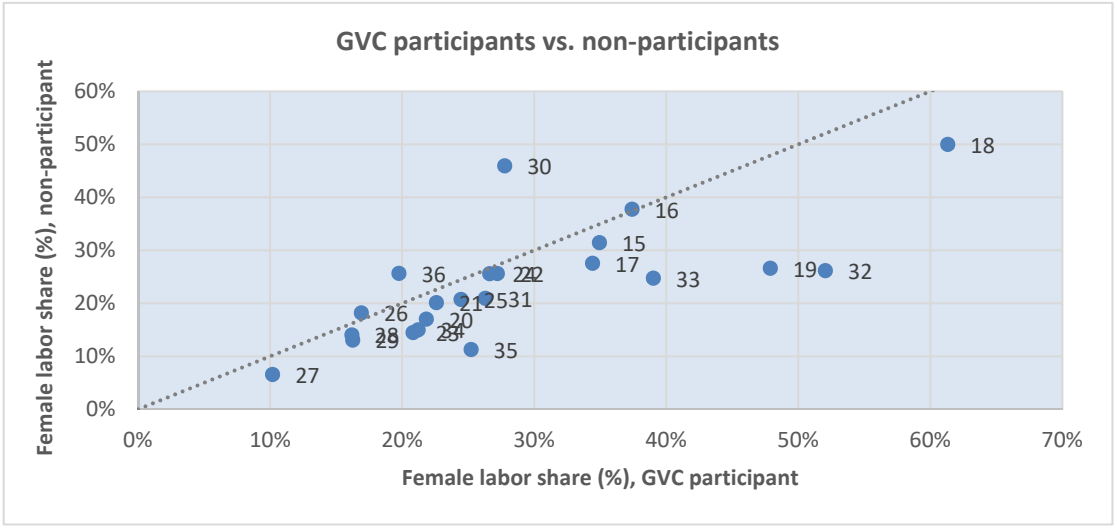
Source: The female labor shares are averages using firm employment as weights. Sector numbers relate to ISIC Rev. 3 sectors. For the sectoral distribution of firms, see Appendix 2.

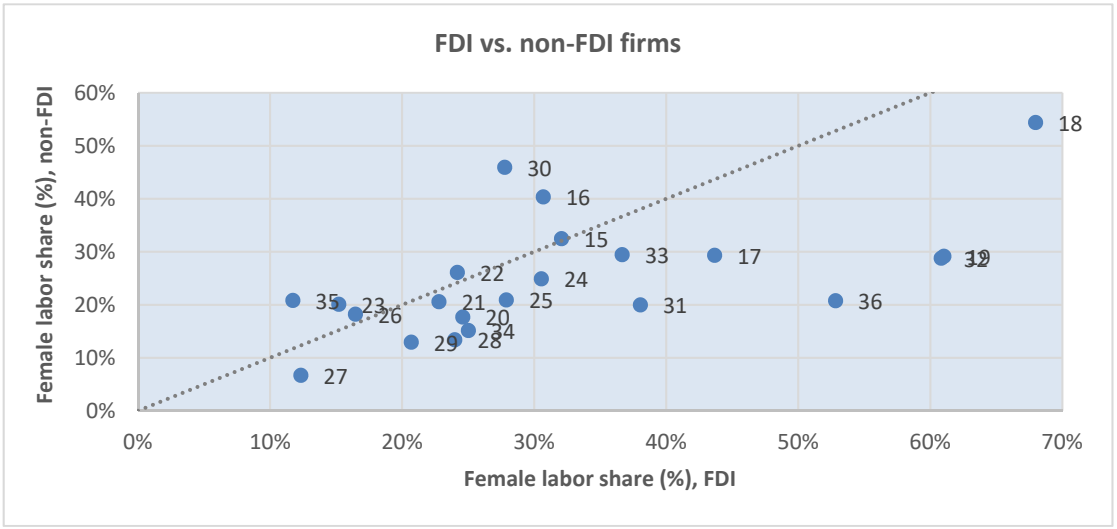
Focusing on importing versus non-importing firms in Figure 4 (bottom panel) confirms the higher average female labor share for importers for the majority of sectors although there are more sectors for which this does not hold. As was the case for exporting, apparel and leather and footwear (ISIC 18 and 19) and medical, precision and optical instruments (ISIC 33) show a large gap between the female labor share for importer as opposed to non-importers, but surprisingly also radio, television, and communication equipment (ISIC 32). Recall that the latter sector showed a higher female labor share for non-exporters compared to exporters (Figure 4). One explanation may be that the products within this sector that are sold to the local market may show a higher female intensity than products that are exported.

GVC participation shows the strongest relationship with the female labor share across sectors (Figure 5, top panel). Almost all sectors show a larger female labor share among GVC participants relative to non-participants, as suggested by the location under the y = x line. Only three sectors are located above the line, in particular office, accounting and computing machinery (ISIC 30). The same four sectors show the largest gap between global and non-global firms: apparel; leather and footwear; radio, television, and communication equipment; and medical, precision and optical instruments (ISIC 18-19 and 32-33).

Finally, the scatterplot in Figure 5 (bottom panel) also tends to suggest a higher female labor share for FDI firms across sectors. The gap in the female labor share between foreign and domestically-owned firms seems to be larger, especially for wearing apparel and leather and footwear (ISIC 18-19), radio, television, and communication equipment (ISIC 32), but also furniture and other manufacturing (ISIC 36), textiles (ISIC 17) and electrical machinery and apparatus (ISIC 31). Overall, the sectoral analysis seems to confirm the hypothesis that trading/global firms show a larger average female labor share than non-trading/non-global firms.

Figure 5: Female labor share, global firms vs. non-global firms, by sector



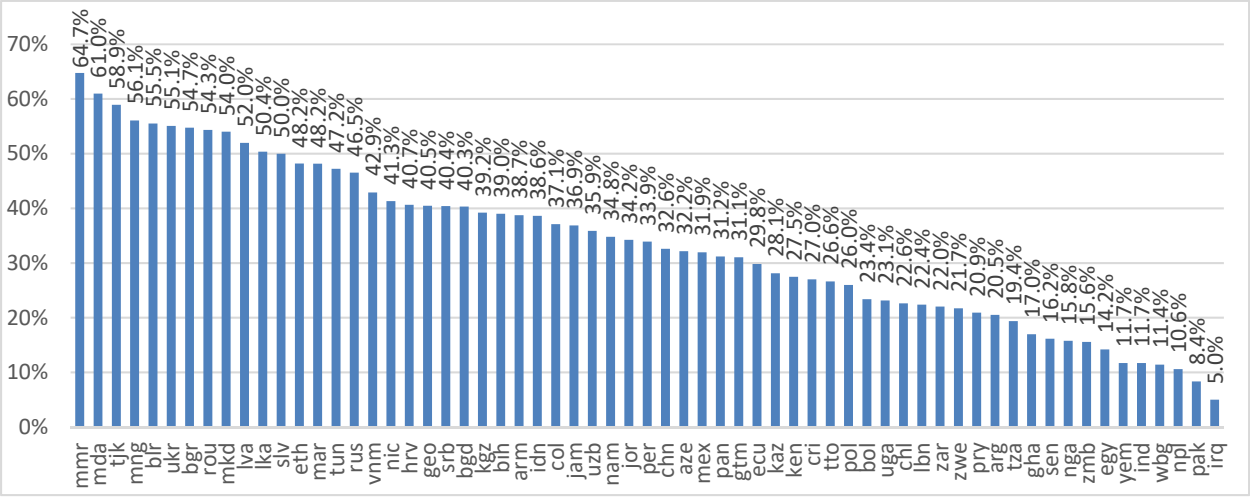


Source: The female labor shares are averages using firm employment as weights. Sector numbers relate to ISIC Rev. 3 sectors. For the sectoral distribution of firms, see Appendix 2.

3.3 Differences across Countries

This section shifts the focus to the average female labor share by country. The number of firms surveyed varies drastically across the country sample, ranging from over 6,000 firms in India, to over 1,000 firms in Bangladesh, China, the Arab Republic of Egypt, Indonesia, and the Russian Federation to around 100 in other countries. The findings of the country analysis therefore need to be treated with caution. They nevertheless allow to get a first idea about the female labor participation across different countries. The main observation of Figure 6 is that the female labor share ranges from almost two-thirds in Myanmar (MMR, 64.7%) to less than 10% in Pakistan (PAK, 8.4%) and Iraq (IRQ, 5%).

Figure 6: Female labor share, by country



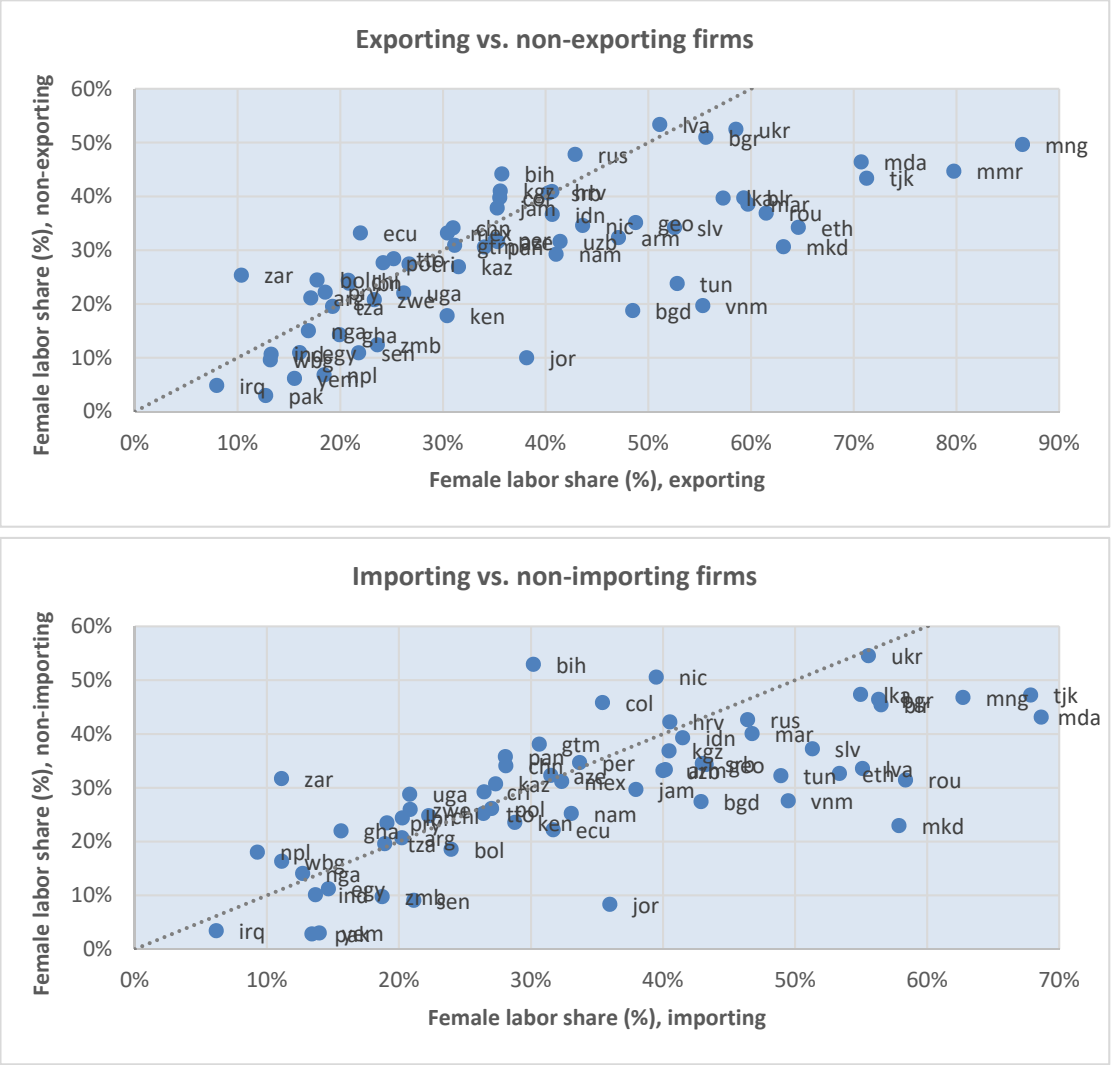
Note: See Appendix 1 for full country names. The female labor shares are averages using firm employment as weights.

The figure also seems to suggest that the female labor share seems to be highest in Eastern European and Central Asian (ECA) countries including Moldova, Tajikistan, Mongolia, Belarus, Ukraine, Bulgaria, Romania, Macedonia, and Latvia, whose female labor shares exceed 50%. These are followed by countries associated with high trade/GVC participation (e.g., Sri Lanka, Ethiopia, Morocco, Vietnam, Bangladesh) exceeding female employment shares of 40%.

Since the previous analysis does not differentiate between trading and non-trading firms, Figure 7 (top panel) plots the average female labor share of permanent workers for exporting firms on the x-axis versus non-exporting firms on the y-axis by country. As was the case for sectors, most countries are located below the dotted y = x line, which suggests higher female labor shares for exporting relative to non-exporting firms. The aforementioned countries in the ECA region and those with a strong trade integration show the highest gaps between exporting and non-exporting firms. A few countries show higher female labor shares for non-exporters, in particular Bosnia-Herzegovina (BHI), Ecuador (ECU) and the Democratic Republic of Congo (ZAR).

Similarly, the female labor share is higher for importing as opposed to non-importing firms (Figure 7, bottom panel) and for GVC participants as opposed to non-participants (Figure 8, top panel). In both cases, ECA countries or those with a high trade integration show higher gaps in the female labor shares. Interestingly, there are more countries for which female labor participation among importers or GVC participants is lower, which mainly consist of countries in Sub-Saharan Africa or Latin America (with the exception of Bosnia-Herzegovina).

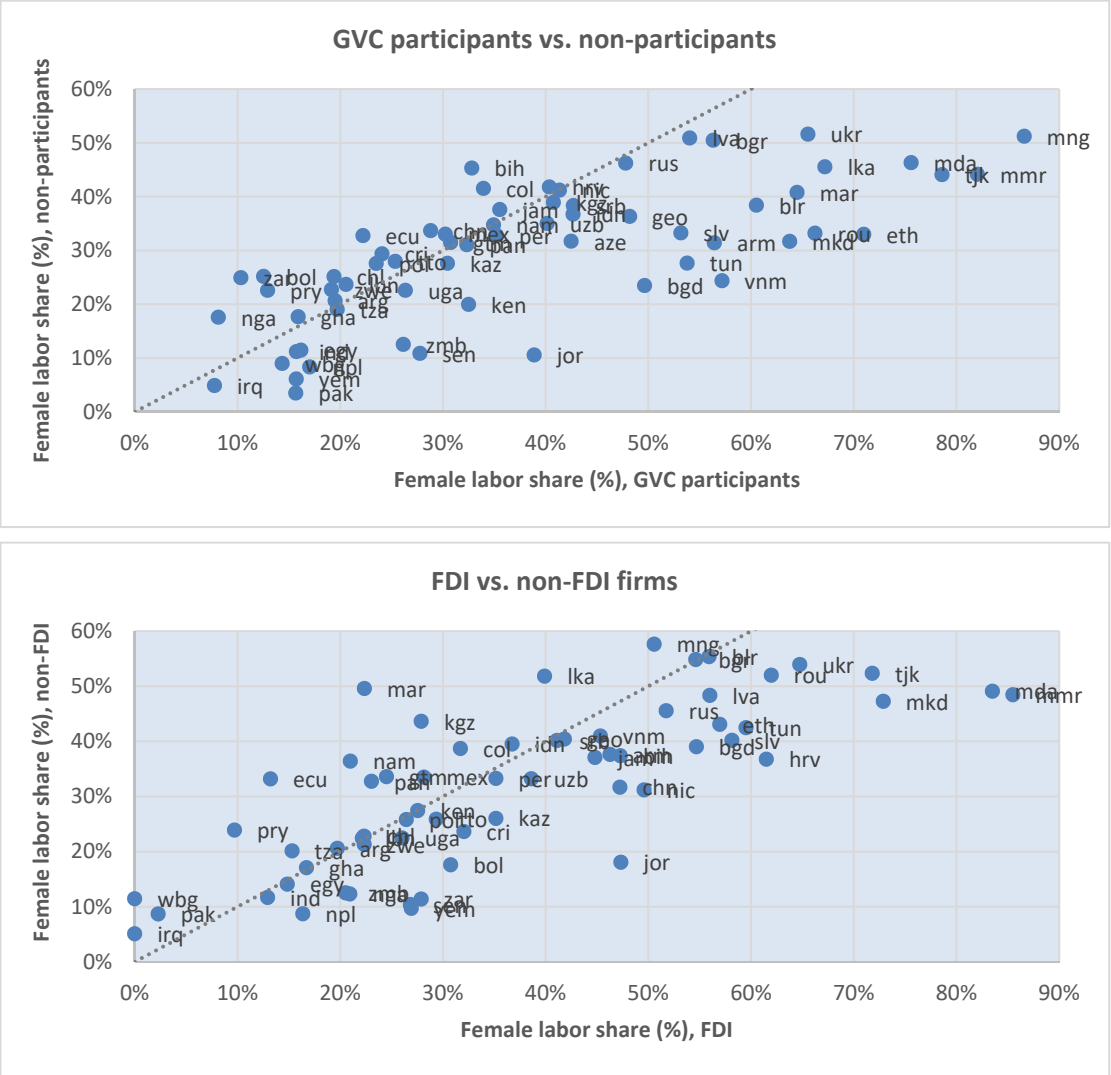
Figure 7: Female labor share, trade participants vs. non-participants, by country



Source: The female labor shares are averages using firm employment as weights. For country abbreviations, see Organization for Standardization (ISO), https://www.iso.org/obp/ui/#search.

Foreign ownership status, on the other hand, shows a different relationship with the female labor share, as suggested by Figure 8 (bottom panel). While the majority of countries are still located below the y = x line, implying a positive association between FDI status and the female labor share in more countries, the composition of countries looks different compared to exporting, importing and GVC participation. Some of the countries with a strong gap in female labor share among non-trading firms, such as Sri Lanka, Morocco, and Mongolia, are now located above the dotted line, i.e. the female labor share appears to be higher among domestically-owned firms. While the low share of foreign firms in the sample of 7% could bias the results, another explanation may be that FDI is less common in female-intensive sectors like apparel.

Figure 8: Female labor share, global vs. non-global firms, by country



Source: The female labor shares are averages using firm employment as weights. For country abbreviations, see Organization for Standardization (ISO), https://www.iso.org/obp/ui/#search.

4. Regression Results

4.1 Baseline Results

The following section shows the results of the regression analysis following the specification of equation (1). We include the following *additional control variables* in all regressions:

- Output, ln*Y* = total sales in natural logarithms.
- Capital intensity, ln*k* = capital stock per output in natural logarithms.
- Total factor productivity, ln*tfp* = total factor productivity in natural logarithms.

The summary statistics are shown in Appendix 3. Table 1 shows the mean differences for the female labor share between trading and non-trading firms, while Table 2 focuses on global versus non-global firms. Focusing on the control variables, we find consistently that output is positively correlated with the female labor share, indicating that larger firm size matters positively. By contrast, TFP is negatively associated with the female labor share, suggesting that women tend to be more employed in less-productive firms. The coefficient sign on capital intensity is negative, implying a higher female labor share in less capital-intensive firms, but the result is not significant.

The results in Table 1 show that exporting is positively correlated with the female labor share, only controlling for fixed effects (column 1). Additionally controlling for a firm's output confirms the positive relationship, although the coefficient is slightly smaller (column 2). Interestingly, additionally including capital intensity and TFP as control variables increases the coefficient on exporting (columns 3 and 4). Interpreting the coefficient in the fully specified model (column 4), the female labor share is 4.4 percentage points higher for exporting firms compared to non-exporting firms. This is lower than the difference of 9 percentage points shown in Figure 1 and can be explained by the inclusion of control variables and fixed country-sector, subnational region and year effects.

Table 1: Female labor share premium of trading vs. non-trading firms

Dependent variable:	***Exporter, exp***				***Importer, imp***			
fem_sh_{isrt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln Y_{isrt}$		0.0986	0.1665*	0.2401**		0.2987***	0.3849***	0.4884***
		(0.179)	(0.096)	(0.025)		(0.000)	(0.000)	(0.000)
$\ln k_{isrt}$			-0.0757	-0.1888			0.0030	-0.1225
			(0.514)	(0.156)			(0.981)	(0.407)
$\ln tfp_{isrt}$				-1.4452**				-1.8372***
				(0.019)				(0.007)
$\mathbf{trade_{isrt}}$	**3.6772*** **	**3.6145*** **	**4.3009*** **	**4.3505*** **	**1.8163*** **	**1.7998*** **	**2.1041*** **	**1.9359*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
constant	17.8032**	0.6479	2.7873	70.3968***	28.6015	41.1258	51.8918***	65.2164***
	(0.014)	(0.601)	(0.746)	(0.000)	(.)	(.)	(0.000)	(0.000)
Obs.	29,075	24,154	15,935	14,485	24,271	19,701	13,950	12,601
R-squared	0.53	0.54	0.54	0.54	0.51	0.53	0.53	0.53

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects.

Focusing on importing firms, the results suggest a female labor share which is on average 1.9 percentage points higher compared to non-importing firms, controlling for output, capital intensity, TFP and the set of fixed effects (column 8). As was the case for exporting, the female labor share premium is lower than the premium of 4.7 percentage points which was shown in Figure 1. In summary, the findings suggest that a firm's export status explains roughly half of the difference in the female labor share (4.4

out of 8.9 percentage points), while other factors explain the other half. Similarly, a firm's import status explains around 40 percent of the difference in the female labor share (1.9 out of 4.7 percentage points).

Table 2 focuses on the mean differences between global and non-global firms. The female labor share premium is 4.0 percentage points for GVC participants compared to non-participants, wheras the difference in the female labor share is only 1.5 percentage points on average between foreign-owned and domestically-owned firms. In other words, GVC participation explains roughly a third (4.0 out of 12.2 percentage points) of the difference in the female labor share relative to non-participants that was shown in Figure 1, while other factors explain two-thirds. FDI explains only around 14 percent (1.5 out of 10.9 percentage points).

Table 2: Female labor share premium of global vs. non-global firms

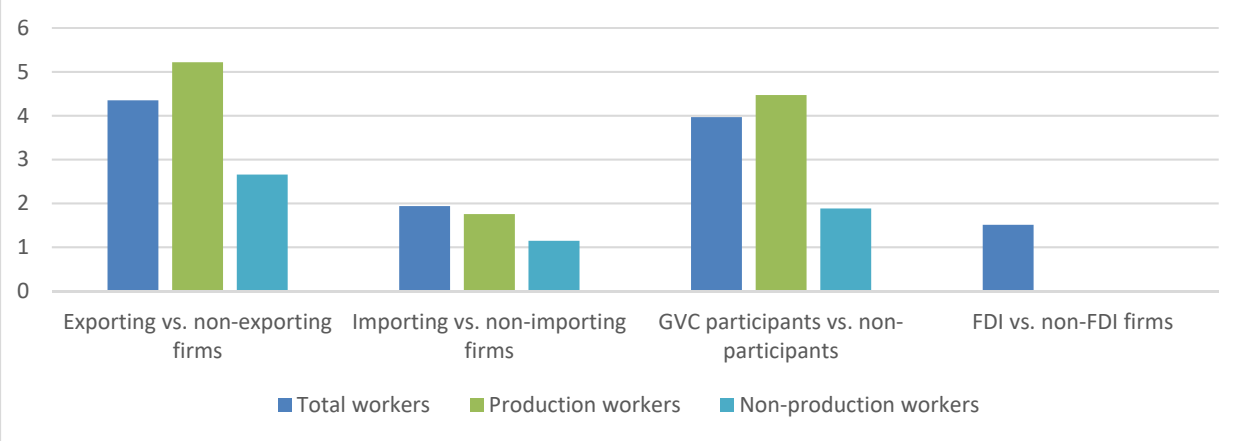
Dependent variable:	***GVC participant, gvc***				***Foreign ownership, FDI***			
fem_sh_{isrt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln Y_{isrt}$		0.1780**	0.2588***	0.3449***		0.2878***	0.4292***	0.5157***
		(0.014)	(0.009)	(0.001)		(0.000)	(0.000)	(0.000)
$\ln k_{isrt}$			-0.0565	-0.1713			-0.0020	-0.1138
			(0.626)	(0.198)			(0.987)	(0.394)
$\ln tfp_{isrt}$				-1.5388**				-1.5336**
				(0.012)				(0.011)
$global_{isrt}$	**3.7144*** **	**3.4534*** **	**4.0120*** **	**3.9658*** **	**2.2865*** **	**1.7237*** **	**1.4961** **	**1.5119** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**	**(0.035)**	**(0.044)**
constant	17.7215**	-0.5901	1.6322	68.8774***	23.3275***	46.8038***	51.3708***	50.4568***
	(0.014)	(0.636)	(0.850)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	29,075	24,154	15,935	14,485	29,060	24,143	15,926	14,476
R-squared	0.52	0.54	0.54	0.54	0.52	0.54	0.54	0.54

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects.

4.2 Production versus Non-Production Workers

In this section, we test the hypothesis (see section 3.1) that the overall findings are driven by production workers. Figure 9 shows female labor share premium for production and non-production workers separately. The latter include managers, administration and sales. The results suggest that the female labor share premium is much higher for production-workers compared to non-production workers. The female labor share premium is twice as high for production workers when comparing exporting with non-exporting firms (5.2 versus 2.7 percentage points) and more than twice as high for GVC participants relative to non-participants (4.5 versus 1.9 percentage points). The female labor share premium between production and non-production workers is much smaller when comparing importing with non-importing firms, and disappears for FDI relative to non-FDI firms. For the underlying regression results, see Appendix 4.

Figure 9: Female labor share premium (percentage points), trading vs. non-trading firms, by worker type



Note: The graph shows mean differences in female labor share between trading and non-trading firms for total, production and non-production workers. All regressions control for output, capital intensity, TFP (all in natural logarithms) as well as country-sector, subnational region and year fixed effects. All results shown are significant at the 10% level. For the underlying regression results, see Appendix 4.

4.3 Robustness Tests

In a next step, Table 3 splits the sample into two periods, namely 2010-2013 and 2014-2017, to detect if the findings hold throughout both periods. Surprisingly, the correlation between exporting and the female labor share more than twice as high for the earlier period 2010-2013. While the female labor share premium is 5.4 percentage points relative to non-exporting firms for the period 2010-13, it was only 2.5 percentage points for the period 2014-17. Moreover, the female labor share premium for importing versus non-importing firms, GVC participants versus non-participants and FDI firms versus non-FDI firms is only significant over the period 2010-2013. While the finding may be related to global GVC trade slowdown, Appendix 1 shows that the 2014-17 surveys contain many Latin American, Sub-Saharan African and some Middle East and North African countries that are less integrated into GVCs and trade, which could have driven the results.

In order to rule out that the overall findings are driven by female-intensive sectors only, we exclude wearing apparel (ISIC 18) and office, accounting and computing (ISIC 30) in the regressions. Figure 10 shows that the female labor share premium for trading firms becomes somewhat smaller for exporters and GVC participants, but not for importers and FDI firms. For the underlying regression results, see Appendix 5 and 6.

One potential omitted variable bias could stem from the lack of gender-specific wage data in the Enterprise Surveys. We are able to address this issue by using gender-specific wage data that are available

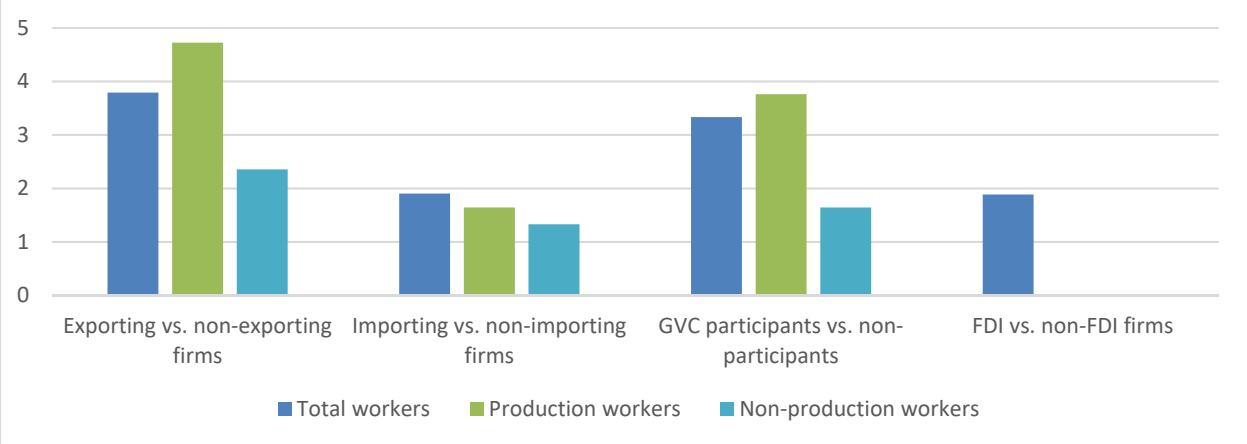
at the ISIC Rev. 3 level for 30 countries in our dataset. We compute the ratio of male to female wages as our control measure of relative wages at the sector level in a country. Another important modification to the econometric model is the change in the dependent variable. Rather than estimating the female labor share (see equation 2), the regressions in this section estimate the female wage share (see equation 1).

Table 3: Female labor share premium, trading vs. non-trading firms, 2010-2013 vs. 2014-2017

Dependent variable:	***2010-2013***				***2014-2017***			
fem_sh_{isrt}	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***	(5) ***exp***	(6) ***imp***	(7) ***gvc***	(8) ***fdi***
$\ln Y_{isrt}$	0.1107	0.3933***	0.2095	0.4750***	0.4244***	0.6738***	0.5355***	0.5661***
	(0.455)	(0.007)	(0.155)	(0.001)	(0.006)	(0.001)	(0.000)	(0.000)
$\ln k_{isrt}$	-0.2386	-0.1816	-0.2114	-0.1185	-0.1212	-0.0064	-0.1043	-0.0960
	(0.198)	(0.329)	(0.254)	(0.524)	(0.523)	(0.979)	(0.583)	(0.614)
$\ln tfp_{isrt}$	-1.4652	-1.3942	-1.5487*	-1.5008	-1.4273*	-2.5379***	-1.5001**	-1.5296**
	(0.122)	(0.131)	(0.097)	(0.103)	(0.060)	(0.009)	(0.048)	(0.044)
$trade_{isrt}$ / $global_{isrt}$	**5.4433*** (0.000)**	**2.3297*** (0.000)**	**5.1306*** (0.000)**	**1.7190* (0.066)**	**2.4588*** (0.001)**	**0.9192 (0.276)**	**1.3171 (0.203)**	**1.1118 (0.378)**
constant	72.2688***	10.8937	70.8940***	66.9885***	58.4506***	0.7596	57.1632***	55.5684***
	(0.000)	(0.120)	(0.000)	(0.000)	(0.000)	(0.892)	(0.000)	(0.000)
Obs.	8,540	8,498	8,540	8,531	5,945	4,103	5,945	5,945
R-squared	0.54	0.54	0.54	0.54	0.51	0.50	0.51	0.51

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects.

Figure 10: Female labor share premium (percentage points), trading vs. non-trading firms excluding apparel and computing, by worker type



Note: The graph shows mean differences in the female labor share between trading and non-trading firms for total, production and non-production workers. All regressions exclude wearing apparel (ISIC 18) and office, accounting and computing (ISIC 30) and control for output, capital intensity, TFP (all in natural logarithms) as well as country-sector, subnational region and year fixed effects. All results shown are significant at the 10% level. For the underlying regression results, see Appendix 5 and 6.

The female wage share premia for trading relative to non-trading firms are shown in Tables 4 and 5. The findings suggest that higher relative wages between male and female workers – or a higher gender wage gap – are associated with a lower female wage share which is in line with expectations (see section

2.1). Output is positively correlated with the female wage share, suggesting that more output benefits the wage bill of female workers more than proportionally. Capital intensity and TFP show negative coefficient signs, but are uncorrelated with the female wage share.

Table 4: Female wage share premium, trading vs. non-trading firms

Dependent variable:	***Exporter, exp***					***Importer, imp***				
S^F_{isrt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
lnY_{isrt}		0.0826	0.1369	0.1887*	0.1897*		0.2387***	0.2835**	0.3485***	0.3503***
		(0.256)	(0.181)	(0.078)	(0.077)		(0.010)	(0.016)	(0.005)	(0.005)
lnk_{isrt}			-0.0665	-0.0708	-0.0704			-0.0091	-0.0215	-0.0212
			(0.573)	(0.593)	(0.595)			(0.947)	(0.892)	(0.893)
lntfp_{isrt}				-0.6686	-0.6676				-0.9439	-0.9484
				(0.256)	(0.259)				(0.185)	(0.186)
ln$(w^{M}/w^{F})_{srt}$					-6.6697***					-7.3527***
					(0.000)					(0.000)
***trade**$_{isrt}$*	**2.3514*** **	**2.1271*** **	**2.5869*** **	**2.5507*** **	**2.5542*** **	**1.1885*** **	**1.0835*** **	**1.2834*** **	**1.1058** **	**1.1052** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.007)**	**(0.010)**	**(0.033)**	**(0.033)**
constant	2.5657***	1.5367	0.3800	0.2899	37.4914***	2.3465***	-0.7318	-1.3844	-1.4560	39.5517***
	(0.000)	(0.154)	(0.793)	(0.851)	(0.000)	(0.001)	(0.611)	(0.447)	(0.450)	(0.000)
Obs.	16,481	15,774	10,392	9,668	9,651	2,891	2,707	2,323	2,214	2,210
R-squared	0.58	0.59	0.57	0.58	0.58	0.54	0.54	0.56	0.56	0.55

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Regressions include the 30 countries highlighted in bold in Appendix 1. All regressions include country-sector, subnational region and year fixed effects.

Table 5: Female wage share premium, global vs. non-global firms

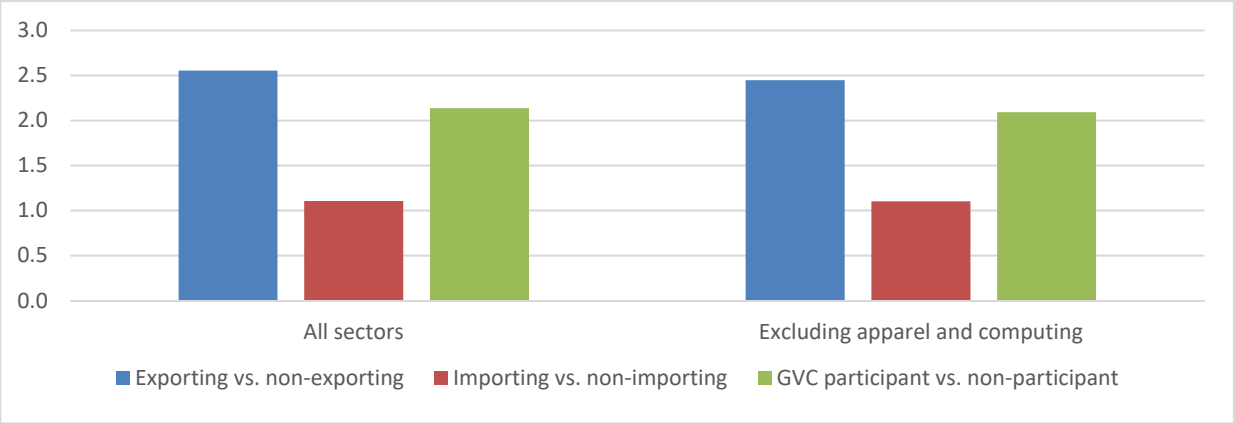
Dependent variable:	***GVC participant, gvc***					***Foreign ownership, fdi***				
S^F_{isrt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
lnY_{isrt}		0.1433**	0.2144**	0.2650**	0.2661**		0.1957***	0.2879***	0.3447***	0.3459***
		(0.043)	(0.033)	(0.012)	(0.011)		(0.005)	(0.003)	(0.001)	(0.001)
lnk_{isrt}			-0.0498	-0.0612	-0.0608			-0.0251	-0.0325	-0.0324
			(0.673)	(0.644)	(0.646)			(0.831)	(0.806)	(0.807)
lntfp_{isrt}				-0.7544	-0.7548				-0.7347	-0.7390
				(0.196)	(0.198)				(0.204)	(0.204)
ln$(w^{M}/w^{F})_{srt}$					-7.2412***					-7.6126***
					(0.000)					(0.000)
***global**$_{isrt}$*	**2.1226*** **	**1.8750*** **	**2.1212*** **	**2.1308*** **	**2.1364*** **	**1.8849*** **	**1.1683* **	**1.2561**	**1.0626**	**1.0638**
	(0.000)	**(0.000)**	**(0.000)**	**(0.001)**	**(0.001)**	**(0.004)**	**(0.088)**	**(0.120)**	**(0.198)**	**(0.198)**
constant	3.0038***	1.1113	-0.2216	-0.2293	40.1618***	3.0178***	0.4143	-1.1767	-1.2822	41.1818***
	(0.000)	(0.301)	(0.878)	(0.882)	(0.000)	(0.000)	(0.696)	(0.409)	(0.399)	(0.000)
Obs.	16,481	15,774	10,392	9,668	9,651	16,481	15,774	10,392	9,668	9,651
R-squared	0.58	0.59	0.57	0.58	0.58	0.58	0.59	0.57	0.58	0.58

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Regressions include the 30 countries highlighted in bold in Appendix 1. All regressions include country-sector, subnational region and year fixed effects.

Exporting firms show a female wage share which is on average 2.5 percentage points higher than non-exporting firms in the fully specified model (column 5). Similarly, importing firms show a female wage share premium of 1.1 percentage points. For GVC participants, the female wage share premium is 2.1 percentage points compared to non-participants, while the regressions do not find a female wage share premium for FDI firms relative to non-FDI firms (Table 5). Note that these patterns hold controlling for the

gender wage gap, output, capital intensity, productivity and fixed effects. The summary is shown in Figure 11, both for the full sample and excluding apparel and computing. Interestingly, the wage share premia are almost identical when the female-intensive sectors apparel and electronics are excluded from the sample.

Figure 11: Female wage share premium (percentage points), trading vs. non-trading firms



Note: The graph shows mean differences between trading and non-trading firms, using firm's female share in total wages as dependent variable. All regressions control for firm output, capital intensity, TFP and relative wages at the sector level (all in natural logarithms) as well as country-sector, subnational region and year fixed effects. All results shown are significant at the 10% level.

4.4 Mediating Role of Female Ownership and Management

This section studies if female ownership and management make a difference for the female labor share premium in trading firms. Analytically, this is assessed by adding an interaction term with the trade variable to equation (2):

$$\boldsymbol{fem_{sh_{isrt}} = \alpha + \beta_1 \ln Y_{isrt} + \beta_2 \ln k_{isrt} + \gamma_1 \ln tfp_{isrt} + \gamma_2 trade_{isrt} + \delta trade_{isrt} * firm_{isrt} + D_{cs} + D_r + D_t + \varepsilon_{isrt}} \quad \textbf{(2a)}$$

where *firm* designates the firm characteristic under consideration.

The total correlation between trade participation and the female labor share is given by the sum of $\gamma_2 + \delta * firm_{isrt}$. Since firm characteristics are positive ($firm_{isrt} > 0$), the joint correlation is larger (smaller, resp.) for $\delta > 0$ ($\delta < 0$, resp.) than γ_2. Firm characteristics to be tested include variables on the role of female management and ownership:

- Female ownership share, *fem_own* = % of the firm owned by females.
- Female top manager, *fem_man* = 1 if the firm's top manager is female, and 0 otherwise.

The preliminary analysis in Appendix 7 suggests that trading firms have a higher probability of being majority-female owned relative to non-trading firms, and to a lesser extent also of having a female top manager. Female ownership and management could thereore also shape the female labor share premium. Following equation (2a), Table 6 (columns 1 to 4) shows the results for female ownership share. The interaction term is positive and significant across all four types of trading. That is, trading firms with a higher female ownership share show significantly larger female labor shares. For example, a 10 percentage point increase in the female ownership share for exporting firms is associated with an expansion of the female labor share premium by 0.9 percentage points from 3.8 to 4.7 percentage points, relative to non-exporting firms. Both the labor share premium and additional gains from female ownership are slightly smaller for GVC participants relative to non-participants.

Table 6: Female labor share premium, trading vs. non-trading firms, role of female ownership and top manager

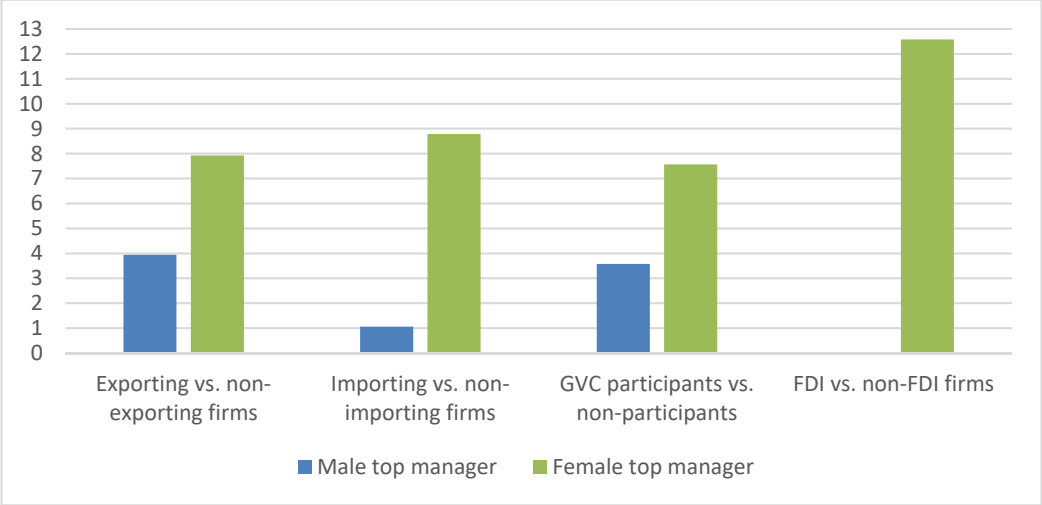
Dependent variable:	***Female ownership share***				***Female manager (dummy)***			
fem_sh_{isrt}	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***	(5) ***exp***	(6) ***imp***	(7) ***gvc***	(8) ***fdi***
$\ln Y_{isrt}$	0.4654***	0.7810***	0.5634***	0.7512***	0.2504**	0.5366***	0.3503***	0.5342***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.019)	(0.000)	(0.001)	(0.000)
$\ln k_{isrt}$	-0.0897	-0.0167	-0.0781	-0.0258	-0.1801	-0.1187	-0.1648	-0.1114
	(0.521)	(0.915)	(0.577)	(0.854)	(0.176)	(0.420)	(0.216)	(0.403)
$\ln tfp_{isrt}$	-1.6845**	-2.1808***	-1.7162***	-1.7039***	-1.4923**	-1.8660***	-1.5918***	-1.5868***
	(0.011)	(0.004)	(0.009)	(0.009)	(0.016)	(0.006)	(0.009)	(0.009)
$\boldsymbol{exp_{isrt}}$	**3.8212*** **				**3.9387*** **			
	(0.000)				**(0.000)**			
$\boldsymbol{exp_{isrt*}\ firm_{isrt}}$	**0.0923*** **				**3.9846*** **			
	(0.000)				**(0.004)**			
$\boldsymbol{imp_{isrt}}$		**0.9449***				**1.0590** **		
		(0.063)				**(0.023)**		
$\boldsymbol{imp_{isrt*}\ firm_{isrt}}$		**0.1007*** **				**7.7247*** **		
		(0.000)				**(0.000)**		
$\boldsymbol{gvc_{isrt}}$			**3.5960*** **				**3.5711*** **	
			(0.000)				**(0.000)**	
$\boldsymbol{gvc_{isrt*}\ firm_{isrt}}$			**0.0673** **				**3.9926** **	
			(0.018)				**(0.031)**	
$\boldsymbol{fdi_{isrt}}$				**0.3374**				**0.2353**
				(0.690)				**(0.758)**
$\boldsymbol{fdi_{isrt*}\ firm_{isrt}}$				**0.1669*** **				**12.3424*** **
				(0.001)				**(0.000)**
constant	12.5661	-13.1416	14.6106*	45.1399***	70.3351***	50.3306***	68.8912***	95.1718
	(0.105)	(0.128)	(0.060)	(0.000)	(0.000)	(0.000)	(0.000)	(.)
Obs.	12,590	10,722	12,590	12,583	14,467	12,588	14,467	14,458
R-squared	0.55	0.54	0.54	0.54	0.54	0.53	0.54	0.54
F-test[1)]	0.0000	0.0000	0.0000	0.0013	0.0000	0.0000	0.0000	0.0000

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects. [1)] F-test of joint significance between trade variable and interaction term.

In Table 6, columns 5 to 8, we look at the role of female management for the female labor share premium. The positive interaction terms suggest that having a female top manager can expand the female

labor share premium dramatically. Exporting firms with a female top manager show a percentage point premium in the female labor share of 8 percentage points relative to non-exporting firms, while the premium for exporting firms with a male top manager is only 4 percentage points. The findings for GVC participants are similar. Interestingly, the correlation between importing and the female labor share is eight times higher for importing firms with a female top manager compared to those with a male top manager. The female labor share premium for FDI firms is only confirmed for FDI firms with a female top manager (see also Figure 12).

Figure 12: Female labor share premium (percentage points), trading vs. non-trading firms, mediating role of a female top manager



Note: The graph shows mean differences in the female labor share between trading and non-trading firms, differentiating between male and female-managed firms. All regressions control for firm output, capital intensity, and TFP (all in natural logarithms) as well as country-sector, subnational region and year fixed effects. All results shown are significant at the 10% level. Exporters are firms with an export share (direct or indirect) of at least 10% of total sales. Importers are firms with an imported input share of at least 10% of total inputs. GVC participants are firms that are classified as both exporter and importers. FDI refers to firms with a foreign ownership share of at least 10%.

4.5 Mediating Role of Sectoral Technology Intensity

In this section, we assess if the female labor share premium differs by sectoral technology intensity. Analytically, we can assess the role of a sector's technology intensity as follows:

$$fem_{sh_{isrt}} = \alpha + \beta_1 \ln Y_{isrt} + \beta_2 \ln k_{isrt} + \gamma_1 \ln tfp_{isrt} + \gamma_2 trade_{isrt} + \delta trade_{isrt} * tech_{srt} + D_{cs} + D_r + D_t + \varepsilon_{isrt} \quad \textbf{(2b)}$$

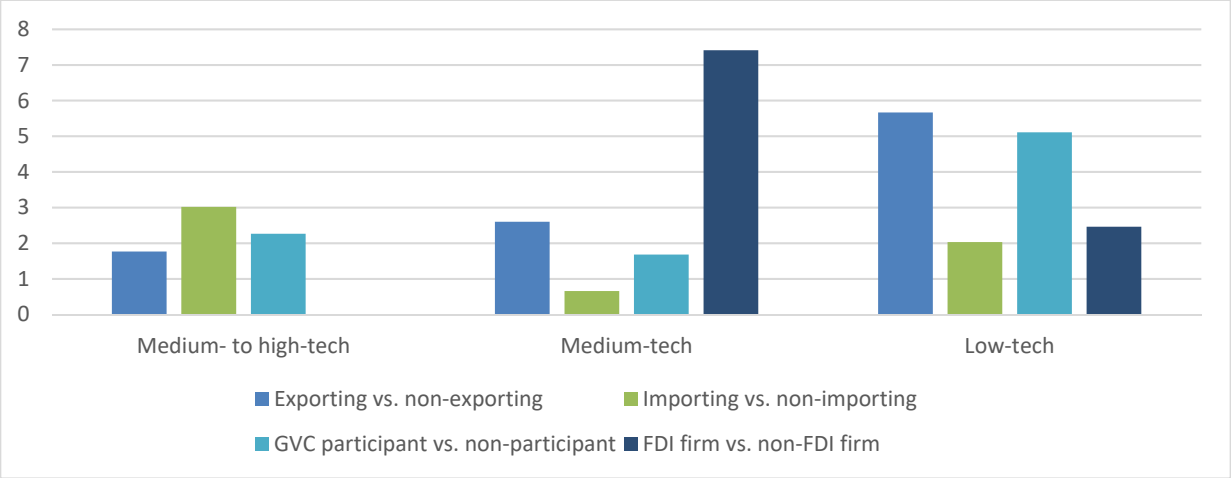
where *tech* designates the sectoral technology intensity under consideration:

- Medium-high or high technology intensity, *tech_h* = 1 if the sector's technology intensity is medium-high or high, and 0 otherwise;

- Medium technology intensity, *tech_m* = 1 if the sector's technology intensity is medium, and 0 otherwise;
- Low technology intensity, *tech_l* = 1 if the sector's technology intensity is low, and 0 otherwise.

Appendix 8 shows the classification of ISIC Rev. 3 across the three technology groups. Figure 13 shows the results for three groups of technology, namely medium- to high-tech, medium-tech, and low-tech. The findings suggest that the female labor share of exporters relative to non-exporters tends to be larger in industries characterized by lower technology intensity. Low-tech industries like food and beverages, or textiles and clothing show the largest female labor share premia for exporters and GVC participants. Exporters operating in low-tech industries have a female labor share that is on average 5.7 percentage points larger than non-exporters in the same industries, controlling for other factors that could explain this difference. The labor share premium for exporters relative to non-exporters in medium-tech industries drops to 2.6 percentage points, while that in medium- to high-tech industries is even lower.

Figure 13: Female labor share premium (percentage points), trading vs. non-trading firms, mediating role of sectoral technology intensity



Note: The graph shows mean differences in the female labor share between trading and non-trading firms, differentiating between medium- to high-tech, medium-tech and low-tech sectors. All regressions control for firm output, capital intensity, and TFP (all in natural logarithms) as well as country-sector, subnational region and year fixed effects. All results shown have a joint significance between trading and the interaction term of at least 10%. Exporters are firms with an export share (direct or indirect) of at least 10% of total sales. Importers are firms with an imported input share of at least 10% of total inputs. GVC participants are firms that are classified as both exporter and importers. FDI refers to firms with a foreign ownership share of at least 10%. For the underlying regression results, see Appendix 9.

The findings for GVC participants are very similar where the female labor share premium relative to non-participants is 5.1 percentage points in low-tech sectors and 1.7 percentage points in medium-tech sectors, but slightly larger again in the highest technology category (2.3 percentage points). These findings

suggest that the positive relationship between exporting or GVC participation and the female labor share is strongest for tasks that appear to be low-skill intensive.

Interestingly, importing firms in medium- to high-tech industries show the highest female labor share premium relative to non-importing firms (3 percentage points), followed by low-tech industries (2 percentage points), whereas FDI firms show a huge female labor share premium in medium-tech industries of 7.4 percentage points compared to non-FDI firms. It appears that while FDI firms overall only show a moderate female labor share premium of 1.5 percentage points, foreign ownership status in medium-tech industries benefits the female labor share much more strongly.

4.6 Additional Analysis

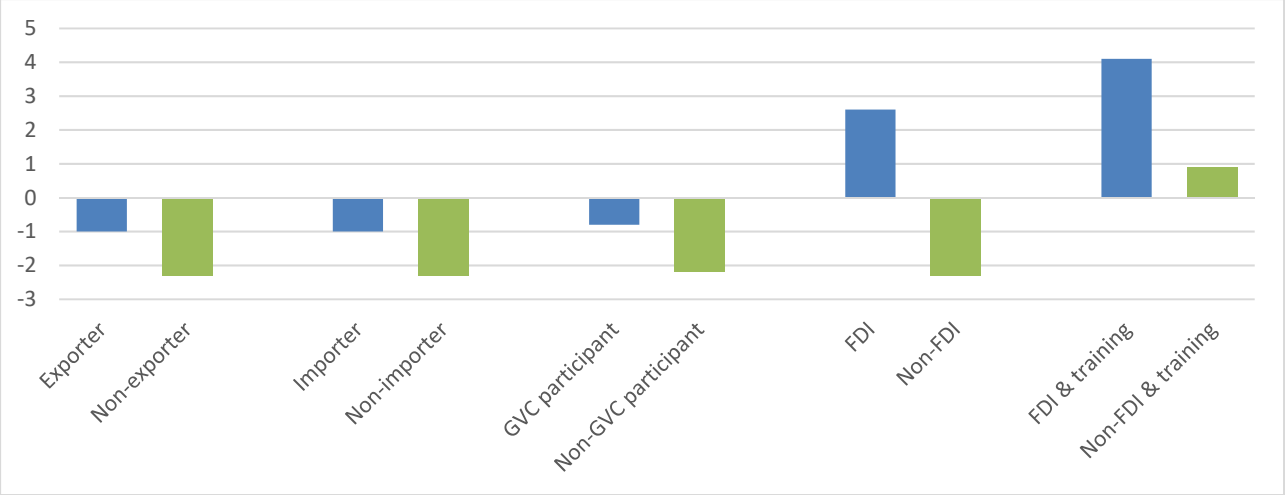
While the previous analysis finds a positive relationship between trading and the female labor and wage share across manufacturing firms, this section assesses the mediating role of a firm's trading status for the link between the firm's female labor share and average wage rates. The analysis correlates the female labor share (which now becomes the independent variable) with a firm's average wage rates (the dependent variable). A negative correlation suggest that firms with a higher female labor share pay lower average wage rates which could imply the existence of a gender wage gap.[12] Appendix 10 gives futher details on the underlying model.

The results find that average wage rates are lower for firms with higher female labor shares, but also suggest that firms that trade, by exporting, importing or integrating into GVCs, show a smaller negative link than non-trading firms (Figure 14). For firms involved in FDI, the relationship between female labor shares and average wages becomes positive. In other words, foreign firms that employ a higher share of women pay higher average wage rates which could relate to cultural norms adopted in those firms. Increasing the female labor share by 10 percentage points is associated with average wage rates of foreign firms being 2.6 percent higher. Interestingly, the correlation between the female labor share and average wages is even higher for FDI firms that offer training to their employees compared to FDI firms that do not train their workforce.[13]

[12] While this type of analysis can be performed with firm-level data only, it cannot control for worker characteristics which might also explain part of the gender wage gap.

[13] These findings are in line with the literature on FDI spillovers, which suggests that foreign investors can help domestic firms upgrade their technological capabilities directly through sharing of production techniques and product design and assisting with technology acquisition (Paus and Gallagher, 2008), and indirectly through personnel training, advance payment, leasing of machinery, provision of inputs, help with quality assurance, and organization of product lines (Lall, 1980; Crespo and Fontoura, 2007; and Javorcik, 2008).

Figure 14: Percent change in wages related to a 10 percentage point increase in female labor share, trading vs. non-trading firms



Note: The graph shows the results of regression analysis described in Appendix 10 and 11 using the firm's average wage rate (in natural logarithms) as dependent variable and the female labor share as independent variable. The model interacts exporter, importer, GVC participant and FDI dummies with the female labor share variable to assess the mediating role of trading/FDI status. Exporters are firms with an export share (direct or indirect) of at least 10% of total sales. Importers are firms with an imported input share of at least 10% of total inputs. GVC participants are firms that are classified as both exporter and importers. FDI refers to firms with a foreign ownership share of at least 10%. All regressions control for age, firm size, capital intensity, skill intensity and country-sector, subnational region and year fixed effects and are at least significant at the 5% level.

5. Conclusions

Using a cross-section of more than 29,000 manufacturing firms in 64 developing and emerging countries from the World Bank's Enterprise Surveys, this paper assessed whether trading firms have a female labor share premium relative to non-trading firms. It focused on four types of trading firms: exporters, importers, GVC participants and FDI firms. The study found a female labor share premium for all four types of trading firms, controlling for firm output, capital intensity, total factor productivity and fixed effects. Exporters and GVC participants show the highest female labor share premium compared to non-exporting and non-participants, respectively, underlining the importance of the export channel. The results also held controlling for differences in relative wages between men and women, and excluding traditional export sectors (apparel and electronics) from the sample.

Interestingly, the female labor share premium is much higher for production workers compared to non-production workers (i.e. managers, sales, administration), implying that women in our country sample specialize in low-skill production. In line with these findings, the female labor share premium for exporters and GVC participants is highest in low-tech sectors, suggesting the largest benefits for women in low-skill intensive sectors. The paper also analyzed the role of female firm ownership and female top

management for the relationship between trading and the female labor share and finds that both expand the female labor share premium of trading firms. Finally, additional analysis explored the link between a firm's female labor share and average wage rates and in particular the mediating role of the firm's trading status. The results suggest that while average wage rates are lower for firms with higher female labor shares, this negative correlation is smaller for trading firms.

While this paper explored the relationship between trading and female labor participation from a variety of angles, i.e. including different types of trading and female labor participation at the firm level, we identify at least four areas for future research: (i) What is the role of policy in shaping the relationship between trading and the female labor share? For example, how does country or sub-national flexibility of labor regulations shape the findings? (ii) Do patterns hold when more explicit measures of technology or innovation (beyond TFP) are included? (iii) Do the findings hold when worker characteristics are taken into account (requiring the use of firm-level surveys or merging firm-level data with datasets on worker characteristics)? (iv) And finally, can a sub-group of countries with panel data be used for a stronger test of causality?

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Appendices

Appendix 1: Number of firms by country

Country	Year	Firms	Country	Year	Firms
Argentina	2017	626	**Mexico**	**2010**	**1,125**
Armenia	2013	104	Moldova	2013	104
Azerbaijan	**2013**	**113**	**Mongolia**	**2013**	**112**
Bangladesh	2013	1,174	Morocco	2013	133
Belarus	2013	114	Myanmar	2016	347
Bolivia	**2017**	**111**	**Namibia**	**2014**	**149**
Bosnia and Herzegovina	2013	115	**Nepal**	**2013**	**240**
Bulgaria	2013	101	**Nicaragua**	**2016**	**107**
Chile	**2010**	**773**	Nigeria	2014	863
China	**2012**	**1,636**	**Pakistan**	**2013**	**873**
Colombia	**2010**	**698**	Panama	2010	108
Costa Rica	**2010**	**309**	**Paraguay**	**2017**	**103**
Croatia	2013	113	Peru	2017	541
Dem. Rep. Congo	2013	237	Poland	2013	140
Ecuador	**2017**	**100**	Romania	2013	169
Egypt, Arab Rep.	**2016**	**1,140**	**Russian Federation**	**2012**	**1,234**
El Salvador	**2016**	**394**	Senegal	2014	233
Ethiopia	**2015**	**369**	Serbia	2013	108
Georgia	**2013**	**101**	**Sri Lanka**	**2011**	**354**
Ghana	2013	350	**Tajikistan**	**2013**	**113**
Guatemala	**2013**	**337**	Tanzania	2013	325
India	**2010**	**6,807**	Trinidad and Tobago	2010	113
Indonesia	**2014**	**1,050**	Tunisia	2013	297
Iraq	**2015**	**470**	**Uganda**	**2013**	**355**
Jamaica	2011	101	Ukraine	2013	658
Jordan	**2010**	**293**	Uzbekistan	2013	124
Kazakhstan	2013	179	**Vietnam**	**2015**	**420**
Kenya	**2013**	**384**	West Bank and Gaza	2013	153
Kyrgyz Republic	2013	102	Yemen, Rep.	2013	107
Latvia	2013	106	Zambia	2013	350
Lebanon	**2013**	**215**	Zimbabwe	2016	286
North Macedonia	2013	113			
			Total		**29,179**

Note: Surveys highlighted in bold are included in the wage share regressions. Surveys from 2014-2017 are in blue.

Appendix 2: Number of firms by sector

ISIC Rev. 3	Sector name	No. of firms	Percent
15	FOOD PRODUCTS AND BEVERAGES	5,292	18.14
16	TOBACCO PRODUCTS	161	0.55
17	TEXTILES	1,948	6.68
18	WEARING APPAREL; DRESSING AND DYEING OF FUR	2,641	9.05
19	TANNING AND DRESSING OF LEATHER; LUGGAGE, HANDBAGS, SADDLERY, HARNESS AND FOOTWEAR	686	2.35
20	WOOD AND OF PRODUCTS OF WOOD AND CORK, EXCEPT FURNITURE	826	2.83
21	PAPER AND PAPER PRODUCTS	505	1.73
22	PUBLISHING, PRINTING AND REPRODUCTION OF RECORDED MEDIA	1,116	3.82
23	COKE, REFINED PETROLEUM PRODUCTS AND NUCLEAR FUEL	84	0.29
24	CHEMICALS AND CHEMICAL PRODUCTS	2,163	7.41
25	RUBBER AND PLASTICS PRODUCTS	2,157	7.39
26	OTHER NON-METALLIC MINERAL PRODUCTS	2,414	8.27
27	BASIC METALS	1,120	3.84
28	FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT	2,526	8.66
29	MACHINERY AND EQUIPMENT N.E.C.	1,773	6.08
30	OFFICE, ACCOUNTING AND COMPUTING MACHINERY	14	0.05
31	ELECTRICAL MACHINERY AND APPARATUS N.E.C.	1,012	3.47
32	RADIO, TELEVISION AND COMMUNICATION EQUIPMENT AND APPARATUS	114	0.39
33	MEDICAL, PRECISION AND OPTICAL INSTRUMENTS, WATCHES AND CLOCKS	261	0.89
34	MOTOR VEHICLES, TRAILERS AND SEMI-TRAILERS	839	2.88
35	OTHER TRANSPORT EQUIPMENT	100	0.34
36	FURNITURE; MANUFACTURING N.E.C.	1,427	4.89
	TOTAL MANUFACTURING	**29,179**	**100**

Note: ISIC classification based on most important product of firm.

Appendix 3: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Female labor participation					
$fem\_sh\_perm_{isrt}$	29,075	23.370	26.123	0.00	100.00
$fem\_sh\_prod_{isrt}$	28,727	21.698	29.211	0.00	100.00
$fem\_sh\_nonp_{isrt}$	26,988	28.070	30.502	0.00	100.00
S^F_{isrt}	16,481	17.056	21.422	0.00	99.98
$\ln wage_{isrt}$	23,891	7.601	1.321	-9.11	14.21
Trade					
exp_{isrt}	29,179	0.230	0.421	0.00	1.00
imp_{isrt}	24,363	0.457	0.498	0.00	1.00
gvc_{isrt}	29,179	0.140	0.347	0.00	1.00
fdi_{isrt}	29,164	0.073	0.259	0.00	1.00
Controls					
$\ln outp_{isrt}$	24,221	13.310	2.233	4.49	21.33
$\ln capint_{isrt}$	15,956	-1.506	1.612	-16.77	5.81
$\ln tfp_{isrt}$	14,499	0.880	0.601	-6.00	2.30
$\ln(w^M/w^F)_{srt}$	16,550	5.050	0.569	1.95	7.69
$\ln age_{isrt}$	27,234	2.849	0.713	0.00	5.83
$skillsh_{isrt}$	28,989	73.714	29.803	0.00	100.00
Characteristics					
fem_own_{isrt}	25,931	9.655	24.570	0.00	100.00
fem_man_{isrt}	29,135	0.109	0.312	0.00	1.00
$train_{isrt}$	29,006	0.388	0.487	0.00	1.00
$tech\_h_{srt}$	29,179	0.202	0.402	0.00	1.00
$tech\_m_{srt}$	29,179	0.208	0.406	0.00	1.00
$tech\_l_{srt}$	29,179	0.590	0.492	0.00	1.00

Appendix 4: Female labor share premium, trading vs. non-trading firms, production vs. non-production workers

Dependent variable:	***Female production workers* (% of total)**				***Female non-production workers* (% of total)**			
fem_sh_{isrt}	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***	(5) ***exp***	(6) ***imp***	(7) ***gvc***	(8) ***fdi***
$\ln Y_{isrt}$	0.1858	0.5255***	0.3265***	0.5395***	0.7368***	0.8669***	0.8314***	0.9324***
	(0.139)	(0.000)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\ln k_{isrt}$	-0.1437	-0.0247	-0.1176	-0.0503	0.1905	0.2254	0.2102	0.2440
	(0.357)	(0.887)	(0.452)	(0.748)	(0.273)	(0.233)	(0.227)	(0.160)
$\ln tfp_{isrt}$	-1.8790***	-2.3142***	-1.9804***	-1.9831***	0.6524	0.6247	0.5970	0.6011
	(0.006)	(0.003)	(0.004)	(0.004)	(0.428)	(0.486)	(0.467)	(0.463)
$trade_{isrt}$ / $global_{isrt}$	**5.2185*** (0.000)**	**1.7543*** (0.001)**	**4.4695*** (0.000)**	**1.0084 (0.254)**	**2.6578*** (0.000)**	**1.1439* (0.065)**	**1.8841*** (0.009)**	**0.2020 (0.822)**
constant	48.3646***	67.3969***	69.1348***	51.1095***	69.9424***	66.8840***	68.5591***	41.0579***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	14,344	12,481	14,344	14335	13,661	11,862	13,661	13,652
R-squared	0.52	0.51	0.51	0.51	0.39	0.38	0.39	0.39

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects.

Appendix 5: Female labor share premium, trading vs. non-trading firms, excluding apparel and computers

Dependent variable:	***Total permanent workers***			
fem_sh_{isrt}	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***
$\ln Y_{isrt}$	0.1480	0.3495***	0.2468**	0.3592***
	(0.171)	(0.003)	(0.021)	(0.001)
$\ln k_{isrt}$	-0.2730**	-0.2392	-0.2533*	-0.2155
	(0.042)	(0.111)	(0.060)	(0.109)
$\ln tfp_{isrt}$	-0.8251	-1.1833*	-0.9031	-0.8737
	(0.177)	(0.081)	(0.137)	(0.147)
$trade_{isrt}$ / $global_{isrt}$	**3.7919*** (0.000)**	**1.9037*** (0.000)**	**3.3342*** (0.000)**	**1.8853** (0.016)**
constant	49.4215***	49.2740***	48.4122***	52.0073***
	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	13,008	11,214	13,008	13,000
R-squared	0.48	0.47	0.48	0.48

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects. Analysis excludes wearing apparel (ISIC 18) and office, accounting and computing machinery (ISIC 30).

Appendix 6: Female labor share premium, trading vs. non-trading firms, production and non-production workers, excluding apparel and computers

Dependent variable:	***Permanent production workers***				***Permanent non-production workers***			
fem_sh_{isrt}	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***	(5) ***exp***	(6) ***imp***	(7) ***gvc***	(8) ***fdi***
$\ln Y_{isrt}$	0.0840	0.3829***	0.2265*	0.3758***	0.6596***	0.7481***	0.7442***	0.8203***
	(0.512)	(0.007)	(0.073)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
$\ln k_{isrt}$	-0.2482	-0.1647	-0.2177	-0.1720	0.1721	0.2043	0.1905	0.2166
	(0.120)	(0.360)	(0.173)	(0.282)	(0.333)	(0.292)	(0.284)	(0.223)
$\ln tfp_{isrt}$	-1.2179*	-1.5718**	-1.3030*	-1.2801*	0.9752	1.0179	0.9271	0.9381
	(0.078)	(0.042)	(0.058)	(0.061)	(0.237)	(0.259)	(0.260)	(0.253)
$trade_{isrt}$ / $global_{isrt}$	**4.7236*** (0.000)**	**1.6429*** (0.003)**	**3.7596*** (0.000)**	**1.3760 (0.145)**	**2.3554*** (0.000)**	**1.3286** (0.040)**	**1.6418** (0.031)**	**0.3568 (0.707)**
constant	39.0111***	14.1549	37.5704***	36.0309***	-7.7307***	-8.6779***	-8.5908***	74.1456***
	(0.000)	(1.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	12,889	11,114	12,889	12,881	12,310	10,592	12,310	12,302
R-squared	0.44	0.43	0.43	0.43	0.39	0.39	0.39	0.39

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects. Analysis excludes wearing apparel (ISIC 18) and office, accounting and computing machinery (ISIC 30).

Appendix 7: Probability of being majority female-owned or of having a female top manager, trading vs. non-trading firms, probit model

Dependent variable:	***Majority female-owned (dummy)***				***Female top manager (dummy)***			
	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***	(5) ***exp***	(6) ***imp***	(7) ***gvc***	(8) ***fdi***
$trade_{isrt}$ / $global_{isrt}$	**-0.083** (0.015)**	**-0.036 (0.274)**	**-0.123*** (0.004)**	**-0.446*** (0.000)**	**0.001 (0.984)**	**-0.013 (0.639)**	**-0.038 (0.269)**	**-0.077* (0.085)**
constant	-1.592***	-1.808***	-1.603***	-1.605***	-1.679***	-1.641***	-1.679***	-1.679***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	18,980	14,582	18,980	18,980	25,459	20,485	25,459	25,449

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects.

Appendix 8: UNIDO Classification of 2-digit ISIC Sectors by technology intensity

ISIC Rev. 4 sector at 2-digit level, by technology intensity		ISIC Rev. 3
Medium-high and high technology		
Division 20	Chemicals and chemical products	24
Division 21	Pharmaceuticals	24
Division 26	Computer, electronic and optical products	30
Division 27	Electrical equipment	31
Division 28	Machinery and equipment n.e.c.	29
Division 29	Motor vehicles, trailers and semi-trailers	34
Division 30	Other transport equipment except ships and boats	35
Medium technology		
Division 22	Rubber and plastics products	25
Division 23	Other non-metallic mineral products	26
Division 24	Basic metals	27
Division 32	Other manufacturing except medical and dental instruments	32, 33
Division 33	Repair and installation of machinery and equipment	n/a
Low technology		
Division 10	Food products	15
Division 11	Beverages	15
Division 12	Tobacco products	16
Division 13	Textiles	17
Division 14	Wearing apparel	18
Division 15	Leather and related products	19
Division 16	Wood and products of wood and cork	20
Division 17	Paper and paper products	21
Division 18	Printing and reproduction of recorded media	22
Division 19	Coke and refined petroleum products	23
Division 25	Fabricated metal products except weapons and ammunition	28
Division 31	Furniture	36

Source: https://stat.unido.org/content/focus/classification-of-manufacturing-sectors-by-technological-intensity-%2528isic-revision-4%2529;jsessionid=561400724511B33A01F1C32CEA4300FB

Appendix 9: Female labor share premium, trading vs. non-trading firms, role of sectoral technology intensity

Dependent variable:	***Medium- to high-tech***				***Medium-tech***				***Low-tech***			
fem_sh$_{isrt}$	(1) ***exp***	(2) ***imp***	(3) ***gvc***	(4) ***fdi***	(5) ***exp***	(6) ***imp***	(7) ***gvc***	(8) ***fdi***	(9) ***exp***	(10) ***imp***	(11) ***gvc***	(12) ***fdi***
ln*Y*$_{isrt}$	0.2401**	0.4867***	0.3457***	0.5145***	0.2336**	0.4872***	0.3387***	0.5138***	0.2297**	0.4886***	0.3392***	0.5171***
	(0.025)	(0.000)	(0.001)	(0.000)	(0.029)	(0.000)	(0.001)	(0.000)	(0.032)	(0.000)	(0.001)	(0.000)
ln*k*$_{isrt}$	-0.1880	-0.1213	-0.1701	-0.1148	-0.1926	-0.1252	-0.1764	-0.1226	-0.1940	-0.1233	-0.1753	-0.1161
	(0.157)	(0.412)	(0.201)	(0.390)	(0.148)	(0.397)	(0.185)	(0.359)	(0.144)	(0.404)	(0.188)	(0.384)
ln*tfp*$_{isrt}$	-1.4247**	-1.8307***	-1.5137**	-1.5336**	-1.4478**	-1.8429***	-1.5456**	-1.5388**	-1.4271**	-1.8398***	-1.5087**	-1.5363**
	(0.020)	(0.007)	(0.013)	(0.011)	(0.019)	(0.007)	(0.011)	(0.011)	(0.020)	(0.007)	(0.014)	(0.011)
exp$_{isrt}$	**4.9530*** **				**4.7570*** **				**2.1834*** **			
	(0.000)				**(0.000)**				**(0.001)**			
exp$_{isrt*}$ ***tech***$_{srt}$	**-3.1893*** **				**-2.1578** **				**3.4801*** **			
	(0.003)				**(0.042)**				**(0.000)**			
imp$_{isrt}$		**1.7565*** **				**2.2024*** **				**1.7326** **		
		(0.001)				**(0.000)**				**(0.018)**		
imp$_{isrt*}$ ***tech***$_{srt}$		**1.2590**				**-1.5460**				**0.2968**		
		(0.277)				**(0.154)**				**(0.743)**		
gvc$_{isrt}$			**4.3460*** **				**4.4776*** **				**1.9834** **	
			(0.000)				**(0.000)**				**(0.022)**	
gvc$_{isrt*}$ ***tech***$_{srt}$			**-2.0807**				**-2.7980** **				**3.1250*** **	
			(0.132)				**(0.039)**				**(0.006)**	
fdi$_{isrt}$				**1.2969**				**2.4705*** **				**-0.0978**
				(0.113)				**(0.004)**				**(0.933)**
fdi$_{isrt*}$ ***tech***$_{srt}$				**1.2152**				**-4.9401*** **				**2.5589***
				(0.541)				**(0.003)**				**(0.088)**
constant	70.3761***	65.4233***	68.8400***	50.4608***	70.4843***	64.9612***	68.9573***	50.5601***	70.5153***	65.1186***	68.9106***	50.5018***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	14,485	12,601	14,485	14,476	14,485	12,601	14,485	14,476	14,485	12,601	14,485	14,476
R-squared	0.54	0.53	0.54	0.54	0.54	0.53	0.54	0.54	0.54	0.53	0.54	0.54
F-test[1)]	0.000	0.001	0.000	0.1122	0.000	0.001	0.000	0.0033	0.000	0.002	0.000	0.0374

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects. See Appendix 8 for UNIDO Classification of 2-digit ISIC Sectors by technology intensity. [1)] F-test of joint significance between trade variable and interaction term.

Appendix 10: Econometric analysis on the gender wage gap, model

Drawing on the World Bank Enterprise Surveys, this paper provides firm-level evidence based on a cross-section of roughly 29,000 manufacturing firms across 64 developing and emerging countries covering the period 2010-2017. In the absence of matched employer-employee data which would be able to test explicitly for the existence and direction of a gender wage gap, we follow the approach by Chen et al. (2012) who test implicitly how a firm's employment share correlates with its average wages. A negative (positive, resp.) relationship between the female labor share and average wages suggests the existence of a gender wage gap. The role of trade is assessed using interaction terms between the female labor share and a firm's trade status.

Following the model by Chen et al. (2012), a firm's average wage rate, *wage*, is estimated as the following function:

$$\ln \boldsymbol{wage} = \boldsymbol{\alpha} + \boldsymbol{\beta_1} \ln \boldsymbol{age} + \boldsymbol{\beta_2} \ln \boldsymbol{emp} + \boldsymbol{\beta_3} \ln \boldsymbol{k} + \boldsymbol{\beta_4 skillsh} + \boldsymbol{\beta_5 femsh} + \boldsymbol{\gamma femsh} * \boldsymbol{trade}$$

The variable *age* designates the number of years a firm has operated (in natural logarithms) to measure experience. The next variable is employment, *emp* (in natural logarithms), to control for firm size. *k* denotes capital intensity, measured as the replacement value of machinery in the firm divided by output (in natural logarithms). *skillsh* is the share of skilled production workers in total production workers. *femsh* is the share of female workers in total employment (see section 2).

More experience ($\beta_1 > 0$), larger firm size ($\beta_2 > 0$) and a larger share of skilled production workers ($\beta_3 > 0$) are expected to be positively correlated with average wages. A larger capital intensity can be positively ($\beta_4 > 0$) or negatively ($\beta_4 < 0$) associated with the demand for labor and thus average wages, depending on whether capital and labor are complements or subsitutes. Due to women's lower skill intensity, a higher female labor share is assumed to be negatively linked to average wages ($\beta_5 < 0$).

The most important element is the interaction term of the female labor share with the trade variable. Due to their higher productivity and possibly higher labor standards, trading firms are expected to show a lower wage gap compared to non-trading firms ($\gamma > 0$). The association between the female labor share and average wages for trading firms is given by the sum of $\beta_5 + \gamma$, while the correlation for non-trading firms is only given by β_5.

The model considers four types of trading firms: exporters, importers, GVC participants and foreign firms. The model also controls for country-sector, subnational region and year fixed effects.

Appendix 11: Econometric analysis on the gender wage gap, regression results

Dependent variable:	***exp***	***imp***	***gvc***	***fdi***	***exp***	***imp***	***gvc***	***fdi***
ln$wage_{srt}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnage_{isrt}	0.0719***	0.0791***	0.0723***	0.0765***	0.0707***	0.0778***	0.0711***	0.0760***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnemp_{isrt}	0.0548***	0.0522***	0.0553***	0.0522***	0.0549***	0.0491***	0.0553***	0.0523***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnk_{isrt}	-0.0867***	-0.0816***	-0.0867***	-0.0867***	-0.0871***	-0.0822***	-0.0872***	-0.0873***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$skillsh_{isrt}$	0.0003	0.0000	0.0003	0.0003	0.0003	0.0000	0.0003	0.0003
	(0.345)	(0.947)	(0.349)	(0.394)	(0.348)	(0.949)	(0.348)	(0.406)
$femsh_{isrt}$	**-0.0023*** **	**-0.0023*** **	**-0.0022*** **	**-0.0023*** **	-0.0023***	-0.0022***	-0.0021***	-0.0023***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	(0.000)	(0.000)	(0.000)
$femsh_{isrt}*exp_{isrt}$	**0.0013** **				**0.0004**			
	(0.027)				**(0.622)**			
$femsh_{isrt}*imp_{isrt}$		**0.0013** **				**0.0001**		
		(0.019)				**(0.837)**		
$femsh_{isrt}*gvc_{isrt}$			**0.0014** **				**-0.0002**	
			(0.041)				**(0.810)**	
$femsh_{isrt}*fdi_{isrt}$				**0.0049*** **				**0.0032** **
				(0.000)				**(0.011)**
$femsh_{isrt}*exp_{isrt}*train_{isrt}$					**0.0017** **			
					(0.047)			
$femsh_{isrt}*imp_{isrt}*train_{isrt}$						**0.0025*** **		
						(0.000)		
$femsh_{isrt}*gvc_{isrt}*train_{isrt}$							**0.0028*** **	
							(0.006)	
$femsh_{isrt}*fdi_{isrt}*train_{isrt}$								**0.0032* **
								(0.055)
constant	5.7793	7.1339***	5.7428	3.2136***	7.0789***	2.7783***	7.1297***	7.4725***
	(.)	(0.000)	(0.996)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	14,217	12,256	14,217	14,208	14,176	12,225	14,176	14,167
R-squared	0.54	0.56	0.54	0.54	0.54	0.56	0.54	0.54

Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region and year fixed effects. Note: See Appendix 10 for the econometric model.