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Yasmine Kamal

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Yasmine Kamal[1]

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Send correspondence to:
Yasmine Kamal
Cairo University
Yasmine_k@feps.edu.eg

[1] Assistant Professor, Faculty of Economics and Political Science, Cairo University, Egypt.

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Abstract

This study examines the effects of firm trade participation on labor productivity, wages, and female employment using recent manufacturing enterprise survey data for Egypt. It finds the labor productivity premium to be positive for both exporting and importing firms; it is the highest for small-sized exporting firms, reflecting their greater benefits from learning by exporting. Importing intermediate inputs enhances productivity the most for firms in medium-high and high technology-intensive sectors. Moreover, both exporting and importing firms pay higher average wages than non-exporters and non-importers, where economies of scale and the higher productivity of trading firms – rather than the skill characteristics or composition of the labor force – work as the explanatory channels. Also, firm trade participation enhances gender labor outcomes by reducing the gender wage gap and employing a higher share of female workers, especially in low-technology export sectors. To translate these favorable impacts into economy-wide labor market improvements in Egypt, more efforts should be made to reform the business environment to enable the greater participation of small firms in export markets and the easier access of firms – especially those operating in technologically advanced sectors – to essential imported inputs that embody advanced foreign knowledge and/or are of higher quality than domestic alternatives.

Keywords: Trade participation, Labor productivity, Average wages, Gender wage gap, Female employment, Firm-level, Egypt.
JEL Classifications: F10, F14, F16.

ملخص

تبحث هذه الدراسة آثار المشاركة التجارية للشركات على إنتاجية العمل والأجور وتوظيف الإناث باستخدام بيانات استقصائية حديثة لمؤسسات التصنيع المصرية. وترى أن علاوة إنتاجية العمل إيجابية لكل من الشركات المصدرة والمستوردة ؛ وهي الأعلى بالنسبة للشركات المصدرة الصغيرة الحجم، مما يعكس فوائدها الأكبر من التعلم عن طريق التصدير. إن استيراد المدخلات الوسيطة يعزز الإنتاجية أكثر من غيرها بالنسبة للشركات في القطاعات المتوسطة والعالية والكثيفة التكنولوجيا. علاوة على ذلك، تدفع كل من الشركات المصدرة والمستوردة متوسط أجور أعلى من غير المصدرين وغير المستوردين، حيث تعمل وفورات الحجم والإنتاجية الأعلى للشركات التجارية - بدلاً من خصائص مهارة أو تكوين القوى العاملة - كقنوات تفسيرية. كما أن المشاركة التجارية الحازمة تعزز نتائج العمل بين النوعين من خلال تقليص الفجوة في الأجور بين النوعين وتوظيف حصة أكبر من العاملات، لا سيما في قطاعات التصدير منخفضة التكنولوجيا. ولترجمة هذه الآثار الإيجابية إلى تحسينات في سوق العمل على مستوى الاقتصاد في مصر، ينبغي بذل المزيد من الجهود لإصلاح بيئة الأعمال التجارية لتمكين زيادة مشاركة الشركات الصغيرة في أسواق التصدير وتيسير وصول الشركات - ولا سيما الشركات العاملة في القطاعات المتقدمة تكنولوجيا - إلى المدخلات المستوردة الأساسية التي تجسد معارف أجنبية متقدمة و/أو ذات نوعية أعلى من البدائل المحلية.

1. Introduction

Firm heterogeneity has been central to international trade research since the seminal contribution of Melitz (2003). Indeed, trading firms have different characteristics than non-trading firms; they tend to be more productive, more capital- and skill-intensive, and pay higher wages (Bernard et al., 2007). Studying the firm-level effects of trade participation helps us understand the macroeconomic implications of trade liberalization in terms of productivity and output growth, poverty, and gender inequality.

Egyptian trading firms are particularly interesting to study given the recent literature that indicates a weak connection between trade and labor market outcomes in the Egyptian economy. In other words, rising exports associated with signing several trade agreements were not translated into increases in average wages or female labor force participation. For example, while average wages steadily increased in Egypt since 2009, they fell in 2017 and have consistently been lower for female workers in comparison to, male workers with an estimated gender wage gap of around eight percent (Robertson et al., 2021). Also, female labor force participation has been low and declining, where it greatly fell from 23 percent in 2009 to 15 percent in 2021, according to ILO estimates.

This study contributes to the literature linking trade participation with labor market outcomes at the micro level. It employs recent enterprise survey data for Egypt's manufacturing firms in 2013, 2016, and 2020, made available by the World Bank. Unlike studies that focus solely on the effect of firm exportation, the effect of importing intermediate inputs is also examined. Controlling simultaneously for both the exporting and importing activities of firms is necessary to accurately estimate the productivity premia of trading firms given the interconnection between the two activities. Moreover, it investigates possible channels that can explain wage differences between trading and non-trading firms, an issue that has not previously been studied in the Egyptian context. Gender labor outcomes are also studied by testing the presence of a gender wage gap in trading firms and estimating the effect of firm trade on the share of female production and non-production workers. Sectoral heterogeneity is considered by differentiating between the effects according to the technological intensity of a manufacturing sector.

The study is organized as follows. Section 2 reviews the theoretical and empirical literature on the effects of firm trade participation on labor outcomes. Section 3 describes the data, offers some descriptive statistics, and presents the methodology. Section 4 shows the empirical results, while section 5 concludes.

2. Literature review

We divide the literature review of the effects of firm trade participation on labor outcomes into three strands. The first examines its impact on labor productivity. The second explores the effect on average wages and the possible channels at work. The third investigates gender wage and employment effects.

2.1. Firm trade participation and labor productivity

There are two main explanations for why exporting firms are expected to be more productive than non-exporters: ***self-selection*** and ***learning by exporting***. Melitz (2003) provides a pioneering theoretical framework in which more productive firms self-select into export markets, while the less productive serve the domestic market. This is because only more productive firms can afford the additional costs of participation in foreign markets, which include transportation costs, distribution and marketing costs, skilled labor to manage foreign networks, and the costs of conforming to foreign standards and technical regulations. Accordingly, there is an ex-ante productivity difference between exporters and non-exporters.[2]

On the other hand, learning by exporting occurs when firms witness an increase in productivity after entry into exporting. This can be attributed to knowledge and technology transfers from international buyers and competitors that exporters enjoy and the fierce competition they face abroad, which induce them to improve their products and/or production processes (Wagner, 2012; Hayakawa et al., 2012).

However, these two explanations are not mutually exclusive. Many empirical studies provided evidence of the self-selection hypothesis, while some found support for learning by exporting. An early study on US firms by Bernard and Jensen (1999) finds that more productive firms become exporters (i.e., there is self-selection). However, they do not find conclusive evidence for a learning effect from exporting. Similar findings are also found by Eliasson et al. (2012) for Swedish small and medium firms. Alvarez and Lopéz (2005) find evidence for both the self-selection of Chilean firms into exporting and an increase in productivity after firms begin to export (i.e., learning by exporting). In their meta-analysis, Martins and Yang (2009) report that learning by exporting is indeed higher for developing than developed countries. De Loecker (2013) shows that after dropping the assumption held in previous studies of exogenous firm productivity, which causes a bias in estimating learning by exporting effects, substantial productivity gains are found for Slovenian firms from entering export markets. A more recent study by Atkin et al. (2017) uses a randomized experiment and finds that exporting increases the productivity and quality of Egyptian rug producers, providing evidence for learning by exporting.

Likewise, the two explanations of self-selection and learning effects are provided to justify the productivity premium of importing firms compared to non-importers. The former implies that only the more productive firms import intermediate inputs because they can afford the sunk costs of importing. These include search costs for potential foreign suppliers, negotiation and contract costs, and the costs of learning about customs procedures (Kraay et al., 2002). The latter implies

[2] It is worthy to note that self-selection can be a "conscious" process where forward-looking firms increase their productivity today with the aim of becoming future exporters (Alvarez and Lopez, 2005).

that importing increases firm productivity through different channels: knowledge and technology transfer, variety, and quality effects. Productivity gains can be enjoyed due to learning from embodied foreign technology in imported intermediates or access to more varieties of intermediates, which increases the efficiency of the production process or the use of imported inputs that are of higher quality than domestic ones (Castellani et al., 2010). Empirical studies reported that importers are more productive than non-importers but found mixed evidence for the presence of self-selection and learning by importing. In support of learning by importing, Amiti and Konings (2007) find that reducing tariffs on intermediate inputs leads to a productivity gain for Indonesian firms that import their inputs. Conversely, Vogel and Wagner (2009) do not find clear evidence for the effect of importing on German firms' productivity due to learning by importing. Muûls and Posu (2009) find a process of self-selection for Belgian firms in both export and import markets, where the fixed costs of imports are of similar magnitude as those of exports.[3] Similarly, Dalgic et al. (2015) find a self-selection effect for both importing and exporting firms in Turkey, but they point to a stronger effect for importers, suggesting that they face higher sunk costs. On the other hand, Forlani (2016) finds no evidence of self-selection of Irish firms into importing but evidence for learning by importing, where the positive effects of importing are better exploited by relatively efficient firms.

2.2. Firm trade participation and average wages

There are several channels through which exporting and importing activities can affect firm-level wages.

Firstly, trade participation may influence a firm's skill utilization. Verhoogen (2008) and Brambilla and Porto (2016) develop models where exporting – especially to richer, more developed countries – requires quality upgrading. Therefore, exporting firms need to modify their production process and become more intensive in skilled labor so that they can produce high-quality products. Similarly, importing firms may need to increase their use of more skilled labor to take advantage of the knowledge and technology embodied in imported inputs (Frazer, 2013). Given that skilled workers are paid higher wages than unskilled workers, average wages are expected to be higher in trading compared to non-trading firms through the skill utilization channel.

Secondly, trading firms can have a different labor force composition than non-traders, i.e., they may differ in the share of female workers, production workers, and temporary workers in their total labor force. Rocha and Winkler (2019) find that trading firms have a female labor share premium relative to non-trading firms using manufacturing firm-level data from 64 developing and emerging countries. Also, since international trade requires more intensive use of operational

[3] Importantly, the authors note that the productivity premium of exporters previously reported in the literature may be overstated because imports were not considered. That's why our regressions in section 4 simultaneously include exporter and importer dummies.

services labor in areas such as international business, language skills, and maritime insurance, trading firms could demand a larger share of non-production workers (Matsuyama, 2007). There is also evidence that traders increase their use of temporary workers due to their much lower dismissal costs compared to permanent workers (Aleksynska and Berg, 2016). Specifically, exporters who face fierce competition abroad and are subject to foreign demand fluctuations may need more flexible work arrangements provided through temporary employment. Average wages in trading firms are thus affected if there is a wage discrepancy between female and male workers, production and non-production workers, and temporary and permanent workers.

Thirdly, trading firms are likely to outperform non-traders in their level of sales, which enables them to enjoy lower average costs of production and hence benefit from economies of scale. This implies a higher profitability of trading firms which could (at least partly) be passed on to workers in the form of higher wages (Duda-Nyczak and Viegelahn, 2018).

Finally, as previously discussed, trading firms are likely more productive (and hence more profitable) than non-traders and will pay higher wages for their workers compared to non-traders due to the presence of rent-sharing. It is worth noting that the third and fourth channels are closely related, as they both link a firm's economic success (profitability) and the average wages received by its workers. This link is theoretically founded by Egger and Kreikemeier's model (2009) which incorporates workers' fair wage preferences into Melitz's (2003) heterogeneous firms' framework. Modifying Akerlof and Yellen's (1990) fair wage-effort model, they introduce a *rent-sharing motive* as a determinant of workers' fair wage preferences. Accordingly, the wage considered to be fair depends on the productivity level (and thus the performance) of the firm. Ex-ante identical workers hence earn different wages, with higher wages being paid to workers employed in more profitable firms.

Several empirical studies support the existence of a wage premium in trading firms.[4] A pioneering study by Bernard and Jensen (1995) using US manufacturing data shows that exporters tend to pay higher wages than non-exporters after controlling for other firm characteristics, industry, year, and region. Using firm-level data on the Italian manufacturing industry, Serti et al. (2010) find that even after controlling for firm size and capital intensity, exporters and importers still pay higher wages than non-exporters and non-importers. Duda-Nyczak and Viegelahn (2018) use African firm-level manufacturing data and find that exporters have a positive wage premium which works through the economies of scale and productivity channels. They, however, find no evidence of a positive importer wage premium.

[4] There is a group of studies that uses detailed linked employer–employee data (rather than average data) to examine the presence of a trading firm wage premium while controlling for individual worker and workplace characteristics. For example, Schank et al. (2007) use linked employer–employee data from Germany and find that the exporter wage premium becomes smaller but does not completely vanish.

2.3. Firm trade participation, female wages, and female employment

Trade can affect gender labor outcomes through different channels. The **first channel** works through the absolute advantage (absolute unit cost of production) theory of trade, where exporting firms face high competition in foreign markets and have an incentive to adopt a cost-cutting strategy. Accordingly, they exploit the persistent gender wage gap to reduce costs and remain competitive by hiring more female workers who receive lower wages compared to men, such that trade improves female employment but not necessarily their pay. A study by Chen and Hu (2023) finds evidence of gender-friendly behaviors of exporters in China, where the female employment share is larger and the gender wage gap is smaller for exporters than non-exporters, as justified by cost-competitive motivations.

The **second channel** works through technological change brought about by trade. As a result of increased competition, trading firms may use new (computerized) technologies that complement labor and make manufacturing jobs less physically demanding. This technological upgrading could disproportionately benefit female workers by making them more productive, especially in production (blue-collar) tasks. Juhn et al. (2014) find that Mexican firms that entered the export market following tariff reductions of the North American Free Trade Agreement (NAFTA) have updated their technology and replaced male blue-collar workers with female blue-collar workers who were also paid higher wages. However, trade-induced technological change can also take the form of automation of routine/repetitive tasks. Therefore, women who tend to be over-represented in these tasks are more likely to lose their jobs than men (UNCTAD, 2022).

The **third channel** works through Becker's (1957) theory of discrimination, where exposure to increased competition reduces the (inefficient) discriminatory hiring and wage practices of employers by making taste-based discrimination against women more costly. Therefore, firms will no longer pay higher wages to equally productive male workers, which leads to a reduction in the gender wage gap. For example, Klein et al. (2010) use German manufacturing data and find that women working in exporting firms have higher wages than those working in non-exporting firms with the effect prevailing across different skill groups. Contrary to Becker's theory, some studies, however, point out that trade may reinforce wage discrimination against women through increased profits of trading firms that enable them to maintain discriminatory wage gaps (Yahmed, 2017) or through the reduced bargaining power of women due to foreign competition as found by Menon and Rodgers (2009) for the Indian manufacturing sector. A study by Bøler et al. (2018) also finds that the gender wage gap is larger for college-educated workers within exporting firms than within non-exporting firms in Norway. They attribute the larger wage gap to exporters perceiving women workers as less flexible and less committed to working particular hours (in order to communicate with foreign partners in different time zones) or traveling on short notice.

3. Data, descriptive statistics, and methodology

3.1. Data

This study relies on firm-level data from the World Bank Enterprise Surveys. The Enterprise Surveys Database covers 155 countries over 2006-21. Each survey comprises a representative sample of firms in the non-agricultural formal private sector of a country. It is conducted across all its geographic regions and covers small, medium, and large firms. Data for manufacturing firms in Egypt (with ISIC Rev 3.1 15-36) are available across three survey years: 2013, 2016, and 2020, with a total of 5,171 observations. The local currency is converted into US dollars and deflated using a GDP deflator with 2009 as a base year to express variables in real terms.

3.2. Descriptive statistics

Table 1 shows the descriptive statistics of the variables used in our empirical analysis. It is worth noting that, on average, 15 percent of manufacturing firms in Egypt over the three survey years are exporters, while 49 percent are importers. Relatedly, 12 percent of firms are both exporters and importers, three percent export but do not import, 37 percent import but do not export, and 48 percent neither export nor import. This indicates the high reliance of manufacturing firms in Egypt (and especially exporters) on imported inputs. It also refers to a relatively low firm participation in exporting. This becomes more evident if we focus on the last survey for 2020, where exporters comprise 13 percent of firms compared to an average of 20 percent in the rest of the developing countries covered by the enterprise surveys.

To get a preliminary idea about the effect of firm exporting and importing on our labor market outcomes of interest (labor productivity, wages, and female employment), we present some graphical illustrations for the 2020 survey. Figure 1 shows kernel densities for labor productivity (in logs) comparing exporters to non-exporters on the left panel, and importers to non-importers on the right panel. The density for exporting firms is shifted to the right, indicating that they are more productive than non-exporting firms. The same conclusion applies to importing compared to non-importing firms. Figure 2 then provides a finer picture of the effects according to the technological classification of the sector, where manufacturing sectors are classified into three groups: low technology, medium technology, and medium-high to high technology.[5] It is evident that exporters are more productive than non-exporters in all sectors. Also, productivity is higher for importing firms than those mainly depending on domestically sourced inputs, with a greater productivity premium for firms operating in medium or medium-high and high technology sectors.

Moving to the trade effect on firm wages, Figure 3 shows kernel densities for average wages (in logs) comparing exporters to non-exporters on the left panel, and importers to non-importers on

[5] This classification follows UNIDO's classification of ISIC industries by technological intensity. It is based on research and development (R&D) expenditure incurred in the production of manufactured goods. It is available at: https://stat.unido.org/content/learning-center/classification-of-manufacturing-sectors-by-technological-intensity-%28isic-revision-4%29

the right panel. Both panels show a higher wage premium for trading firms, which is more pronounced for importing firms. As Figure 4 suggests, it is prevalent in all sectors for exporters and importers, though at differing magnitudes. The wage premium is the largest for importing firms in the most technology-intensive sectors (i.e., medium-high, and high technology sectors), which is in line with our finding that importers in these sectors enjoy higher productivity than non-importers.

As for the effect on female workers' share in total employment, the kernel densities of Figure 5 indicate that exporters hire a larger share of female workers than non-exporters, while the effect is not clear for importers.[6] Figure 6 thus restricts the analysis to comparing exporters to non-exporters and indicates a large sectoral heterogeneity. The female labor share of exporters relative to non-exporters is larger in low-technology sectors and the share premium gets smaller as the technology intensity of the sector increases. It even gets reversed in medium-high and high technology sectors where female workers have a lower share in exporting than in non-exporting firms.

According to our simple graphical illustrations, we can thus conclude that trading firms in Egypt's manufacturing sector are more productive, pay higher average wages, and employ a higher female labor share, where the last effect is confined to exporters. We also reveal some heterogeneous effects according to the technological intensity of sectors. We then estimate empirical models that control for different firm characteristics to obtain more robust and quantifiable effects of firm trade participation on the three labor outcomes.

3.3. Methodology

Pooled Ordinary Least Squares (POLS) regressions are used to estimate three main equations.[7] Firstly, to examine the effect of firm trading status on labor productivity, the following equation is estimated:

$$\ln lp_{fst} = \alpha + \beta\ exporter_{fst} + \gamma\ importer_{fst} + \delta\ X_{fst} + I + \epsilon_{fst} \qquad (1)$$

Where f denotes a firm, s is a manufacturing sector (ISIC 15-36), and t is a survey year (2013, 2016, and 2020).

The dependent variable in (1) is labor productivity in logs (measured as real sales over the number of full-time employees, in logs). The main explanatory variables are the export status of the firm, which is a dummy variable that equals 1 if the firm directly exports at least 10 percent of its sales,

[6] An insignificant impact of firm importing on female employment share is confirmed by our regressions in section 4.
[7] The adopted methodology and control variables' choice is guided by Rocha and Winkler (2019), Montalbano et al. (2018), Duda-Nyczak and Viegelahn (2018), and Duda-Nyczak and Viegelahn (2017).

and the import status is a dummy variable that equals 1 if the firm imports at least 10 percent of its inputs.

X_{fst} is a set of control variables that include real capital per worker (in logs), a dummy variable if the firm is foreign-owned (i.e., its foreign private ownership is at least 10 percent), firm age[8] (in logs) and two dummies for medium and large-sized firms.[9] *I* controls for three sets of fixed effects; the sub-regional, sector, and year effects to capture unobserved heterogeneity across firms.

Secondly, to examine the effect of firm trading status on average wages, the following equation is estimated:

$$\ln avwage_{fst} = \alpha + \beta\ exporter_{fst} + \gamma\ importer_{fst} + \delta\ X_{fst} + I + \epsilon_{fst} \qquad (2)$$

The dependent variable in (2) is the real average wage paid by the firm in logs (measured as real total labor costs over the number of full-time employees). The main explanatory variables (the exporting and importing status of the firm) are defined as before. The control variables X_{fst} include real capital intensity[10] (real capital stock over sales, in logs), a dummy variable if the firm is foreign-owned (i.e., its foreign private ownership is at least 10 percent), and firm age (in logs). *I* controls for three sets of fixed effects; the sub-regional, sector, and year effects to capture unobserved heterogeneity across firms. In our regressions, the possible channels through which firm trading affects average wages are explored.

To test for the existence of a gender wage gap and investigate if it differs among trading and non-trading firms, equation (2) is modified by adding the female employees' share in a firm's total employment and its interaction with the firm's export and import status.

Thirdly, to examine the effect of firm trading status on female employment share, the following equation is estimated:

$$femalesh_{fst} = \alpha + \beta\ exporter_{fst} + \gamma\ importer_{fst} + \delta\ X_{fst} + I + \epsilon_{fst} \qquad (3)$$

The dependent variable in (3) is the share of female employees in a firm's total employment (measured as the number of full-time female employees as a percentage of the total number of full-time employees). Distinguishing production and non-production workers, this equation will also

[8] Firm age is measured as the difference between the survey year and the year in which the establishment began operations.

[9] The enterprise survey defines small firms as those with five to 19 employees, medium firms have 20 to 99 employees, and large firms have 100 employees or more.

[10] It is worth noting that the impact of capital intensity on average wages is ambiguous, as it depends on whether labor and capital are substitutes or complements.

be run for the female production workers percentage in the total number of full-time production workers, and the female non-production workers percentage in the total number of full-time non-production workers. Besides the main explanatory variables (the exporting and the importing status of the firm) defined as before, the control variables X_{fst} include real capital (in logs), real sales (in logs) to control for firm size, a dummy variable if the firm is foreign-owned (i.e., its foreign private ownership is at least 10 percent), and firm age (in logs). *I* controls for three sets of fixed effects; the sub-regional, sector, and year effects to capture unobserved heterogeneity across firms.

Throughout the regressions, we also interact the exporter and importer dummies with the technological intensity of the sector (low, medium, and medium-high/high technology sectors, as explained in section 3.2) to examine the heterogenous effects of firm trading on labor outcomes of productivity, wages, and female employment in the three groups of sectors.

4. Empirical results

We begin with regressions on labor productivity. Table 2 shows a significantly positive productivity premium for both exporting and importing firms in Egypt in line with the findings of Bernard et al. (2007), Muûls and Pisu (2009), and Békés et al. (2011) for US, Belgian, and Hungarian firms, respectively.[11] Column 1 indicates that in the sample of all firms, exporters are, on average, 60.8 percent more productive than non-exporters,[12] while importers are 36.3 percent more productive than non-importers.[13] Positive productivity premia for trading firms are maintained in small, medium, and large-sized firms (columns 2-4), where the exporter premium ranges from 43.3 percent to 114.3 percent and is the highest for small firms as in Montalbano et al. (2018), while the importer premium ranges from 16.1 percent to 62.3 percent and is the highest for large firms. As for the control variables, capital per worker has a positive effect on labor productivity, as expected. Specifically, a 10 percent increase in capital per worker raises productivity by about three percent. Medium and large firms are found to be more productive in comparison to small firms. On the other hand, foreign ownership does not have a significant effect on productivity, except for large firms where the effect is positively significant but lower than exporting and importing effects. Younger firms of small and medium size are more productive, whereas age is not significant for large firms.

[11] Since our data is pooled cross-sectionally, we cannot formally test for the reason behind the productivity premium of exporting/importing firms: self-selection, learning by exporting/importing, or both. However, we can assume the presence of some learning effects from Egyptian firms' engagement in both exporting and importing. Exporters in developing countries have much more to learn from foreign buyers and competitors, and their importers can have access to inputs from the forefront of knowledge and technology or of better quality than those available domestically (Martins and Yang, 2009; Wagner, 2012; Atkin et al., 2017).

[12] Our estimated exporter productivity premium is much less than the 170 percent found by Saad (2012), who used Egyptian firm-level manufacturing census dataset from 2013. This can be attributed to our control of the import status of the firm to avoid an upward bias in the exporter premium.

[13] The dependent variable is in logarithmic form. Therefore, the percentage difference (premium) between exporting and non-exporting firms is computed as $100*(\exp(\beta)-1)$ and that between importing and non-importing firms as $100*(\exp(\gamma)-1)$, where α and β are the respective estimated coefficients.

Table 3 then examines if the effects of firm trade participation on productivity vary according to the technological intensity of sectors. The productivity premium of exporters is larger in sectors of low technology intensity (50.1 percent) and medium-high and high technology intensity (59.2 percent) than in the medium technology sectors (35.1 percent), as indicated by the latter significantly negative interaction term. Comparing importers and non-importers, we find that the productivity premium of importers gets larger as the sector becomes more technology-intensive, which goes in line with our earlier graphical analysis. It is the largest for importing firms in medium-high and high technology sectors (68.7 percent), followed by medium technology sectors (63.1 percent), while it is the smallest for low technology sectors (21.8 percent). This indicates that imported inputs play a more important role in raising firms' productivity in technologically advanced sectors.

Moving to regressions on average wages, column 1 of Table 4 shows that exporters pay significantly higher average wages than non-exporters with a premium of 16.4 percent while importers have a wage premium of 21.4 percent in line with the findings of Bernard and Jensen (1995), De Loecker (2007), and Serti et al. (2010) for US, Slovenian, and Italian firms, respectively. For control variables, we find that firms with higher capital intensity pay lower average wages, indicating that capital generally acts as a substitute for labor. Interestingly, foreign ownership does not have a significant effect, while younger firms pay higher average wages. We then investigate potential channels that can explain the difference in average wages between trading and non-trading firms.

In column 2, we control for the skill characteristics of workers, measured by the share of production workers who are highly- or semi-skilled. As expected, firms that hire a larger share of skilled production workers pay higher average wages. Importantly, controlling for this factor does not greatly change the wage premia of exporters and importers and they remain significantly positive.

In column 3, we control for the composition of the workforce by including the shares of female workers, production workers, and temporary workers in a firm's total employment. While increased shares of female and temporary workers tend to lower firms' average wages, the wage premia of exporters and importers, again, remain significantly positive. Therefore, neither workers' skill characteristics nor their composition can explain the wage differences between trading and non-trading firms.

In column 4, we control for the firm's total sales and find that firms with larger sales pay higher average wages, however, the exporter premium now turns negative, and the importer premium becomes insignificant. This gives rise to the economies of scale explanation for the wage premia

in trading firms, i.e., exporting and importing firms sell more and can thus achieve lower costs per unit of output enabling them to pay higher average wages compared to non-trading firms.

Lastly, in column 5, we control for labor productivity and find that it has a positive effect on average wages. Both exporter and importer wage premia become insignificant, indicating that labor productivity (which is higher in trading firms as confirmed in our regressions of Table 2) is another important channel that explains the average wage differences between exporters and non-exporters, and between importers and non-importers. The results are similar to those found by Duda-Nyczak and Viegelahn (2018) for channels explaining the exporter wage premium in African firms.

Table 5 then examines the differential impacts of firm trade participation on average wages by the technological intensity of sectors. The positive wage premium in exporting firms does not vary between low, medium, and medium-high/high technology sectors; as their interaction coefficients are all insignificant. On the other hand, the wage premium in importing firms is lower for low-technology sectors while it is higher for medium-high and high-technology sectors. This can be explained by our finding in Table 3 that the productivity premium for importers is the highest in the latter sectors.

Our previous estimations in Table 4 (column 3) suggest the presence of a gender wage gap as firms employing higher female shares pay lower average wages, which can be attributed to the generally lower levels of education and skills of female compared to male workers. To see if the gender gap differs between trading and non-trading firms, Table 6 shows the estimated coefficients for the interaction terms between female labor share and a firm's trading status. Since the interaction coefficients are both positive, we can conclude that the gender wage gap is reduced (though it does not fully disappear) in exporting and importing firms, which is consistent with the findings of both Chen and Hu (2023) for exporting firms in China as well as Rocha and Winkler (2019) for exporting and importing firms in a large set of developing countries. This result can be attributed to the higher productivity and profitability of trading firms and their potentially lower engagement in costly and inefficient gender discriminatory practices.

Finally, we present regressions on female employment share. Table 7 shows that the share of female workers in total employment is 2.4 percent higher in exporting firms compared to non-exporting ones. Conversely, there is no significant effect of firm importing on female employment share. For control variables, we find that foreign-owned firms as well as younger firms employ significantly higher female shares. Decomposing workers into production and non-production workers, columns 2 and 3 indicate that the positive female employment share premium in exporting firms is maintained for female production workers while it is insignificant for female non-production (such as sales and administration) workers. Table 8 investigates if the effects differ by the technological intensity of sectors. The results indicate that exporters have the highest female

employment share premium relative to non-exporters in low-technology sectors (4.84 percent). This premium gets lower for exporters in medium-technology sectors (2.76 percent) and turns negative for exporters in medium-high and high-technology sectors (-1.83 percent). Similar findings are reached when conducting separate regressions for female production workers share (columns 4-6) and female non-production workers' share (columns 7-9). However, the effect of firm exporting for female non-production workers' share is insignificant in medium technology sectors. Our results are in line with the findings of Rocha and Winkler (2019) and Duda-Nyczak and Viegelahn (2017), which indicate the presence of a female labor share premium for trading (exporting as well as importing) firms in several developing and African countries, respectively. However, we could not find evidence for this premium in Egyptian importing firms. As in Rocha and Winkler (2019), the share premium is the largest for female production workers in exporting firms operating in low-technology sectors (about four percent). This suggests that women achieve the largest employment gains as production workers in low-skill-intensive export sectors (such as food and textiles) and potentially indicates a cost-competitive motivation of exporters to hire more female workers who receive lower wages than their male counterparts.

5. Conclusion

This paper studies the effects of firm trade participation on different labor market outcomes using recent manufacturing enterprise survey data for Egypt. It finds a positive labor productivity premium for both exporting and importing firms, being the highest for small-sized exporting firms which are the greatest beneficiaries of learning by exporting. While importing intermediate inputs is associated with higher firm productivity across all sectors, the effect gets larger as the technological intensity of the sector increases. This reflects the productivity-enhancing role played by imported inputs – being of higher quality and/or encompassing advanced foreign knowledge – for firms in medium- and high-technology-intensive sectors.

Regarding average wages, we find that both exporting and importing firms pay higher average wages than non-exporters and non-importers. This positive wage difference between trading and non-trading firms is prevalent for exporters and importers in all sectors and is higher for importers in medium-high and high-technology sectors. It is not attributed to a difference in the skill characteristics of their workforce nor its composition into female, production, and temporary workers. Rather, it can be explained by the existence of economies of scale and the productivity superiority of trading firms. Both the cost and productivity advantages of trading firms mean that they achieve higher profits, which are partly passed on to their workers in a rent-sharing setting. We also find a reduced (though still existing) gender wage gap in trading firms, which could arise from their higher productivity or lesser ability to practice inefficient discriminatory practices in the face of foreign competition à la Becker (1957). Additionally, a female labor share premium is found in exporting but not in importing firms. The effects are more robust for female production workers and the share premium is the highest in low-technology sectors, potentially indicating

exporters' exercise of a cost-reduction strategy by employing a higher share of cheaper female workers, i.e., exploiting the existing gender wage gap to remain competitive.

Taken together, our results indicate the potentially big role that trade can play in improving labor market outcomes in Egypt, specifically in the form of higher average wages (stemming from a higher productivity of trading firms), a reduced gender wage gap, and an improvement in female employment. However, for these micro-level effects to be translated into wide-range macroeconomic improvements in growth rates, poverty reduction, and gender equality, more efforts should be made to reform the business environment. This would enable greater private sector participation in the Egyptian economy, more entry of small and medium firms into export markets, and easier access of firms, especially those operating in technologically advanced sectors to essential imported inputs.

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Tables

Table 1. Descriptive statistics for manufacturing firms in Egypt

Variable	Obs	Mean	Std. Dev.	Min	Max
Exporter	5,150	0.15	0.36	0	1
Importer	5,087	0.49	0.50	0	1
Foreign	5,148	0.07	0.25	0	1
ln firm age	5,122	2.82	0.85	0	5.35
ln real average wage	4,774	7.31	0.97	1.40	12.56
ln real capital stock	4,369	12.38	2.31	5.08	20.20
ln real capital per worker	4,363	8.86	1.67	1.70	14.47
ln real capital intensity	4,109	-0.50	1.59	-6.90	4.87
ln real sales	4,516	12.93	2.17	6.88	20.38
ln real sales per worker	4,474	9.41	1.32	2.64	14.60
Female employment share (%)	4,881	10.72	18.74	0	100
Female production workers' employment share (%)	4,866	10.51	21.96	0	100
Female non-production workers' employment share (%)	4,755	13.55	23.48	0	100
Production workers' employment share (%)	4,974	74.00	14.23	0	100
Skilled production workers' employment share (%)	4,776	74.95	26.95	0	100
Temporary employment share (%)	4,983	7.25	17.25	0	100

Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2013, 2016, and 2020.

Table 2. Firm trading and labor productivity

	All firms	Small firms	Medium firms	Large firms
	(1)	(2)	(3)	(4)
	Ln labor productivity			
Exporter	**0.475*** **	**0.762*** **	**0.502*** **	**0.360*** **
	(0.0566)	(0.205)	(0.0880)	(0.0797)
Importer	**0.310*** **	**0.384*** **	**0.149** **	**0.486*** **
	(0.0382)	(0.0540)	(0.0645)	(0.0943)
Ln capital per worker	0.313***	0.282***	0.321***	0.345***
	(0.0123)	(0.0167)	(0.0216)	(0.0271)
Foreign	0.0776	0.108	-0.193	0.273***
	(0.0747)	(0.158)	(0.140)	(0.0975)
Ln firm age	-0.113***	-0.150***	-0.118***	0.0584
	(0.0208)	(0.0269)	(0.0427)	(0.0500)
Medium	0.368***			
	(0.0399)			
Large	0.196***			
	(0.0553)			
Observations	4,039	1,687	1,442	905
R-squared	0.345	0.313	0.297	0.414
Subregional fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Firm trading and labor productivity, by technological intensity of sectors

	Low tec	Med tec	Med-high/High tec
	(1)	(2)	(3)
	Ln labor productivity		
Exporter	**0.406*** **	**0.516*** **	**0.465*** **
	(0.0790)	(0.0636)	(0.0636)
Exporter*tec	0.107	**-0.215***	0.0468
	(0.104)	(0.124)	(0.122)
Importer	**0.497*** **	**0.266*** **	**0.268*** **
	(0.0637)	(0.0423)	(0.0411)
Importer*tec	**-0.300*** **	**0.223** **	**0.255** **
	(0.0771)	(0.0933)	(0.103)
Ln capital per worker	0.311***	0.312***	0.312***
	(0.0123)	(0.0123)	(0.0123)
Foreign	0.0746	0.0738	0.0726
	(0.0749)	(0.0750)	(0.0744)
Ln firm age	-0.113***	-0.113***	-0.114***
	(0.0209)	(0.0209)	(0.0209)
Medium	0.365***	0.367***	0.367***
	(0.0399)	(0.0399)	(0.0399)
Large	0.196***	0.195***	0.199***
	(0.0551)	(0.0552)	(0.0553)
Observations	4,039	4,039	4,039
R-squared	0.348	0.346	0.347
Subregional fixed effects	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Firm trading and average wages: Alternative channels

	(1)	(2)	(3)	(4)	(5)
	Ln average wage				
Exporter	**0.152*****	**0.169*****	**0.160*****	**-0.157*****	-0.0416
	(0.0435)	(0.0436)	(0.0445)	(0.0443)	(0.0387)
Importer	**0.194*****	**0.183*****	**0.211*****	0.00168	-0.0290
	(0.0297)	(0.0308)	(0.0308)	(0.0296)	(0.0265)
Ln capital intensity	-0.101***	-0.106***	-0.103***	-0.0458***	0.0135
	(0.0104)	(0.0106)	(0.0108)	(0.00990)	(0.00936)
Foreign	0.0126	0.0593	0.0241	-0.101	-0.0442
	(0.0676)	(0.0688)	(0.0712)	(0.0652)	(0.0583)
Ln firm age	-0.0770***	-0.0861***	-0.0888***	-0.0994***	-0.0396***
	(0.0168)	(0.0172)	(0.0174)	(0.0160)	(0.0148)
Female workers' share			-0.00335***		
			(0.000888)		
Production workers' share			0.000660		
			(0.00129)		
Temporary workers' share			-0.00140*		
			(0.000760)		
Skilled production workers' share		0.00369***			
		(0.000539)			
Ln sales				0.171***	
				(0.00829)	
Ln labor productivity					0.405***
					(0.0124)
Observations	4,038	3,846	3,813	4,038	4,015
R-squared	0.138	0.150	0.148	0.229	0.370
Subregional fixed effects	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Firm trading and average wages, by technological intensity of sectors

	Low tec	Med tec	Med-high/ High tec
	(1)	(2)	(3)
	Ln average wage		
Exporter	**0.180*** **	**0.134*** **	**0.152*** **
	(0.0669)	(0.0497)	(0.0478)
Exporter*tec	-0.0562	0.0780	0.00568
	(0.0868)	(0.101)	(0.110)
Importer	**0.260*** **	**0.193*** **	**0.165*** **
	(0.0505)	(0.0331)	(0.0323)
Importer*tec	**-0.107***	0.000447	**0.176** **
	(0.0627)	(0.0758)	(0.0829)
Ln capital intensity	-0.101***	-0.101***	-0.100***
	(0.0104)	(0.0104)	(0.0103)
Foreign	0.0122	0.0148	0.00969
	(0.0673)	(0.0674)	(0.0674)
Ln firm age	-0.0773***	-0.0766***	-0.0780***
	(0.0168)	(0.0168)	(0.0168)
Observations	4,038	4,038	4,038
R-squared	0.139	0.138	0.139
Subregional Fixed effects	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05,
* p<0.1

Table 6. Firm trading and the gender wage gap

	Ln average wage
Ln capital intensity	-0.102***
	(0.0104)
Foreign	0.0669
	(0.0692)
Ln firm age	-0.0784***
	(0.0172)
Female workers' share	**-0.00605*** **
	(0.00107)
Female workers' share* Exporter	**0.00397** **
	(0.00182)
Female workers' share* Importer	**0.00519*** **
	(0.00132)
Observations	3,938
R-squared	0.133
Subregional fixed effects	Yes
Sector fixed effects	Yes
Year fixed effects	Yes
Estimation method	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. Firm trading and female employment

	(1) Female employment share	(2) Female production workers share	(3) Female non-production workers share
Exporter	**2.424*** **	**2.723*** **	-0.558
	(0.839)	(0.962)	(1.118)
Importer	-0.674	-0.799	-0.614
	(0.594)	(0.698)	(0.867)
Ln capital	0.0118	-0.0964	0.663**
	(0.200)	(0.222)	(0.275)
Ln sales	0.177	-0.0572	1.160***
	(0.211)	(0.235)	(0.296)
Foreign	2.922**	3.703**	2.926*
	(1.230)	(1.567)	(1.698)
Ln firm age	-0.746**	-1.161***	-0.114
	(0.353)	(0.414)	(0.486)
Observations	3,963	3,950	3,885
R-squared	0.221	0.231	0.102
Subregional fixed effects	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

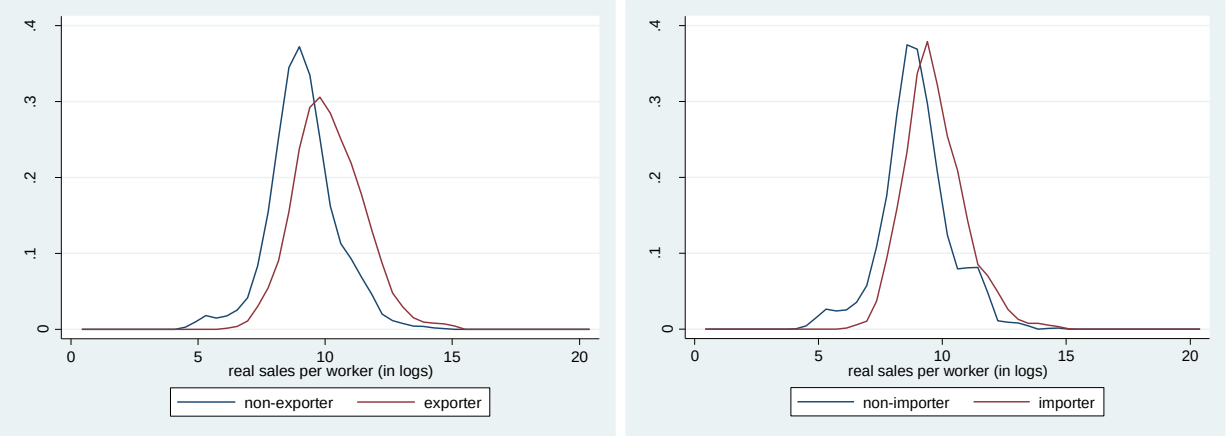
Table 8. Firm trading and female employment, by technological intensity of sectors

	Low tec	Med tec	Med-high/ High tec	Low tec	Med tec	Med-high/ High tec	Low tec	Med tec	Med-high/ High tec
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Female employment share			Female production workers share			Female non-production workers share		
Exporter	-0.205	**2.759*** **	**3.643*** **	0.574	**3.045*** **	**3.674*** **	**-3.717** **	-0.0136	0.711
	(0.964)	(1.008)	(0.964)	(1.050)	(1.165)	(1.117)	(1.526)	(1.289)	(1.239)
Exporter*tec	**4.841*** **	-1.374	**-5.474*** **	**3.962** **	-1.305	**-4.301** **	**5.718*** **	-2.514	**-5.756** **
	(1.518)	(1.481)	(1.719)	(1.736)	(1.646)	(1.901)	(2.050)	(2.235)	(2.544)
Importer	-0.441	-0.575	-0.858	-0.879	-0.672	-0.866	0.696	-0.924	-0.894
	(0.887)	(0.691)	(0.645)	(0.993)	(0.808)	(0.771)	(1.350)	(0.984)	(0.928)
Importer*tec	-0.304	-0.313	0.708	0.192	-0.448	0.0850	-2.032	1.676	1.277
	(1.172)	(1.262)	(1.564)	(1.347)	(1.487)	(1.673)	(1.681)	(1.852)	(2.374)
Ln capital	0.0270	0.0169	0.0110	-0.0842	-0.0916	-0.0977	0.681**	0.670**	0.663**
	(0.200)	(0.201)	(0.200)	(0.222)	(0.222)	(0.222)	(0.275)	(0.275)	(0.275)
Ln sales	0.157	0.172	0.176	-0.0713	-0.0612	-0.0572	1.126***	1.145***	1.157***
	(0.211)	(0.211)	(0.210)	(0.235)	(0.236)	(0.234)	(0.298)	(0.297)	(0.297)
Foreign	2.891**	2.888**	3.008**	3.696**	3.671**	3.791**	2.899*	2.877*	3.036*
	(1.230)	(1.230)	(1.229)	(1.567)	(1.567)	(1.567)	(1.702)	(1.702)	(1.697)
Ln firm age	-0.741**	-0.755**	-0.716**	-1.155***	-1.170***	-1.135***	-0.114	-0.121	-0.0863
	(0.352)	(0.354)	(0.353)	(0.414)	(0.415)	(0.414)	(0.485)	(0.486)	(0.486)
Observations	3,963	3,963	3,963	3,950	3,950	3,950	3,885	3,885	3,885
R-squared	0.223	0.221	0.223	0.232	0.231	0.232	0.103	0.102	0.103
Subregional fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

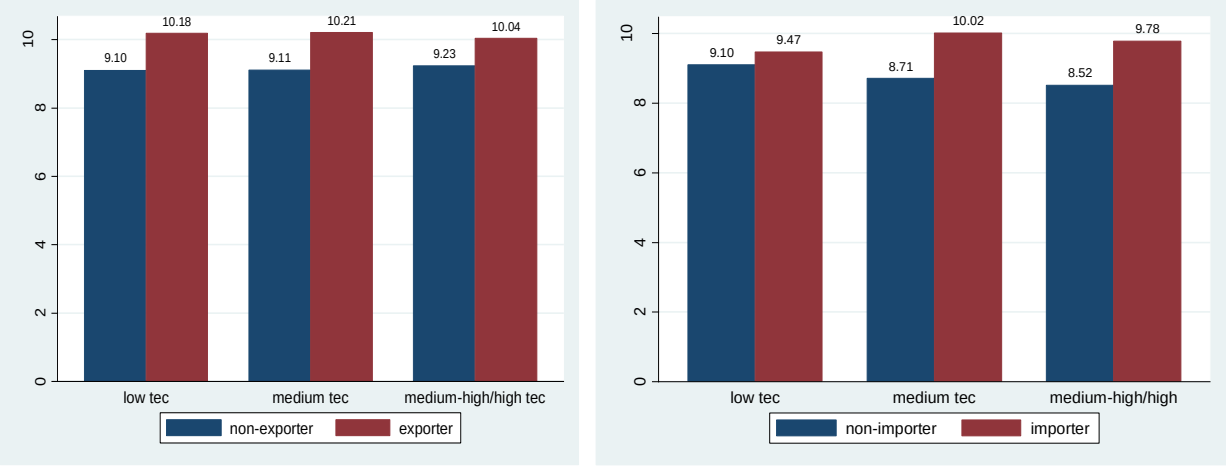
Figures

Figure 1. Kernel densities of labor productivity (in logs) for trading vs. non-trading firms



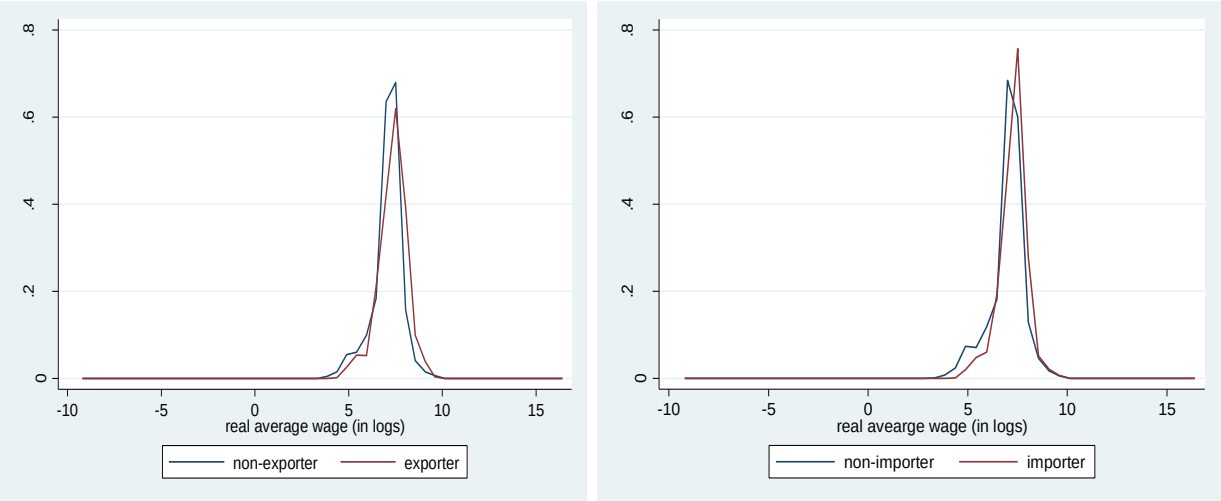
Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2020.

Figure 2. Mean labor productivity (in logs) by trading status and sector technological intensity



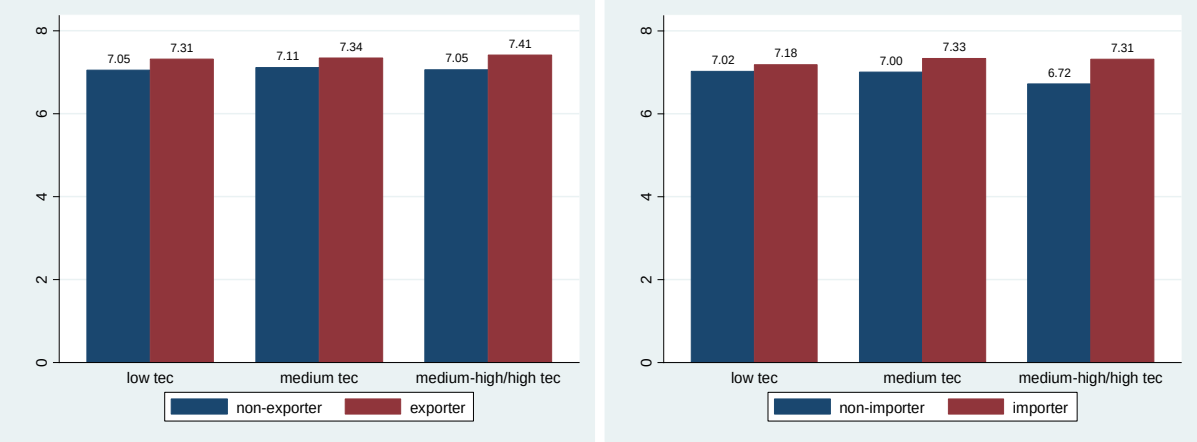
Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2020.

Figure 3. Kernel densities of average wage (in logs) for trading vs. non-trading firms



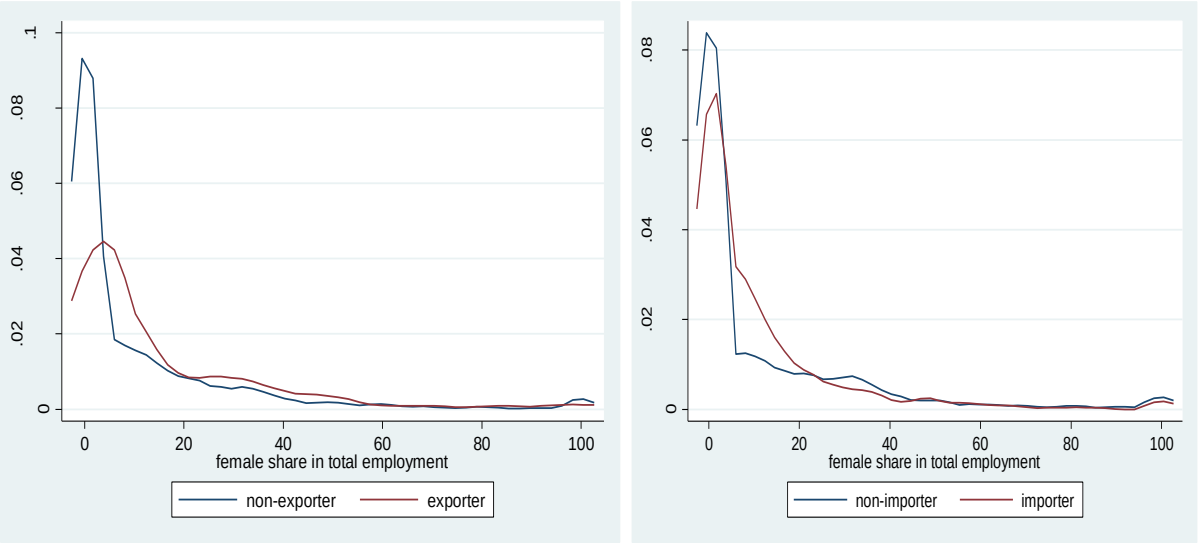
Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2020.

Figure 4. Mean wage per worker (in logs) by trading status and sector technological intensity



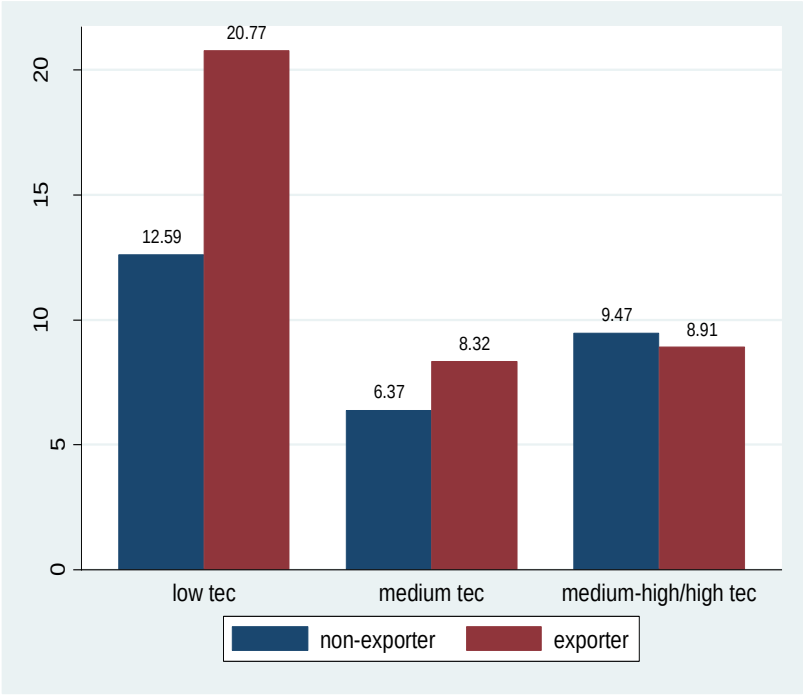
Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2020.

Figure 5. Kernel densities of female employment share (%) for trading vs. non-trading firms



Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2020.

Figure 6. Mean female employment share (%) by trading status and sector technological intensity



Source: Constructed by the author using manufacturing firm-level data of the World Bank Enterprise Survey, Egypt 2020.