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**The Glass Border:
Gender and Exporting in Developing Countries**

Ronald B Davies and Arman Mazhikeyev,
University College Dublin

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The Glass Border: Gender and Exporting in Developing Countries*

Ronald B. Davies[†]
(University College Dublin)

Arman Mazhikeyev
(University College Dublin)

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Abstract

Using firm level data across 99 developing and transition economies, we explore the productivity differences between firms depending on their export status and the gender of their owners. We find that female-owned exporters have roughly half the exporter productivity premium of comparable male firms. This is particularly true for larger firms, suggesting that this difference may reflect greater difficulty in implementing learning by exporting for female-owned firms. Nevertheless, we also find evidence consistent with selection into exporting where female-owned firms face relatively higher export costs. Together, these point to significant discrimination barriers female firms face when exporting.

JEL classification: F14; J16.

Keywords: Exporting; Trade Barriers; Gender; Discrimination.

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[†]Corresponding author: University College Dublin. Email: ronbdavies@gmail.com.

1 Introduction

A large body of evidence highlights the economic benefits of exporting, both at the country level and for an individual firm.¹ As is well established, although exporting firms have higher profits, greater productivity, and pay higher wages, only a minority of firms export due to the costs of exporting. The typical costs considered are economic (e.g. transport costs), policy-generated (e.g. tariffs or non-tariff barriers), or informational (e.g. finding a trading partner). In addition, although less discussed, cultural barriers play a significant role in economic choices. In particular, women may be at a disadvantage in both domestic and international dealings if they find it more costly to overcome a barrier than do their male counterparts if they face discrimination. For example, if exporting requires an export permit, a female applicant (or the representative of her firm) may face discrimination that can be overt (such as a request for a bribe) or more subtle (such as a delay in processing the application), both of which make it more costly to obtain the permit. Further, such barriers may inhibit a female-identified firm from taking full advantage of the technology, practices, and other improvements it is exposed to when exporting, thereby inhibiting learning from exporting. Together, these higher costs and lower benefits may work to stop female firms from exporting with potential effects on their growth, wages, and survival. This paper makes a first attempt to document such possible gender barriers when exporting.

We do so by utilizing data on nearly 19,000 firms across 99 developing and transition economies which contains information on firm level characteristics, including exporting behavior and the gender of the firm's owner(s). We then use these data to examine the relationships between gender, exporting, and productivity by comparing the exporter productivity premium (EPP, the difference in productivity between an exporter and non-exporter that is typically attributed to selection into or learning from exporting) across male and female firms (where firm gender is defined by whether there is a female owner or not). In our base-

¹For example, Frenkel and Romer (1999) is a classic example of work linking trade to country-level growth, with Singh (2010) providing a recent survey of the literature. Melitz and Redding (2014), meanwhile, provide a recent survey of the firm-level results which emerged following the contribution of Melitz (2003).

line estimates, we find that the EPP of female-owned firms is only half that of male-owned firms, suggesting that learning by exporting may be severely inhibited for female-owned firms. Furthermore, we find that this result is most evident for larger firms. In the literature on learning by exporting, size is commonly used as a proxy for the firm’s absorptive capacity, that is, its ability to make use of the lessons learned from exporting.² If small firms have little ability to learn by exporting but larger firms do, then it is primarily the larger female-owned firms that will find learning by exporting to be impeded due to discrimination. This is indeed the pattern we find. This is not to say that there is no difference in selection across firm genders. Using a measure of export costs, we find that the EPP of female-owned firms (and particularly large ones) increases with these costs, suggesting that a rise in these non-tariff barriers is a greater problem for female firms. This too is indicative of gender-based discriminatory barriers to exporting. Finally, we examine the intensive margin of trade and find that, relative to male firms, female-owned firms, and particularly large ones, exporter a smaller share of their output.

Thus, our results add to the large and growing literature highlighting nexus of barriers to trade, productivity, and exporting behavior. In addition to those examining the role of traditional barriers such as tariffs (Debaer and Mostashari (2010) or Buono and Lalanne (2012)) or distance between trade partners (Lawless, 2010), this literature includes exporting costs (Davies and Jeppesen, 2015), exchange rate movements (Araújo and Paz, 2014), and cultural links (Bastos and Silva, 2013). Beyond simply adding to the list of factors affecting export choices, recognizing the links between gender and exporting is important because, as is well documented, exporting firms pay higher wages. Beginning with the seminal works of Bernard and Jensen (1995, 1997), a sizable body of evidence has shown that across countries and industries, firms that export pay more.³ Such linkages have been explained as the result of rent sharing or “fair” wages (Egger and Kreickemeier (2009, 2010, 2012)), efficiency wages (Helpman, et al. (2010)), and the quality match of firm and employee (Krishna, et al. (2014))

²See Farole and Winkler (2012) for a review.

³See Schank, Schnable and Wagner (2007) or Melitz and Redding (2014) for surveys of these studies.

and Davidson et al. (2012)). Thus, if female-owned firms have more difficulty in exporting and in learning from that activity, this has implications for gender income inequality and the host of social issues that impacts.⁴

In addition, our paper adds to the literature on trade and gender where the focus has heretofore been on the impact of trade on the relative wages and employment of female workers. In this work, a number of different avenues have been identified in which trade liberalization impacts female workers differently than male ones. For example, Wood (1991) presents evidence that liberalization in a developing country encourages growth of low-skill (and heavily female) sectors. Other studies consider how trade interacts with discrimination (e.g. Black and Brainerd (2004); Ederington, et al. (2009)), gender-biased technological growth (Juhn, et al. (2014); Ben Yahmed (2013)), or labour informality (Ben Yahmed and Bombarda (2015)). In contrast, we examine how gender affects trade, thus providing an additional link between the two.

The rest of the paper is organized as follows. In the next section, we provide an overview of the literature on selection into exporting and learning by exporting. Section 3 presents our data, including a discussion of its overarching features. Section 4 describes our econometric approach and provides our results. Section 5 concludes.

2 Exporting and Productivity

In the literature linking exporting and productivity, two main threads have emerged: selection into exporting and learning by exporting. Although both of these predict that exporters will typically be more productive than non-exporters, the rationales and data implications are quite different. Here, we provide an overview of the two with a particular eye towards how the impact of gender may differ across them. Given the ubiquity of these models, we omit a detailed derivation of theoretical results, but instead introduce gender into the standard frameworks for discussion purposes so as to guide our empirical investigation. Also, given

⁴See Weichselbaumer and Winter-Ebmer (2005) for a survey of this literature.

the remarkable size of this literature, we do not attempt to provide an exhaustive review of either thread of the research, instead referring the reader to Melitz and Redding (2014) and the work they cite.

2.1 Selection into Exporting

In this strand of the literature, theoretically popularized in Melitz (2003), firm i 's productivity a_i is exogenous and known to the firm.⁵ Armed with this productivity, the firm makes several choices at both the extensive and intensive margins. First, it must decide whether to produce for the domestic market, with very low-productivity firms finding this unprofitable because their high costs (and therefore high prices) yield variable profits insufficient to cover the fixed cost of producing for domestic consumption. If a firm i in country l does open for domestic production, it may also find it desirable to export. Exporting profits are given by:

$$\pi_{i,l} = ((1 + \tau(l, g_i)) a_i)^{1-\varepsilon} \kappa^* - F_X(l, g_i) \quad (1)$$

where $\tau(l, g_i)$ is the variable cost of exporting, $\varepsilon > 1$ is the elasticity of substitution in demand, κ^* is a measure of overseas market size, and $F_X(l, g_i)$ is the fixed cost of exporting.⁶ Note that both of the exporting costs depend on the firm's location (l) and gender (g_i is an indicator function equal to one if the firm is female). We assume that for all l , both of these are at least as large for female firms as for male firms, i.e. there is no discrimination against male firms. Because exporting carries additional fixed and variable costs, only the most productive firms (those with low costs and high sales) will find doing so profitable. Thus, more productive firms self-select into exporting with the value of exports increasing in productivity. Both of these predictions are very well documented in the literature with exporting firms having a clear EPP.

Against this backdrop, because trade costs are at least as high for female firms as their

⁵Oftentimes, this productivity is drawn at some cost from a distribution.

⁶To minimize notation, we normalize wages in all locations to unity.

male counterparts, one would expect the productivity premium to be higher for a female exporter than for a comparable male firm, i.e. a positive EPP gap. Further, suppose that $\tau(l, g_i) = \tau(l)(1 + \gamma g_i)$ where $\gamma > 0$. This would then imply that the gap in trade costs between genders is greater when baseline trade costs $\tau(l)$ are larger. In such a setting the EPP gap would be higher in high trade cost locations. In addition, all else equal, this would then suggest that female firms would export lower volumes than their male counterparts.

2.2 Learning by Exporting

In learning by exporting, rather than productivity driving the decision of whether or not to export, the act of exporting increases productivity. This can occur because exporting exposes a firm to new technologies, practices, and input sources that encourage productivity growth compared to its non-exporting counterparts. Often, this productivity boost is assumed to depend on the firm's absorptive capacity Δ_i , that is, its ability to make use of what it learns by exporting. Thus, this part of the literature examines the evolution of productivity as a function $a_{i,t}(EX_{i,t}, \Delta_i)$ where $EX_{i,t}$ is a vector describing the firm's current and past exporting behavior and $\frac{d^2 a_{i,t}}{dEX_{i,t} d\Delta_i} > 0$.

Relative to the evidence of selection, as surveyed by Keller (2004, 2010) the evidence on productivity improvements via learning by exporting is more mixed.⁷ The findings of Clerides et al. (1998), Bernard and Jensen (1999), Aw, et al. (2000), Delgado et al. (2002), and Smeets and Warzynski (2010) reject learning by exporting, finding that although exporters are more productive than non-exporters, these differences are present prior to exporting and exhibit no change after it commences. Nevertheless, there is a good deal of research supporting learning by exporting, in particular when controlling for absorptive capacity and using data from less-advanced countries. Examples here include Blalock and Gertler (2004) for Indonesia, Van Biesebroeck (2005) for sub-Saharan Africa, Park et al. (2010) and Yang and Mallick (2010), both of whom use Chinese data, and the Slovenian results of De Loecker

⁷In a related approach, Wang (2012) finds evidence of quality improvements in Chinese firms that is created via learning by exporting.

(2013). The focus on absorptive capacity is because, even if a firm is exposed to productivity-enhancing innovations while exporting, this may not affect its productivity unless it has the ability to implement those innovations. This is indeed the finding of Dai and Yu (2013) who use R&D investment as a measure of capacity and Imbriani, et. al (2014) who use firm size as a capacity proxy.⁸ Similarly, Bustos (2011) finds that Argentine exporters increased technology investment faster when facing lower destination tariffs, something Griffith, et al. (2004) and Hu, et al.(2005) link to absorptive capacity and technological catchup.⁹

If, all else equal, female firms have greater challenges putting the information learned while exporting to use (due, for example, to discrimination), then one would expect the EPP for a female exporter to be smaller than that for a comparable male firm. For example, if $\Delta_i = \delta_i (1 + \Gamma g_i)$ with $\Gamma < 0$ and g_i as above, then the absorptive capacity for two firms with the same δ_i would be lower for the female firm. As such, the productivity premium of a female exporter would be lower than her male counterpart, particularly if the baseline absorptive capacity is higher. As such, if as in Schmidt (2010) or Imbriani, et al. (2014) absorptive capacity is proxied by firm size (with larger firms having more capacity), the difference in the exporter premium would become even more negative as firm size increases.¹⁰

In practice, both selection and learning are likely at play, with both predicting that more productive firms export albeit for different reasons. Indeed, several empirical studies, such as Pattnayak and Thangavelu (2014), find simultaneous evidence of both. Therefore which dominates the relationship between exporting and productivity is an empirical question. Nevertheless, with respect to firm gender, the two approaches suggest some differing predictions. In particular, the selection approach would suggest that the EPP should be larger for female firms than male firms with this gap increasing in the exporting country's trade costs. In contrast, the learning by exporting approach would suggest that the female

⁸Farole and Winkler (2012) also use firm size as a measure of capacity when examining the impact of FDI spillovers on firms in developing countries.

⁹Lileeva and Treffer (2010) find learning by exporting among Canadian firms, but only for those which were initially low-productivity.

¹⁰Farole and Winkler (2012) provide a review of the literature using size as a proxy for absorptive capacity.

exporters gain less than their male counterparts with this difference growing (i.e. becoming more negative) as absorptive capacity rises. As such, the female-male EPP gap should be negative and become more negative as firm size increases. Thus, although we have no a priori predictions regarding the sign of the female-male EPP gap, we do have predictions in how it moves in trade costs and absorptive capacity.

3 Data

In this section, we describe the construction of our data and provide an overview of its important features.

3.1 Data Sources

Our firm-level data come from the World Bank’s Enterprise Surveys (World Bank, 2012).¹¹ The final data set used covers manufacturing firms in 99 developing and transition countries over the period 2006 to 2010.¹² The data are cross-sectional with surveys taking place once in each country during the time period.¹³ Across the countries, the surveys have a similar layout and were conducted using a common methodology of random stratified sampling.¹⁴ In all cases, the World Bank (2012) defines the survey universe as “commercial, service or industrial business establishments with at least five fulltime-employees”. The list of countries, their number of observations, and the year of their survey is provided in Table 1.

While the surveys contain some country-specific questions, most questions are common across surveys and include information regarding export behaviour, firm-size and sales fig-

¹¹These can be found at <http://www.enterprisesurveys.org/>, where we use the standardized surveys.

¹²Specifically, we use firms in industries 15 to 37 using the ISIC 3.1 Rev. Classification. Although the data also include information on services and retail/wholesale firms, as these firms do not face the same types of export barriers manufacturers do, we restrict the data to manufacturing.

¹³A handful of countries have been surveyed twice, however, as we cannot tell which firms were surveyed more than once, we cannot use this aspect of the data and therefore only use the largest survey round for each country. This has no qualitative impact on our results.

¹⁴Specifically, it uses strata on firm size (with three categories: <20 employees, 20-99 employees, and 100+ employees), a split which drives our classification of firms into small, medium, and large.

ures. All monetary values are reported in local currencies, which we deflate using the annual consumer price index from the World Bank Development Indicators (World Bank, 2012c) and then convert to US dollars using the annual average exchange rate from the same source.¹⁵ After cleaning the data, the sample contains 19,433 firms.

For our measure of productivity, we use the log of sales relative to employment. This metric is often employed as a measure of labour productivity (see Pavnick (2002) for a discussion). It is critical to note, however, that this is not productivity itself as it does not control for other inputs such as capital. However, given the lack of such data in the World Bank surveys, we are unable to derive a more accurate measure of productivity.¹⁶ As such, our results must be interpreted in this light.

The firm’s gender is determined by whether or not there is a female owner.¹⁷ In addition, surveys after 2008 include data on whether or not there is a female executive. The correlation between the two is .359, indicating that while the correlation is positive, it is most definitely not the case that all female-owned firms have female executives and vice versa. Due to the restricted availability of the executive information (which also restricts geographic coverage), along with the fact that it rarely had a significant impact in conjunction with exporting, we omit it except as noted below.

In addition, we make use of several other firm characteristics identified by the literature as having a significant relationship with productivity. First, and for obvious reasons, we include a dummy variable *Exporter* which equals one if the firm reports positive exports. In addition to this extensive measure, to explore the intensive margin for exporters, we use the logged *Export Share* which is the share of exports in total sales.¹⁸ As older and larger firms are typically found more productive, we include the logged age of the firm (*Age*) and

¹⁵Sales values are reported in dollars only for Ecuador. The consumer price index for Chile (2006) came from the IMF’s Economic Outlook Database.

¹⁶Gorodnichenko and Schnitzer (2013) calculate a measure of productivity for Eastern European countries from the World Bank’s data, however, as they acknowledge, missing data (particularly for capital) significantly lowers their number of observations.

¹⁷Thus, female firms are those with at least one female owner.

¹⁸Note that as we will only consider exporting firms here, there is no issue with the log of zero.

the logged number of employees as our measure of firm size (*Size*). Finally, we include a set of dummy variables: *Foreign Owned* (which equals one if at least 10% of the firm is foreign owned), *Quality Cert.* (which equals one if the firm has an international quality certificate), *Multi-product* (which equals one if the firm is a multi-product firm), *Tech. License* (which equals one if the firm licenses a foreign technology), and *Import* (which equals one if the firm imports intermediate inputs). Based on the previous literature, we expect all of these to be positively correlated with productivity.

Finally, we utilize the log of the cost of exporting, *Export Cost* provided by the World Bank (2012a).¹⁹ This measure calculates the cost of exporting a container (including a variety of non-tariff barriers to trade including internal transport, documentation costs, and other inspection fees) in US dollars. Note that as we do not have the destination of exports, we will be exploiting the variation in *Export Cost* across the countries in which the firms are located, not in where they export to. Further, as non-exporters do not report any information on barriers to exports in the World Bank surveys, we must instead rely on a country-wide measure of export costs, not a firm-specific one. Summary statistics for all variables are in Table 2.

3.2 Summary Statistics

Before proceeding to econometric analysis, it is useful to make some simple comparisons between male and female firms. Table 3 begins this by presenting the means for our variables for female- and male-owned firms. The first item of note is that the majority of firms are male, with female-owned firms making up 36% of the sample. In column 3, we report the difference between the female and male firms and indicate the significance of this difference from a regression where we control for year, country, and industry effects. As can be seen, these differences are typically quite significant. Looking at ownership, we see that female firms are significantly more productive than male firms. It must be remembered that this

¹⁹Note that due to missing data on this variable, when using it we lose 53 observations.

does not control for other factors that are often correlated with productivity. Indeed, female owned firms have higher sales and employment, are also older, and more likely to license a foreign technology, all of which are typical of more productive firms. In contrast, female-owned firms are less likely to be foreign-owned or multi-product firms.

As a different approach to the data, Figure 1 plots the distribution of productivity for female and male firms for all firms (left) and exporters only (right). In each case, it appears that the distribution of male firms is generally to the right of female firms, something confirmed by the Kolmogorov - Smirnov tests which are reported in the top panel of Table 4. Looking at the picture for exporters, this suggests that either female firms face lower trade barriers than do male firms (enabling them to export despite lower productivity) or that their productivity improves by less when they export. Again, however, it must be remembered that this does not control for other characteristics (which motivates our regression analysis in the next section).

Because we will use size (measured as logged employment) as our proxy for absorptive capacity, it is useful to compare the distributions of firm size across genders. Figure 2 does so in the same way as Figure 1 did: the left figure uses all firms whereas the right uses only exporters. As can be seen, comparable to the productivity distributions, the size distribution of male firms is to the right of female firms (although less so for exporting firms). Again the significance of these differences is confirmed by Kolmogorov - Smirnov tests, the results of which are in the bottom panel of Table 4. This pattern therefore suggests that male firms may have an advantage in absorptive capacity relative to female firms. If this translates into greater learning by exporting, that may help to explain the productivity differences seen in Figure 1.

Thus, the summary statistics of the data suggest that female exporting firms may not have as large an EPP as their male counterparts do, potentially due to lower absorptive capacity. With this in mind, we now turn to regression analysis to see whether these partial correlations hold up when controlling for additional correlates with productivity.

4 Results

In Section 3, we found significant differences in the productivity and exporting behavior of male and female firms. However, before attributing the differences to gender, it must be remembered that there were other significant differences as well. Therefore in this section, we turn to regression analysis of the data. Specifically, in our baseline regressions, we estimate for firm i in country j in sector s surveyed in year t :

$$\ln a_i = \beta_0 + \beta_1 Female_i + \beta_2 Exporter_i * Female_i + \beta_3 Exporter_i + \beta_4 X_i + \theta_j + \theta_s + \theta_t + \varepsilon_i \quad (2)$$

where a_i is firm i 's labour productivity, $Female_i$ is a dummy equal to 1 if the firm is female, $Exporter_i$ is a dummy equal to 1 if the firm exports, X_i is a vector of controls as discussed above, and the θ s are a set of country, sector, and year dummy variables. These latter then control for unobservables common across firms in a given country (which are all observed in the same year by nature of the survey), common across all firms in a given sector, and for global phenomenon common to all firms surveyed in a given year. With this specification, the EPP for a male exporter is β_3 whereas that for a female firm is $\beta_2 + \beta_3$. Note here that we are not claiming causation, merely correlation. If the difference between genders is primarily due to higher trade barriers for female firms, then we would expect $\beta_2 > 0$. If $\beta_2 < 0$, this instead suggests that female firms learn less by exporting. Because the data come from a stratified survey, we weight the observations according to the strata in the survey (employment in three categories (under 20, 20-99, and 100+) and country).²⁰ Further, we cluster the standard errors by country. To this baseline, we introduce additional controls intended to proxy for the differential export costs between male and female firms and differences in absorptive capacity across firms. These additions are described in turn below.

²⁰See <http://www.enterprisesurveys.org/methodology> for discussion on the survey stratification.

4.1 Baseline Estimates

Table 5 reports our baseline estimates. Column 1 presents results when excluding size (measured as employment), column 2 then includes size. We do this since our labour productivity measure is sales per employee and as such one may be concerned about having employment as a control variable. That said, as can be seen, the inclusion of employment (which itself is significant) does not have much of an effect on our other control variables. We therefore include it in all subsequent regressions. Finally column 3 also includes information on whether the firm has a female executive. As can be seen, this cuts the sample size in half.

In column 2, we see that point estimate indicates that female owned firms are .02% less productive than male firms, but that this difference is insignificant. This suggests that the differences found in the summary statistics above were driven by other correlates. Indeed, the other correlates are all highly significant with their anticipated signs, suggesting that the difference in productivity may be due to, for example, differences in foreign ownership. Looking to the EPP, we see that a male-owned exporter is on average .202% more productive than a comparable male non-exporter. The EPP of a female-owned exporter, however, is roughly half that, amounting to $.202 - .095 = .107\%$ (a net effect that is significant at the 1% level). This indicates that there is an economically as well as statistically significant difference in the export productivity premium across genders. Nevertheless, we are able to reject the null hypothesis that there is no productivity premium for female exporters at the 1% level as indicated at the bottom of the table. This would suggest that, as hinted at by Figure 1, female firms have a positive, but smaller, productivity premium, a result consistent with learning by exporting being more difficult for them. Also, recall that as the regression controls for sector, country, and year dummies, that these are not driven by differences in gender patterns across countries or industries.

In column 3, where we also include data on the gender of executives, we see that firms with a female-executive are significantly less productive than those that do not. This, however, does not vary according to whether or not the firm exports. Given the focus of the paper on

exporting behavior and the fact that this variable markedly reduces our sample size, we do not use it further. Nevertheless, in unreported results where we continue to use it, we find very little evidence of an interaction between executive gender and exporting.²¹

4.2 Absorptive Capacity and Export Costs

While our baseline estimates suggest that the gender difference may be dominated by learning by doing, this does not imply that there are no differences in trade barriers between male and female firms. Furthermore, the theory suggests that the learning by doing difference may be driven by differences in absorptive capacity. Here, we explore some of these issues by following Imbriani, et. al (2014) and Farole and Winkler (2012) and making use of firm size as a proxy for absorptive capacity and by including information on export costs.

In Table 6, we begin by splitting our sample into small firms (under 20 employees, column 1), medium firms (20-99 employees, column 2), and large firms (those with 100 or more workers, column 3).²² In contrast to the baseline results, small non-exporting female firms are significantly less productive than male firms. Also different from before, we find no significant difference between female non-exporters and female exporters. Medium and large firms, however, match the pattern in the baseline, i.e. no gender difference for non-exporters, with a significantly lower productivity for female exporters when compared to male exporters. This is consistent with larger firms having the capacity to make use of what is observed while exporting with female firms having a more difficult time doing so. In particular, for large firms we (marginally) fail to reject that the EPP of female firms is zero. Thus, these results again suggest an important role for gender in learning by exporting.

This, however, should not be taken to mean that there are no differences in trade barriers across genders. In Table 7, we return to the full sample but introduce additional interactions to our baseline specification (column 1) and then for our three size-based subsamples (columns 2, 3, and 4). Specifically, we interact the export cost measure with the gender

²¹These are available on request.

²²Note that this classification follows the size strata used in the World Bank's survey.

dummy, the exporter dummy, and the product of the two. The third of these is our variable of interest here, as its coefficient indicates how the difference in the EPP between male and female firms moves in export costs. If an increase in export costs raises barriers more for female firms than male firms, then we would expect a positive coefficient, i.e. a female firm selecting into exporting requires an even higher level of productivity in order to hurdle the additional export costs. Note that, as we include country dummies and the export cost measure is at the country level, we do not include it on its own.

Excepting the large firm subsample, we see no significant difference between male and female non-exporters. In this subsample, we also find the only significant interaction between female ownership and export costs. Combining these and using the sample mean for export costs, we find that in this specification female non-exporters are significantly less productive than male ones. Looking to the interaction between gender and exporting, we find similar results as in Table 6, i.e. the smaller EPP is for larger firms only. In addition, we now see that the interaction between gender, exporting, and export costs is positive and significant for the whole sample, a result primarily driven by the large firms. Thus, as expected, as export costs rise, this hinders marginally productive female firms more than it does their male counterparts. At the mean for export costs (7.03), however, it is still the case that female-owned exporters are significantly more productive than their non-exporting counterparts as indicated at the bottom of the table.

Together, these results paint a picture in which the EPP is positive, especially for larger firms and those in low exporting cost countries, with a somewhat smaller EPP for female-owned firms. As export costs rise, female firms (especially large ones) find this particularly burdensome, meaning that they require an even larger export productivity premium to find it profitable to export. As absorptive capacity grows, learning by exporting becomes possible, with female firms having a more difficult time implementing these lessons, resulting in a smaller boost to productivity.

4.3 Selection into Exporting

As stated above, our data do not permit us to determine causation of the link between exporting and productivity, only correlation, with our focus on how that correlation varies by gender, size, and export costs. As an alternative approach, Table 8 uses a logit estimator to examine whether or not the firm exports depending on its productivity and the other controls. Note that this includes the gender of the owner, both on its own and interacted with export costs, as well as a new interaction between gender and productivity.²³ Note that we use the logit estimator due to the desire to continue including country, year, and industry fixed effects. Column 1 uses the full sample, with 2, 3, and 4 using the firm size subsamples.

Beginning with the standard controls, we find a picture much as in the baseline, i.e. more productive, larger, foreign-owned firms are more likely to export. In addition, those with a quality certificate, that produce multiple products, license a foreign technology, and/or import intermediates are more likely to export. Age, however, has no significant impact. Similarly, female ownership on its own has no significant effect. That said, in line with the above results, the interaction between gender and productivity is significantly negative, especially for larger firms. This highlights the interaction between gender, exporting, and productivity for large firms. In contrast, we find no significant effect from the interaction between gender and export costs, regardless of firm size. Thus, given that reversing the presumed direction of causality leads to broadly comparable results especially with respect to the role of absorptive capacity, we hope this serves to provide some meek assurance that the results are not overly driven by endogeneity.

4.4 Intensive Trade

Finally, in Table 9 we use the logged share of total sales that are exported (only for firms that do export) as our dependent variable to gain some insight into the role gender may play

²³We again caution the reader to interpret these with caution due to potential endogeneity.

in the intensive decision.²⁴ As in Table 8, we include labour productivity on its own and interacted with gender as additional control variables while continuing to use the same set of controls as in the extensive regressions. Also, as before, column 1 uses the full sample with subsequent columns using our different firm sizes. In all columns, we continue to include country, sector, and year dummies and use a Tobit estimator (as the non-logged share cannot go above 100%).

Looking first at the non-gender controls, we see that older firms, more productive firms, and those that are multi-product export a smaller share of their sales. Foreign-owned firms and those with a quality certificate, on the other hand, export a greater share of their sales. In addition, at least for large firms, those with more employees export more whereas those that license a foreign technology export less. Importing intermediates has no effect, regardless of firm size.

Turning to the three gender variables, we see a role for gender primarily in the large firm subsample. The female variable on its own is significantly negative, indicating less of an outward focus for these firms. The two interactions, one between gender and productivity and one between gender and export costs are both significantly positive. This suggests that the shift away from exporting as productivity rises is about 5% smaller in female firms. Somewhat surprisingly given the results that a rise in export costs hurts large female firms at the extensive margin, the results here suggest that it aids them at the intensive margin. In any case, while there may be some impacts of gender on export intensity, these occur mostly for the large firms.

5 Conclusion

There has been increasing attention given to the determinants of export behaviour driven in part by the fact that exporters are more productive and pay higher wages. This has led to a body of literature demonstrating the importance of geographic, policy, and cultural barriers.

²⁴Note that as we only use the subsample of exporters, we have no issues of taking the log of zero.

This paper adds to this by using data from 99 developing and transition economies to estimate the impact of gender on exporting behavior. We identify two separate and conflicting avenues for this link. First, female-owned firms may have more difficulty in implementing the innovations observed when exporting, impeding the learning-by-doing effect. Second, even when faced with the same barriers to trade, female firms may find them more costly to overcome. While, in our data, the first effect seems to dominate, we find evidence for both, particularly for large firms. This suggests that non-tariff barriers to exporting may well impede female-owned firms more than their male counterparts, which has a implications for the gender wage gap.

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Figure 1: Distribution of Productivity

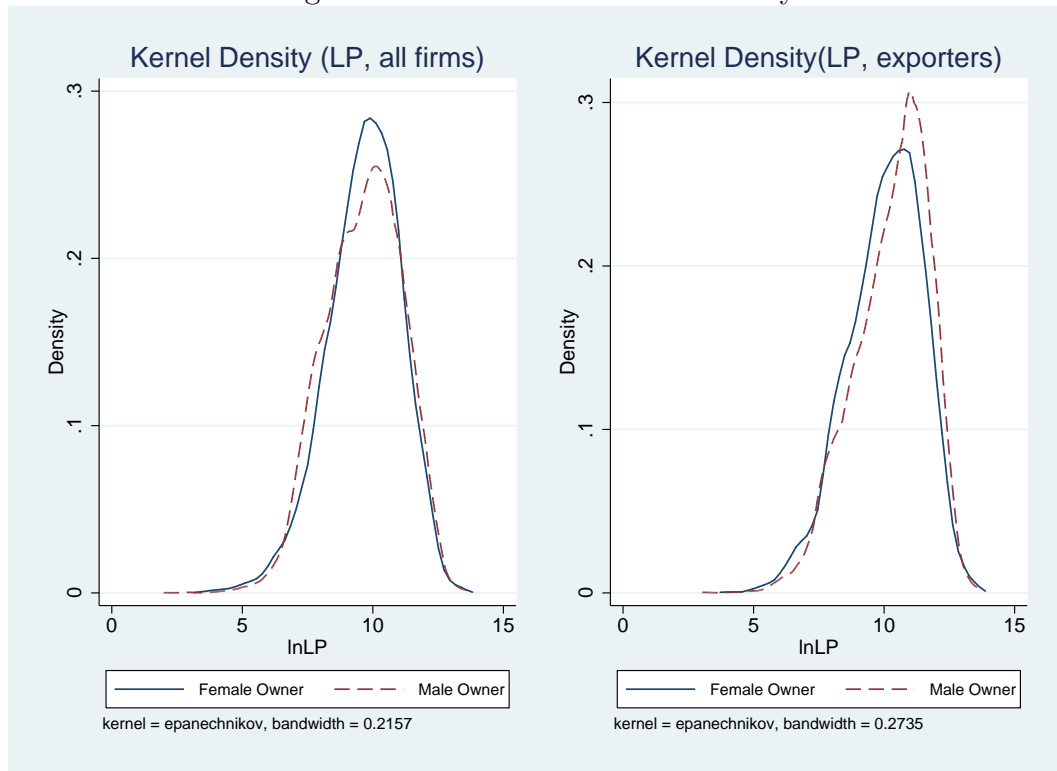


Figure 2: Distribution of Size

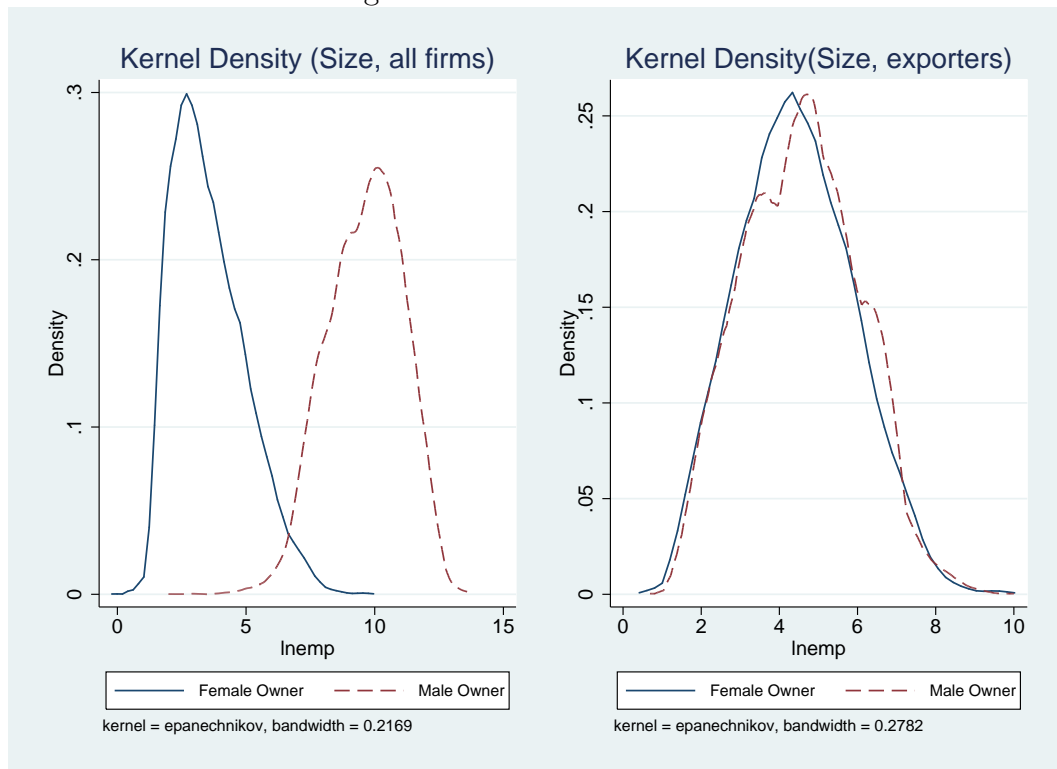


Table 1: Countries in the Sample

Country	Obs.	Year	Country	Obs.	Year	Country	Obs.	Year	Country	Obs.	Year
Afghanistan	24	2008	Czech Republic	51	2009	Latvia	80	2009	Samoa	23	2009
Albania	60	2007	DRC	146	2006	Lithuania	77	2009	Senegal	234	2007
Angola	205	2006	Dominican Republic	92	2010	Madagascar	82	2009	Serbia	103	2009
Argentina	611	2010	Ecuador	341	2006	Malawi	51	2009	Slovak Republic	53	2009
Armenia	77	2009	El Salvador	393	2006	Mali	288	2007	Slovenia	85	2009
Azerbaijan	83	2009	Eritrea	42	2009	Mauritania	72	2006	South Africa	645	2007
Bahamas	28	2010	Estonia	75	2009	Mauritius	51	2009	St Kitts and Nevis	24	2010
Bangladesh	1009	2007	Fiji	19	2009	Mexico	890	2010	St Vincent and Grenadines	42	2010
Belarus	56	2008	Fyr Macedonia	88	2009	Moldova	100	2009	Swaziland	62	2006
Benin	40	2009	Gambia	32	2006	Mongolia	84	2009	Tajikistan	96	2008
Bhutan	86	2009	Georgia	69	2008	Montenegro	22	2009	Tanzania	251	2006
Bolivia	261	2006	Grenada	18	2010	Mozambique	306	2007	Timor Leste	4	2009
Bosnia and Herzegovina	88	2009	Guatemala	304	2006	Namibia	90	2006	Togo	15	2009
Botswana	112	2006	Guinea	114	2006	Nepal	121	2009	Tonga	37	2009
Brazil	725	2009	Guinea Bissau	48	2006	Nicaragua	266	2006	Trinidad and Tobago	100	2010
Bulgaria	467	2007	Guyana	56	2010	Niger	23	2009	Turkey	621	2008
Burkina Faso	65	2009	Honduras	235	2006	Nigeria	839	2007	Uganda	283	2006
Burundi	98	2006	Hungary	88	2009	Panama	168	2006	Ukraine	307	2008
Cameroon	74	2009	Indonesia	229	2009	Paraguay	252	2006	Uruguay	252	2006
Cape Verde	31	2009	Ivory Coast	42	2009	Peru	654	2010	Uzbekistan	109	2008
Chad	57	2009	Jamaica	78	2010	Philippines	701	2009	Vanuatu	9	2009
Chile	630	2010	Kazakhstan	125	2009	Poland	84	2009	Vietnam	680	2009
Colombia	563	2006	Kenya	367	2007	Romania	91	2009	Yemen	151	2010
Costarica	187	2010	Kosovo	53	2009	Russia	391	2009	Zambia	273	2007
Croatia	319	2007	Kyrgyz Republic	78	2009	Rwanda	52	2006			

Table 2: Summary Statistics

Variable	Obs.	Mean	Std.Dev.	Min	Max
Female Owner	18761	0.361	0.480	0.000	1.000
Female Executive	9162	0.150	0.357	0.000	1.000
Productivity	18761	9.639	1.456	1.989	13.603
Size	18761	3.504	1.432	0.000	9.997
Exporter	18761	0.327	0.469	0.000	1.000
Foreign Owned	18761	0.108	0.310	0.000	1.000
Quality Cert.	18761	0.227	0.419	0.000	1.000
Age	18761	2.631	0.858	0.000	5.829
Multi-product	18761	0.639	0.480	0.000	1.000
Tech. License	18761	0.145	0.352	0.000	1.000
Import	18761	0.339	0.474	0.000	1.000
Export Cost	18708	1220.853	548.809	500.000	3840.000

Table 3: Summary Statistics by Gender

	Female Owned	Male Owned	Difference
Productivity	9.658	9.628	0.03***
Size	3.559	3.473	0.086*
Exporter	0.352	0.313	0.039
Foreign Owned	0.09	0.118	-0.028***
Quality Cert.	0.23	0.225	0.005
Age	2.702	2.591	0.112***
Multi-product	0.626	0.646	-0.02***
Tech. license	0.148	0.143	0.004**
Import	0.355	0.331	0.024
Obs.	6770	11991	

Notes: ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively from a regression including country, sector, and year dummies.

Table 4: Kolmogorov-Smirnov test

Productivity		
	Difference	P-value
Male vs. Female	0.0442	0.000
Male Exporter vs. Female Exporter	0.0973	0.000
Size		
	Difference	P-value
Male vs. Female	0.0488	0.000
Male Exporter vs. Female Exporter	0.0559	0.000

Notes: ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively.

Table 5: Labour Productivity: Baseline Results

	(1)	(2)	(3)
Female Owner	-0.021 (0.021)	-0.020 (0.020)	0.042 (0.035)
Female Owner*Exporter	-0.097*** (0.033)	-0.095*** (0.033)	-0.171*** (0.050)
Female Executive			-0.155*** (0.047)
Female Executive*Exporter			0.079 (0.071)
Exporter	0.235*** (0.022)	0.202*** (0.023)	0.237*** (0.035)
Size		0.042*** (0.008)	0.025** (0.012)
Foreign Owned	0.134*** (0.027)	0.117*** (0.027)	0.095** (0.039)
Quality Cert.	0.271*** (0.020)	0.242*** (0.021)	0.217*** (0.029)
Age	0.054*** (0.010)	0.042*** (0.010)	0.054*** (0.016)
Multi-product	0.075*** (0.016)	0.073*** (0.016)	0.097*** (0.026)
Tech. License	0.075*** (0.023)	0.067*** (0.023)	0.053* (0.031)
Import	0.388*** (0.018)	0.357*** (0.019)	0.355*** (0.028)
Constant	7.613*** (0.150)	7.533*** (0.150)	9.850*** (0.193)
Observations	18,761	18,761	9,162
R-squared	0.552	0.553	0.446
Prod. of Female Exp = Female Non-Exp (p-value)	0.000	0.000	0.132

Notes: ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively. All specifications include country, sector, and year dummies.

Table 6: Labour Productivity by Firm Size

	(1) Small	(2) Medium	(3) Large
Female Owner	-0.075*** (0.027)	-0.016 (0.036)	0.099 (0.073)
Female Owner*Exporter	-0.043 (0.072)	-0.112** (0.056)	-0.163** (0.083)
Exporter	0.189*** (0.045)	0.199*** (0.037)	0.273*** (0.054)
Size	0.100*** (0.027)	0.054* (0.028)	-0.102*** (0.025)
Foreign Owned	0.191*** (0.056)	0.124*** (0.046)	0.145*** (0.048)
Quality Cert.	0.233*** (0.047)	0.216*** (0.033)	0.293*** (0.039)
Age	-0.000 (0.015)	0.055*** (0.019)	0.087*** (0.025)
Multi-product	0.073*** (0.024)	0.028 (0.029)	0.140*** (0.041)
Tech. License	0.113** (0.044)	0.040 (0.037)	0.071* (0.043)
Import	0.381*** (0.034)	0.345*** (0.030)	0.303*** (0.041)
Constant	7.134*** (0.186)	7.166*** (0.384)	7.621*** (1.110)
Observations	7,704	6,648	4,409
R-squared	0.543	0.500	0.563
Prod. of Female Exp = Female Non-Exp (p-value)	0.015	0.055	0.102

Notes: ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively. All specifications include country, sector, and year dummies.

Table 7: Labour Productivity and the Role of Exporting Costs

	(1) All Firms	(2) Small	(3) Medium	(4) Large
Female Owner	0.325 (0.337)	-0.482 (0.460)	0.682 (0.575)	1.971* (1.082)
Female Owner*Exporter	-1.341** (0.579)	-0.603 (1.188)	-1.167 (1.033)	-3.078** (1.292)
Female Owner*Exp. Cost	-0.049 (0.048)	0.058 (0.065)	-0.099 (0.081)	-0.268* (0.154)
Female Owner*Exporter*Exp. Cost	0.179** (0.083)	0.081 (0.168)	0.150 (0.147)	0.419** (0.184)
Exporter	0.841** (0.372)	0.724 (0.805)	1.311* (0.679)	0.440 (0.842)
Exporter*Exp. Cost	-0.091* (0.053)	-0.077 (0.113)	-0.158 (0.096)	-0.024 (0.119)
Size	0.042*** (0.008)	0.100*** (0.027)	0.053* (0.028)	-0.102*** (0.025)
Foreign Owned	0.117*** (0.027)	0.191*** (0.056)	0.126*** (0.046)	0.149*** (0.048)
Quality Cert.	0.242*** (0.021)	0.233*** (0.047)	0.219*** (0.034)	0.289*** (0.039)
Age	0.042*** (0.010)	-0.002 (0.015)	0.056*** (0.019)	0.086*** (0.025)
Multi-product	0.073*** (0.016)	0.074*** (0.024)	0.029 (0.029)	0.140*** (0.041)
Tech. License	0.063*** (0.023)	0.112** (0.044)	0.036 (0.037)	0.071 (0.043)
Import	0.356*** (0.019)	0.380*** (0.034)	0.342*** (0.030)	0.304*** (0.041)
Constant	7.533*** (0.151)	7.143*** (0.186)	7.127*** (0.384)	9.921*** (0.187)
Observations	18,708	7,668	6,631	4,409
R-squared	0.554	0.545	0.501	0.564
Prod. of Female Exp = Female Non-Exp (p-value)	0.201	0.960	0.986	0.008

Notes: Dependent variable is labour productivity. ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively. All specifications include country, sector, and year dummies.

Table 8: Extensive Margin

	(1) All Firms	(2) Small	(3) Medium	(4) Large
Female Owner	0.629 (0.849)	-1.424 (1.748)	0.391 (1.370)	1.145 (1.708)
Productivity	0.234*** (0.026)	0.267*** (0.055)	0.224*** (0.044)	0.230*** (0.048)
Female Owner*Productivity	-0.084*** (0.032)	-0.084 (0.064)	-0.065 (0.054)	-0.107* (0.061)
Female Owner*Exp. Cost	0.043 (0.115)	0.348 (0.239)	0.048 (0.181)	0.002 (0.238)
Size	0.638*** (0.020)	0.506*** (0.096)	0.513*** (0.071)	0.499*** (0.066)
Foreign Owned	0.670*** (0.070)	0.581*** (0.167)	0.667*** (0.112)	0.838*** (0.132)
Quality Cert.	0.701*** (0.053)	0.640*** (0.131)	0.799*** (0.082)	0.659*** (0.099)
Age	0.007 (0.028)	0.053 (0.056)	0.014 (0.046)	0.037 (0.060)
Multi-product	0.184*** (0.046)	0.165* (0.093)	0.111 (0.073)	0.324*** (0.101)
Tech. License	0.217*** (0.061)	0.144 (0.140)	0.237** (0.094)	0.181 (0.116)
Import	0.835*** (0.049)	1.043*** (0.102)	0.746*** (0.076)	0.802*** (0.098)
Constant	-8.210*** (0.499)	-7.650*** (0.750)	-7.830*** (0.819)	-8.355*** (1.205)
Observations	18,695	7,567	6,581	4,385

Notes: ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively. All specifications include country, sector, and year dummies.

Table 9: Export Share

	(1)	(2)	(3)	(4)
	All Firms	Small	Medium	Large
Female Owned	-1.203* (0.706)	0.704 (1.715)	0.324 (1.240)	-1.934*** (0.028)
Productivity	-0.082*** (0.022)	-0.083 (0.056)	-0.064* (0.037)	-0.106*** (0.002)
Female Owned*Productivity	-0.014 (0.025)	-0.056 (0.060)	-0.034 (0.043)	0.006** (0.003)
Female Owned*Exp. Cost	0.169* (0.096)	-0.044 (0.234)	-0.017 (0.166)	0.244*** (0.004)
Size	0.118*** (0.015)	-0.101 (0.108)	0.055 (0.053)	0.082*** (0.004)
Foreign Owned	0.284*** (0.049)	0.204 (0.164)	0.346*** (0.087)	0.266*** (0.016)
Quality Cert.	0.223*** (0.040)	0.217* (0.112)	0.190*** (0.065)	0.222*** (0.018)
Age	-0.275*** (0.025)	-0.143** (0.059)	-0.220*** (0.042)	-0.282*** (0.006)
Multi-product	-0.308*** (0.040)	-0.301*** (0.100)	-0.344*** (0.066)	-0.287*** (0.019)
Tech. License	-0.090** (0.045)	0.017 (0.142)	-0.059 (0.073)	-0.176*** (0.016)
Import	0.016 (0.041)	0.097 (0.106)	0.022 (0.064)	0.013 (0.020)
Constant	-0.077 (0.284)	0.586 (0.708)	-0.180 (0.457)	0.624*** (0.022)
Sigma	1.212*** (0.013)	1.119*** (0.032)	1.144*** (0.020)	1.211*** (0.002)
Observations	6,131	909	2,225	2,997

Notes: ***, **, and * on difference denote significance at the 1%, 5%, and 10% levels respectively. All specifications include country, sector, and year dummies.

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