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KCG Working Paper

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No. 22 | October 2020

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Why are Africa's Female Entrepreneurs not Playing the Export Game? Evidence from Ghana

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Abstract: We explore the export performance of Africa's underperforming female entrepreneurs, using the Ghanaian ISSER-IGC panel, a comprehensive dataset of manufacturing firms for 2011–2015. Uniquely, the data provides information about the severity of key business constraints, across both male and female entrepreneurs. We find that females are less likely to export (and optimize their exporting) than their male peers. Although reduced access to finance seriously constrains the exports of female entrepreneurs, this limitation does not explain their relative inability to leverage value from exports. Consistent with related work, we find that certain social and cultural constraints, in particular constraints linked to bribes and security concerns, are more deeply felt by female entrepreneurs. This may hint at the exclusion of Africa's females (voluntarily or involuntarily) from male-dominated networks or business practices.

Keywords: female entrepreneurship; business constraints; productivity; exporting; Africa; Ghana

JEL Classification: D22; F14; J16

KCG Working Paper No. 22 | Oct. 2020

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1 Intoduction

Women's economic participation through decent employment represents a new frontier for social change in the global empowerment of women. Indeed, achieving gender equality and empowering women is one of the United Nation's Sustainable Development Goals. There is a growing recognition that female underrepresentation in business and public life carries heavy consequences for the status of women, especially in developing countries.

Across Africa, large numbers of women and men rely on the income they earn as small business owners to support themselves and their families. However, these enterprises face constraints that prevent them from expanding, increasing productivity, and elevating earnings. This is particularly true for female-owned and -managed enterprises. Indeed, research has highlighted a few startling inequalities. For example, in many countries, both developed and developing, fewer women than men manage to start a business (Kelley et al., 2010). And those businesses that get started (or managed) by women, generally perform worse (de Mel et al., 2008; Essers et al., forthcoming; Langevang et al. 2015). Yet few disagree that starting a business is one of the few ways in which women can gain employment, where other opportunities are lacking.

The purpose of our paper is to investigate the female underperformance problem using firm level data for Ghana (the Ghana ISSER-IGC panel). Unlike previous studies, we focus on a neglected aspect of firm performance – exporting – an activity which offers entrepreneurs the chance to expand sales by attracting new customers. Specifically, we investigate differences between male and female run firms in terms of their propensity to export, and their ability to 'learn' from exporting, where learning is expected to boost productivity. Additionally, we examine the role of constraints to firm performance (access to land, capital, etc.) reported by entrepreneurs, both male and female, using differences in these responses to help explain the export performance gap. If export gains are biased towards male entrepreneurs, this has severe implications for their female peers. It is therefore important to investigate this gender gap and understand its causes.

Our paper relates to a larger literature attempting to find answers to this question of female underperformance – with limited success (e.g., Campos and Gassier, 2017). McKenzie and Woodruff (2015) show that developing country businesswomen tend to use less sophisticated management practices. In a study comparing male and female entrepreneurs in Ghana, Fafchamps et al. (2014) reveal that women tend to underinvest in their business because the money is needed to cover household expenses, a problem compounded by the fact that women have difficulty in raising external capital (e.g., de Mel et al., 2008; Field et al., 2010). But juggling the financial needs of household and business is only part of the story. The unequal distribution of assets, finance, and technology represents another source of gender inequality, with far-reaching consequences (Doss et al., 2014). The latter can be important determinants of productivity and earnings within the enterprise.

More broadly speaking, social and economic institutions, including laws and government policies, reinforce inequalities between men and women. Restrictive social norms represent a further and significant threat to gender equality (Folbre, 1994; Hallward-Driemeier et al., 2013). In some developing countries, where social norms make it hard for women to find a role outside of the home, businesswomen face the toughest constraint of all – exclusion from business networks. In a well-cited

study by Field et al. (2010: page 5), the authors conclude that 'women subject to extreme restrictions had too little agency to easily change their aspirations or activities'.

Social norms and psychological differences may help explain why female entrepreneurs tend to shy away from certain business practices. Take the practice of bribes, for example. In a seminal article on bribes and corruption, Swamy et al. (2001) demonstrated that women (across numerous countries) are less likely to use bribes or to condone their use. In a place where bribes are seen to open doors to business opportunities, female entrepreneurs are forced to take a back seat. Esarey and Chirillo (2013) argue that gender discrimination makes women more reluctant to violate institutional norms. As such, in contexts where corruption is stigmatized, women are less tolerant towards corruption and therefore less likely to engage in corrupt behaviours (Alhassan-Alolo, 2007; Breen et al., 2017; Gatti et al., 2003; Lavallée and Roubaud, 2019; Swamy et al., 2001).

Against the backdrop of the above studies, we analyse the export performance gap between Ghana's male and female entrepreneurs. We find, unsurprisingly, that female entrepreneurs are less likely to export than their male peers. More interestingly, they fail to fully capture productivity gains from exporting. Importantly, we find that although females rank access to finance more highly as a constraint than males (and finance constraints hamper exporting), this perceived finance gap does not explain the mediocre export performance of female-managed firms.[1] Instead, social and cultural norms might provide some of the answer. Specifically, female entrepreneurs appear to experience more deeply the negative aspects of these norms – especially bribery and security concerns. In highlighting the adverse role of social and cultural norms, we agree with Field et al. (2010), who concluded that cultural norms are among the most important problems facing females in developing countries.[2]

This paper offers several novel aspects. To our knowledge, our study is the first to compare gender differences in exporting outcomes, for a developing country.[3] Additionally, we explore a wide array of constraints, from economic factors to those reflecting social and cultural norms. Bribery has not been investigated in this context so far. The paper that probably comes closest to ours is Hanousek et al (2019), which shows that corruption has a higher potential to damage the productivity of firms in Central and Eastern Europe when these companies are run by female rather than male CEOs. They do not consider exports, however. Our study also extends the literature on the effects of trade on employees, both male and female (e.g., Do et al., 2016; Gaddis and Pieters, 2017; Juhn et al., 2014; Kis-Katos et al., 2018). In contrast to the latter, we look at the effects of trade on entrepreneurs (not employees).

Our focus on Ghana is highly relevant – a developing country where more women than men start a business (Kelley et al., 2010). Yet, evidence suggests that female entrepreneurs still have a long way to go to catch up with their male peers (Abor and Quartey, 2010). They perform significantly worse than their male counterparts, with reduced productivity (Owoo et al., 2019) and sales (Agyire-Tettey et al., 2018).

[1] Access to finance has been found to be an important constraint to exporting, even without considering a gender dimension, as concluded in several studies (Berman and Hericourt, 2010; Görg and Spaliara, 2018; Manova et al., 2015).

[2] Note that Field et al. (2010) investigate employees. We, in contrast, investigate entrepreneurs. A similar intuition applies.

[3] In so doing, our approach is similar to that used by others, e.g. Irarrazabal et al. (2013), who investigate to what extent worker heterogeneity can explain productivity premia from exporting. The latter however, consider the workforce, while we consider entrepreneurs, with a focus on gender.

The remainder of the paper is organized as follows – starting with a review of the related literature on corruption, firm performance and gender. This is followed by a description of the data and descriptive statistics of the key variables. The section that follows presents our main analysis, where we examine, for male and female entrepreneurs, the interplay between export participation and export-related productivity gains for male and female entrepreneurs, respectively. We then go on to report some robustness checks. Finally, we conclude with a section on the implications of our findings.

2 Corruption, Firm Performance and Gender

As stated in the Introduction, we investigate a wide range of business obstacles, including corruption. Our resulting analysis reveals how male and female entrepreneurs perceive this obstacle differently and how this difference in perception links to export performance. This section sets out to position our finding at the intersection of two strands of literature. First is the literature on how bribery – or more broadly, corruption – affects firm performance. The second is the literature documenting how gender differences can shape the participation of individuals in corrupt behaviour.[4]

Corruption and firm performance

The impact of corruption on the economy in general and on the performance of individual companies has long been discussed. Nevertheless, there is still an intense debate about whether corruption is always harmful or whether it leads to better economic performance under certain circumstances. In other words, whether corruption 'sands' or 'greases' the wheels of business.

The seminal paper of Baumol (1990) argues that corruption is detrimental to economic development, diverting economic resources and entrepreneurial talent towards unproductive activities (Murphy et al., 1991). In line with this argument, most country-level studies find a negative correlation between corruption and development (e.g., Mauro, 1995; Méon and Sekkat, 2005).

Alternatively, those who view corruption in its role of 'greasing the wheels' of commerce, argue that under certain institutional settings, corruption can be a means of improving economic efficiency. Transaction cost economics, in particular, sees bribery as a means of overcoming business obstacles created by poorly functioning institutions, such as lengthy bureaucratic procedures (Lui, 1985). In such a setting, the payment of bribes can be considered the second-best option for private firms when dealing with public officials. In line with this argument, empirical studies supporting the view that corruption greases the wheels of commerce, tend to find its positive effect is stronger in countries with weaker institutions (e.g., Méon and Weill, 2010; Mendoza et al., 2015).[5]

In recent years, numerous firm-level empirical studies have examined the effects of corruption on firm performance, with firm performance usually measured either as sales growth, productivity,

[4] Bribery is perhaps the most widely known form of corruption. Both in public discourse and in academic research, corruption is often understood narrowly as bribery, i.e., informal payments that public officials demand to perform an official task or to circumvent laws and regulations (De Rosa et al., 2015). In our paper, corruption is also presented as bribery/informal payments. Corruption is nevertheless a broader concept that encompasses all forms of illegal activities (e.g., favouritism, nepotism, cronyism) in which public or private officials misuse their positions of power for private gain. The literature includes papers using both definitions of corruption.

[5] Interestingly, papers that find no support for the efficient grease hypothesis – e.g., Méon and Sekkat (2005), De Rosa et al. (2015) – find that the institutional environment has the opposite mediating effect, namely weaker institutions worsen the negative economic consequences of corruption.

investment or innovation activity. [6] Nevertheless, this new literature is as inconclusive as previous studies, with some papers (e.g., De Rosa et al., 2015, on 28 post-communist countries; Nur-tegin and Jakee, 2020 on 136 countries) concluding that corruption is harmful, while others (e.g., Williams and Kedir, 2016, on 40 African countries; Krammer, 2019, on 30 emerging economies) find it can enhance firm performance.

These findings naturally highlight the factors mediating the relationship between corruption and firm performance. The strength of a country's institutional environment is one such mediating factor. Also, smaller firms may suffer more from corruption than larger firms because they have fewer resources to offer as bribes (O'Toole and Tarp, 2014; Mendoza et al., 2015; Paunov, 2016). Furthermore, it has been shown that selling in foreign markets mitigate the negative effects of a corrupt domestic environment (Olney, 2016; Martins et al., 2020), even though exporters are often forced into one-off bribery to obtain export licences (Sharma and Mitra, 2015; Soans and Abe, 2016; Seck, 2020).

Some studies emphasize the characteristics of the company's owner or senior manager in mediating the impact of corruption on firm performance. Firms with owners/managers who are willing to engage in corrupt transactions and who belong to the circles where corruption actually occurs, are better positioned to benefit from corruption's greasing effect (e.g., Mironov, 2015, Van den Berg and Noorderhaven, 2016).

Our paper suggests that the gender of the business owner (or top manager) can also influence the way corruption affects firm performance. Corruption may be more harmful to female-owned businesses than to those owned by men. To the best of our knowledge, only one paper, Hanousek et al. (2019), has suggested gender represents such a mediating factor. The latter use firm-level data from Central and Eastern Europe to document how a corrupt environment is detrimental to firm performance, a finding more pronounced for firms led by female CEOs.

Gender and corruption

To understand why corruption could have a gendered impact on business, one can survey the extensive literature on gender differences in attitudes toward corruption.

There is robust empirical evidence that countries with higher female representation in public life also report reduced levels of corruption (Dollar et al. 2001; Swamy et al. 2001). This observation has triggered a debate on whether promoting gender equality represents an effective policy instrument to fight corruption (e.g., Sung, 2003). Subsequent empirical literature has scrutinized this issue by considering the institutional context and often applying data at the individual level (e.g., Torgler and Valev, 2010; Ramdani and Witteloostuijn, 2012; Breen et al., 2017). Most of these papers confirm the existence of gender differences in attitudes to corruption across a variety of cultures and institutional settings. In short, women are less likely to engage in corrupt behaviour than men.

Nevertheless, whether or not countries can combat corruption by improved gender equality, to some extent depends on the reasons for the gender differences. Are women inherently less tolerant towards corruption than men? Or does society simply prevent women from engaging in corrupt practices? In the latter case, if customs and norms change, women have the potential to become as corrupt as men. Existing literature leaves this question largely open.[7] It is not our aim to take a stand

[6] See Martins et al. (2020) for a comprehensive overview

[7] Experimental research from psychology/behavioural economics pinpoints gendered behavioural differences, women being more risk-averse than men and more sensitive to social signals (Croson and Gneezy, 2009; Eckel

on this debate. In fact, we remain relatively agnostic about the causes of gender differences in corruption, when interpreting our findings. Whether due to differences in behaviour and attitudes (e.g., related to risk) or lack of opportunities, women are less inclined to engage in corrupt transactions – something that can hamper the performance of businesswomen in countries with weak institutional environments where bribes are necessary to 'get things done'.

3 Data and Descriptives

The Ghanaian ISSER-IGC Panel

Our resulting analysis bases on a survey of micro, small and medium-sized manufacturing enterprises in Ghana, the data collected by the *Institute of Statistical, Social and Economic Research* (ISSER). Based at the University of Ghana, the latter is financed by the *International Growth Centre* (IGC). The survey was conducted in August/September 2016, whereby data was collected for five consecutive years (2011 to 2015, inclusive).[8]

The sample frame underpinning the questionnaire was taken from the first phase of the Ghana Integrated Business Establishment Survey (IBES). The latter represents an economic census of non-household enterprises conducted by the Ghana Statistical Service (GSS) in 2014 through 2015. Specifically, the firms sampled were taken from the universe of manufacturing micro, small and medium-sized enterprises (MSMEs) located in the cities of Accra, Tema, Kumasi and Sekondi-Takoradi, the main industrial clusters of Ghana. To assist completeness, the data also includes firms from Ghana's informal sector. From the IBES, all manufacturing MSMEs located in the four cities were selected, amounting to 1,244 firms altogether. The survey interviewers attempted to approach all of these firms. Of those approached, 73 firms refused to participate in the survey, 55 had ceased to operate and 231 could not be located using the contact information obtained from the GSS. To sum up, altogether 880 firms completed the questionnaire, which corresponds to a 70 per cent response rate.

The sampled firms operate in 20 different two-digit manufacturing industries, applying the International Standard Industrial Classification (ISIC) Revision 4 classification. Nevertheless, the overwhelming majority of these firms are active in a few industries, namely the manufacturing of foodstuffs, textiles and clothing, wood products and furniture. The number of firms per location across four broad industry groups are shown in Table 1.

Table 1 here

and Grossman, 2008). Esarey and Chirillo (2013) support this hypothesis that women are less prone to corruption. Goetz (2007) argues that differences exist because women have fewer opportunities to practice corruption, being excluded from male-dominated networks, a viewpoint that chimes with the case-study evidence by Van den Berg and Noorderhaven (2016) who find that bribery is profitable' only for members of an inner circle.

[8] See Abeberese et al. (2019) for a detailed description and application of the panel. Because of the retrospective nature of the survey, a potential cause for concern is recall error. However, we should point out the data were collected through face-to-face interviews with respondents who were instructed to extract the information directly from the firm's written records. In 60 and 30 percent of the interviews, the respondent was the owner or a senior manager, respectively. Furthermore, Abeberese et al. (2019) tested the robustness of their results by successively dropping earlier years from their estimation sample. Their estimation results remained robust to these modifications, suggesting that recall error does not seriously compromise the data.

The sample firms are predominantly privately and domestically owned. Firms are majority state-owned in only a tiny minority of the observations (0.5 per cent). Similarly, only a minority of firms have a foreign ownership share of at least 10 per cent (1.7 per cent). In a large minority of the cases, a female entrepreneur is named as the primary owner (43 per cent). Female-entrepreneurs are therefore reasonably represented in the ISSER-IGC panel. However, their presence is strongly concentrated in a few industries. As much as 98 per cent of female-owned firms are active in the categories *Textiles and Clothing* and *Food and Beverages*.

Data elicited from business respondents include information on output, capital, investment, employment, material inputs, wages, and engagement of the firm in international trade.[9] Employment is distinguished into production and non-production workers. Based on the latter, we can define a skill intensity variable by calculating the share of non-production workers in the firm's overall workforce. This skill indicator ranges between 0 and 1, with a sample mean of 0.26.

Additionally, the survey questionnaire collects information on the share of output that is exported annually (export intensity). Based on this, we generate an export dummy for the firm's export status, in any given year. The dummy takes the value one if a firm is recorded to have exported in that year and zero otherwise. In our sample, only 3.5 per cent of the firm-year observations are exporters, reflecting the low export presence of the small to medium-sized firms in the Ghanaian ISSER-IGC panel. Additionally, we use export intensity as a measure of firm's intensive margin in our empirical analysis.

Table 2 here

The likelihood of being an exporter is considerably larger for businesses with male primary owners. As Table 2 shows, at least three-quarters of exporters are male-owned in each year while female-owned exporters are relatively few (There are no exporters among state-owned firms). This contrasts with the relatively large share of female managed firms in the total sample, suggesting the latter face higher export entry barriers.

Nevertheless, those firms that do manage to export, sell a considerable share of their total output on foreign markets (high export intensity). This pattern is true, for both male and female entrepreneurs. The average exporter sells roughly a third of its output abroad, although this figure masks large variations among firms (Figure 1). The distribution for female exporters exhibits somewhat larger bunching towards the high and low ends of the export-intensity distribution.

Figure 1 here

The data allow us to measure total factor productivity (TFP) of a firm, estimated as the residual from a production function. The surveyed firms report annual values for their output, the replacement cost of their capital items (land, buildings, machinery), and the cost of raw materials used in production. We deflate all these variables to 2006 Ghanaian *Cedis* using the manufacturing producer price index from the Ghana Statistical Service. This information, together with the number of workers, enables us to estimate production functions and infer TFP for each firm and year.

[9] We cleaned the raw data in two ways. For output and exports, reported both at the product level and as totals, we consolidated the two sources of information. To reduce the impact of outliers, we winsorized the top and bottom one percentages of the distribution of key variables.

We assume a Cobb-Douglas production function with three factors of production – capital, labour and materials – and standard Hicks-neutral technological change, which yields the estimating equation in logarithm,

$$y_{it} = \alpha_k k_{it} + \alpha_l l_{it} + \alpha_m m_{it} + \omega_{it} + \varepsilon_{it} \quad (1)$$

where y_{it} is gross output, k_{it}, l_{it} and m_{it} are capital, labour and material inputs, respectively, ω_{it} is the unobserved total factor productivity and ε_{it} is an error term. One can obtain the logarithm of TFP for each firm and year as the residual,

$$\widehat{tfp}_{it} = y_{it} - \widehat{\alpha_k} k_{it} - \widehat{\alpha_l} l_{it} - \widehat{\alpha_m} m_{it}. \quad (2)$$

A problem in estimating production functions is that firms can obtain information on their productivity ω_{it} which, in turn, may affect their decisions on how much inputs to use in period t. As ω_{it} is not observable to us, it becomes part of the error term in the estimation. We apply three different methods for estimating (1), each of which provides some solution to the above endogeneity problem, albeit under different assumptions (Van Beveren, 2012): the fixed effects estimator, the two-step control function estimation procedure of Levinsohn and Petrin (2003) and the estimator of Wooldridge (2009).[10]

It turns out that these three estimation methods lead to very similar TFP estimates for our Ghanaian firms, with pairwise correlation coefficients above 0.9. [11] Hence, in what follows, we adopt the fixed-effects TFP estimate as our baseline productivity measure, using the other two TFPs only for robustness checks.

After netting out industry means from the TFP variables, we plot the TFP distributions of exporters and non-exporters as well as male and female run firms on Figures A.2 and A.3, respectively. The figures reveal that exporters are clearly more productive than non-exporters, which is not surprising, being a stylized fact in the literature. More interestingly, our distributions of TFP also show that male-managed firms are more productive than their female-managed counterparts. Of course, a simple visual comparison of distributions cannot consider other potential differences between these two groups (for example, skill intensity). Nor do they allow us to infer causality. We therefore return to a more formal modelling of the effect of commencing exports on productivity and the role of gender.

Business Constraints

Next, we look at which business constraints reported by firms, hinder their business performance. Also, we consider whether gender differences play a role in modifying the importance of these constraints. In the survey, firms were asked to sort nine business constraints according to their implications for the firm's activities: 'Please rank the following 9 obstacles in terms of their importance to the enterprise's operations in [year].' These constraints are taxation, customs and regulation, security, bribery/informal payments, as well as a group of constraints relating to access – access to finance, land, electricity, infrastructure (roads, water, etc.) and markets.

[10] The FE estimator relies on the assumption that the component of productivity causing the endogeneity problem is constant over time, removable via the firm-specific fixed effect. The other two methods which allow productivity to vary over time, expressed as a function of the observable variables, assume that productivity is the only unobserved variable affecting firms' input choices.

[11] Their similarity is also demonstrated by the distribution plot in Figure A.1 in the Appendix.

These constraint indicators assume integer values of between one and nine. Additionally, rankings are free to vary each year. To ease their interpretation, we reverse the rankings so that nine and one denote the highest and lowest importance, respectively.

Figure 2 plots the distribution of rankings in the full sample as a percentage of observations. The majority of businesses, across the years, systematically rank *access to finance* and *access to electricity* as the two most important constraints. *Taxation* and *market access* are also relatively highly ranked. In contrast, *customs and regulation*, *bribery* and *security*, display a relatively low ranking.

Figure 2 here

Are there systematic differences between the rankings of female versus male owned firms? We compare the two groups first by simply plotting the distributions next to each other, followed by the application of exact tests. Visual comparison of the distributions on Figure A.2 reveals that the rankings of the two groups are broadly similar, with mildly visible differences. In particular, a larger share of females than males seem to report security as an important constraint. This appears to be in line with the literature on female performance gaps, which argues that cultural or social norms, including violence directed towards women, are important constraints discouraging women (Campos and Gassier, 2017; Field et al., 2010).

In addition to merely eyeballing the data, we also apply the Wilcoxon rank-sum test to compare male and female rankings.[12] Before running the tests, we subtract the industry means from the business constraint variables, to ensure the results are not driven by industry differences in the ratio of male-to-female firms. The test results in Table A.1 reveal statistically significant differences between male and female rankings. Males are more likely than females to designate *customs and regulation* and *access to electricity* as important. By contrast, any randomly drawn female firm is significantly more likely to designate *access to finance*, *security*, *bribery* and *access to land* as important. Accordingly, apart from hard economic factors like *access to finance* and *access to land*, constraints ranked highly by female entrepreneurs pick up on softer issues, such as security and bribery. These softer issues are more indicative of social and cultural norms which inhibit female empowerment.

4 Exporting and Business Constraints

In what follows we explore the link between exporting, performance, and female-ownership, also considering the role of the nine business constraints for this relationship. First, we document that female-owned businesses are less likely to export and explore the role of the nine business constraints in explaining this phenomenon. We also show that, once exporting, female-owned firms on average export with the same intensity as male-owned exporters. Second, we look at whether businesses – male or female – can improve their productivity after expanding their export sales, which we consider as an indication of learning by exporting. We document a female-to-male gap in this learning ability and explore how it relates to the nine business constraints.

[12] The rank-sum test tests the equality of distributions, across their entirety. Note that for ordinal variables, such as rankings, the rank-sum test is better suited than a simple t-test of equality of means. Moreover, unlike the t-test, it does not rely on the assumptions of the normal distribution.

Export Participation

In our sample there are three times more male exporters than female exporters, although 43 per cent of the firms are owned by females. This could indicate that – perhaps because of high entry barriers – female businesses in Ghana have to perform exceptionally well to enter the export market.

As a first step, let us document and estimate the magnitude of the female gap in the propensity to export. We do this with the help of a probit model. The model predicts the probability that firm *i* in industry *s*, location *l* and year *t* is exporting, conditional on several firm characteristics and assuming that $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution.

$$Pr(export_{it} = 1|X_{it-1}, \delta_s, \delta_l, \delta_t) = \tag{4}$$
$$= \Phi(\beta \cdot female_i + \gamma \cdot controls_{it-1} + \delta_s + \delta_l + \delta_t)$$

Our parameter of interest is β, showing how female ownership associates with the probability of exporting. If female businesses are, ceteris paribus, less likely to enter the export market than similar male-owned businesses, then our estimate for β should be significantly negative. The estimation controls for industry, location and year effects (the δs) and numerous firm-specific control variables lagged by one year. The latter include the lagged values of firm age, size (as number of employees), total factor productivity, and dummies for importing production materials and having a bank account.

In an alternative specification we also include among the controls a variable that measures a firm's past export experience. This is motivated by the literature on the sunk-cost hysteresis hypothesis, which states that the presence of a sunk export entry cost leads to persistence in export participation (see, e.g., Roberts and Tybout, 1997). A firm is therefore more likely to export if it has already exported in the past and has therefore paid the entry costs. We measure a firm's past export experience with the lagged export intensity (that is, the share of sales sold abroad in the previous year), which captures both the fact and the extent of past exporting.

The first and third columns of Table 3 present the probit estimation results. These confirm that female run enterprises are, ceteris paribus, significantly less likely to export than male run ones. The average marginal effect for being female-owned, reported at the bottom of Table 3, shows that having a female owner associates with an export probability that is by 1.4–1.8 percentage points lower than the export probability for males. This gender gap is sizeable, considering the fact that the average firm in our sample exports with single-digit probability.

The results are consistent with our prior expectations also concerning the other covariates. Larger and more productive firms and firms which also import and have a bank account are significantly more likely to start to export. If past export activity is also considered, productivity, size and the firm's import status lose predictive power, but the role of gender becomes even more significant.

Table 3 here

The analysis of export participation is augmented by a linear regression for export intensity – i.e. how much a firm exports, having entered the export market. The corresponding estimation results are reported in the second and fourth columns of Table 3. To account for the fact that firms do not randomly select into exporting, we implement the Heckman selection correction by including among the regressors the Inverse Mills Ratio from the probit (Heckman, 1979). Otherwise, the regressions include the same set of control variables as the probit, except for firm age and the bank account dummy, which serve as exclusion variables. We find no evidence that, once a firm entered the export

market, female exporters would export significantly less or more than male exporters. This holds true whether or not we control for a firm's past export experience.

Let us now examine which business constraints (BCs, for convenience) might be responsible for the gender gap in export participation. We take the probit model (4) and include as additional regressors the BCs (lagged by one year) and their interactions with the female dummy. This approach allows us to estimate partial correlations between exporting and the business constraints. BCs that enter the probit with significantly negative coefficients are those that non-exporters rank systematically higher than exporters. And BCs with negative coefficients on the interaction term with the female dummy are those that positively associate with the (negative) female-to-male gap in export participation.

Table 4 here

Table 4 presents the results, with each of the nine BCs entering in separate regressions. The business constraint which is significantly negatively associated with export participation for both genders is *access to land*. In contrast, *access to finance* and, to a lesser extent, *access to infrastructure* are the constraints significantly associated with the gender gap. Put differently, these latter two constraints seem to hamper the export participation of females, but not that of males. Our finding on the central role of *access to finance* in predicting female export participation is in line with earlier literature emphasizing female entrepreneurs' difficulty in raising external capital (e.g., de Mel et al., 2008, Field et al., 2010).

Productivity Consequences of Exporting

The previous section has shown that there exists a gender gap in export participation even conditional on the productivity level of the firm. Female-owned businesses that manage to export are therefore especially productive. Another (complementary) explanation for the high productivity premium of exporting females could be related to 'learning by exporting'. It could be the case that female-owned businesses, once they export, are better able than male-owned firms to achieve productivity gains from exporting. This section examines this possibility empirically and finds strong counterevidence.

The learning-by-exporting hypothesis in the international trade literature suggests that exporting can induce learning effects and productivity gains in firms. This can happen via different channels. Higher competition for quality and prices on the export markets may force new exporters to produce more efficiently. Also, international exchange can facilitate cross-border spillovers of technology and managerial know-how, helping firms improve their productivity (Grossman and Helpman, 1991). The few existing firm-level studies that test the validity of this hypothesis on African data do find positive learning effects (Atkin et al., 2017; Bigsten et al., 2004; Bigsten and Gebreeyesus, 2009; Van Biesebroeck 2005). To the best of our knowledge, however, no study takes gender differences into account in this context.

Next, we investigate the possibility of such learning effects by looking at whether exporters in our sample show signs of productivity improvements as they increase export activity. Additionally, we investigate whether there are gender differences in the ability of firms to achieve such productivity gains from exporting. To isolate these gains from the positive correlation between exporting and productivity due to self-selection, we rely on the simple solution of controlling for firm fixed effects in the productivity regression. More specifically, we estimate a production function with firm fixed effects (δ_i),

$$y_{it} = \alpha_k k_{it} + \alpha_l l_{it} + \alpha_m m_{it} + \beta X_{it} + \delta_i + \delta_t + u_{it}, \quad (5)$$

augmented with indicators of exporting, the gender of the business owner, as well as other firm characteristics (all subsumed into X_{it}). Finally, we include common time dummies (δ_t) to account for business cycle trends.[13] Because firm fixed effects control for time-invariant productivity differences between firms, our coefficient estimate for the export variable is purged from any correlation due to firms' self-selection on the basis of different initial productivity levels. The inclusion of firm fixed effects also means that all effects arise from the time variation in the data. Therefore, the export coefficient is now interpreted in terms of time changes – how productivity changes following a change in the firm's export activity. This estimate we interpret as a productivity gain accruing to the firm, having engaged in exporting. In order to measure gender differences in the export-productivity gain, we augment the base model to include the interaction of the export variable with the female dummy. The coefficient estimate for this interaction captures the female-to-male gap in the productivity gain described above.

We are, of course, aware of the relatively small number of exporters – and especially female exporters – in our sample and of the limitations this fact imposes on identifying effects from time variation. As a remedy, we opt for measuring exports with export intensity, instead of the exporter status dummy. Because export intensity varies for all exporters in all years, it provides more data variation for measurement. Note that export intensity is also a more precise measure of a firm's engagement in exporting. This is important for capturing learning-by-exporting effects, since large export intensities can bring about stronger learning effects than marginal export engagement.

The estimation results are reported in Table 5, both with exporter status and export intensity, for comparison purposes. As the first column shows, the estimate for the exporter status is not statistically different from zero (though it is positive and of reasonable magnitude suggesting an increase in productivity of 8 per cent following export entry). As noted above, the insignificance of this coefficient may result from the limited time variation in the exporter dummy variable. In contrast, as the third column suggests, increasing export intensity is followed by significantly higher productivity. This estimate is quite large, suggesting a 1.55 per cent increase in productivity following an increase in export intensity of one percentage point.

Table 5 here

This productivity increase, however, only occurs at firms with male owners, as shown by the last column. The coefficient for export intensity (1.89 and highly significant) shows to what extent male-owned businesses improve their productivity, following an increase in the amount exported. Conversely, the sum of this value and the negative estimate for the interaction term, which is practically zero, indicates that no such productivity windfall exists for female-owned enterprises, increasing their exports. In other words, there seems to be a worrying female-to-male gap in Ghana with respect to export-induced productivity gains. This message is unchanged when we examine the point estimates for the exporter status dummy (second column), although here the estimates do not differ statistically from zero.

[13] Since the production function estimations revealed no substantial differences between the results of alternative estimations, we opt for the most parsimonious FE estimation and estimate in one step. Alternative regressions using the Levinsohn-Petrin or Wooldridge TFP estimations are available upon request.

But what is the reason for this gender gap for female entrepreneurs seeking to expand their exports? To help answer this question, we move to examine the role played by the nine business constraints in creating a non-level playing pitch for male and female entrepreneurs. We recall that female and male business owners attach different importance to the obstacles facing their business. Specifically, any randomly drawn female firm is more likely to rank more consistently highly *security*, *bribery* and *access to finance* and *land*. Moreover, the analysis of the gender gap in export participation in the previous section has revealed that it is especially poor access to finance that correlates with females' lower probability to export. In this section, we investigate which BCs may be responsible for the failure of female exporters to leverage productivity from exporting.

We first test whether the gender gap disappears after including the BC variables in the estimation. If differences between the constraint rankings of female versus male exporters explain the observed gap, then we should see that the negative coefficient on the latter tends towards statistical insignificance. We see from the first column in Table 6 that this is not the case.[14] The estimate for the export-female interaction remains virtually unchanged, compared to the same measure reported in Table 5.

Next, we look at how the gender gap correlates with the business constraint rankings by also including interactions with the business constraints on the right-hand side of the regression equation. Specifically, we include among the X_{it} in (5) export intensity, the female dummy (swept away by firm fixed effects, though), a business constraint variable and the second- and third-order interactions of these three variables. Formally, the terms included are

$$\begin{aligned} &\beta_1 export_{it} + \beta_2 female_i + \beta_3 BC_{it} + \\ &+ \beta_{12} export_{it} \times female_i + \beta_{13} export_{it} \times BC_{it} + \beta_{23} BC_{it} \times female_i + \\ &+ \beta_{123} export_{it} \times female_i \times BC_{it}. \end{aligned} \tag{6}$$

In a specification without BC interactions, β_1 captures how the average male firm increases its productivity following export expansion ('male export gain') and β_{12} shows the gender gap. When BC interactions are included, β_{13} measures the correlation of the business constraint with the male export gain and β_{123} the correlation of this constraint with the gender gap. Business constraints, for which β_{13} is negative, are associated with reduced male export gain. Put differently, male-owned firms reporting large export gains, rank these business constraints low. Similarly, business constraints, for which β_{123} is negative, are associated with a larger (more negative) gender gap. That is, firms that drive the estimated gender gap in our data, rank these business constraints consistently higher.

Table 6 here

Our estimation results containing the BC interactions are reported in columns 2 to 10 of Table 6, each column corresponding to an individual business constraint. Looking at the interaction of export intensity with BC, we find quite a few business constraints which are negatively and significantly associated with the male export gain. Male exporters reporting problems with *access to finance*,

[14] Note that the rankings of the nine constraints are perfectly collinear, because the ranks of any eight constraints determine the rank of the ninth. Accordingly, only eight can be included jointly in a regression. In the regressions presented in Table 6 it is always bribery that is excluded.

infrastructure, *markets*, *land* and *electricity* tend to have smaller productivity gains than those male exporters ranking high the dimensions of *security*, *bribery* and *customs* and *regulation*.

Additionally, when we look at the triple interaction estimates, we can see that the pattern for female exporters is different. *Access to finance*, *infrastructure*, *markets*, *land* and *electricity* – some of male exporters' gravest concerns – are not negatively associated with the ability of female entrepreneurs to optimize exports. Rather, the most polarizing business constraint for the gender gap is *bribery*. This finding illustrates that some of the most urgent problems facing female entrepreneurs are related to social and cultural norms, rather than hard economic factors. Unlike male exporters, female exporters that rank *bribery* high are inable to increase their productivity, following an expansion of exports.

5 Robustness

Business Constraint Category Dummies

In the above analysis we treated business constraint rankings as numerical variables, while rankings are in fact ordinal measures. Because of this, it cannot be assumed that the distances between two equally spaced ranks are truly equal. For example, in the case of a firm with only one or two serious business constraints, the difference in importance between constraints ranked one and five can be much smaller than the difference in importance between those ranked five and nine. Therefore, it is more appropriate to relax the assumption of equal distances and replace the original business constraint measures with categorical variables.

In what follows, we carry out a robustness check, where we reproduce the regressions in Table 6 while capturing each business constraint using category dummies. The most flexible specification would involve replacing each BC variable in the regression with nine dummies (access to finance ranked one, access to finance ranked two, etc.). The problem is that including so many dummies and their interactions makes the resulting estimations hard to interpret. Therefore, we decide to reduce the number of dummies to three, representing *top3*, *middle3* and *bottom3* ranked categories. For example, the *top3* dummy for *access to finance* takes the value of one if a firm ranks access to finance among its three most important constraints (ranking them as seven, eight or nine) and zero otherwise. In a similar vein, the *middle3* dummy corresponds to ranks four, five and six, the *bottom3* to ranks one, two and three.

Regressions are identical to those presented in Table 6 with the only difference that now each BC variable is replaced with two dummies, *BC_t3* and *BC_m3*, representing the *top3* and *middle3* categories, respectively, while *bottom3* is chosen to be the base category. The corresponding estimation results are presented in Table 7. Overall, our findings are largely robust to this modified specification.

Table 7 here

The constraints negatively associated with the male export gain remain *access to finance*, *electricity*, *infrastructure* and *markets* – but no longer *access to land*. Constraints positively associated with the male export gain are – as before – *customs*, *security* and *bribery*, but the list extends to include *taxation* as well. The variable *taxation* shows a nonlinear correlation pattern, which might explain its

limited role in the baseline estimation. Male owned firms ranking *taxation* as moderately important are the ones experiencing the largest productivity increase following their export expansion.

The coefficients for the gender gap interactions are associated with very large standard errors, reflecting higher noise in this more data-demanding specification. Nevertheless, our core finding remains unchanged – female exporters reporting *bribery* as one of their most important business constraints, are driving the negative gender gap. Specifically, when bribery is ranked among the *top3* constraints, this pattern emerges.

Business Constraints as Principal Components

Rank order variables, like our business constraint rankings, produce particular correlation patterns. They tend to correlate negatively with one another. This feature of rank order variables follows from the simple fact that if a firm ranks some constraints high, it has to rank others low. Pairwise correlation coefficients between the nine business constraints, presented in Table A.2 in the Appendix, indeed confirm that they correlate negatively in most of the cases. Out of the total 36 pairs, 30 pairs show highly significant negative pairwise correlations. Moreover, the nine constraints together form a perfectly collinear system because, for each firm and year, the ranks of any eight constraints determine the rank of the final ninth constraint.

Acknowledging these features of our data, we perform an additional robustness exercise, running a principal component analysis (PCA) on the business constraints and applying the resulting principal component scores in the regressions, to replace the rank order variables. This approach has the advantage that principal components are, by construction, uncorrelated with one another. A disadvantage, however, is that the interpretation of the components is often not straightforward, for they represent linear combinations of potentially many business constraints. Nevertheless, the use of principal components better acknowledges the fact that rank order variables are relative measures, that is the ranking of one business constraint cannot be viewed independently from the ranking of the rest.

We run PCA, extracting eight principal components which fully represent the nine business constraint rankings. The eigenvectors of these principal components are presented in Table 8. The columns show how the principal components are constructed as linear combinations of the business constraints, each value in a column showing the weight of a given business constraint in the linear combination. Put differently, these numbers show how the business constraints correlate with the principal components. For a better overview, the largest weights (over 0.4 in absolute value) are highlighted in grey. To illustrate, the first component correlates strongly positively with *customs* (0.512) and *bribery* (0.430) and negatively with *access to infrastructure* (-0.479). Hence, this principal component takes large values for firms which gave a high ranking to *customs* and *bribery* and a low ranking to *access to infrastructure*.[15]

Table 8 here

[15] A clear disadvantage of working with the components instead of the original variables is the loss of direct interpretability. To improve on interpretability, one could rotate the eigenvectors so that they correlate mostly with one business constraint only, but then the principal components are not uncorrelated any longer. Hence, we decide not to do that.

Typically, PCA is used to reduce the number of variables by concentrating most of the data variation in the first few principal components. Note that this is not our primary aim here. Also, the eigenvalues of the principal components shown on Figure A.3 suggest that there is little scope for reducing the number of components. To explain why - these eigenvalues reflect how much variance individual components represent and, following a rule of thumb, components with eigenvalues smaller than one are usually dropped. In our case, five of the eight eigenvalues lie at or above 1. Even the smallest eigenvalues are not much below 1. Therefore, we decide to retain all the eight principal components for the robustness analysis.

We perform a robustness check to the results presented in Table 6, replacing the original business constraint variables with the principal components. Table 9 contains the results of this robustness exercise. The first columns of Table 6 and Table 9 are identical, proving that the eight principal components fully represent the nine business constraints. The remainder of Table 9 contains regressions with interaction terms between export intensity, female ownership and the principal components, with each column including only one principal component in the interactions.

Table 9 here

The 'male export gain' is larger, the higher a firm scores on the third, sixth and first components. Analogously, it is higher, the lower it scores on the fourth component. Table 8 helps us to translate these results into business constraints. For instance, the third component increases mainly as a result of how high a firm ranks *security* relative to *access to finance*, and firms scoring high on this component enjoy higher export gain. This means that the male export gain is positively associated with a higher importance attached to *security* and reduced importance to *access to finance*, a result in line with our earlier findings. In a similar vein, access to *electricity* and *infrastructure* respectively, and *taxation* are also negatively associated with the male export gain, while *customs and regulation* and *bribery* are positively associated with it.

As regards the gender gap, the triple interaction estimates show that the gap is driven by firms scoring high on the first and third principal components. Unlike male exporters, female exporters ranking *security*, *bribery* and *customs and regulation* high (and *access to finance* and *infrastructure* low) are unable to increase their productivity after intensifying their export activity.

Assessing these robustness results and the main results in Table 6, we can conclude that the inability of female exporters to benefit from exporting is not due to problems with hard economic factors such as access to finance, but to business constraints such as bribery or security issues. These are constraints related to social and cultural norms, which usually do not hinder male exporters.

6 Conclusions and Policy Implications

Overall, our results suggest that in order to close the performance gap between male and female entrepreneurs, it is insufficient to help female entrepreneurs to access capital or to provide the necessary skills for females to manage their business. Our results indicate that social or cultural norms – evidenced in concerns about security and bribery – adversely inhibit the export performance of female entrepreneurs.

Our findings are broadly in line with those reported by Field et al. (2010), where cultural restrictions prevented women from optimizing the skills they had learned. Similarly, our findings echo those of Swamy et al. (2001) who highlighted the reluctance of women to use bribes – the lower tolerance of women towards corruption. The fact that our research reveals a heightened sensitivity among women towards bribes, suggests that female entrepreneurs may be excluded from important business networks. Alternatively, female entrepreneurs may (voluntarily) exclude themselves from certain business practices favoured by their male peers.

Debski et al. (2018) have suggested that corruption is a symptom more than a cause, arguing that culture is the underlying driver of corruption. Specifically, corruption is more a feature of countries with hierarchical, male-dominated systems of governance. Owing to the importance of culture, it would be interesting to test our findings using cross country data, a goal for future research.

What initiatives can deal with the problems we have highlighted in this study? What follows is, by no means, an exclusive list of possibilities. Mentoring is one option. Female mentoring schemes do exist, although the effectiveness of these schemes remains to be tested (examples include the *Lionesses of Africa* program). Another, possibly more promising option, are technological solutions allowing female entrepreneurs to sell their products from home. An emerging group of online services could fill this need (examples include *Jumia* and *Takealot*, in Africa alone). Finally, the use of cooperatives could help female entrepreneurs to optimize their exports by spreading the costs of advertising, certifying and distributing their products. Overall, there is no silver bullet for Africa's female entrepreneurs when it comes to optimizing their exports, or indeed their overall business performance. Recognizing the cultural and social constraints under which they operate, however, represents an important first step.

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Figures and Tables

Figure 1: Histogram of Export Intensity by Gender if Firm is Exporting

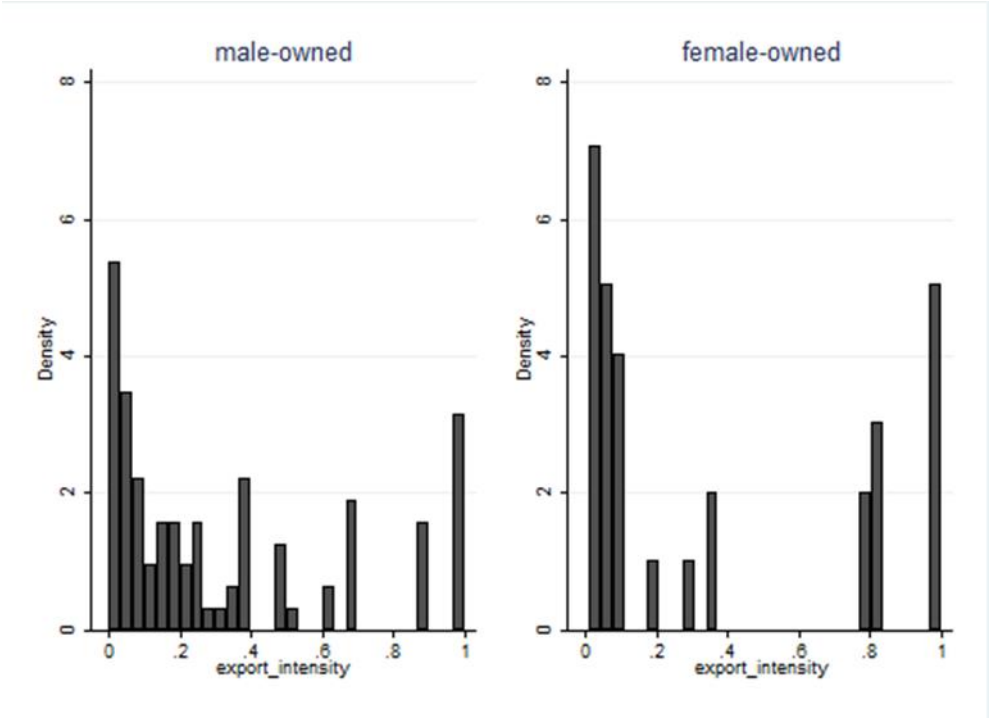

Figure 2: Distributions of Business Constraint Ranks

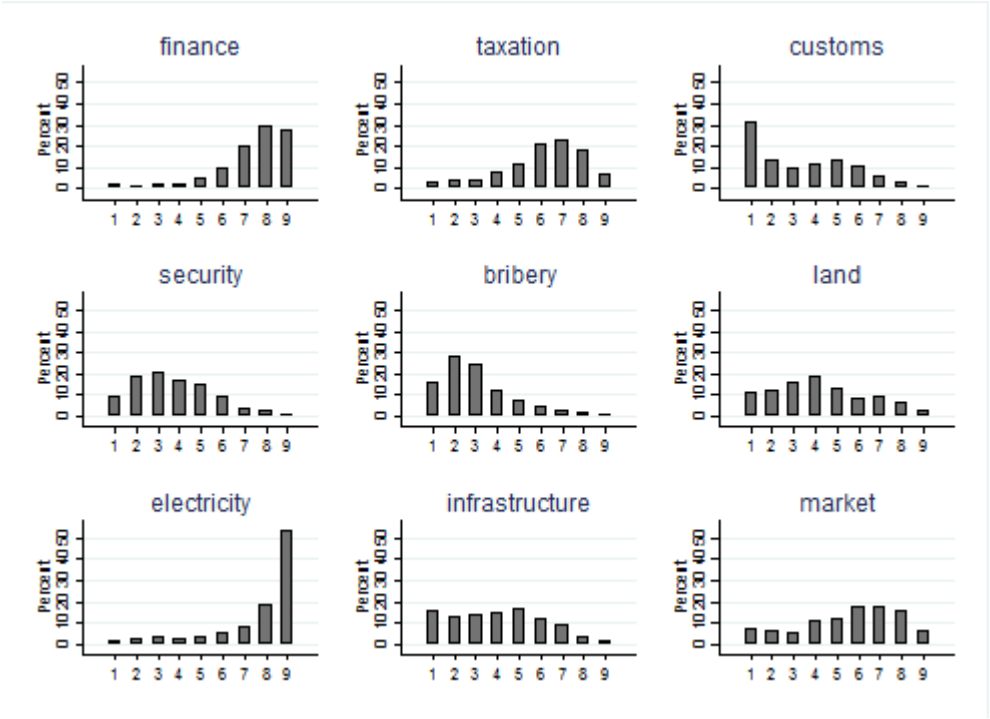

Table 1: Number of Firms by Industry and Location

Industry group	Location of enterprise				
	Accra	Tema	Kumasi	Sekondi-Takoradi	Total
Food and Beverages	40	20	41	16	117
Textiles and Clothing	198	35	218	62	513
Wood Processing	59	22	84	14	179
Other Manufacturing	28	3	31	9	71
Total	325	80	374	101	880

Table 2: Exporting Activity by Year and Gender of Business Owner

	Number of exporters		Export intensity if exporter	
Year	Male-owned	Female-owned	Male-owned	Female-owned
2011	21	7	0.323	0.334
2012	20	6	0.378	0.353
2013	18	6	0.335	0.380
2014	19	6	0.310	0.383
2015	17	5	0.323	0.392

Table 3: Gender Gap in Export Participation

	Probit (1st stage)	2nd stage with selection correction	Probit (1st stage)	2nd stage with selection correction
Dep. var.:	Exporter	Export intensity	Exporter	Export intensity
Female	-0.346**	0.0818	-0.621***	0.00626
	(0.155)	(0.0622)	(0.218)	(0.0321)
Export intensity t-1			14.95***	0.964***
			(1.410)	(0.0865)
Employment t-1 (log)	0.190***	0.0954***	-0.0863	0.0208
	(0.0632)	(0.0363)	(0.0973)	(0.0180)
TFP t-1 (log)	0.146**	-0.0242	-0.0255	0.00103
	(0.0577)	(0.0260)	(0.0848)	(0.0122)
Importer t-1	1.208***	-0.120	0.772	0.0437
	(0.249)	(0.173)	(0.470)	(0.0659)
Age t-1 (log)	-0.188**		-0.300***	
	(0.0746)		(0.113)	
Bank account t-1	0.309**		0.695***	
	(0.129)		(0.201)	
Inverse Mills Ratio		-0.155		0.0757***
		(0.150)		(0.0245)
Fixed effects		Industry, Location, Year		
Observations	2,270	2,270	2,270	2,270
Uncensored obs		70		70
Pseudo R-squared	0.1832		0.6455	
Average marginal effect for Female				
dy/dx	-0.0183**		-0.0143***	
	(0.0075)		(0.0048)	

Notes: Heckman's (1979) selection correction model, with two-step efficient estimation. The first stage is a probit for export participation, the second stage is a linear OLS regression for export intensity which includes the Inverse Mills Ratio from the probit to account for selection into exporting. Standard errors in parentheses. Standard errors for the average marginal effect are calculated with the Delta-method. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Female Export Participation and Nine Business Constraints

Dep. var.:					Exporter				
BC included:	finance	taxation	customs	security	Bribery	land	electricity	infrastr.	market
Female	0.836*	-0.663	-0.384	-0.280	-0.860***	-0.508*	-3.113**	0.289	-0.624
	(0.486)	(0.532)	(0.274)	(0.312)	(0.326)	(0.298)	(1.353)	(0.302)	(0.397)
BC t-1	0.0258	0.0664*	0.00722	0.0129	-0.00359	-0.122***	-0.0236	0.0729**	-0.00137
	(0.0455)	(0.0370)	(0.0330)	(0.0375)	(0.0390)	(0.0339)	(0.0343)	(0.0341)	(0.0307)
Female x BC t-1	-0.175***	0.0482	0.0100	-0.0191	0.151*	0.0252	0.332**	-0.160**	0.0476
	(0.0674)	(0.0799)	(0.0632)	(0.0768)	(0.0795)	(0.0712)	(0.156)	(0.0678)	(0.0621)
Other controls	Employment (log), TFP (log), Importer, Age (log), Bank account (all t-1)								
Fixed effects	Industry, Location, Year								
Observations	2,270	2,270	2,270	2,270	2,270	2,270	2,270	2,270	2,270
Pseudo R2	0.197	0.193	0.183	0.183	0.190	0.209	0.195	0.194	0.184

Notes: Probit for export participation estimated with Maximum Likelihood. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Gender Gap in 'Learning' from Exports

Dep. var.:	Output (log)			
Exporter	0.0815	0.110		
	(0.108)	(0.124)		
Exporter x Female		-0.119		
		(0.252)		
Export intensity			1.555***	1.899***
			(0.441)	(0.472)
Export intensity x Female				-2.753**
				(1.335)
Employment (log)	0.249***	0.249***	0.243***	0.241***
	(0.0304)	(0.0304)	(0.0304)	(0.0304)
Capital (log)	0.0233	0.0234	0.0225	0.0232
	(0.0170)	(0.0170)	(0.0169)	(0.0169)
Materials (log)	0.147***	0.148***	0.144***	0.143***
	(0.0149)	(0.0149)	(0.0149)	(0.0149)
High-skilled	-0.0504	-0.0503	-0.0494	-0.0491
	(0.0450)	(0.0450)	(0.0449)	(0.0449)
Importer	-0.0118	-0.00852		
	(0.162)	(0.162)		
Import intensity			0.0369	-0.0749
			(0.534)	(0.537)
Fixed effects	Firm, Year			
Observations	3,214	3,214	3,214	3,214
R-squared	0.419	0.420	0.422	0.423
Number of firms	691	691	691	691

Notes: Fixed effects estimation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Business Constraints and the Gender Gap in 'Learning' from Exports

Dep. var.:	Output (log)									
BC included:	none	finance	taxation	customs	security	bribery	land	electricity	infrastr.	market
Export intensity	1.917***	4.799***	1.626***	1.072**	0.272	0.879*	2.982***	3.612***	3.215***	3.991***
	(0.472)	(0.729)	(0.568)	(0.506)	(0.538)	(0.502)	(0.549)	(0.726)	(0.542)	(0.685)
Export intensity x Female	-2.806**	-6.062***	-1.806	-14.35	-1.750	-0.982	-4.145***	-5.373***	-3.039	-5.936***
	(1.337)	(1.708)	(1.545)	(9.817)	(1.747)	(1.472)	(1.455)	(1.867)	(2.208)	(1.813)
Export intensity x BC		-0.396***	0.0492	0.329***	0.397***	0.330***	-0.292***	-0.199***	-0.385***	-0.327***
		(0.0764)	(0.0529)	(0.0732)	(0.0640)	(0.0569)	(0.0773)	(0.0649)	(0.0803)	(0.0781)
Exporter intensity x Female x BC		0.481**	-0.173	2.192	-0.147	-0.626***	0.519	0.296**	0.221	0.453***
		(0.220)	(0.134)	(1.985)	(0.499)	(0.222)	(0.490)	(0.148)	(0.271)	(0.156)
BC x Female		-0.00783	0.00893	-0.00786	0.0204	-0.00340	-0.00560	-0.0148	0.0109	0.00371
		(0.0146)	(0.0144)	(0.0161)	(0.0147)	(0.0162)	(0.0118)	(0.0112)	(0.0132)	(0.0127)
Control variables	Employment (log), Capital (log), Materials (log), High-skilled, Import intensity, all BCs, BC x State-owned									
Fixed effects	Firm, Year									
Observations	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214
R-squared	0.425	0.431	0.425	0.430	0.434	0.433	0.428	0.427	0.431	0.429
Number of firms	691	691	691	691	691	691	691	691	691	691

Notes: Fixed effects estimation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Robustness with Business Constraint Dummies

Dep. var.:	Output (log)									
BC included:	none	finance	taxation	customs	security	bribery	land	electricity	infrastr.	market
Export intensity	1.908***	3.807***	0.0297	1.621***	1.026**	1.574***	1.324**	3.095***	2.843***	3.262***
	(0.473)	(0.619)	(0.662)	(0.473)	(0.507)	(0.572)	(0.558)	(0.618)	(0.501)	(0.702)
Export intensity x Female	-2.547*	-8.306***	8.918	-12.27	-1.516	-2.422*	-2.046	24.09	-16.02*	-21.07***
	(1.348)	(3.165)	(18.44)	(7.546)	(1.370)	(1.380)	(1.377)	(43.41)	(8.829)	(6.788)
Export intensity x BC_t3		-2.218***	1.016**	2.014***	1.845***	1.986***	-0.554	-1.254***	-1.721***	-1.673*
		(0.457)	(0.442)	(0.364)	(0.390)	(0.357)	(0.551)	(0.420)	(0.443)	(0.856)
Export intensity x BC_m3		-0.854**	2.130***	1.491***	0.482	0.740	0.945*	-0.750**	-1.799***	-1.584***
		(0.386)	(0.504)	(0.409)	(0.335)	(0.834)	(0.488)	(0.373)	(0.339)	(0.341)
Exporter intensity x Female x BC_t3		5.490**	-11.29	-2.037	-9.622	-26.94***	8.753	-26.62	14.44	19.20***
		(2.764)	(18.48)	(28.18)	(7.561)	(7.805)	(18.17)	(43.42)	(8.918)	(6.850)
Exporter intensity x Female x BC_m3		4.110	-11.87	8.734	-19.27*	-1.264	-3.289	-27.53	11.00	2.150***
		(2.737)	(18.47)	(7.646)	(9.876)	(0.985)	(6.802)	(43.42)	(14.66)	(0.644)
BC_t3 x Female		0.153	0.00505	-0.0715	0.0732	-0.103	0.00925	-0.141	0.0703	0.0212
		(0.115)	(0.0823)	(0.0940)	(0.0915)	(0.108)	(0.0701)	(0.0902)	(0.0787)	(0.0742)
BC_m3 x Female		0.202*	-0.0510	-0.0444	0.0166	0.0162	0.0680	-0.130	-0.0351	0.0331
		(0.113)	(0.0749)	(0.0659)	(0.0577)	(0.0585)	(0.0609)	(0.0971)	(0.0620)	(0.0666)
Control variables	Employment (log), Capital (log), Materials (log), High-skilled, Import intensity, all BC dummies, (BC_t3, BC_m3) x State-owned									
Fixed effects	Firm, Year									
Observations	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214
R-squared	0.426	0.433	0.432	0.434	0.433	0.437	0.432	0.429	0.436	0.433
Number of firms	691	691	691	691	691	691	691	691	691	691

Notes: Fixed effects estimation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Principal Components (Eigenvectors)

	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8
finance	-0.104	0.336	-0.494	0.380	0.508	0.097	0.308	0.176
taxation	0.349	-0.300	0.225	0.345	-0.034	-0.653	0.188	0.226
customs	0.512	0.180	-0.290	-0.164	-0.032	-0.094	-0.198	-0.644
security	0.077	-0.075	0.679	0.007	0.450	0.404	0.141	-0.223
bribery	0.430	0.224	0.011	-0.357	-0.313	0.340	0.160	0.566
land	-0.306	0.506	0.277	0.184	-0.144	-0.142	-0.594	0.138
electricity	-0.082	-0.551	-0.223	0.403	-0.315	0.456	-0.239	-0.010
infrastructure	-0.479	0.091	0.048	-0.142	-0.446	-0.095	0.574	-0.287
market	-0.293	-0.377	-0.177	-0.605	0.349	-0.198	-0.214	0.181

Table 9: Robustness with Principal Components

Dep. var.:	Output (log)								
Component included:	none	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8
Export intensity	1.917***	1.938***	2.219***	1.929***	1.898***	1.923***	1.786***	1.952***	1.902***
	(0.472)	(0.470)	(0.497)	(0.469)	(0.471)	(0.479)	(0.473)	(0.472)	(0.481)
Export intensity x Female	-2.806**	-2.951**	-3.555**	-3.304**	-3.000*	-2.637*	-2.566*	-2.759**	-3.697**
	(1.337)	(1.333)	(1.497)	(1.396)	(1.799)	(1.375)	(1.342)	(1.344)	(1.481)
Export intensity x Comp		0.327***	0.512*	0.744***	-0.509***	-0.0169	0.382***	0.329*	0.0510
		(0.0647)	(0.262)	(0.122)	(0.128)	(0.283)	(0.115)	(0.188)	(0.276)
Exporter intensity x Female x Comp		-0.689**	-0.771*	-1.451**	0.382	0.182	-0.0836	-0.617*	-0.945
		(0.328)	(0.462)	(0.581)	(0.740)	(0.375)	(0.382)	(0.341)	(0.682)
Comp x Female		-0.00393	0.000958	0.0434	-0.0234	0.0165	-0.0154	0.0337	-0.0125
		(0.0269)	(0.0217)	(0.0266)	(0.0274)	(0.0248)	(0.0262)	(0.0265)	(0.0291)
Control variables	Employment (log), Capital (log), Materials (log), High-skill, Import intensity, all Comps, Comp x State-owned								
Fixed effects	Firm, Year								
Observations	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214	3,214
R-squared	0.425	0.431	0.426	0.434	0.429	0.425	0.428	0.426	0.425
Number of firms	691	691	691	691	691	691	691	691	691

Notes: Fixed effects estimation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix

Figure A1: Kernel Density Estimates for the TFP Variables

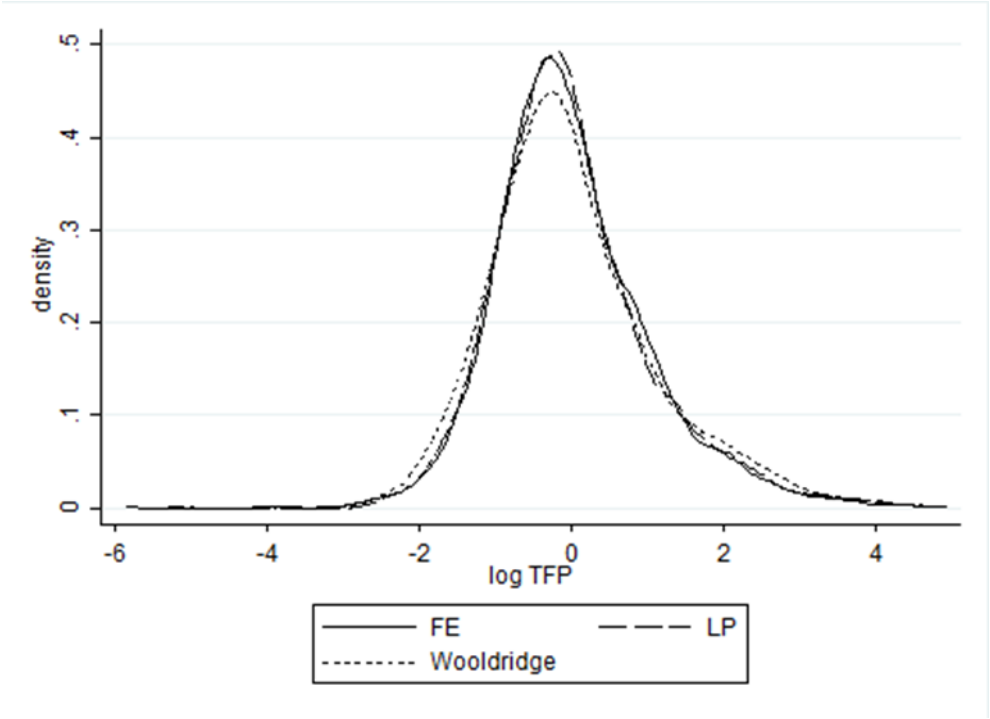

Figure A2: Ranking of Business Constraints by Gender of Owner

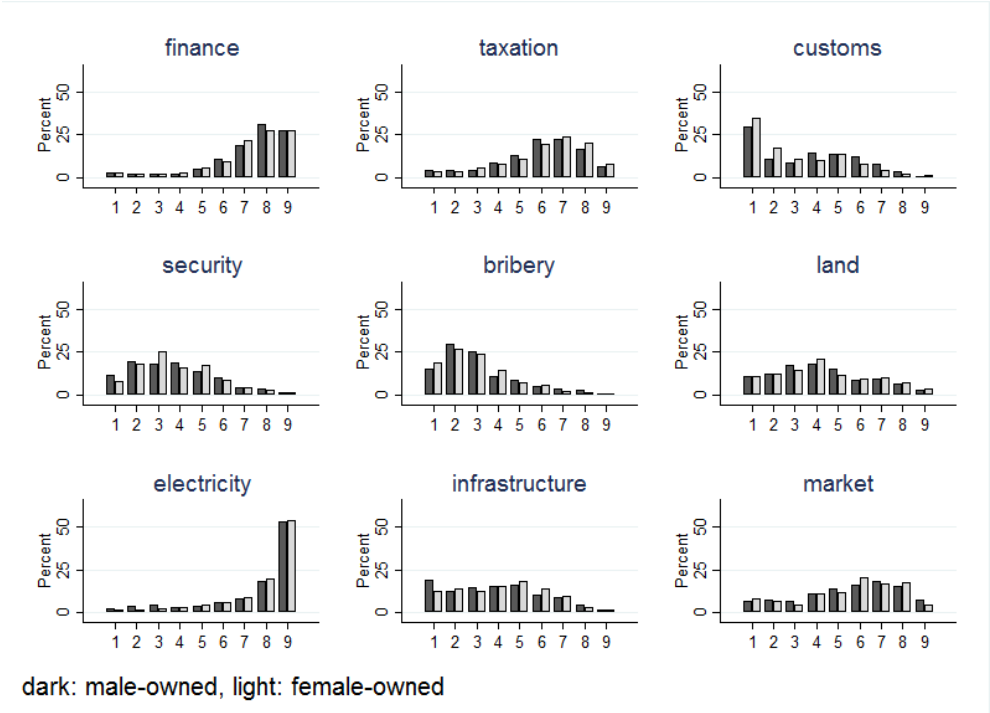

Figure A3: Scree Plot of Eigenvalues After Principal Component Analysis

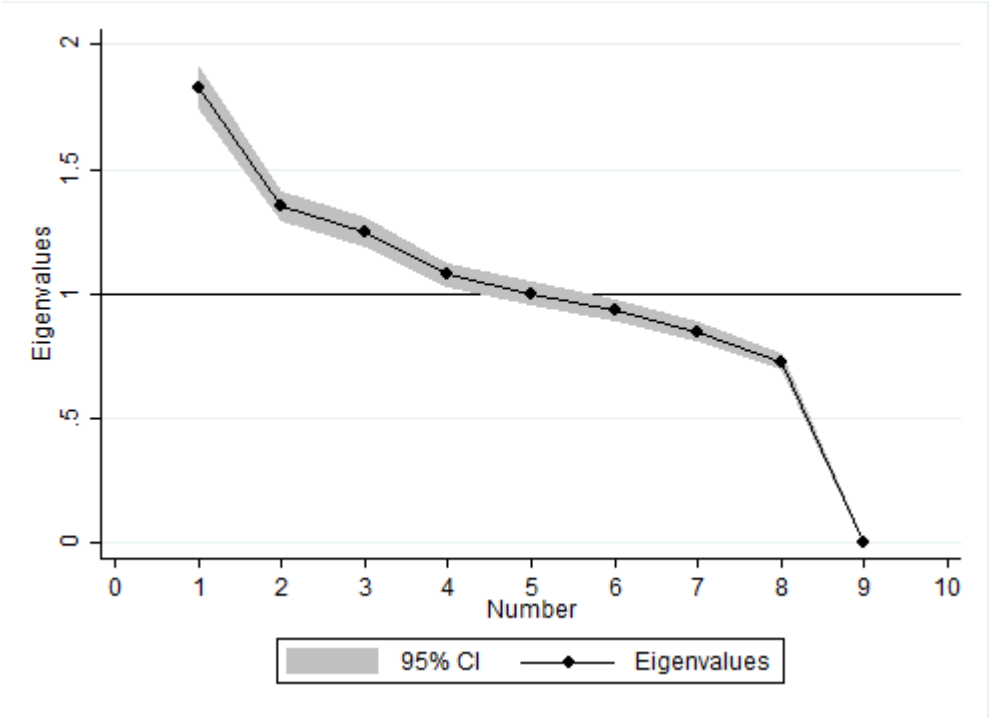

Table A1: Wilcoxon Rank-Sum Test Results

	finance	taxation	customs	security	bribery	land	electricity	infrastr.	market
					H0: equal distributions				
z	-2.013	-0.331	3.968	-3.673	-2.241	-2.877	3.798	-1.171	0.437
Prob > |z|	0.0441**	0.7409	0.0001***	0.0002***	0.0250**	0.0040***	0.0001***	0.2415	0.6625
Pr(male>female)	0.4820	0.4970	0.5360	0.4670	0.4800	0.4740	0.5330	0.4890	0.5040

Notes: Rank variables are net of industry means. * significant at 1%, ** at 5%, *** at 1%.

Table A2: Pairwise Correlation Coefficients of Business Constraints

	finance	taxation	customs	security	bribery	land	electricity	infrastr.	Market
finance	1.0000								
taxation	-0.1940	1.0000							
customs	-0.0638	0.0335	1.0000						
security	-0.1854	-0.0061[(a)]	-0.1643	1.0000					
bribery	-0.1451	-0.0260[(a)]	0.2031	-0.0399	1.0000				
land	-0.0336	-0.2315	-0.2426	-0.0699	-0.1777	1.0000			
electricity	-0.1151	-0.0499	-0.1839	-0.1355	-0.1770	-0.2239	1.0000		
infrastr.	-0.0776	-0.2613	-0.3576	-0.1591	-0.2259	0.0774	-0.0874	1.0000	
market	-0.1250	-0.2034	-0.2375	-0.1296	-0.2385	-0.1722	-0.0427	0.0137[(a)]	1.0000

Notes: All correlation coefficients are significant at 5% level, except for those marked with [(a)].