

# Gender Bias in Access to Trade Credit: Firm-Level Evidence from Emerging Markets

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## Abstract

Using firm-level data on 95 emerging and developing economies over 2009-2020, we contribute to the literature on gender bias and credit access by examining three specific questions: First, is there a gender bias in obtaining inter-firm trade credit? Second, if there is one, can those women-led businesses (WLBs) with access to traditional bank finance use it as a signal to obtain trade credit? Third, how does this relationship hold for SMEs that are women-led? After tackling potential endogeneity bias, our empirical findings show that WLBs are less likely to obtain inter-firm trade credit relative to their male counterparts, although we observe that this bias tends to disappear when WLBs have received an institutional source of financing. We establish robustly that bank credit can act as a signaling device enabling the accessibility of inter-firm trade credit, suggesting a complementary relationship between trade credit and bank credit for WLBs.

Keywords: Trade Credit; Women-Led Businesses; Small and Medium Enterprises (SMEs); Gender Bias; Discrimination; Emerging and developing economies (EMDEs); Sustainable Development Goals (SDGs)

JEL Classification: L25; G21; J16; J71

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## **1. Motivation and Contribution to the Literature**

How do small and medium-sized enterprises (SMEs) led by women fare with respect to obtaining trade credit? SMEs in general typically finance their activities using one of the following three sources. First, they can rely on raising their own funds from family and business partners. Second, they can arrange payment facilities from suppliers and pre-payments from clients -- commonly referred to as inter-firm trade credit. Third, they look for credit from formal banking and other financial institutions (Dornel et al. 2020). Among these options, trade credit and formal banking credit remain the most important vehicles through which they meet their financing needs. For instance, data from World Bank Enterprise Survey (WBES) show that across EMDEs, 42% of firms either have access to a formal line of credit or rely on inter-firm trade credit. Within this sample, 28% of the firms have a dependence on inter-firm trade credit.

While both trade credit and bank credit have long been viewed as potentially important financing instruments for SMEs, there is considerable ambiguity in the existing literature as to whether they complement or substitute each other from the perspective of credit-seeking SMEs. This is even more important for Women-Led Businesses (WLBs) in EMDEs who tend to face higher severity of credit constraints relative to their male counterparts (Wellalage & Thrikawala, 2021).

The literature governing credit constraints notes that SMEs in general have significant challenges in establishing and maintaining a relationship with banks, which typically come in the way of them accessing formal bank credit (see Gopalan & Sasidharan, 2020 for a discussion). So, when inadequacy of assets can adversely affect a firm's probability of obtaining bank credit, it can resort to obtaining inter-firm trade credit for its financing needs (Petersen & Rajan, 1997; Berger & Udell, 1998), implying a substitutability between trade credit and bank credit. This is also largely true when a firm is denied access to a formal source of finance, which leaves the firm more reliant on trade credit, especially when there are no alternatives (Coleman, 2005; Gopalan & Reddy, 2022).

In contrast to the substitutable nature of trade and bank credit, some studies have pointed out how both these sources of financing can also exhibit a complementary relationship. For instance, when firms can obtain trade credit initially, they can use it as a possible signaling mechanism to obtain bank credit (Andrieu et al.2018; Berger & Udell, 1998; Del Gaudio et al.2021; Giannetti et al.2011). In theory, SMEs that succeed in

obtaining trade credit reflects their creditworthiness, which could possibly result in the extension of bank credit to them. Alternatively, one can also view this complementarity to proceed from bank credit to trade credit, i.e., firms that obtain bank financing can utilize it as a signal to obtain inter-firm trade credit, a point that has not received much attention in the extant literature.

Despite the lack of empirical consensus on whether trade credit and bank credit are substitutes or complements, a plausibly more important question considering the United Nations' Sustainable Development Goals (SDGs), pertains to how gender bias influences this relationship. Although there is a well-documented literature testing the existence of gender bias in firms' seeking credit (Wellalage & Thrikawala, 2021; Chaudhuri et al.2018; Muravyev et al.2009, Bertrand et al.2022), most studies on this topic have focused only on traditional bank-based financing. Notwithstanding the importance of traditional bank-based financing to a firm's credit access, a tangential strand of literature has underlined the crucial role played by (inter-firm) trade credit as an important alternative especially to SMEs in EMDEs (Agostino & Trivieri, 2014; Andrieu et al., 2018; Rahman et al., 2018), which is the focus of our paper. In a recent study, Allen et al. (2022) highlight that alternative financing in the form of trade credit not only remains an important factor in meeting firms' financial needs but are also preferred by firms due to various implicit benefits arising out of social networks, business connections, and transactional externalities between lenders and borrowers.

Given this context, in this paper, we empirically test for the presence of gender bias in accessing trade credit. We further conjecture that if Women-Led Businesses (WLBs) succeed in obtaining bank credit, they can use it as a signaling mechanism to receive trade credit, thereby overcoming the bias. To test this hypothesis, we exploit a cross-country dataset featuring 43,338 firms from 95 EMDEs. By doing so, we make a three-fold contribution to the literature. First, we contribute to the understanding on WLBs and credit constraints in EMDEs but with an explicit focus on their probability of obtaining inter-firm trade credit. Second, we focus on factors determining trade credit for SMEs in particular that are women-led. Third, we test for the complementarity versus substitutability of trade credit and bank credit for WLBs and whether they can use bank credit as a signal that influences its outcome in terms of obtaining trade credit.

To preview the main conclusions, we find that the likelihood of obtaining trade credit for WLBs is less relative to their male counterparts, underlining the gender bias

against female-led firms. However, we also show how women-led SMEs tend to overcome this discrimination in accessing trade credit by using bank financing as a signal. The remainder of the paper is structured as follows: Section 2 offers a survey of the limited literature on determinants of trade credit as well on gender bias in terms of credit access. Section 3 furnishes the details of the data and variables used in the paper, while Section 4 discusses the empirical model, results and robustness checks. Section 5 concludes.

## **2. Selected Literature**

There is burgeoning academic literature that has devoted considerable attention to the issue of understanding firms' access to credit in general, both in advanced economies as well as emerging markets. While the two most common forms of financing available to firms are bank credit from formal financial institutions and inter-firm trade credit from firms and suppliers, much of the extant literature has focused predominantly on formal bank financing and the constraints faced by firms, particularly SMEs, in accessing it. Given this background, there are two strands of literature that are tangentially relevant to this discussion. The first pertains to the handful of studies that focus on determinants of trade credit. The second pertains to gender bias in access to credit in general. We offer a brief survey of both these streams below.

As noted, empirical studies trying to explore the factors that determine trade credit are sparse, with the available studies largely limited to an analysis of selected advanced economies owing to data constraints. Notwithstanding the scarcity of literature, extant studies on trade credit can be broadly classified into two related streams. The first set of studies deal with establishing the importance of trade credit as such focusing on why firms seek trade credit. The second set of studies attempt to throw some light on the firm specific characteristics that matter in obtaining trade credit.

With regard to the first set, studies show that one of the reasons why firms seek trade credit broadly stems from operating efficiencies and cost improvement enabled by the use of trade credit (García-Teruel & Martínez-Solano, 2010). Yet another key aspect of trade credit is that it fosters long-term relationships with suppliers and customers (Ng et al., 1999). The literature also shows the use of trade credit by firms during episodes of economic downturns (Davis and Yeoman, 1974; Petersen and Rajan, 1997; and Nilsen, 2002). Empirically, available studies have also underlined the importance of financial motives as a key determinant of trade credit. Financial motives arise from the ability of a

particular set of creditworthy firms or suppliers who possess an informational advantage about their customers or firms (who need trade credit) relative to traditional banking and financial institutions. This is akin to the established literature on how most SMEs possess only soft information which acts as a barrier to receiving credit from traditional banking and financial institutions, while those which have hard information in the form of audited statements overcome that advantage. In the context of trade credit provision, it can be argued that SMEs which do not have hard information to begin with can actually use trade credit as a signal to seek formal banking credit. This highlights the importance of greater information availability about the creditworthiness of smaller firms and how those firms without such information can still benefit from inter-firm trade credit when the suppliers have an informational advantage.

Probing the determinants of trade credit for a sample of over 47000 SMEs in selected European countries over the period 1996-2002, García-Teruel & Martínez-Solano (2010) find that there are several common factors that bind the SMEs seeking trade credit. For instance, the study points out how suppliers who can raise financing from capital markets grant more trade credit to other firms (customers). The study also shows how firms with alternative sources of finance are less likely to resort to seek trade credit implying a substitutability in the relationship between traditional bank credit and trade credit.

In a study focusing on Asian countries, Wignaraja & Jinjara (2015) explore the factors that shape the probability of obtaining trade credit for firms from China, Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam. The study shows how firm ownership structure, age, size, and trade participation emerge as key factors affecting a firm's probability of obtaining trade credit, with older firms, exporting firms, and foreign owned firms are more likely to obtain trade credit relative to the rest.

With regard to the literature on gender bias and access to credit, one of the central results from the literature exploring the connections between gender inequality and access to credit is that WLBs tend to suffer from lower access to credit relative to male counterparts (Wellalage & Thrikawala, 2021; Chaudhuri et al.2018; Muravyev et al.2009). The related literature offers two plausible but competing explanations for such an outcome. On the one hand, there is a classic literature that argues how such discrimination is largely supply-driven implying that financial institutions or banks explicitly decide to evaluate the loan applications from WLBs differently from that of male

managed firms, even if both sets of firms have similar characteristics in terms of creditworthiness (Aristei & Gallo, 2016; Stefani & Vacca, 2015; Beck et al.2018). This then translates into lower credit access for WLBs driven by the prejudices of the lenders (so-called taste-based discrimination).

On the other hand, an increasing number of studies have argued that the observed lower credit access for female managed firms is driven predominantly by a variety of demand-side factors. This implies that the gender bias in credit access is largely a function of behavioural characteristics of women entrepreneurs, ranging from higher risk aversion (relative to male entrepreneurs) to having higher expectations of loan rejection, which eventually results in a lower demand for bank loans (Cavalluzzo et al.2002; Babcock & Laschever, 2003; Ongena and Popov, 2016; Moro et al. 2017). Beyond behavioural traits, even cultural institutions such as gendered languages could discourage WLBs to apply for loans (relative to male entrepreneurs), as pointed out in a recent study by Bertrand et al. (2022).

As noted earlier, despite the considerable number of studies that have documented the existence of gender bias in firms' obtaining credit, a majority of these studies have restricted their focus only on traditional bank-based financing. However, as argued earlier, trade credit plays an equally if not more important role as an alternative source of finance especially to SMEs, and firms run by women in EMDEs.

### **3. Data and Variables**

We draw on rich firm-level data from the World Bank Enterprise Surveys (WBES) to explore various facets of gender bias in obtaining trade credit. The WBES data consists of survey information on multiple aspects of a firm's balance sheet along with information on gender characteristics (ownership and labor force), corruption, access to finance, among others for a large panel of 153 economies. It has been well-documented that such information is collected via in-person interviews with owners or managers of the firm. Further, the selection of firms for the survey is done using a stratified random sampling method where the strata are based on firm size, sector, and region.

We construct our measure of interfirm trade credit from the survey by creating a dummy variable that takes the value one if at least one-third of firms' working capital is purchased on credit from either suppliers or customers, and zero otherwise (Gopalan &

Reddy, 2022). Further, by imposing a minimum threshold level of 33%, our metric of trade credit accounts for firms that use interfirm trade credit extensively for both their short-term and long-term needs. However, as a measure of robustness we also use an alternative metric of interfirm trade credit removing the minimum threshold level from the baseline measure.

The key variable of interest in our analysis is a women-led business (WLB) which is a binary variable that takes the value one if the firm's top manager is female and zero otherwise (Liu et al., 2021). Further, we also generate a set of firm-specific controls using the WBES database. To capture firm size, we use information on the number of workers in the firm. We use a dummy variable to capture financial access of a firm where the binary variable takes the value 1 if the firm responds yes to the question – “*Establishment has a Line of Credit or Loan from a Financial Institution?*” and 0 otherwise. To account for firm experience, we control for a firm’s age measured as the number of years a firm has been in operation. To factor in the ownership of the firm, we construct a *sole* dummy that takes the value one if the firm is a sole proprietor differentiating it from business group affiliated firms, captured by zero. An important aspect in most firm-specific studies is the importance of productivity. In our analysis we proxy for firm productivity by using log of value added per worker. In addition to the aforementioned firm-specific controls we also consider macro-level control variables in our analysis. Specifically, we include GDP per capita, accounting for income levels, as well as institutional effectiveness proxied by a composite measure of World Governance Indicators (Mollagholamali & Rao, 2022).

As is the case with most firm-specific studies, data needs to be filtered to make sure that the presence of missing variables or outliers do not induce bias in our estimation. On account of this, we drop firms with missing information on key variables such as sales, workers, and age. Further, as mentioned earlier, the literature governing gender bias and trade credit is yet to receive substantial attention from the perspective of emerging and developing economies (EMDEs). To bridge this gap, we restrict our sample to EMDEs. As a result, our final sample is a pooled cross-section of 43,338 firms from manufacturing sectors encompassing 95 EMDEs over 2009-2020 (See Figure 1 for a visual representation of the distribution of firms across our sample).<sup>2</sup>

**[Insert Figure 1 here]**

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<sup>2</sup> Available at <https://www.enterprisesurveys.org/en/survey-datasets>

Table 1 provides information on the construction of variables used in the analysis and descriptive statistics. From the table, we can observe that the number of firms using trade credit for their operations are approximately 12% of the sample. Further, almost 14% of the firms can be characterized as women-led businesses. In terms of access to finance, 35.6% of the sample firms have access to a formal source of finance. Further, in terms of firm size, the average number of workers in a firm is around 105, highlighting the possibility that the sample has more large firms than small and medium firms. In this regard, we also construct size dummies wherein small & medium firms (SMEs) takes the value one if the number of workers is less than 100 and zero otherwise. The table highlights that almost 76% of the firms are SMEs in nature, highlighting that oversampling of large firms is not a concern in our empirical setup.

**[Insert Table 1 here]**

#### **4. Empirical Model and Results**

##### **4.1. Women-Led Businesses and Trade Credit: Bank Financing as a Signal?**

We first try to answer the focal question of the present study - whether WLBs with access to traditional bank-based finance are more likely to obtain trade credit? To answer this, we estimate a probit model as specified in Eq. (1), with the choice of the model driven by the binary nature of the dependent variable. In addition to the firm and country-specific controls, we include industry fixed effects (at the two-digit level) to account for possible clustering of women in certain industries, along with year and country fixed effects to account for possible endogeneity.<sup>3</sup>

$$Trade\ Credit_{ijct} = \Phi(\alpha + \beta_1 Financial\ Access_{ijct} + \beta_2 Female\ Manager_{ijct} + \beta_3 Financial\ Access \times Female\ manager_{ijct} + \beta Controls_{ijct} + \delta_t + \lambda_j + \theta_c + \mu_{ijct}) \quad (1)$$

Table 2 reports the marginal effects of our probit estimation. Three important observations emerge. First, the coefficient of  $\beta_1$  that captures the impact of firms' financial access on the probability of obtaining trade credit shows how firms having a line of credit from a financial institution are 0.8%-4.8% more likely to obtain trade credit than those who do not. The finding is consistent with Rahman et al. (2018), who find that firms with a line of credit and bank overdraft receive more trade credit. Similarly, Lau and Schaeede

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<sup>3</sup> Due to the cross-sectional nature of the data, we are unable to include lagged variables in the estimation. We tackle a range of identification issues including selection bias in the robustness section.



(2020) highlight that a continuous supply of finance from banks also signals to the suppliers that lending trade credit is safe. In similar vein, Murro & Peruzzi (2022) also note that firms with long-lasting relationships with their banks, receive more trade credit from their suppliers. This result provides further evidence of the complementarity between bank credit and trade credit (Giannetti et al., 2011; Agostino and Trivieri, 2014).

**[Insert Table 2 here]**

Second, in terms of the gender effect on trade credit access, the coefficient on  $\beta_2$  shows that female managed firms are at a relative disadvantage in obtaining trade credit. The marginal coefficient highlights that women-led businesses are 1.5%-1.9% less likely to obtain trade credit vis-à-vis male-managed firms. These results indicate the presence of discrimination in obtaining trade credit for WLBS, controlling for confounding factors. Unlike traditional banking credit that requires a formal screening process from banks, considering that inter-firm trade credit is largely driven by supplier networks, the observed gender bias is likely driven more by demand-side factors as opposed to supply-side factors.<sup>4</sup>

Third, the gender disadvantage in obtaining trade credit seems to disappear when female managed firms appear to have secured bank financing that could be used as a signal to obtain trade credit. This effect is captured by the coefficient of the interaction term between female manager and financial access,  $\beta_3$  which turns out to be positive and significant across all specifications. Our results suggest that if a female-managed firm has access to traditional bank finance, it can possibly act as a screening process and positively nudge the suppliers to extend trade credit. As far as other traditional determinants of trade credit are concerned, we observe that firms that are old, small, run by sole proprietors, and firms that are more productive are more likely to obtain trade credit.

#### **4.2. *Women-Led SMEs and Access to Trade Credit***

While in general SMEs that do not have access to bank financing turn to seeking trade credit (Petersen & Rajan, 1997; Berger & Udell, 1998), the literature also seems to suggest that male-led SMEs tend to fare better than women-led SMEs in terms of profits, survival rates, employment, sales, and loan approval rates (Chaudhuri et al., 2020; Kiefer

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<sup>4</sup> This result can also be viewed as complementary to the tangential literature that has emphasized the importance of various demand-side factors including behavioral traits and cultural institutions that drive gender bias in traditional bank-based credit access (Moro et al. 2017; Bertrand et al. 2022).

et al., 2020). Thus, on the one hand, while credit constrained SMEs seem more likely to depend on trade credit, on the other hand, female-led SMEs find obtaining formal finance challenging. Against this backdrop, we examine the interplay between access to finance, female-led SMEs, and its implication on their ability to obtain trade credit.

Specifically, we estimate the following equation to explore how female-led SMEs with access to finance fare in obtaining trade credit.<sup>5</sup>

$$Trade\ Credit_{ijct} = \Phi(\alpha + \beta_1 Financial\ Access_{ijct} + \beta_2 Female\ Manager_{ijct} + \beta_3 SME_{ijct} + \beta_4 Female\ manager\ x\ SME_{ijct} + \beta_5 Financial\ Access\ x\ Female\ manager\ x\ SME_{ijct} + \beta Controls_{ijct} + \delta_t + \lambda_j + \theta_c + \mu_{ijct}) \quad (2)$$

Table 3 highlights the results of estimating Eq (2). Consistent with our priors, we find that the coefficient of interaction between SME x Female Manager is negative and significant. However, the coefficient on SME turns out to be positive and significant, suggesting that even though SMEs are more dependent on trade credit, they are less likely to obtain credit from suppliers/customers if they are female-led businesses. Interestingly, however, the triple interaction between Financial Access x Female Manager x SME yields a positive and statistically significant coefficient highlighting that female-led SMEs with access to institutional finance are 3%-3.5% more likely to obtain trade credit. Hence, access to formal finance emerges as an important factor in overcoming the discrimination female-led SMEs face in obtaining trade credit.

**[Insert Table 3 here]**

#### **4.3. Addressing Endogeneity Concerns**

Our investigation of the existence of a gender bias in obtaining trade credit gives rise to plausible endogeneity concerns. Endogeneity in our empirical setup can originate due to simultaneity between our measure of trade credit and financial access of a firm. Given the complementarity channel between trade credit and financial access established in the literature, it is feasible that access to trade credit may act as a signaling mechanism and helps firm obtain bank credit (Andrieu et al.2018; Berger & Udell, 1998; Del Gaudio et al.2021; Giannetti et al.2011). Hence, the presence of a bi-directional relationship

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<sup>5</sup> For estimating Equation 2, we replace log size with SME dummy which caters to a more feasible and intuitive interpretation of our findings.

between trade credit and financial access can possibly lead to issues of endogeneity in the model, resulting in biased estimates.

To overcome this econometric concern, we employ an instrumental variable approach. While contemplating on the choice of instrument, it is important to note that a variable can be accepted as a valid instrument if, in our case, the variable affects firms' probability of obtain bank finance but does not have a direct impact on firm trade credit. However, given that both trade credit and formal bank loans are financing avenues for firms, factors affecting financial access (say for instance, age, size,) may also affect the probability of obtaining trade credit. Hence, finding a natural instrument, especially in a cross-country setup becomes an arduous task. To obviate this problem, we use an alternative identification strategy proposed by Lewbel (2012, 2018), that achieves identification through instruments constructed from the existing data, in the absence of natural instruments. The Lewbel (2012, 2018) estimator is heteroskedasticity-based and constructs instruments for endogenous  $Z$  using information from the heteroskedasticity of  $\varepsilon_2$ . ( $Z = X'\alpha + \varepsilon_2$ ). The Lewbel model is a modified two-stage least square model and the identification is achieved if the product of the heteroscedastic errors is not correlated with the regressors (Lewbel, 2012).<sup>6</sup>

Table 4 documents the results obtained from Lewbel (2012, 2018) estimation where results in columns 1-4 corresponds to estimation of Equation 1 and columns 5-8 for Equation 2. Across the models, we can observe that the results are in tandem with the baseline findings. Our main findings that WLBs and SMEs that are women-led are more likely to obtain trade credit when they have received a formal line of credit from a financial institution are preserved. The results underscore that formal finance acts as a signaling mechanism enabling small firms and WLBs to overcome the bias against them in the credit market.<sup>7</sup>

**[Insert Table 4 here]**

On a tangential note, the literature related to gender discrimination and access to formal credit highlights an important methodological concern of selection bias (Pham &

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<sup>6</sup> For a recent application of Lewbel approach, see Czarnitzki et al. (2020); Delera et al. (2022).

<sup>7</sup> Further, based on the Kleibergen-Papp LM test reported, we reject the null hypothesis that the model is under-identified. In addition, the Cragg-Donald Wald F statistic (CDW-F) reported in the table is also significantly greater than Stock-Yogo critical values highlighting that the model does not suffer from the problem of weak instruments.

Talavera). The existence of selection bias in the literature on access to credit stems from two sets of firms. First, firms that do not need an external source of financing (Chaudhuri et al., 2020). Second, firms that are discouraged borrowers, where those that anticipate rejection on their loan applications do not make a formal application (Presbitero et al., 2014). Studies have further documented that female entrepreneurs are more likely to feel discouraged than their male counterparts. While all these are possibly important concerns in the tangential literature on access to credit, it is pertinent to note here that the selection bias in all these scenarios arise due to the presence of a formal application process to obtain a loan from a bank. However, in the case of inter-firm trade credit which is the subject of interest to this analysis, such formal applications and collateral requirements are not the norm as inter-firm trade credit is offered typically on the basis of a relationship between the firm and its suppliers/consumers. Therefore, the concerns of a typical selection bias are not directly pertinent to our analysis when the focus is on aspects of trade credit as opposed to formal finance from banks.

#### **4.4. Robustness Checks**

We offer three more empirical exercises to establish the robustness of our results established so far. The first sensitivity check arises from using alternative measures of trade credit. The second robustness exercise utilizes alternative estimating techniques. The final exercise involves trimming our sample further by removing countries with a disproportionate representation of observations in our sample to eliminate the possibility that a few large countries could drive our results.

To start with, we define trade credit in an alternative fashion by removing the minimum threshold restriction and instead identifying trade credit as a binary variable that takes the value one when the firm reports any positive percentage of working capital purchased on credit/advances from suppliers/customers (Table 5). In addition, we also define it as a continuous variable (percentage of trade credit that a firm secures) and re-estimate equations 1 & 2 using an OLS regression (Table 6). The results in Tables 5 and 6 show that the findings are consistent with and similar to our baseline estimates where WLBS as well as SMEs that are women-led are less likely to obtain trade credit. However, in the presence of formal finance, WLBS and women-led SMEs are able to overcome this disadvantage as captured by the positive coefficient on *Female Manager x Financial*

*Access*, and *Female Manager x Financial Access X SMEs* in Tables 5 and 6. The results also establish that our baseline results are robust to alternative measures of trade credit.

**[Insert Tables 5 & 6 here]**

Second, to ensure that our results are not sensitive to the choice of estimation procedure, we use a logit model to re-estimate both equations. As Table 7 shows, the benchmark findings are robust, with the signs and significance of the key variables in both equations (1) and (2) preserved (Table 7).

**[Insert Table 7 here]**

Finally, to ensure that our results are not driven by a disproportionate representation of certain economies in our sample (see Figure 1), we re-run our empirics by excluding India and Egypt which account for almost 22% of our sample distribution (Table 8). Both these empirical exercises as captured by the results shown in Tables 7 and 8 reveal that our fundamental results remain robust and consistent.

**[Insert Table 8 here]**

## **5. Concluding Remarks**

Do women-led SMEs face a bias in obtaining trade credit? This question assumes immense significance in emerging markets and developing economies (EMDEs), considering how trade credit plays an instrumental role as an alternative source of financing for women-led businesses (WLBs). Notwithstanding the established literature on the presence of gender bias in firms' access to credit, as we have noted in this paper, these studies have largely focused on gender discrimination in obtaining traditional bank-based financing. However, the existing literature does not focus on trade credit, which can present an important alternative to many WLBs. In light of the existing gaps in the literature, in this paper, we have attempted to make a modest contribution by shedding some light on the prevalence of gender bias in obtaining trade credit and how women-led firms can possibly overcome it, which generate crucial policy implications for EMDEs.

By tapping into a cross-country firm-level dataset featuring 43,338 firms representing 95 EMDEs for the time period 2009 to 2020, we have empirically established that WLBs are less likely to obtain inter-firm trade credit, corroborating the existing strand of literature that highlights the existence of discrimination against female-

led firms. Accounting for endogeneity concerns, we also show that if a female-led firm has access to a formal source of financing, its probability of obtaining inter-firm trade credit increases, highlighting how bank finance can act as a signaling mechanism allowing suppliers and customers to extend credit to female-led firms. Finally, we find that though SMEs are more dependent on trade credit, a female-led SME would find it even more strenuous to access it, which can be overcome if it has access to an institutional line of credit.

The results also have important policy implications especially in the wake of shocks to Global Value Chains (GVCs) that have rendered firms weak across the globe. In this regard, fostering greater supply of formal loans could enable WLBs and Women-Led SMEs in providing a positive signal to their suppliers, which could in turn help supply chain networks build resilience among them.

Finally, we would like to outline an important limitation of our study. Despite the extensive robustness checks we have furnished, we are unable to use the information from WBES to identify the use of trade credit, i.e., whether they are used for short-term or long-term objectives of the firm. This becomes important because the availability of such information would help unravel the short-term and long-term dynamics of trade credit as well as explore the dependency patterns of firms in obtaining trade credit. However, data limitations restrict us from undertaking such an analysis, which if overcome, can be a promising avenue for future research.

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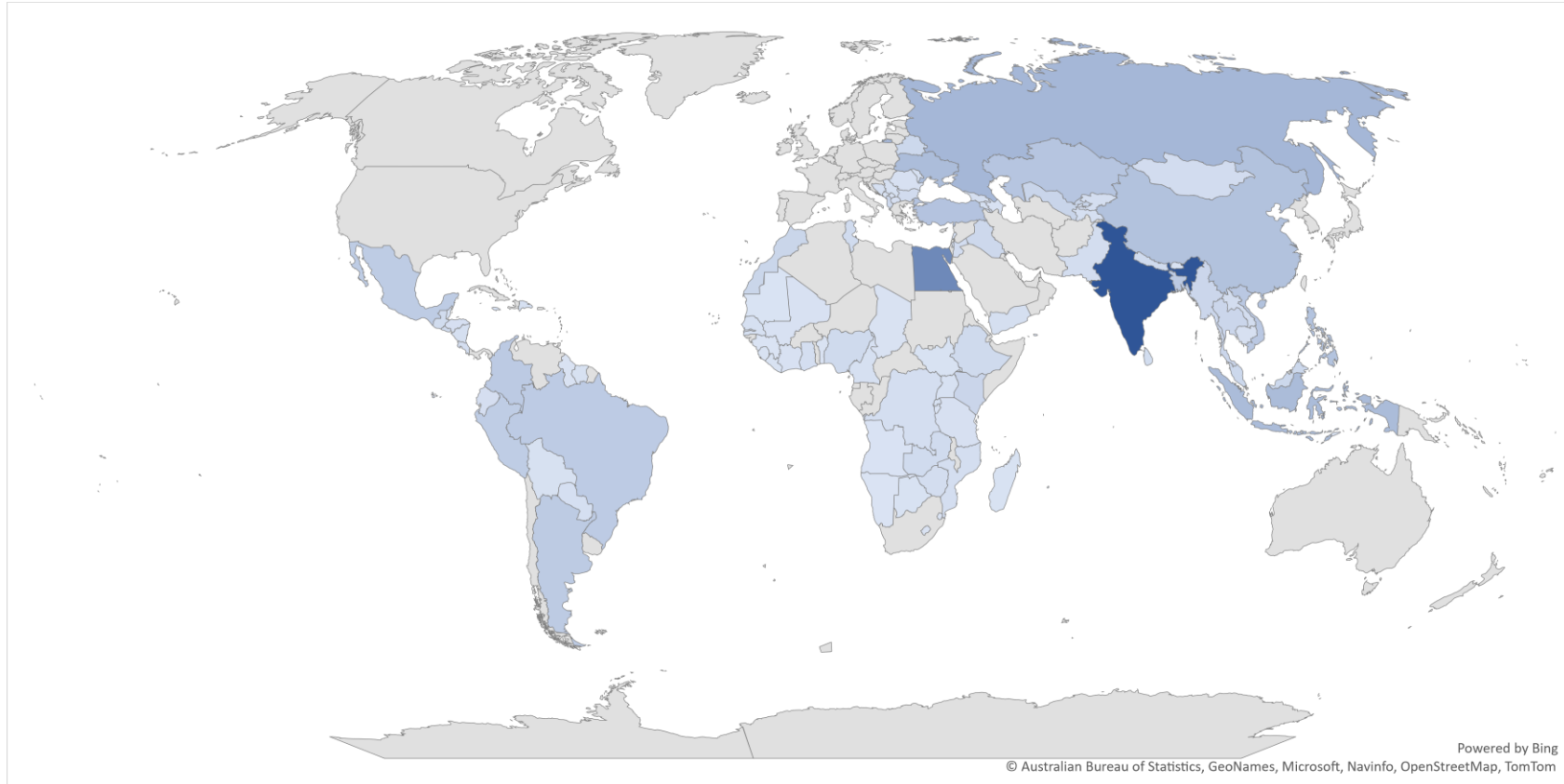
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**Figures**

**Figure 1 – Distribution of Firms Across EMDEs in Our Sample**



Source: Authors' using WBES database

## Tables

**Table 1 - Descriptive Statistics**

Variable		Obs.	Mean	Std. Dev.	Min	Max
Trade Credit	=1 if firm has at least 33 % of Working Capital Purchased on Credit/Advances from Suppliers / Customers; 0 otherwise	43338	0.119	0.323	0	1
Female Manger	=1 if the top manager is female; 0 otherwise	43338	0.137	0.344	0	1
Fin Acc	=1 if firm has access to line of credit from a financial institution and 0 otherwise	43338	0.356	0.479	0	1
Workers	Number of workers in the firm	43338	104.99	258.17	1	7000
Log Size	Log of Number of workers in a firm	43338	2.815	0.709	0.693	5.832
SME	=1 if number of workers are less than 100; 0 otherwise	43338	0.760	0.427	0	1
Log Age	Log of Number of years firm has been in operation	43338	2.815	0.709	0.693	5.832
Sole	Equals 1 if sole proprietorship and 0 otherwise	43338	0.038	0.191	0	1
Log Value Added	Log of Value added per worker	43338	9.107	1.441	0.76	16.684
Log GDP	Log of GDP Per Capita	43338	26.182	1.803	21.145	29.820
WGI	Median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law, obtained from World Governance Indicators	43338	-0.423	0.0809	-0.535	-0.2334

Source: Authors

**Table 2: Women-Led Businesses and Trade Credit**

DV: Probability of Obtaining Trade Credit	(1) Year FE	(2) Year and Industry FE	(3) Year, Industry & Country FE	(4) Full Model
<b>Financial Access</b>	<b>0.0109***</b> (0.00349)	<b>0.0109***</b> (0.00349)	<b>0.00848**</b> (0.00356)	<b>0.00662*</b> (0.00356)
<b>Female Manager</b>	<b>-0.0181***</b> (0.00587)	<b>-0.0190***</b> (0.00592)	<b>-0.0157***</b> (0.00589)	<b>-0.0165***</b> (0.00590)
<b>Female Manager X Financial Access</b>	<b>0.0299***</b> (0.00882)	<b>0.0300***</b> (0.00881)	<b>0.0253***</b> (0.00882)	<b>0.0248***</b> (0.00880)
Log Age	0.00928*** (0.00222)	0.00893*** (0.00223)	0.00469** (0.00225)	0.00532** (0.00224)
Log Size	-0.00242** (0.00121)	-0.00267** (0.00122)	2.07e-05 (0.00123)	-0.000473 (0.00122)
Sole	-0.0220*** (0.00799)	-0.0200** (0.00798)	-0.0216*** (0.00806)	-0.0205** (0.00803)
Log Value Added	0.00515*** (0.00111)	0.00558*** (0.00113)	0.00544*** (0.00116)	0.00225* (0.00118)
Log GDP				0.0264*** (0.00246)
WGI				-0.566*** (0.0586)
Year FE	Yes	Yes	Yes	Yes
Industry FE	-	Yes	Yes	Yes
Country FE	-	-	Yes	Yes
Observations	43,338	43,338	43,338	43,338

Notes: This table presents the marginal effects of Equation 1 estimated using a probit model. The dependent variable is trade credit which is a dummy variable that takes the value 1 if firm has at least 33 % of working capital purchased on credit/advances from suppliers / customers; 0 otherwise. The key variable of interest is the interaction between female manger and financial access of the firm. Female manager =1 if the firm's manager is a female. Similarly, financial access =1 if a firm has access to line of credit from a financial institution. Log age is measured as the log of number of years a firm has been in operation. Log size is the log of number of workers in a firm. Sole is a binary variable representing sole proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects (at the two-digit level), year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**Table 3: Women-Led SMEs and Trade Credit**

DV: Probability of Obtaining Trade Credit	(1) Year FE	(2) Year and Industry FE	(3) Year, Industry & Country FE	(4) Full Model
Financial Access	0.0113*** (0.00341)	0.0113*** (0.00341)	0.00943*** (0.00349)	0.00745** (0.00348)
Female Manager	0.00321 (0.00933)	0.00192 (0.00933)	0.00585 (0.00932)	0.00576 (0.00927)
SME	0.0122*** (0.00388)	0.0128*** (0.00391)	0.00672* (0.00389)	0.00826** (0.00388)
<b>Female Manager x SME</b>	<b>-0.0252**</b> (0.0113)	<b>-0.0247**</b> (0.0113)	<b>-0.0261**</b> (0.0112)	<b>-0.0272**</b> (0.0112)
<b>Financial Access x Female Manager x SME</b>	<b>0.0356***</b> (0.00987)	<b>0.0354***</b> (0.00985)	<b>0.0300***</b> (0.00987)	<b>0.0296***</b> (0.00985)
Log Age	0.00950*** (0.00220)	0.00911*** (0.00221)	0.00527** (0.00223)	0.00584*** (0.00222)
Sole	-0.0214*** (0.00796)	-0.0195** (0.00796)	-0.0203** (0.00803)	-0.0194** (0.00801)
Log Value Added	0.00519*** (0.00111)	0.00562*** (0.00113)	0.00561*** (0.00116)	0.00241** (0.00118)
Log GDP				0.0264*** (0.00246)
WGI				-0.569*** (0.0586)
Year FE	Yes	Yes	Yes	Yes
Industry FE	-	Yes	Yes	Yes
Country FE	-	-	Yes	Yes
Observations	43,338	43,338	43,338	43,338

Notes: This table presents the marginal effects of Equation 2 estimated using probit model. The dependent variable is Trade credit which is a dummy variable that takes the value 1 if firm has at least 33 % of Working Capital Purchased on Credit/Advances from Suppliers / Customers; 0 otherwise. The key variable of interest is the triple interaction between female manger, financial access, and SME status of the firm. Female manager =1 if the firm's manager is a female, while financial access =1 if firm has access to line of credit from a financial institution and SME=1 if a firm is a small or medium firm (i.e., firms employing less than 100 workers). Log age is measured as the log of number of years a firm has been in operation. Sole is a binary variable representing sole proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects, year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**Table 4: Endogeneity Correction**

DV: Probability of Obtaining Trade Credit	Women-Led Businesses and Trade Credit				Women-Led SMEs and Trade Credit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year FE	Year and Industry FE	Year, Industry & Country FE	Full Model	Year FE	Year and Industry FE	Year, Industry & Country FE	Full Model
Financial Access	0.027*** (0.005)	0.027*** (0.005)	0.013** (0.005)	0.012** (0.005)	0.035*** (0.007)	0.034*** (0.007)	0.014** (0.007)	0.014** (0.007)
Female Manager	-0.013** (0.005)	-0.017*** (0.005)	-0.014** (0.006)	-0.015*** (0.006)	-0.003 (0.009)	-0.006 (0.009)	0.002 (0.009)	0.001 (0.009)
<b>Female Manager X Financial Access</b>	<b>0.026**</b> (0.01)	<b>0.027***</b> (0.01)	<b>0.022**</b> (0.011)	<b>0.021**</b> (0.01)				
SME					0.014*** (0.004)	0.015*** (0.004)	0.007* (0.004)	0.009** (0.004)
Female Manager x SME					-0.011 (0.011)	-0.012 (0.011)	-0.02* (0.011)	-0.02* (0.011)
<b>Financial Access x Female Manager x SME</b>					<b>0.028**</b> (0.013)	<b>0.029**</b> (0.013)	<b>0.027**</b> (0.013)	<b>0.025**</b> (0.012)
CDW-F stat	2527.455	966.257	230.820	237.078	391.442	137.731	47.946	51.080
Kleibergen–Paap LM statistic	1.8e+4	1.8e+04	1.5e+4	1.6e+04	7647.299	7673.759	7551.735	7941.456
Kleibergen–Paap LM statisticP-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	43338	43338	43338	43338	43338	43338	43338	43338

Notes: Columns 1-4 presents the marginal effects of Equation 1, and Columns 5-8 presents the marginal effects of Equation 2 estimated using probit model. The dependent variable is Trade credit which is a dummy variable that takes the value 1 if firm has at least 33 % of Working Capital Purchased on Credit/Advances from Suppliers / Customers; 0 otherwise. The key variable of interest is the triple interaction between female manger, financial access, and SME status of the firm. Female manager =1 if the firm’s manager is a female, while financial access =1 if firm has access to line of credit from a financial institution and SME=1 if a firm is a small or medium firm (i.e., firms employing less than 100 workers). Log age is measured as the log of number of years a firm has been in operation. Sole is a binary variable representing sole proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects, year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**Table 5: Alternative Dummy for Trade Credit**

DV: Alternative Dummy for Trade Credit	Women-Led Businesses and Trade Credit				Women-Led SMEs and Trade Credit			
	(1) Year FE	(2) Year and Industry FE	(3) Year, Industry & Country FE	(4) Full Model	(5) Year FE	(6) Year and Industry FE	(7) Year, Industry & Country FE	(8) Full Model
Financial Access	0.0850*** (0.00474)	0.0852*** (0.00474)	0.0897*** (0.00475)	0.0899*** (0.00474)	0.0890*** (0.00462)	0.0894*** (0.00462)	0.0938*** (0.00464)	0.0937*** (0.00463)
Female Manager	-0.0412*** (0.00802)	-0.0399*** (0.00809)	-0.0297*** (0.00801)	-0.0280*** (0.00801)	0.00524 (0.0126)	0.00517 (0.0126)	-0.00557 (0.0125)	-0.00651 (0.0125)
<b>Female Manager X Financial Access</b>	<b>0.0620***</b> (0.0123)	<b>0.0614***</b> (0.0123)	<b>0.0442***</b> (0.0122)	<b>0.0411***</b> (0.0121)				
SME					0.00261 (0.00533)	0.00153 (0.00537)	-0.00717 (0.00529)	-0.00524 (0.00527)
Female Manager x SME					-0.0503*** (0.0153)	-0.0489*** (0.0153)	-0.0253* (0.0152)	-0.0224 (0.0152)
<b>Financial Access x Female Manager x SME</b>					<b>0.0597***</b> (0.0139)	<b>0.0589***</b> (0.0139)	<b>0.0428***</b> (0.0138)	<b>0.0401***</b> (0.0137)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	43338	43338	43338	43338	43338	43338	43338	43338

Notes: Columns 1-4 presents the marginal effects of Equation 1, and Columns 5-8 presents the marginal effects of Equation 2 estimated using probit model. The dependent variable is Trade credit which is a dummy variable that takes the value 1 if firm reports any positive percentage of Working Capital Purchased on Credit/Advances from Suppliers / Customers; 0 otherwise. The key variable of interest is the triple interaction between female manger, financial access, and SME status of the firm. Female manager =1 if the firm's manager is a female, while financial access =1 if firm has access to line of credit from a financial institution and SME=1 if a firm is a small or medium firm (i.e., firms employing less than 100 workers). Log age is measured as the log of number of years a firm has been in operation. Sole is a binary variable representing sole proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects, year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**Table 6: Continuous Measure for Trade Credit**

DV: Continuous Measure for Trade Credit Equations estimates using OLS	Women-Led Businesses and Trade Credit				Women-Led SMEs and Trade Credit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year FE	Year and Industry FE	Year, Industry & Country FE	Full Model	Year FE	Year and Industry FE	Year, Industry & Country FE	Full Model
Financial Access	1.626*** (0.223)	1.634*** (0.223)	1.593*** (0.226)	1.505*** (0.226)	1.679*** (0.218)	1.690*** (0.218)	1.671*** (0.221)	1.576*** (0.221)
Female Manager	-1.282*** (0.346)	-1.286*** (0.349)	-1.122*** (0.349)	-1.122*** (0.349)	-0.279 (0.580)	-0.313 (0.581)	-0.423 (0.579)	-0.466 (0.577)
<b>Female Manager X Financial Access</b>	<b>2.135***</b> (0.566)	<b>2.136***</b> (0.566)	<b>1.644***</b> (0.563)	<b>1.572***</b> (0.562)				
SME					0.596** (0.244)	0.629** (0.246)	0.211 (0.246)	0.315 (0.245)
Female Manager x SME					-1.150* (0.690)	-1.106 (0.690)	-0.812 (0.687)	-0.761 (0.685)
<b>Financial Access x Female Manager x SME</b>					<b>2.561***</b> (0.641)	<b>2.531***</b> (0.641)	<b>1.975***</b> (0.637)	<b>1.894***</b> (0.636)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	43338	43338	43338	43338	43338	43338	43338	43338

Notes: Columns 1-4 presents the marginal effects of Equation 1, and Columns 5-8 presents the marginal effects of Equation 2 estimated using OLS model. The dependent variable is Trade credit which is measured as percentage of trade credit that a firm secures as Advances from Suppliers / Customers; 0 otherwise. The key variable of interest is the triple interaction between female manger, financial access, and SME status of the firm. Female manager =1 if the firm's manager is a female, while financial access =1 if firm has access to line of credit from a financial institution and SME=1 if a firm is a small or medium firm (i.e., firms employing less than 100 workers). Log age is measured as the log of number of years a firm has been in operation. Sole is a binary variable representing sole proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects, year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.



**Table 7: Robustness - Logit Estimation**

DV: Probability of Obtaining Trade Credit	Women-Led Businesses and Trade Credit				Women-Led SMEs and Trade Credit			
	(1) Year FE	(2) Year and Industry FE	(3) Year, Industry & Country FE	(4) Full Model	(5) Year FE	(6) Year and Industry FE	(7) Year, Industry & Country FE	(8) Full Model
Financial Access	0.0119*** (0.00347)	0.0116*** (0.00347)	0.0104*** (0.00356)	0.00813** (0.00355)	0.0122*** (0.00340)	0.0119*** (0.00340)	0.0112*** (0.00349)	0.00889** (0.00348)
Female Manager	-0.0182*** (0.00613)	-0.0193*** (0.00617)	-0.0171*** (0.00614)	-0.0182*** (0.00614)	0.000864 (0.00957)	-0.000759 (0.00957)	0.00277 (0.00956)	0.00212 (0.00953)
<b>Female Manager X Financial Access</b>	<b>0.0286***</b> (0.00884)	<b>0.0290***</b> (0.00882)	<b>0.0254***</b> (0.00884)	<b>0.0253***</b> (0.00882)				
SME					0.0121*** (0.00389)	0.0126*** (0.00391)	0.00747* (0.00390)	0.00879** (0.00388)
Female Manager x SME					-0.0222* (0.0116)	-0.0215* (0.0116)	-0.0235** (0.0116)	-0.0240** (0.0116)
<b>Financial Access x Female Manager x SME</b>					<b>0.0338***</b> (0.00981)	<b>0.0339***</b> (0.00979)	<b>0.0295***</b> (0.00982)	<b>0.0293***</b> (0.00979)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	43338	43338	43338	43338	43338	43338	43338	43338

Notes: Columns 1-4 presents the marginal effects of Equation 1, and Columns 5-8 presents the marginal effects of Equation 2 estimated using probit model. The dependent variable is Trade credit which is a dummy variable that takes the value 1 if firm has at least 33 % of Working Capital Purchased on Credit/Advances from Suppliers / Customers; 0 otherwise. The key variable of interest is the triple interaction between female manger, financial access, and SME status of the firm. Female manager =1 if the firm's manager is a female, while financial access =1 if firm has access to line of credit from a financial institution and SME=1 if a firm is a small or medium firm (i.e., firms employing less than 100 workers). Log age is measured as the log of number of years a firm has been in operation. Sole is a binary variable representing sole proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects, year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

**Table 8: Re-Estimating Eq (1) and (2) Excluding India and Egypt**

DV: Probability of Obtaining Trade Credit	Model 1: Estimation of Equation 1 (1)	Model 2: Estimation of Equation 2 (2)
Financial Access	0.0149*** (0.00417)	0.0156*** (0.00407)
Female Manager	-0.0181*** (0.00672)	0.00107 (0.0105)
<b>Female Manager X Financial Access</b>	<b>0.0246**</b> (0.00981)	
SME		0.00304 (0.00460)
Female Manager x SME		-0.0232* (0.0126)
<b>Financial Access x Female Manager x SME</b>		<b>0.0298***</b> (0.0109)
Controls	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	Yes
Observations	33,526	33,526

Notes: Columns 1 and 2 present the marginal effects of estimating Equations 1 and 2 respectively. In this sub-sample, we exclude India and Egypt. The dependent variable is trade credit which is a dummy variable that takes the value 1 if firm has at least 33 % of working capital purchased on credit/advances from suppliers / customers; 0 otherwise. The key variable of interest in Equation (1) is the interaction between female manager and financial access of the firm. In this regard, both female manager and financial access are binary variables with the former =1 if the firm manager is a female. Similarly, financial access =1 if a firm has access to a line of credit from a financial institution. Log age is measured as the log of number of years a firm has been in operation. The key variable of interest in Equation (2) is the triple interaction between female manager, financial access, and SME status of the firm where SME=1 if a firm is a small or medium firm (i.e., firms employing less than 100 workers). Log size is the log of number of workers in a firm. Sole is a binary variable representing solely proprietor firms. Log value added is the log of value addition per worker which is employed in the model to proxy for firm performance. Log GDP and WGI are country level controls. Log GDP is the log of GDP per capita. WGI is the aggregate median value of six different world governance indicators. Specifically, WGI includes median of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, voice and accountability, and rule of law. The model also includes industry fixed effects at the two-digit level, year and country fixed effects. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.