Online Appendix: Escape Through Export? Women-Owned Enterprises, Domestic Discrimination, and Global Markets

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Appendix A: Model and Proofs

Model setup and equilibrium

This paper employs a modified version of the model developed in Melitz and Ottaviano (2008) to derive each of the main predictions. All readers are referred to the original for a complete discussion of the consumers utility maximization problem and of the producer's profit maximization problem. The primary addition to the model is the division of each country into two groups of firms, $g \in \{1,2\}$, which face differing costs of production, both at home and abroad, generated by discrimination. For a firm producing in market i and selling in market j, these costs are denoted by τ_{ij}^g, which is a per unit variable cost of trade. τ_{ij}^g includes trade-policy costs such as tariffs, transport costs, and all additional costs imposed by discriminatory institutions, whether domestic or foreign. If $i \neq j$ then the firm is exporting from i to j, otherwise sales are domestic.

As in Melitz and Ottaviano (2008), costs enter into the firms production decisions as a scalar multiple of the firm's constant cost of production c. Unit production costs for firm k of group g located in market i and serving market j are therefore $c_k \tau_{ij}^g$. Consumer demand is zero at a 'choke price' (denoted $\overline{p}_i$) which will equal the marginal cost of the least productive extant firm of group g located in market i and serving market j. This productivity cutoff will be denoted c_{ij}^g. We refer to the set of all firms located in i of group g with Ω_i^g.

The core equilibrium condition is that, net of any additional costs, consumers treat all varieties at the same price in the same way. This implies the following key relationship between the choke price, cutoffs and variable costs:

$$\overline{p}_i = c_{ii}^1 \tau_{ii}^1 = c_{ii}^2 \tau_{ii}^2 = c_{ji}^1 \tau_{ji}^1 = c_{ji}^2 \tau_{ji}^2. \qquad (1)$$

Note that if group 1, for example, faces no additional costs for servicing the domestic market ($\tau_{ii}^1 = 1$), which is a standard assumption in the literature, then their equilibrium cutoff can is equal to the trade-cost adjusted cutoffs of all other firms. In particular, domestic producers in group 1 will be most able to service their own market and all other groups will be at a disadvantage due to both trade- and discrimination-generated costs.

This paper assumes a Pareto distribution for firm productivity which is given by

$$G_i^g(c) = \left(\frac{c}{m_i^g}\right)^k.$$

The parameter m_i^g determines the average cost of firms in i of group g. Permitting this parameter to vary between groups incorporates discriminatory costs into the prior distribution of firm productivity before any additional costs of discrimination through production costs are imposed. The shape parameter of the Pareto distribution is assumed to be a constant k across all countries and groups, a standard simplifying assumption. Under this assumption, the cost distribution of all types of firms, foreign and domestic and of any group, will be equalized in the same market. Using the results of the consumer's utility maximization problem, the total number of firms which serve market i is given by

$$N_i = \frac{2(k+1)\gamma}{\eta}\frac{\alpha - \overline{p}_i}{\overline{p}_i}. \qquad (2)$$

All of the results in this paper are based on a short-run version of the Melitz and Ottaviano (2008) model. Accordingly, there is a pre-existing, fixed measure of entrants for each group in each country written as N_{Ei}^g. The measure of extant firms is also permitted to vary between groups reflect the impact of discrimination before production begins. For much of the analysis that follows, it will prove useful to treat m_i^g and N_{Ei}^g jointly and so we defined $A_i^g = N_{Ei}^g/(m_i^g)^k$. This object recurs frequently throughout the analysis.

We employ a one-period and short-run version of the model for reasons of analytical tractability. We see no reason why the same results would not hold in a one-period version of the model with long-run entry. Similarly, we believe that the same results would hold for a multi-period model where trade liberalization reduces the number of firms in high-discrimination countries. Indeed, our model permits countries to vary in the extent of liberalization in ways systematically correlated with the extent of discrimination. These differences are then 'differenced out' in the ratios of the number of firms, again illustrating the robustness of our theoretical and empirical results to confounders affecting all firms. This is discussed further in the section "Discrimination and other institutions' effects on entrepreneurship".[1]

The number of firms which profitably produce for any given group is given by

$$N_{ij}^g = A_i^g (c_{ij}^g)^k. \qquad (3)$$

We can then combine equations 1-3 and the following key relationship to determine equilibrium cutoffs and numbers of firms:

$$N_i = N_{ii}^1 + N_{ii}^2 + N_{ji}^1 + N_{ji}^2. \qquad (4)$$

For example, c_{ii}^1 is defined implicitly by

$$\frac{\alpha - c_{ii}^1}{\left(c_{ii}^1\right)^{k+1}} = \frac{\eta}{2(k+1)\gamma}\left(\left(\tau_{ii}^1\right)^{-k} A_i^1 + \left(\tau_{ii}^2\right)^{-k} A_i^2 + \left(\tau_{ji}^1\right)^{-k} A_j^1 + \left(\tau_{ji}^2\right)^{-k} A_j^2\right).$$

Note that c_{ii}^1 increases when the right hand side decreases so c_{ii}^1 increases when τ_{ii}^2 or τ_{ji}^2 increase, or A_1^2 decreases. All remaining cutoffs are determined residually though the use of equation 1, and once cutoffs are determined the equilibrium number of firms serving all markets is also determined.

Proof of Proposition 1

Part 1a: The number of firms which remain to serve the domestic market from group g is

$$N_{ii}^g = A_i^g \left(c_{ii}^g\right)^k.$$

[1] A reader of this paper also suggested that it might be interesting to consider heterogeneity in the extent to which firms discriminate, as in Becker (1957), and so the evolution of the number of discriminating firms over time. We think this is a superb idea but we do not believe that it would fundamentally alter the argument presented here. We leave this suggestion for future research.

Noting that $\frac{c_{ii}^2}{\tau_{ii}^2} = \frac{c_{ii}^1}{\tau_{ii}^1}$, it follows that

$$\frac{N_{ii}^2}{N_{ii}^1} = \frac{A_i^2}{A_i^1}\left(\frac{\tau_{ii}^2}{\tau_{ii}^1}\right)^{-k}.$$

Because of the assumptions we have made about τ_{ii}^2 increasing and A_i^2 decreasing in δ_i, we need only further assume that $A_i^2 \le A_i^1$ in the absence of any discrimination for there to be a minority of firms that are women-owned in countries with *any* positive level of discrimination. This assumption would be satisfied, for example, if there are equal numbers of potential entrants from both groups in the absence of discrimination. It would also be satisfied if the sole impact of discriminatory institutions was to restrict entry for the group that is discriminated against, but not to raise costs.

Part 1b: By analogy with 1a and noting that $N_{ij}^g = A_i^g\left(c_{ij}^g\right)^k$, we have that

$$\frac{N_{ij}^2}{N_{ij}^1} = \frac{A_i^2}{A_i^1}\left(\frac{\tau_{ij}^2}{\tau_{ij}^1}\right)^{-k}.$$

As above, positive levels of discrimination imply that there are greater numbers of men then women exporters, as long as we assume that $A_i^2 \le A_i^1$.

Part 2: Average domestic revenues for group g in country i are given by

$$\begin{aligned}\bar{R}_{ii}^g &= \int_0^{c_{ii}^g} \frac{L_i}{4\gamma}\left(\tau_{ii}^g\right)^2\left(\left(c_{ii}^g\right)^2 - c^2\right)\mathrm{d}G(c) \\ &= \frac{L_i}{2\gamma}\frac{1}{k+2}(\tau_{ii}^g)^2\left(c_{ii}^g\right)^2.\end{aligned}$$

It is straightforward to see that the relation between domestic cutoffs for the two groups implies that $\bar{R}_{ii}^2 = \bar{R}_{ii}^1$ for any τ_{ii}^2 and τ_{ii}^1. More simply, the fact that the distribution of productivities, net of any costs, is equalized among firms implies that their average revenue and profits will be equal in the domestic market, as well.

Part 3: As defined in the main text, average export revenues among all firms, whether exporters or not, are

$$\bar{R}_{ij}^g = p_{ij}^g \frac{L^j}{2\gamma}\frac{1}{k+2}(c_{ij}^g\tau_{ij}^g)^2.$$

Note that this is increasing in τ_{ij}^2 for members of group 2 and decreasing in τ_{ij}^2 for members of group 1.

The ratio among the two groups therefore resolves to

$$\begin{aligned}\frac{\bar{R}_{ij}^2}{\bar{R}_{ij}^1} &= \frac{p_{ij}^2}{p_{ij}^1} \\ &= \left(\frac{c_{ij}^2}{c_{ii}^2}\right)^k\left(\frac{c_{ij}^1}{c_{ii}^1}\right)^{-k} \\ &= \left(\frac{\tau_{ij}^2}{\tau_{ij}^1}\right)^{-k}\left(\frac{\tau_{ii}^2}{\tau_{ii}^1}\right)^k\end{aligned}$$

In the meantime, we have also shown the relation identified in part 3a.

Finally, turning to the proportion of sales accounted for by exports, at the country level, we have that

$$\begin{aligned}\Pi_{ij}^{g} &= \frac{\bar{R}_{ij}^{g}}{\bar{R}_{ij}^{g}+\bar{R}_{ii}^{g}} \\ &= \frac{1}{1+\frac{L^{i}}{L^{j}}\left(\frac{c_{ii}^{g}}{c_{ij}^{g}}\right)^{k+2}\left(\frac{\tau_{ii}^{g}}{\tau_{ij}^{g}}\right)^{2}}\end{aligned}$$

and so

$$\begin{aligned}\frac{\Pi_{ij}^{2}}{\Pi_{ij}^{1}} &= \frac{1+\frac{L^{i}}{L^{j}}\left(\frac{c_{ii}^{1}}{c_{ij}^{1}}\right)^{k+2}\left(\frac{\tau_{ii}^{1}}{\tau_{ij}^{1}}\right)^{2}}{1+\frac{L^{i}}{L^{j}}\left(\frac{c_{ii}^{2}}{c_{ij}^{2}}\right)^{k+2}\left(\frac{\tau_{ii}^{2}}{\tau_{ij}^{2}}\right)^{2}} \\ &= \frac{\left(\frac{\tau_{ii}^{1}}{\tau_{ij}^{1}}\right)^{-2}+\frac{L^{i}}{L^{j}}\left(\frac{c_{ii}^{1}}{c_{ij}^{1}}\right)^{k+2}}{\left(\frac{\tau_{ii}^{1}}{\tau_{ij}^{1}}\right)^{-2}+\frac{L^{i}}{L^{j}}\left(\frac{c_{ii}^{1}}{c_{ij}^{1}}\right)^{k+2}\left(\frac{\tau_{ij}^{2}}{\tau_{ij}^{1}}\right)^{k}\left(\frac{\tau_{ii}^{2}}{\tau_{ii}^{1}}\right)^{-k}}.\end{aligned}$$

We see from this that $\frac{\Pi_{ij}^{2}}{\Pi_{ij}^{1}}$ will be less than one if the escape through export condition does not hold, and greater than one if it does hold.

Proof of Proposition 2

Before proceeding to the proofs, it will be helpful to establish a couple of relationships. First, recall that c_{ii}^{1} is defined implicitly by

$$\frac{\alpha-c_{ii}^{1}}{\left(c_{ii}^{1}\right)^{k+1}}=\frac{\eta}{2(k+1)\gamma}\left(\left(\tau_{ii}^{1}\right)^{-k}A_{i}^{1}+\left(\tau_{ii}^{2}\right)^{-k}A_{i}^{2}+\left(\tau_{ji}^{1}\right)^{-k}A_{j}^{1}+\left(\tau_{ji}^{2}\right)^{-k}A_{j}^{2}\right).$$

Note that c_{ii}^{1} increases when the right hand side decreases. In particular, c_{ii}^{1} increases when τ_{ii}^{2} or τ_{ji}^{2} increase, or A_{1}^{2} decreases.

$$\begin{aligned}\frac{\partial c_{ii}^{1}}{\partial\delta_{i}} &= \frac{\partial c_{ii}^{1}}{\partial\tau_{ii}^{2}}\frac{\mathrm{d}\tau_{ii}^{2}}{\mathrm{d}\delta_{i}}+\frac{\partial c_{ii}^{1}}{\partial A_{i}^{2}}\frac{\mathrm{d}A_{i}^{2}}{\mathrm{d}\delta_{i}}+\frac{\partial c_{ii}^{1}}{\partial\tau_{ji}^{2}}\frac{\mathrm{d}\tau_{ji}^{2}}{\mathrm{d}\delta_{i}} \\ &> 0.\end{aligned}$$

The inequality follows from the assumptions we have made about domestic discrimination's effects on costs faced by group 2 firms, whether domestic or foreign, and on the competitiveness of domestic group 2 firms.

Part 1a: Recall that $N_{ii}^{g}=A_{i}^{g}\left(c_{ii}^{g}\right)^{k}$. We also assumed above that $\frac{\partial A_{i}^{1}}{\partial\delta_{i}}=0$ and $\frac{\partial A_{i}^{2}}{\partial\delta_{i}}<0$. Increasing discrimination increases the number of group 1 firms in equilibrium by reducing domestic competition.

$$\begin{aligned}\frac{\partial N_{ii}^1}{\partial \delta_i} &= \frac{\partial A_i^1}{\partial \delta_i}\left(c_{ii}^1\right)^k + kA_i^g\left(c_{ii}^1\right)^{k-1}\frac{\partial c_{ii}^1}{\partial \delta_i}\\ &> 0.\end{aligned}$$

The effect of increased discrimination on group 2 firms are more complex, because increasing discrimination raises costs while reducing competition, both at home and abroad.

$$\begin{aligned}\frac{\partial N_{ii}^2}{\partial \delta_i} &= \frac{\partial A_i^2}{\partial \delta_i}\left(c_{ii}^2\right)^k + kA_i^2\left(c_{ii}^2\right)^{k-1}\left(\frac{\partial c_{ii}^1}{\partial \delta_i}\frac{1}{\tau_{ii}^2} - \frac{c_{ii}^1}{\left(\tau_{ii}^2\right)^2}\frac{\partial \tau_{ii}^2}{\partial \delta_i}\right)\\ &= \frac{\left(c_{ii}^2\right)^{k-1}}{\tau_{ii}^2}\left(\frac{\partial A_i^2}{\partial \delta_i}\left(c_{ii}^1 + kA_i^2\frac{\partial c_{ii}^1}{\partial A_i^2}\right) + kA_i^2\left(\frac{\partial c_{ii}^1}{\partial \tau_{ii}^2} - \frac{c_{ii}^1}{\tau_{ii}^2}\right)\frac{\partial \tau_{ii}^2}{\partial \delta_i} + kA_i^2\frac{\partial c_{ii}^1}{\partial \tau_{ji}^2}\frac{\partial \tau_{ji}^2}{\partial \delta_i}\right)\end{aligned}$$

At this point, note that greater discrimination has potentially ambiguous effects, even excluding the negative externalities created by discrimination on foreign firms. For example, increasing discrimination might lower the a priori competitiveness of group 2 firms but that also lowers overall competition in the economy. As one might expect, however, the direct costs always outweighs the indirect benefits, which we seek to prove here.

$$\begin{aligned}c_{ii}^1 + kA_i^2\frac{\partial c_{ii}^1}{\partial A_i^2} &= c_{ii}^1 - kA_i^2\frac{\eta}{2(k+1)\gamma}\left(\tau_{ii}^2\right)^{-k}\frac{\left(c_{ii}^1\right)^{k+2}}{k\alpha + \alpha - kc_{ii}^1}\\ &\propto \frac{\alpha + \frac{\alpha}{k} - c_{ii}^1}{\left(c_{ii}^1\right)^{k+1}} - \frac{\eta}{2(k+1)\gamma}\left(\tau_{ii}^2\right)^{-k}A_i^2\\ &> 0.\end{aligned}$$

The latter inequality follows from examining the implicit definition of c_{ii}^1 and by noting that $\frac{\alpha}{k}$ is positive.

We now need to perform a similar set of steps for the second term in $\frac{\partial N_{ii}^2}{\partial \delta_i}$.

$$\begin{aligned}\frac{\partial c_{ii}^1}{\partial \tau_{ii}^2} - \frac{c_{ii}^1}{\tau_{ii}^2} &= \frac{k\eta}{2(k+1)\gamma}\left(\tau_{ii}^2\right)^{-k-1}A_i^2\frac{\left(c_{ii}^1\right)^{k+2}}{k\alpha + \alpha - kc_{ii}^1} - \frac{c_{ii}^1}{\tau_{ii}^2}\\ &= \frac{\eta}{2(k+1)\gamma}\left(\tau_{ii}^2\right)^{-k}A_i^2 - \frac{\alpha + \frac{\alpha}{k} - c_{ii}^1}{\left(c_{ii}^1\right)^{k+1}}\\ &< 0.\end{aligned}$$

We can now sign $\frac{\partial N_{ii}^2}{\partial \delta_i}$. As long as $\frac{\partial \tau_{ji}^2}{\partial \delta_i}$ isn't too large relative to $|\frac{\partial A_i^2}{\partial \delta_1}|$ and $\frac{\partial \tau_{ii}^2}{\partial \delta_1}$ then $\frac{\partial N_{ii}^2}{\partial \delta_i} < 0$.

Finally, we also consider the ratio $\frac{N_{ii}^2}{N_{ii}^1}$. As shown above, this is equal to

$$\frac{A_i^2}{A_i^1}\left(\frac{\tau_{ii}^2}{\tau_{ii}^1}\right)^{-k}.$$

The first ratio is clearly decreasing in δ_i because $\partial A_i^2/\partial\delta_i < 0$. The second ratio is also decreasing in δ_i because $\tau_{ii}^2\partial\delta_i > 0$. Therefore, the ratio of women-owned to men-owned firms is decreasing in δ_i.

Part 1b: Changes in domestic discrimination also affect the number of firms which export, $N_{ij}^g = N_{Ei}^g\left(\frac{c_{ij}^g}{m_i}\right)^k$, through exactly the same channels as above, except that there is no direct effect which operates through foreign firms. The exporting cutoff for group 1 firms is increasing in domestic discrimination.

$$\begin{aligned}\frac{\partial c_{ij}^1}{\partial\delta_i} &= \frac{1}{\tau_{ij}^1}\left(\frac{\partial c_{jj}^1}{\partial\tau_{ij}^2}\frac{\partial\tau_{ij}^2}{\partial\delta_i} + \frac{\partial c_{jj}^1}{\partial A_i^2}\frac{\partial A_i^2}{\partial\delta_i}\right)\\ &> 0.\end{aligned}$$

Therefore, so is the number of exporting firms in group 1.

$$\begin{aligned}\frac{\partial N_{ij}^1}{\partial\delta_i} &= kA_i^1\left(c_{ij}^1\right)^{k-1}\frac{\partial c_{ij}^1}{\partial\delta_i}\\ &> 0.\end{aligned}$$

As above, the derivative for group 2 is somewhat more complex:

$$\frac{\partial N_{ij}^2}{\partial\delta_i} = \frac{\left(c_{jj}^2\right)^{k-1}}{\tau_{ij}^2}\left(\left(c_{jj}^1 + kA_i^2\frac{\partial c_{jj}^1}{\partial A_i^2}\right)\frac{\partial A_i^2}{\partial\delta_i} + kA_i^2\left(\frac{\partial c_{jj}^1}{\partial\tau_{ij}^2} - \frac{c_{jj}^2}{\tau_{ij}^2}\right)\frac{\partial\tau_{ij}^2}{\partial\delta_i}\right)$$

This is directly analagous to the expression we examined above for $\frac{\partial N_{ii}^2}{\partial\delta_i}$ with the exception of one term. Using our results from above, then, this will always be negative.

At this point, we also draw a comparison between the rate of change of all firms and just those firms which export as discrimination increases. When is $\frac{\partial N_{ii}^2}{\partial\delta_i} < \frac{\partial N_{ij}^2}{\partial\delta_i}$, meaning that the rate of loss of all firms is greater than the loss of exporting firms as discrimination increases?

$$\frac{\frac{\left(c_{jj}^2\right)^{k-1}}{\tau_{ij}^2}\left(\left(c_{jj}^1 + kA_i^2\frac{\partial c_{jj}^1}{\partial A_i^2}\right)\frac{\partial A_i^2}{\partial\delta_i} + kA_i^2\left(\frac{\partial c_{jj}^1}{\partial\tau_{ij}^2} - \frac{c_{jj}^2}{\tau_{ij}^2}\right)\frac{\partial\tau_{ij}^2}{\partial\delta_i}\right)}{\frac{\left(c_{ii}^2\right)^{k-1}}{\tau_{ii}^2}\left(\left(c_{ii}^1 + kA_i^2\frac{\partial c_{ii}^1}{\partial A_i^2}\right)\frac{\partial A_i^2}{\partial\delta_i} + kA_i^2\left(\frac{\partial c_{ii}^1}{\partial\tau_{ii}^2} - \frac{c_{ii}^1}{\tau_{ii}^2}\right)\frac{\partial\tau_{ii}^2}{\partial\delta_i} + kA_i^2\frac{\partial c_{ii}^1}{\partial\tau_{ji}^2}\frac{\partial\tau_{ji}^2}{\partial\delta_i}\right)} < 1$$

This condition will hold when $\frac{\partial\tau_{ii}^2}{\partial\delta_i}$ is sufficiently large relative to $\frac{\partial\tau_{ij}^2}{\partial\delta_i}$ and $\frac{\partial\tau_{ji}^2}{\partial\delta_i}$. There is no clear relationship between $\frac{\partial A_i^2}{\partial\delta_i}$ and this condition.

Finally, note that the proof for $\frac{N_{ij}^2}{N_{ij}^1}$ is directly analagous to part 1a discussed above.

Part 2: Average domestic revenues for each group are given by

$$\bar{R}_{ii}^g = \frac{L^i}{2\gamma}\frac{1}{k+2}(c_{ii}^g\tau_{ii}^g)^2.$$

Conditional on L_i, γ and k (that is, certain country and industry characteristics) average revenues are increasing in discrimination in both groups because $\tau_{ii}^2 c_{ii}^2 = \tau_{ii}^1 c_{ii}^1$ is increasing in τ_{ii}^2 because c_{ii}^1 is increasing in δ_i. Discrimination cuts the number of firms in the discriminated group but increases the average revenues of those that remain in either group.

Part 3a: The proportion of firms who export in group g can be written as

$$p_{ij}^{g} = \left(c_{jj}^{1}\right)^{k}\left(\tau_{ij}^{g}\right)^{-k}\left(c_{ii}^{g}\right)^{-k}.$$

The derivation for this part of the proposition is directly analagous to the deriviation in the next section.

Part 3b: We can express average export profits across all firms as

$$\bar{R}_{ij}^{g} = \frac{L^{j}}{2\gamma}\frac{1}{k+2}\left(c_{jj}^{1}\right)^{k+2}\left(\tau_{ij}^{g}\right)^{-k}\left(c_{ii}^{g}\right)^{-k}.$$

For group 2, we can make this a function of c_{ii}^{1} by including the coefficient $\left(\tau_{ii}^{2}\right)^{-k}$. The two derivatives we then need are:

$$\begin{aligned}\frac{\partial \bar{R}_{ij}^{1}}{\partial \delta_i} &\propto (k+2)\left(c_{jj}^{1}\right)^{-1}\frac{\partial c_{jj}^{1}}{\partial \delta_i} - k\left(\tau_{ij}^{1}\right)^{-1}\frac{\partial \tau_{ij}^{1}}{\partial \delta_i} - k\left(c_{ii}^{1}\right)^{-1}\frac{\partial c_{ii}^{1}}{\partial \delta_i}\\ &= (k+2)\left(c_{jj}^{1}\right)^{-1}\left(\frac{\partial c_{jj}^{1}}{\partial \tau_{ij}^{2}}\frac{\partial \tau_{ij}^{2}}{\partial \delta_i} + \frac{\partial c_{jj}^{1}}{\partial A_i^{2}}\frac{\partial A_i^{2}}{\partial \delta_i}\right)\\ &\quad -k\left(c_{ii}^{1}\right)^{-1}\left(\frac{\partial c_{ii}^{1}}{\partial \tau_{ii}^{2}}\frac{\partial \tau_{ii}^{2}}{\partial \delta_i} + \frac{\partial c_{ii}^{1}}{\partial A_i^{2}}\frac{\partial A_i^{2}}{\partial \delta_i} + \frac{\partial c_{ii}^{1}}{\partial \tau_{ji}^{2}}\frac{\partial \tau_{ji}^{2}}{\partial \delta_i}\right)\end{aligned}$$

and

$$\begin{aligned}\frac{\partial \bar{R}_{ij}^{2}}{\partial \delta_i} &\propto (k+2)\left(c_{jj}^{1}\right)^{-1}\left(\frac{\partial c_{jj}^{1}}{\partial \tau_{ij}^{2}}\frac{\partial \tau_{ij}^{2}}{\partial \delta_i} + \frac{\partial c_{jj}^{1}}{\partial A_i^{2}}\frac{\partial A_i^{2}}{\partial \delta_i}\right) - k\left(\tau_{ij}^{2}\right)^{-1}\frac{\partial \tau_{ij}^{2}}{\partial \delta_i}\\ &\quad -k\left(c_{ii}^{1}\right)^{-1}\left(\frac{\partial c_{ii}^{1}}{\partial \tau_{ii}^{2}}\frac{\partial \tau_{ii}^{2}}{\partial \delta_i} + \frac{\partial c_{ii}^{1}}{\partial A_i^{2}}\frac{\partial A_i^{2}}{\partial \delta_i} + \frac{\partial c_{ii}^{1}}{\partial \tau_{ji}^{2}}\frac{\partial \tau_{ji}^{2}}{\partial \delta_i}\right) + k\left(\tau_{ii}^{2}\right)^{-1}\frac{\partial \tau_{ii}^{2}}{\partial \delta_i}.\end{aligned}$$

This second derivative captures the four potential impacts of increased discrimination on average export revenues. Increased discrimination: lowers competition in the foreign market; reduces group 2's sales abroad; reduces competition in the home market; and reduces the number (and productivity) of group 2 firms which exist to potentially export. Now, if we consider the difference between $\frac{\partial \bar{R}_{ij}^{2}}{\partial \delta_i}$ and $\frac{\partial \bar{R}_{ij}^{1}}{\partial \delta_i}$ it will be positive as long as $\frac{\partial \tau_{ii}^{2}}{\partial \delta_i}$ is sufficiently large relative to $\frac{\partial \tau_{ij}^{2}}{\partial \delta_i}$.

Relaxing the entry assumptions

Our results above assume that there is a single set of entrants for each group, all of whom have the opportunity of serving both the domestic and foreign market. Moreover, the impacts of discrimination on **a priori** productivity do not depend on whether domestic sales or exporting are undertaken. But it could be that discrimination impacts business operations by especially suppressing, for example, the number of potential exporters. We seek to show that these assumptions can be considerably relaxed to generate similar effects.

To do so, we first define N^g_{eii} as the number of potential domestic-only entrants and N^g_{eij} as the number of potential exporting entrants, each for group g in country i. Similarly, we define m^g_{ii} and m^g_{ij} as the top end of the productivity distributions for these two groups. While this is a relatively dramatic change in model assumptions, it is easily handled in the existing short-run framework developed by Melitz and Ottaviano (2008). Note that key equilibrium assumption in equation (1) remains unchanged, as it is a principal of consumer behavior. The number of firms which profitably produce for any given group is given by

$$N^g_{ij} = N^g_{eij}\left(\frac{c^g_{ij}}{m^g_{ij}}\right)^k$$

and the cutoffs are implicitly defined in the same manner. For example,

$$\frac{\alpha - c^1_{ii}}{\left(c^1_{ii}\right)^{k+1}} = \frac{\eta}{2(k+1)\gamma}\left(\left(\tau^1_{ii}m^1_{ii}\right)^{-k}N^1_{eii} + \left(\tau^2_{ii}m^2_{ii}\right)^{-k}N^2_{eii} + \left(\tau^1_{ji}m^1_{ji}\right)^{-k}N^1_{eij} + \left(\tau^2_{ji}m^2_{ji}\right)^{-k}N^2_{eij}\right).$$

Analagous to above, c^1_{ii} increases when the right hand side decreases. So, c^1_{ii} increases if either N^2_{eii} or N^2_{eij} decrease (that is, when discrimination suppresses enterpreneurship) or when m^2_{ii} or m^2_{eij} (that is, when discrimination harms the *a priori* productivity of firms.)

We now seek to prove a revised version of Proposition 1, part 3a. The relevant ratio of ratios is given by

$$\frac{p^2_{ij}}{p^1_{ij}} = \frac{N^2_{eij}\left(\frac{c^2_{ij}}{m^2_{ij}}\right)^k N^1_{eii}\left(\frac{c^1_{ii}}{m^1_{ii}}\right)^k}{N^2_{eii}\left(\frac{c^2_{ii}}{m^2_{ii}}\right)^k N^1_{eij}\left(\frac{c^1_{ij}}{m^1_{ij}}\right)^k} = \left(\frac{\tau^2_{ij}}{\tau^1_{ij}}\right)^{-k}\left(\frac{\tau^2_{ii}}{\tau^1_{ii}}\right)^{k}\left(\frac{m^2_{ij}}{m^1_{ij}}\right)^{-k}\left(\frac{m^2_{ii}}{m^1_{ii}}\right)^{k}\left(\frac{N^2_{eij}}{N^1_{eij}}\right)\left(\frac{N^2_{eii}}{N^1_{eii}}\right)^{-1}$$

This equation provides the basis for an augmented 'escape through export condition'. Under this model specification, note that the general form of the escape through export condition looks very familiar:

$$\left(\frac{\tau^2_{ij}}{\tau^1_{ij}}\right)^{-k}\left(\frac{\tau^2_{ii}}{\tau^1_{ii}}\right)^{k}\left(\frac{m^2_{ij}}{m^1_{ij}}\right)^{-k}\left(\frac{m^2_{ii}}{m^1_{ii}}\right)^{k}\left(\frac{N^2_{eij}}{N^1_{eij}}\right)\left(\frac{N^2_{eii}}{N^1_{eii}}\right)^{-1} = \left(\frac{\theta^2_{ij}}{\theta^1_{ij}}\right)^{-k}\left(\frac{\theta^2_{ii}}{\theta^1_{ii}}\right)^{k}$$

if we define

$$\theta^g_{ij} = \tau^g_{ij}m^g_{ij}(N^g_{eij})^{-\frac{1}{k}}.$$

However, rather thana function of the variable costs of production, the condition is now also determined by the impact of discrimination on the *a priori* productivity of firms and their numbers. For example, if the burden of discrimination on productivity falls mainly on domestic sales (via m^2_{ii}) than the escape through export condition is more likely to hold; if it falls mainly on export sales (via m^2_{ij}) then it is less likely to hold. Similarly, if discrimination most sharply curtails the number of potential group 2 exporters, than export provides no real escape (or permits escape for only a select few). In contrast, if discrimination is most harmful for the numbers of potential domestic entrants than trade liberalization, for example, could be quite beneficial to groups facing discrimination. Note that the above derivation also applies part 3b of Proposition 1.

Two observations are worth making at this point. First, when discrimination is permitted to differentially effect the number of entrants and their productivity depending on whether they export or not, the empirical implications of this discrimination are identical to variable costs of trade which differ by market served. This provides some additional generality to the interpretation of our results in the main text. The variable costs we describe can also be thought of as facets of discrimination which impact the number of potential entrepreneurs and their productivity, depending on which market they serve. Second, the literature on firm heterogeneity has generally assumed that virtually all exporters serve their domestic market. We find this to be the case in our data, too. So the notion that numbers of potential exporters could be cut without reducing numbers of domestic-serving firms is somewhat strained. For this reason, we maintain our simpler approach in the main text.

Appendix B: Data and Empirical Methods

Data sources, cleaning and imputation

Main firm-level data: The main data source for this study is the World Bank Enterprise Surveys (World Bank, 2013*a*), a firm-level survey which now covers 192 country-years and 128 separate countries and over 100000 manufacturing and services firms. The comprehensive dataset released on January 17, 2014, the latest available at time of writing, is employed.

The main explantory variable is whether the business has at least one female owner (perhaps among several) (WBES survey question *B.4*). A small number of the country surveys (17, all in sub-Saharan Africa) contain more disaggregated measures for the number of women and men owners, and these measures are used to fill in the cruder measure that we employ throughout here, where it is not available. 7 of 192 country-years do not record the gender of the owner, and are removed from the data completely. (These are not included in the figure of 128 total countries above.)

Firms report their total sales. All firms which either refuse to do so or 'don't know' are treated as missing data. Firms also report the percentage of sales from direct exports and indirect exports (sold domestically to third parties who then export the goods). These are used with the total sales figure to construct export sales. We record both direct and total exports, but generally use total exports in all models. Firms which have non-zero exports, whether direct or indirect, are coded as exporters. All sales figures are converted to US dollars using exchange rates averaged over the year the survey data was collected.

Main country-level data: The main country-level indicator of discriminatory institutions employed here is the OECD Social Institutions and Gender Index (OECD, 2013). We use the value of the index averaged across all dimensions. This index is not available for all of countries, so we use a large set of other indices contained in the Gender, Institutions and Development database during the imputation phase (OECD, 2014). These include: the Human Development Index value; the Gender Empowerment index; a measure of the rate of female representation in government and managerial positions; the female literacy rate; estimated female as a proportion of male income; and, the gender-related development index.

Additional firm-level covariates: Here we describe certain cleaning decisions for the firm-level covariates used in Table **??**. A number of firms are recorded as of size '0' or '4' which are not defined in the codebook; these are recoded as size '1' ('3'), the smallest (largest) size that is coded. All other sizes are codes for varieties of missingness or undefined, and so considered missing. A number of firms have missing sizes from the sampling but were coded by size by the screener; the latter are used to replace the former, where missing.

The type of establishment variable (WBES survey question *A.8*) is missing in the majority of the data. However, a huge proportion of these establishments report being not part of a larger firm. They are therefore coded as 'HQ with production and/or sales in this location.' All percentage reported in the percentage private and public ownership variables, that fall outside 0 and 100 are considered missing, as are all respondents who report 'Not applicable' on this question. All remaining coding decisions are provided in the replication code.

Additional country-level covariates: The sources for all additional country-level covariates are described in the main text.

Multiple imputation: The imputed datasets were created in R using software developed by Honaker, King and Blackwell (2011). Five imputed datasets were created. Country-level variables were permitted to vary across firms in the imputation stage; but those imputations were then averaged (by country) to ensure only country-level variation.

Discrimination and other institutions' effects on entrepreneurship

We examine here how discriminatory institutions are related to the overall number of firms. We do so primarily in order to investigate two potential concerns about confounding. First, countries with discriminatory institutions are also likely to have other institutions which tend to impede growth and discourage entrepreneurship. This will reduce the overall number of firms, whether exporters or not. Second, countries with discriminatory institutions may be less open to the global economy, and therefore have fewer exporters. As noted above, there is a substantial literature which argues that openness to the global economy, for a variety of reasons, might contribute to improvements in women's rights, or human rights more generally (Hafner-Burton, 2005; Richards and Gelleny, 2007; Kittilson and Sandholtz, 2006).

The results contained in Table B1 suggest that both types of these patterns are present within our data. Each of the cells in the table is a country-level regression coefficient from a measure of discrimination against women (*Discrimination* on the left side; *Dev index* on the right) on the (log) estimated number of firms of a particular type.[2] The top half consider all firms, and the bottom half only exporting firms. Models 1 and 3 only control for GDP whereas models 2 and 4 contain a full battery of controls likely to explain exposure to international trade and which pick up other types of anti-competitive institutions.[3]

Discriminatory institutions are associated with far fewer women-owned enterprises, which is as we expect. However, discriminatory institutions are also associated with significantly *fewer* men-owned enterprises, and this correlation is especially strong among men-owned exporters. There are several possible explanations for this correlation, but we consider the most likely to be that discrimination against women is associated with other anti-competitive and anti-growth institutions generally, and negatively associated with openness to the global economy, as the literature has emphasized. This may be because more open countries have improved their human rights practices,[4] or because high-discrimination countries have other negative economic and legal institutions which tend to diminish competitiveness among all firms, especially exporters.

[2] We employ our main measure of discrimination, *Discrimination* which is derived from the SIGI index, as well as an alternative measure (*Dev index* which is based on the Gender Development Index. The estimates of the number of firms use the Horvitz-Thompson estimator with the standard enterprise survey weights.

[3] These include: log GDP; the number of documents and time needed to export (World Bank, 2013*b*); the World Bank ease of doing business index; a measure of services and manufacturing as a percentage of GDP; and three geographical measures described in Appendix 2.

[4] Mansfield and Pevehouse (2006) argue that recently democratized states — those likely to grant rights — join international organizations, including trade agreements, to help cement reforms.

Table B1
Discriminatory Institutions and Estimated Number of Firms

	1	2	3	4
Institutions measure:	Discrimination	Discrimination	Dev index	Dev index
All firms ($N_{ii}^1 + N_{ii}^2$)	−1.11	−1.50	−0.89	−1.61
Men-owned (N_{ii}^1)	−0.74	−1.01	−0.57	−1.10
Women-owned (N_{ii}^2)	−2.35	−3.12	−1.67	−2.69
All exporters ($N_{ij}^1 + N_{ij}^2$)	−2.13	−1.72	−2.27	−2.44
Men-owned (N_{ij}^1)	−1.75	−1.31	−1.86	−1.89
Women-owned (N_{ij}^2)	−3.08	−2.78	−2.94	−3.01

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$. All DVs logged. Each cell in this table presents the coefficient on a measure of discrimination (either *Discriminatoin* or *Dev index*) from a regression of absolute number of firms on discrimination. The number of firms is estimated using the Horvitz-Thompson estimator.

The most important thing to note is that our tests of the impact of discrimination are quite robust to the forms of confounding described above. The reason for is this simple: our main tests of the escape through export condition (reported in Figure **??**, and discussed later) employ *ratios* rather than absolute numbers. To illustrate, suppose that discriminatory institutions are associated with other country-level features that tend to suppress exports for both men- and women-owned firms. The absolute numbers of exporters for both groups will naturally be lower, but it is easy to show within our model that the relative numbers of the two groups will be unchanged as long as the extra costs imposed by these 'other' institutions raise the costs for men- and women-owned firms to the same degree.[5] For reasons described above, our statistical models primarily use differences in rates of exporting between men- and women-owned enterprises (as in model 3a). These models are unaffected by any negative correlation between discriminatory institutions and the overall number of firms. However, the coefficient for any measure of discrimination will tend to be pushed towards zero to the extent that there is a negative relationship between export exposure and discriminatory institutions. This pushes against us finding a statistically significant result, but we think that is a reasonable price to pay in order to take advantage of the stability of our preferred dependent variables, which use differences in ratios.

Finally, and on a substantive note, the results in Table B1 suggest that taking advantage of any 'escape through export' effect of trade liberalization may require significant additional investment in export facilitation. This may include export infrastructure like ports, roads and airports; assistance with export financing and financial intermediation; and, reduction in customs and shipping fees and blockages. This injects a note of caution into any overly sunny predictions about the benefits of globalization for women-owned firms, because taking full advantage of those potential benefits will require significant investment in infrastructure and economic institutions linked to export competitiveness.

[5] If they differentially affected the two groups, they would simply change the costs of discrimination, and so these effects are accounted for in our modeling framework.

Illustrating the structure of costs: identifying k

The parameter k is partially identifiable from the data, using the following steps. First, note that $\ln N_{ii}^2 - \ln N_{ii}^1 = k \ln \tau_{ii}^1 - k \ln \tau_{ii}^2$. Then estimate the following version of country-level model 1a:

$$\ln N_{ii}^2 - \ln N_{ii}^1 = \beta_0 + \beta_1 \ln(1 + \delta_i)$$

and then note that by differentiating with respect to δ_i we get $k = -\beta_1 \frac{\partial \ln(1+\delta_i)}{\partial \ln \tau_{ii}^1}$. (The use of $1 + \delta_i$ is preferable here because it puts our measure of discrimination on a scale, from 1 to roughly 2, rather than 0 to 1, where percentage increases can be sensibly interpreted and which is comparable to the scale for $\tau_{ii}^2 \geq 1$. Adding one also ensures that the domain of the predictor does not extend to $-\infty$ for countries with the lowest scores on our index.) k is therefore identifiable from the data as long as we are willing to make an assumption about the elasticity of τ_{ii}^2 with respect to $1 + \delta_i$, or its inverse, which we will define here as $\epsilon_{ii}^{\tau,\delta}$.

What values for $\epsilon_{ii}^{\tau,\delta}$ will be plausible? To answer this, consider that our measure of discrimination ranges approximately form 1 to 2 so a 100% increase in the discrimination measure means moving from the lowest to the highest level of discrimination. We have already found that this increase could increase the ratio of men- to women-owned businesses from around 1.5-to-1 to around 4-to-1, so it seems likely that a 100% increase in the discrimination measure is creating at the very least least a 30% increase in costs for women-owned enterprises, and probably something very much larger. Taking our range of plausible elasticities to be $[.50, 3.33]$, then the results of the model estimated suggest that $k \in [1.05, 7.02]$. The figure of $k = 3.4$ chosen by Bernard, Redding and Schott (2007) fits nicely into this range, so we proceed with that to illustrate the results.

Placebo Tests

This section provides a number of placebo tests to show that institutions other than gender discrimination are not driving our findings. A series of other institutions are introduced as alternative explanatory variables for model 3a of Table 2.

Table B2
Placebo tests.

	Placebo tests for Model 3a						
	1	2	3	4	5	6	7
Int.	−0.005	0.026	0.031	0.010	−0.246	−0.002	0.035
	(0.010)	(0.010)	(0.038)	(0.019)	(0.099)	(0.019)	(0.021)
Discrimination	0.085						
	(0.024)						
Polity score		−0.001					
		(0.001)					
Index of Prop Rights			−0.004				
			(0.012)				
Index of Fin Rights				0.002			
				(0.003)			
Contract enforcement					0.042		
					(0.016)		
Ease of business						0.000	
						(0.000)	
CPI Index							−0.004
							(0.006)
N	128	128	128	128	128	128	128
Adj. R^2	0.10	0.01	0.00	0.00	0.05	0.01	0.01
F-test	13.25	1.02	0.12	0.36	7.26	1.88	0.64

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$. Null hypothesis for intercepts are that $\beta_j = 1$ otherwise that $\beta_j = 0$.

Models with survey weighting

We also check the robustness of our empirical tests using the survey weights from the WBES as well as augmented survey weights. The WBES stratified the sample by sector of activity, size and geographic location. For all countries, the survey is representative of manufacturing firms; in larger countries the WBES created samples that are representative for certain non-manufacturing industries as well. The main concern for this study was the stratification based on firm size. The WBES oversampled large firms to make sure that they captured data on these firms. Because export activity is correlated with firm size, the oversample may have biased our results towards finding more export firms. As we argue that, post discrimination, women- and men-owned firms should have the same average size, we have no reason to think that this oversampling should affect the number of women- and men-owned firms differently. Nonetheless, as a robustness check we re-examine our main empirical tests using the survey weights (Tables B3, B4, B5, and B6).

We also re-examine our main empirical tests using an adjusted set of survey weights. The WBES survey weights have a large amount of variance. Using China as an example, the minimum weight on a firm is 1.48 and the maximum is 13480, while the mean is about 346. The survey literature suggests that large weights should be truncated at about 5 times the mean weight; in the case of China, this would be at 1,730. Large survey weights increase the possibility that outliers will unduly influence the results and also likely inflate the variance (DeBell and Krosnick, 2009, 8).

In order to trim the survey weights while maintaining the correct number of firms in the data we take two steps. First, we remove all variation in the survey weights that is attributable to survey stratification by country region, leaving only weighting that is the result of stratification by firm size and industry. To do so, we sum up the weights for all firms in the same size and industry strata (ignoring all information about country region), and divide by the total number of observations within that stratum. Second, for countries with a coefficient of variation on the weights greater than .5, we rebalance the weights so that the coefficient of variation is equal to .5. This increases smaller weights and reduces larger weights while maintaining the same overall population figures for each country. To illustrate the impact of these steps, the largest weight for China becomes 1314 and the smallest is 212.6, a ratio of about 6 : 1.

We report all models contained in the main text with both the original survey weights provided by the WBES and our highly truncated weights in Tables B3, B4, B5, and B6. These tables show that our core results not driven by the non-use of weights in the main text (or by the choice among weights). This suggests that the sampling procedure did not differentially affect the inclusion of women- and men-owned firms, and that the effects of discriminatory institutions did not systematically vary across the survey strata in a way that would lead to biased conclusions in the unweighted results.

Table B3
This table recreates Table ?? using the survey weights furnished by the WBES in the top half and our own truncated weights in the bottom half.

	Country-level models					
	1a	1b	2	3a	3b	3c
Outcome	Number of Firms $N^W - N^M$	Number of Exporters $N_X^W - N_X^M$	Domestic Revenues $\overline{R}^W - \overline{R}^M$	Proportion Exporters $p_X^W - p_X^M$	Export Revenue $\overline{R}_X^W - \overline{R}_X^M$	Pr. Revenue from Export $\Pi_X^W - \Pi_X^M$
Using original weights						
Int.	−0.269	−0.240	−0.139	0.005	−0.008	0.001
	(0.092)	(0.123)	(0.081)	(0.012)	(0.151)	(0.007)
Discrimination	−1.659	−1.397	0.153	0.067	0.898	0.041
	(0.224)	(0.292)	(0.206)	(0.029)	(0.366)	(0.019)
N	128	128	128	128	128	128
Adj. R^2	0.31	0.16	0.01	0.05	0.05	0.04
F-test	55.49	23.97	0.81	6.05	6.38	5.81
Using adjusted weights						
Int.	−0.261	−0.251	−0.140	−0.001	−0.102	−0.003
	(0.088)	(0.106)	(0.071)	(0.010)	(0.137)	(0.006)
Discrimination	−1.624	−1.269	0.207	0.074	1.040	0.048
	(0.214)	(0.256)	(0.176)	(0.024)	(0.339)	(0.016)
N	128	128	128	128	128	128
Adj. R^2	0.32	0.16	0.01	0.07	0.08	0.08
F-test	57.99	24.76	1.68	9.54	10.36	10.31

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. Number of firms and exporters are logged; revenues are logged before averaging.

Table B4
This table recreates Table ?? using the survey weights furnished by the WBES in the top half and our own truncated weights in the bottom half.

	Firm-Level Models			
	2	3a	3b	3c
Outcome	Domestic Revenues R_l	Export Status e_l	Export Revenue R_{Xl}	Pr. Revenue from Export Π_{Xl}
Using original weights				
Int.	12.658	0.286	3.708	10.279
	(0.055)	(0.010)	(0.115)	(0.474)
Woman-owned	−2.302	−0.150	−2.034	−4.470
	(0.087)	(0.006)	(0.075)	(0.214)
Discrimination	−0.155	−0.039	−0.539	−1.872
	(0.033)	(0.011)	(0.134)	(0.125)
Disc. · Woman-owned	−0.375	0.185	2.441	6.238
	(0.063)	(0.020)	(0.207)	(0.240)
N	102424	102424	102424	102424
(Cond.) R^2	0.08	0.02	0.02	0.02
LRT test	229.06	496.33	507.61	232.60
Using adjusted weights				
Int.	12.681	0.315	4.109	11.004
	(0.044)	(0.007)	(0.068)	(0.372)
Woman-owned	−2.012	−0.160	−2.177	−4.764
	(0.085)	(0.005)	(0.068)	(0.215)
Discrimination	−0.081	−0.030	−0.455	−1.715
	(0.031)	(0.003)	(0.044)	(0.066)
Disc. · Woman-owned	−0.282	0.154	2.156	5.534
	(0.048)	(0.006)	(0.070)	(0.132)
N	102424	102424	102424	102424
(Cond.) R^2	0.06	0.02	0.02	0.01
LRT test	92.34	348.92	379.87	164.00

Notes: Linear models with industry and country random effects. $^{***}p < 0.001, ^{**}p < 0.01, ^{*}p < 0.05, ^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. The DVs in models 2 and 3b are logged.

Table B5
This table recreates Table ?? using the survey weights furnished by the WBES.

	Subset analysis for Model 3a					
	1	2	3	4	5	6
Subset	All Firms	Top Managers	Majority-Owned	Singly-Owned	SMEs	Excluding Subsidiaries
Country-level models, using original weights						
Int.	0.005	−0.041	−0.002	−0.018	0.003	0.011
	(0.012)	(0.011)	(0.014)	(0.026)	(0.012)	(0.014)
Discrimination	0.067	0.056	0.059	0.091	0.058	0.065
	(0.029)	(0.025)	(0.034)	(0.068)	(0.029)	(0.035)
N	128	128	128	123	128	128
Adj. R^2	0.04	0.03	0.03	0.01	0.03	0.03
F-test	6.05	5.22	4.36	2.44	5.34	4.46
Firm-level models, using original weights						
Int.	0.286	0.290	0.261	0.226	0.248	0.271
	(0.010)	(0.009)	(0.005)	(0.005)	(0.008)	(0.006)
g_k	−0.150	−0.144	−0.155	−0.136	−0.145	−0.152
	(0.006)	(0.005)	(0.006)	(0.009)	(0.006)	(0.006)
δ_i	−0.039	−0.081	−0.061	−0.024	−0.037	−0.022
	(0.011)	(0.002)	(0.007)	(0.006)	(0.012)	(0.008)
$\delta_i \cdot g_k$	0.185	0.192	0.184	0.074	0.179	0.152
	(0.020)	(0.004)	(0.014)	(0.013)	(0.021)	(0.015)
N	102424	102424	74080	43345	83116	85893
(Cond.) R^2	0.02	0.02	0.02	0.02	0.02	0.02
LRT test	496.33	360.03	287.46	18.12	410.04	362.29

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$. Null hypothesis for intercepts are that $\beta_j = 1$ otherwise that $\beta_j = 0$.

Table B6
This table recreates Table ?? using our truncated survey weights.

	Subset analysis for Model 3a					
	1	2	3	4	5	6
Subset	All Firms	Top Managers	Majority-Owned	Singly-Owned	SMEs	Excluding Subsidiaries
Country-level models, using adjusted weights						
Int.	−0.001	−0.046	−0.007	−0.014	0.000	0.004
	(0.010)	(0.010)	(0.010)	(0.022)	(0.009)	(0.012)
Discrimination	0.074	0.075	0.069	0.072	0.058	0.069
	(0.024)	(0.022)	(0.025)	(0.066)	(0.023)	(0.029)
N	128	128	128	123	128	128
Adj. R^2	0.06	0.08	0.05	0.01	0.05	0.04
F-test	9.54	12.03	8.02	2.07	7.26	6.43
Firm-level models, using adjusted weights						
Int.	0.315	0.321	0.296	0.253	0.254	0.296
	(0.007)	(0.007)	(0.023)	(0.005)	(0.005)	(0.005)
g_k	−0.160	−0.158	−0.182	−0.152	−0.141	−0.164
	(0.005)	(0.005)	(0.031)	(0.007)	(0.005)	(0.005)
δ_i	−0.030	−0.082	−0.026	−0.027	−0.024	−0.024
	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
$\delta_i \cdot g_k$	0.154	0.187	0.123	0.112	0.141	0.143
	(0.006)	(0.003)	(0.012)	(0.008)	(0.006)	(0.007)
N	102424	102424	74080	43345	83116	85893
(Cond.) R^2	0.02	0.02	0.13	0.02	0.02	0.02
LRT test	348.92	304.79	278442.52	36.71	282.77	286.64

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$. Null hypothesis for intercepts are that $\beta_j = 1$ otherwise that $\beta_j = 0$.

Appendix C: Replication of Models without Imputation

In order to check that our findings are not unduly influenced by the specification of the imputation model, we replicate our main findings without any imputation whatsover. All observations with missing data are deleted.

Table C1
Replication of Table ?? without multiple imputation.

	1a	1b	2	3a	3b	3c
Outcome	Number of Firms $N^W - N^M$	Number of Exporters $N_X^W - N_X^M$	Domestic Revenues $\overline{R}^W - \overline{R}^M$	Proportion Exporters $p_X^W - p_X^M$	Export Revenue $\overline{R}_X^W - \overline{R}_X^M$	Pr. Revenue from Export $\Pi_X^W - \Pi_X^M$
Int.	−0.246	−0.318	−0.080	−0.009	−0.258	−0.010
	(0.102)	(0.096)	(0.098)	(0.012)	(0.181)	(0.008)
Discrimination	−1.617	−0.865	0.093	0.073	1.204	0.054
	(0.216)	(0.204)	(0.207)	(0.025)	(0.384)	(0.018)
N	83	83	83	83	83	83
Adj. R^2	0.41	0.18	0.00	0.10	0.11	0.10
F-test	55.80	18.01	0.20	8.71	9.85	9.42

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. Number of firms and exporters are logged; revenues are logged before averaging.

Table C2
Replication of Table ?? without multiple imputation.

	2	3a	3b	3c
Outcome	Domestic Revenues R_l	Export Status e_l	Export Revenue R_{Xl}	Pr. Revenue from Export Π_{Xl}
Int.	12.538	0.296	3.841	8.285
	(0.273)	(0.024)	(0.323)	(1.132)
Woman-owned	−0.920	−0.164	−2.090	−2.586
	(0.043)	(0.005)	(0.065)	(0.230)
Discrimination	−0.047	−0.027	−0.491	−2.137
	(0.040)	(0.004)	(0.060)	(0.214)
Disc. · Woman-owned	0.475	0.146	2.247	6.715
	(0.089)	(0.010)	(0.132)	(0.484)
N	66594	66594	66594	74585
(Cond.) R^2	0.11	0.08	0.08	0.06
LRT test	8677.44	2942.61	11038.87	16348.84

Notes: Linear models with industry and country random effects. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. The DVs in models 2 and 3b are logged.

Table C3
Replication of Table ?? without multiple imputation.

	Country-level models					
	1a	1b	2	3a	3b	3c
Outcome	Number of Firms $N^W - N^M$	Number of Exporters $N_X^W - N_X^M$	Domestic Revenues $\overline{R}^W - \overline{R}^M$	Proportion Exporters $p_X^W - p_X^M$	Export Revenue $\overline{R}_X^W - \overline{R}_X^M$	Pr. Revenue from Export $\Pi_X^W - \Pi_X^M$
Int.	−0.376	−0.027	−0.740	−0.158	−2.402	−0.087
	(2.164)	(2.021)	(2.034)	(0.242)	(3.799)	(0.179)
Discrimination	−1.519	−0.549	−0.206	0.165	2.533	0.107
	(0.437)	(0.409)	(0.411)	(0.049)	(0.768)	(0.036)
ln GDP pc	−0.321	−0.118	−0.056	−0.000	0.007	0.003
	(0.159)	(0.149)	(0.150)	(0.018)	(0.280)	(0.013)
GDP growth	0.007	−0.006	0.005	−0.001	−0.012	−0.000
	(0.023)	(0.021)	(0.021)	(0.003)	(0.040)	(0.002)
Exp/GDP	0.132	−0.398	0.392	−0.080	−1.498	−0.075
	(0.929)	(0.867)	(0.873)	(0.104)	(1.631)	(0.077)
Imp/GDP	0.205	0.758	0.229	0.097	1.508	0.060
	(0.817)	(0.763)	(0.768)	(0.092)	(1.435)	(0.068)
Docs to exp	−0.438	−0.666	0.814	−0.059	−0.779	−0.051
	(0.490)	(0.457)	(0.461)	(0.055)	(0.860)	(0.041)
Time to exp	−0.005	0.166	−0.278	0.016	0.296	0.019
	(0.245)	(0.228)	(0.230)	(0.027)	(0.430)	(0.020)
Ease of bus	0.445	−0.146	−0.146	−0.102	−1.419	−0.060
	(0.475)	(0.444)	(0.447)	(0.053)	(0.835)	(0.039)
Serv/GDP	3.391	2.385	0.045	0.285	4.374	0.186
	(1.406)	(1.313)	(1.322)	(0.158)	(2.470)	(0.116)
Mnfr/GDP	1.413	0.511	−1.194	0.185	2.728	0.116
	(1.388)	(1.296)	(1.305)	(0.155)	(2.437)	(0.115)
Waterways	−0.203	−0.211	0.443	−0.044	−0.832	−0.040
	(0.394)	(0.368)	(0.370)	(0.044)	(0.692)	(0.033)
Prox to water	0.060	0.032	0.059	−0.005	−0.113	−0.004
	(0.116)	(0.108)	(0.109)	(0.013)	(0.204)	(0.010)
Polity score	−0.018	−0.026	−0.007	−0.003	−0.042	−0.002
	(0.017)	(0.016)	(0.016)	(0.002)	(0.030)	(0.001)
Contract enforcement	0.017	−0.052	0.043	0.019	0.233	0.007
	(0.203)	(0.190)	(0.191)	(0.023)	(0.357)	(0.017)
CPI Index	0.124	0.038	−0.076	−0.011	−0.159	−0.006
	(0.090)	(0.084)	(0.085)	(0.010)	(0.159)	(0.007)
N	71	71	71	71	71	71
Adj. R^2	0.42	0.30	0.17	0.30	0.29	0.26
F-test	2.67	1.57	0.73	1.61	1.52	1.29

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. Number of firms and exporters are logged; revenues are logged before averaging.

Table C4
Replication of Table ?? without multiple imputation.

	Subset analysis for Model 3a					
	1	2	3	4	5	6
Subset	All Firms	Top Managers	Majority-Owned	Singly-Owned	SMEs	Excluding Subsidiaries
Country-level models						
Int.	−0.009	−0.062	−0.021	−0.000	−0.009	−0.004
	(0.012)	(0.012)	(0.017)	(0.028)	(0.009)	(0.012)
Discrimination	0.073	0.103	0.062	0.070	0.061	0.070
	(0.025)	(0.026)	(0.035)	(0.062)	(0.019)	(0.026)
N	83	68	83	77	83	83
Adj. R^2	0.10	0.20	0.04	0.02	0.11	0.08
F-test	8.71	16.03	3.17	1.25	9.81	7.45
Firm-level models						
Int.	0.296	0.057	0.295	0.215	0.209	0.281
	(0.024)	(0.013)	(0.023)	(0.018)	(0.016)	(0.023)
Woman-owned	−0.164	−0.009	−0.200	−0.148	−0.127	−0.194
	(0.005)	(0.004)	(0.006)	(0.006)	(0.005)	(0.006)
Discrimination	−0.027	0.356	−0.024	0.006	−0.010	−0.021
	(0.004)	(0.004)	(0.006)	(0.007)	(0.004)	(0.005)
Disc. · Woman-owned	0.146	−0.218	0.129	0.030	0.085	0.135
	(0.010)	(0.009)	(0.014)	(0.016)	(0.010)	(0.011)
N	66594	53713	40643	28051	53843	54784
(Cond.) R^2	0.08	0.19	0.09	0.07	0.05	0.08
LRT test	2942.61	10784.05	1724.82	1062.91	1603.89	2548.72

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$. Null hypothesis for intercepts are that $\beta_j = 1$ otherwise that $\beta_j = 0$.

Appendix D: Replication of Models with Manufacturers Only

This section replicates all of the tables presented in the paper using only manufacturing firms. Including only the manufacturing firms lowers the total number of firm-level observations from 100284 to 56978. The first set of tables (which are numbered D1, D2, D3, D4, and D5) replicate the tables contained within the main text of the article. We find that all of our core country- and firm-level results are very similar in statistical significance and comparable in size in Tables D1 and D2, respectively. The subset analyses conducted in in Table D5 also look very similar, although significance is weakened somewhat by the loss of country observations; the firm-level results are very similar.

Table D1
This table replicates Table ?? using manufacturing firms only.

	Country-level models					
	1a	1b	2	3a	3b	3c
Outcome	Number of Firms $N^W - N^M$	Number of Exporters $N_X^W - N_X^M$	Domestic Revenues $\overline{R}^W - \overline{R}^M$	Proportion Exporters $p_X^W - p_X^M$	Export Revenue $\overline{R}_X^W - \overline{R}_X^M$	Pr. Revenue from Export $\Pi_X^W - \Pi_X^M$
Int.	−0.355	−0.314	0.059	0.013	−0.011	−0.002
	(0.087)	(0.092)	(0.128)	(0.015)	(0.199)	(0.009)
Discrimination	−1.434	−0.798	−0.162	0.086	1.328	0.061
	(0.219)	(0.229)	(0.339)	(0.037)	(0.483)	(0.022)
N	128	128	128	128	128	128
Adj. R^2	0.26	0.10	0.00	0.12	0.06	0.08
F-test	44.48	13.47	0.63	16.76	8.55	10.42

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. Number of firms and exporters are logged; revenues are logged before averaging.

Table D2
This table replicates Table ?? using manufacturing firms only.

	Firm-Level Models			
	2	3a	3b	3c
Outcome	Domestic Revenues R_l	Export Status e_l	Export Revenue R_{Xl}	Pr. Revenue from Export Π_{Xl}
Int.	12.367	0.387	5.105	14.135
	(0.300)	(0.025)	(0.346)	(1.425)
Woman-owned	−1.557	−0.294	−4.114	−12.421
	(0.544)	(0.045)	(0.626)	(2.414)
Discrimination	0.074	−0.029	−0.591	−3.347
	(0.052)	(0.006)	(0.077)	(0.313)
Disc. · Woman-owned	−0.179	0.191	2.899	10.427
	(0.106)	(0.014)	(0.176)	(0.720)
N	57089	57089	57089	57089
(Cond.) R^2	0.27	0.15	0.16	0.14
LRT test	5.29	266.66	316.11	232.14

Notes: Linear models with industry and country random effects. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. The DVs in models 2 and 3b are logged.

Table D3
This table replicates Table ?? using manufacturing firms.

	Country-level models					
	1a	1b	2	3a	3b	3c
Outcome	Number of Firms $N^W - N^M$	Number of Exporters $N_X^W - N_X^M$	Domestic Revenues $\overline{R}^W - \overline{R}^M$	Proportion Exporters $p_X^W - p_X^M$	Export Revenue $\overline{R}_X^W - \overline{R}_X^M$	Pr. Revenue from Export $\Pi_X^W - \Pi_X^M$
Int.	2.389	4.373	−1.173	0.412	5.084	0.265
	(1.835)	(1.883)	(2.674)	(0.325)	(4.268)	(0.198)
Discrimination	−1.617	−0.984	0.256	0.082	1.284	0.053
	(0.312)	(0.302)	(0.495)	(0.050)	(0.700)	(0.031)
ln GDP pc	−0.201	−0.225	0.010	−0.001	0.125	0.002
	(0.134)	(0.128)	(0.184)	(0.021)	(0.300)	(0.013)
GDP growth	0.010	−0.002	−0.016	0.000	0.008	0.000
	(0.019)	(0.018)	(0.028)	(0.003)	(0.047)	(0.002)
Exp/GDP	0.513	0.599	0.258	−0.022	−1.198	−0.032
	(0.691)	(0.675)	(1.094)	(0.112)	(1.644)	(0.073)
Imp/GDP	−0.806	−1.140	0.554	−0.093	−0.370	−0.052
	(0.577)	(0.586)	(1.013)	(0.098)	(1.452)	(0.069)
Docs to exp	−0.255	−0.151	0.385	−0.036	−0.537	−0.027
	(0.400)	(0.387)	(0.528)	(0.066)	(0.918)	(0.038)
Time to exp	0.301	0.239	−0.104	−0.004	−0.322	−0.004
	(0.197)	(0.185)	(0.269)	(0.031)	(0.430)	(0.018)
Ease of bus	−0.275	−0.213	−0.333	0.056	0.607	0.024
	(0.474)	(0.472)	(0.679)	(0.085)	(1.089)	(0.048)
Serv/GDP	−0.851	−1.626	1.712	−0.043	−0.817	−0.056
	(1.186)	(1.177)	(1.671)	(0.198)	(2.745)	(0.123)
Mnfr/GDP	−1.026	−1.466	−0.455	−0.063	−1.173	−0.056
	(1.037)	(1.029)	(1.640)	(0.191)	(2.632)	(0.129)
Waterways	−0.178	−0.136	−0.190	−0.018	−0.182	−0.008
	(0.304)	(0.289)	(0.415)	(0.050)	(0.722)	(0.030)
Prox to water	−0.170	−0.265	−0.017	−0.030	−0.272	−0.014
	(0.089)	(0.087)	(0.121)	(0.014)	(0.196)	(0.008)
Polity score	0.008	0.011	−0.023	−0.003	−0.046	−0.001
	(0.017)	(0.016)	(0.029)	(0.003)	(0.038)	(0.002)
Ind. of property rights	0.165	0.235	0.155	0.018	0.157	0.007
	(0.135)	(0.128)	(0.193)	(0.021)	(0.294)	(0.012)
Ind. of financial rights	0.008	0.007	−0.042	0.008	0.105	0.005
	(0.038)	(0.036)	(0.051)	(0.006)	(0.083)	(0.003)
Contract enforcement	−0.091	−0.192	0.006	−0.018	−0.204	−0.012
	(0.164)	(0.158)	(0.231)	(0.026)	(0.359)	(0.016)
CPI Index	0.082	0.016	−0.117	−0.017	−0.269	−0.009
	(0.077)	(0.075)	(0.109)	(0.013)	(0.173)	(0.007)
N	128	128	128	128	128	128
Adj. R^2	0.39	0.35	0.13	0.26	0.20	0.22
F-test	4.08	3.51	0.93	2.25	1.58	1.88

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. Number of firms and exporters are logged; revenues are logged before averaging.

Table D4
This table replicates Table ?? using manufacturing firms.

	Firm-Level Models			
	2	3a	3b	3c
Outcome	Domestic Revenues R_l	Export Status e_l	Export Revenue R_{Xl}	Pr. Revenue from Export Π_{Xl}
Int.	13.188	0.344	4.668	7.793
	(0.334)	(0.032)	(0.404)	(1.777)
Discrimination	−0.827	−0.167	−2.256	−7.664
	(0.554)	(0.040)	(0.554)	(2.171)
Woman-owned	0.016	−0.009	−0.245	−1.806
	(0.051)	(0.006)	(0.069)	(0.297)
Disc. · Woman-owned	−0.528	0.081	1.195	4.847
	(0.106)	(0.013)	(0.159)	(0.687)
Est. Type: HQ with prod.	−0.192	−0.017	−0.318	−0.610
	(0.071)	(0.009)	(0.098)	(0.513)
Est. Type: Non-HQ, Alone	−0.137	−0.012	−0.182	0.046
	(0.103)	(0.012)	(0.152)	(0.802)
Est Type: Non-HQ, Together	−0.303	−0.032	−0.549	−0.687
	(0.143)	(0.024)	(0.253)	(0.969)
Status: Private LLC	−0.574	−0.004	−0.392	1.023
	(0.071)	(0.009)	(0.122)	(0.481)
Status: Sole Proprietorship	−0.934	−0.092	−1.599	−3.041
	(0.083)	(0.010)	(0.140)	(0.549)
Status: Partnership	−0.746	−0.058	−1.114	−1.450
	(0.082)	(0.010)	(0.144)	(0.555)
Status: Other	−0.714	0.002	−0.300	0.556
	(0.138)	(0.015)	(0.197)	(0.824)
Size: Medium	1.077	0.133	1.813	4.762
	(0.036)	(0.004)	(0.054)	(0.228)
Size: Large	1.753	0.365	5.763	17.098
	(0.047)	(0.005)	(0.067)	(0.284)
Per private domestic owned	0.002	0.000	0.001	−0.002
	(0.001)	(0.000)	(0.002)	(0.009)
Per private foreign owned	−0.007	0.002	0.038	0.160
	(0.001)	(0.000)	(0.002)	(0.010)
Per largest owner	−0.001	−0.000	−0.005	−0.019
	(0.001)	(0.000)	(0.001)	(0.005)
Year founded - 1950	−0.022	−0.001	−0.015	0.053
	(0.001)	(0.000)	(0.001)	(0.006)
Capital region	0.206	0.008	0.037	−1.358
	(0.042)	(0.005)	(0.061)	(0.258)
N	55732	55732	55732	55732
(Cond.) R^2	0.31	0.28	0.33	0.24
LRT test	11479.27	11440.91	22486.03	20388.86

Notes: Linear models with industry and country random effects. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$ from a two-tailed test with null hypothesis $\beta_j = 0$. The DVs in models 2 and 3b are logged.

Table D5
This table replicates Table ?? using manufacturing firms only.

	Subset analysis for Model 3a					
	1	2	3	4	5	6
Subset	All Firms	Top Managers	Majority-Owned	Singly-Owned	SMEs	Excluding Subsidiaries
Country-level models:						
Int.	0.013	−0.028	0.006	−0.001	0.012	0.030
	(0.015)	(0.022)	(0.016)	(0.027)	(0.014)	(0.020)
Discrimination	0.086	0.041	0.098	0.097	0.075	0.084
	(0.037)	(0.053)	(0.042)	(0.075)	(0.035)	(0.051)
N	128	128	128	115	128	128
Adj. R^2	0.05	−0.00	0.04	0.01	0.04	0.02
F-test	7.27	0.84	6.98	2.42	5.95	3.63
Firm-level models						
Int.	0.387	0.392	0.371	0.338	0.313	0.368
	(0.025)	(0.025)	(0.024)	(0.024)	(0.022)	(0.024)
Woman-owned	−0.294	−0.282	−0.297	−0.260	−0.241	−0.295
	(0.045)	(0.045)	(0.045)	(0.052)	(0.041)	(0.045)
Discrimination	−0.029	−0.082	−0.027	−0.009	−0.009	−0.022
	(0.006)	(0.009)	(0.007)	(0.010)	(0.006)	(0.006)
Disc. · Woman-owned	0.191	0.201	0.161	0.088	0.112	0.182
	(0.014)	(0.021)	(0.018)	(0.026)	(0.014)	(0.015)
N	57089	57089	40056	22342	43881	48330
(Cond.) R^2	0.15	0.15	0.16	0.19	0.15	0.16
LRT test	266.66	180.80	115.89	20.87	97.31	219.79

Notes: All models OLS. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.10$. Null hypothesis for intercepts are that $\beta_j = 1$ otherwise that $\beta_j = 0$.

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