NOT FOR PUBLICATION

Online Appendix for
"Institutions and Export Dynamics"

Luis Araujo

Michigan State University and São Paulo School of Economics-FGV

Giordano Mion

London School of Economics, CEPR and CEP

Emanuel Ornelas

London School of Economics, CEPR and CEP

January 8, 2012

Abstract

This online Appendix has two parts. One contains extensions of the model in the main text. First, we introduce stochastic demand shocks to allow "bad outcomes" to arise despite the actions of distributors. Second, we consider that distributors and producers return to the pool of inactive agents after their partnerships are terminated. The other part of the Appendix has supplementary empirical results, obtained from restricted samples and using different controls, as well additional controls estimates and descriptive statistics.

A-1 Extensions of the Model

A-1.1 Exogenous "bad outcomes": demand shocks

We assume in our model that "bad outcomes" from the perspective of the exporter arise only when the distributor defaults on the contract. An implication of that assumption is that, after the realization of any outcome where the producer receives less than $R(Q)$ from the distributor, he immediately concludes that the distributor is myopic. But while very convenient analytically, this assumption seems too strong. Here we relax it by considering an environment that is exactly as in our model but with stochastic demand.

Specifically, we assume that the demand for each product in each period can be either "high" or "low". If demand is high, it generates revenue $R(q)$. If demand is low, then we normalize it so that revenue is zero. The probability that demand is high is $\gamma \in [0, 1]$. Distributors observe demand shocks, but producers do not. Thus, if a producer does not receive any revenue in a certain period, he does not know whether the demand for his product was low or whether the distributor chose to default on their contract. When a producer does not receive any revenue, we say that he experienced a bad outcome.

In this modified environment, consider a partnership between a producer and a distributor. Under the assumption that a patient distributor never defaults and a myopic distributor defaults whenever he has a chance to do so, the producer's current expected profit is given by

$$\pi(q, \theta; \lambda, \gamma, c, \kappa) = -cq + \gamma[\theta\lambda + 1 - \theta]R(q) - \kappa.$$

After a contract is signed, the producer's optimal production decision is given by $Q^\gamma = Q(\theta; \lambda, \gamma, c)$, where

$$-c + \gamma[\theta\lambda + 1 - \theta]R'(Q^\gamma) = 0.$$

Analogously to assumptions $A1$, $A2$ and $A3$, we now have

$$\begin{aligned} A1' &: \quad Q(1; \lambda, \gamma, c) > 0, \\ A2' &: \quad \pi(Q^\gamma, 1; \lambda, \gamma, c, \kappa) < 0, \\ A3' &: \quad \pi(Q^\gamma, 0; \lambda, \gamma, c, \kappa) > 0, \end{aligned}$$

with the interpretation of each assumption being the same as in the benchmark case.

The producer's belief evolves over time according to his experience within the partnership. Let $\theta_k(C, \theta_0)$ be the belief that the distributor is myopic in a partnership that started at date t and is currently in period $t + k$, where the producer has observed C bad outcomes and his initial belief that the distributor is myopic is θ_0. Under the assumed strategy for the distributor, the exporter's belief is given by

$$\theta_k(C) = \frac{(1 - \lambda\gamma)^C (\lambda\gamma)^{k-C} \theta_0}{(1 - \lambda\gamma)^C (\lambda\gamma)^{k-C} \theta_0 + (1 - \gamma)^C \gamma^{k-C} (1 - \theta_0)}, \tag{A1}$$

NOT FOR PUBLICATION

Notice that $\theta_k(C)$ is increasing in C, so an experience with more bad outcomes leads to a higher belief that the distributor is myopic.

Consider now a producer at some date t with a belief θ who needs to decide whether to maintain an ongoing partnership. His flow payoff is equal to the current profit $\pi(\theta)$, where

$$\pi(\theta) = -cQ^{\gamma} + \gamma[\theta\lambda + 1 - \theta]R(Q^{\gamma}) - \kappa.$$

His continuation payoff depends on whether he observed a bad outcome or not at the end of period t. The probability of a bad outcome is given by $(1-\theta)(1-\gamma)+\theta(1-\lambda\gamma)$, which is the probability that the distributor is patient times the probability of a bad outcome when the distributor is patient, plus the probability that the distributor is myopic times the probability of a bad outcome when the distributor is myopic. As a result, the producer's expected profit can be described in terms of a value function $V(\theta)$ as follows:

$$\begin{aligned} v(\theta) = \max\{0, \pi(\theta) + \beta_e\left[(1-\theta)(1-\gamma) + \theta(1-\lambda\gamma)\right] v(\theta_1\left(1,\theta\right)) \\ + \beta_e\left[(1-\theta)\gamma + \theta\lambda\gamma)\right] v(\theta_1\left(0,\theta\right))\}. \end{aligned}$$

At every date, given the belief θ, the exporter maximizes $v(\theta)$. If he terminates the partnership, his net payoff is zero, since he becomes obsolete. If he keeps the partnership, he receives expected profits $\pi(\theta)$ and he obtains additional information about the distributor's type.

This problem is similar to a class of problems known as two-armed bandit.[1] In our case, one arm corresponds to terminating the partnership. This arm always gives the same return and is absorbing, i.e., if it is chosen at some date t, it has to be chosen in all dates thereafter.[2] The other arm corresponds to continuing with the partnership. That arm is stochastic and its expected return depends on the belief θ.

Lemma $A-1$ describes the producer's optimal decision as a function of his belief regarding the type of the distributor.

[1] Generally, "a k-armed bandit [...] is a slot machine with k arms, each yielding an unknown, possibly different distribution of payoffs. You do not know which arm gives you the greatest average return, but by playing the various arms of the slot machine you can gain information on which arm is best" [Fergusson, Optimal Stopping and Applications, chapter 7, p.1 (www.math.ucla.edu/~tom/Stopping/sr7.pdf)].

[2] This feature differs from the standard two-armed bandit problem, where the deterministic arm is not assumed to be absorbing. However, it can be shown that, if an agent chooses the deterministic arm, his optimal decision is to keep choosing the same arm forever, so the assumption is actually inconsequential.

NOT FOR PUBLICATION

Lemma A-1 *There is a unique value $\theta^c \in (0,1)$ such that, if $\theta_0 < \theta^c$, a producer forms a partnership with a distributor. Moreover, he chooses to maintain the partnership if and only if his current belief θ that the distributor is myopic is lower than θ^c. In this case, he exports the quantity $Q^\gamma \equiv Q(\theta;\lambda,\gamma,c)$.*

Proof. Since the quantity in a contract is chosen by the exporter and $Q(\theta;\lambda,\gamma,c)$ is the solution to the exporter's maximization problem, the quantity in the contract must be given by $Q(\theta;\lambda,\gamma,c)$. We now prove the existence of the threshold θ^c. First, we show that $v(\theta)$ is a decreasing function. Let $T : C[0,1] \to C[0,1]$ be equal to

$$Tf(\theta) = \max\{0, \pi(\theta) + \beta_e Ef\left[\theta^{(1)}(\theta)\right]\},$$

where $C[0,1]$ is the set of all real-valued continuous functions defined on $[0,1]$ endowed with the sup-norm and $\theta^{(1)}(\theta)$ is the distribution of posterior beliefs when the current prior is θ. It is easy to see that Tf is indeed continuous since $\theta^{(1)}(\theta)$ is a discrete probability distribution and the Bayesian updating rule is continuous on the prior. We can apply the Blackwell conditions to show that T is a contraction. First, note that T is monotonic, i.e., if $f, g \in C[0,1]$ and $f \geq g$, then $Tf \geq Tg$. Moreover, since

$$\max\{0, \pi(\theta) + \beta_e E(f+z)\left[\theta^{(1)}(\theta)\right]\} \leq \max\{0, \pi(\theta) + \beta_e Ef\left[\theta^{(1)}(\theta)\right]\} + \beta_e z,$$

where c is some positive real number, we have that $T(f+z) \leq Tf + \beta_e z$ for all $f \in C[0,1]$ and $z \geq 0$. Therefore, T satisfies the Blackwell sufficiency conditions, and so is a contraction. This means that it has a unique fixed point in $C[0,1]$, which is exactly the value function $v(\theta)$.

We now show that the contraction T takes decreasing functions into decreasing functions. Let f be a decreasing function. Moreover, consider $\theta > \theta'$. We have

$$\theta_1(i,\theta) > \theta_1(i,\theta'),\ i = 0, 1,$$

and

$$\Pr\left[\theta_1(1,\theta)\right] - \Pr\left[\theta_1(1,\theta')\right] = \Pr\left[\theta_1(0,\theta')\right] - \Pr\left[\theta_1(0,\theta)\right] = (\theta - \theta')\gamma(1-\lambda).$$

These two results imply that, if f is decreasing in θ, then so is $Ef\theta^{(1)}(\theta)$. Moreover, since $\pi(\theta)$ is also decreasing in θ, we conclude that $Tf(\theta)$ is decreasing in θ. This proves that the map T takes decreasing functions into decreasing functions. Because $\{f \in C[0,1]\colon f \text{ is decreasing}\}$ is a closed subset of $C[0,1]$, standard arguments show that the unique fixed point of T must belong to this set. Hence, $v(\theta)$ is a decreasing function.

Now, note that, if $\theta = 0$, $\theta^{(1)}(\theta)$ is degenerate at $\theta = 0$. Hence

$$v(0) = \max\{0, \pi(0) + \beta_e v(0)\}.$$

Since $\pi(0) > 0$, we have $v(0) = \frac{\pi(0)}{1-\beta_e}$. If, instead, $\theta = 1$, $\theta^{(1)}(\theta)$ is degenerate at $\theta = 1$. Then

$$v(1) = \max\{0, \pi(1) + \beta_e v(1)\}.$$

Since $\pi(1) < 0$, we have $v(1) = 0$. Finally, since $\pi(\theta)$ is a strictly decreasing function of θ, and $v(\theta)$ is decreasing in θ, we can conclude that $\pi(\theta) + \beta_e Ev\left[\theta^{(1)}(\theta)\right]$ is strictly decreasing in θ. Moreover,

$$\pi(1) + \beta_e Ev\left[\theta^{(1)}(1)\right] = \pi(1) < 0$$

and

$$\pi(0) + \beta_e Ev\left[\theta^{(1)}(0)\right] = \frac{\pi(0)}{1-\beta_e} > 0.$$

Hence, there exists $\theta^c \in (0,1)$ such that

$$\pi(\theta^{c\prime}) + \beta_e Ev\left[\theta^{(1)}(\theta^c)\right] = 0.$$

Therefore, since $\theta \geq \theta^c$ implies

$$\pi(\theta) + \beta_e Ev\left[\theta^{(1)}(\theta)\right] \leq 0,$$

the producer prefers to abandon the partnership. Alternatively, since $\theta < \theta^{c\prime}$ implies

$$\pi(\theta) + \beta_e Ev\left[\theta^{(1)}(\theta)\right] > 0,$$

he prefers to maintain the partnership. ■

Lemma $A-1$ shows that, after facing an experience with a high enough number of defaults, the producer becomes sufficiently convinced that the distributor is myopic—i.e. his belief goes above the threshold θ^c—and abandons the Foreign market. Otherwise, he keeps the partnership. Note that partnerships can now be dissolved even when a distributor is patient, since there is always a positive probability of a long sequence of events in which demand is continuously low.

NOT FOR PUBLICATION

In the discussion above we assumed that a patient distributor never defaults and a myopic distributor defaults whenever possible. To prove this assertion, we need to describe first the dynamics of a partnership. We first consider a scenario where the distributor must make an once and for all choice at the beginning of the partnership between always defaulting or never defaulting. Below we present conditions under which this assumption can be relaxed.

Let ρ_k^m (ρ_k^p) be the probability that a partnership formed at date t still exists at the beginning of date $t+k$ when the distributor is myopic (patient). We begin by considering the long-run features of partnerships. We find that, when the distributor is patient and never defaults, there is a positive probability that the partnership will go on forever. Conversely, when the distributor is myopic, there is a zero probability that a partnership continues indefinitely.

Proposition A-2 $\lim_{t\to\infty} \rho_t^m = 0$ *and* $\lim_{t\to\infty} \rho_t^p = \rho > 0$.

Proof. We first show that $\lim_{t\to\infty} \rho_t^m = 0$. For this, suppose that the producer stays in the partnership for an infinite number of periods. If that is the case, he learns what is the type of the distributor from the law of large numbers. We can think that in every period of a partnership a producer faces 1 independent toss of a biased coin, with the probability of heads being given by the probability p of a good outcome (which is equal to $\gamma\lambda$ if the distributor is myopic and equal to γ when the distributor is patient). Hence, by tossing this coin an infinite number of times he learns what is the value of p with probability one. In particular, when $p = \gamma\lambda$, the belief θ of the producer converges to one with probability one. Because a producer should always choose to terminate the partnership when his belief gets above $\theta^{c\prime}$, we cannot have both $p = \gamma\lambda$ and a producer staying in the partnership an infinite number of periods. Therefore, $p = \gamma\lambda$ implies that with probability one a producer stays in the partnership only a finite number of periods, and so it must be that $\lim_{t\to\infty} \rho_t^m = 0$, as we wanted to show. Now we can use a result by Banks and Sundaram (1992, theorem 5).[3] It says that in a two-armed bandit problem with independent arms, if at any point in time an arm is selected by an optimal strategy, then there exists at least one type of this arm with the following property: conditional on the arm's type being this particular one, this arm remains, with non-zero probability, an optimal choice forever. In our case, this implies that if the partnership

[3] Banks, J. and R. Sundaram (1992), "Denumerable-Armed Bandits", *Econometrica* Vol 60(5), September.

is chosen at some point in time, then there must exist $\upsilon > 0$ such $\rho_t^p > \upsilon$ for all t. As a result, $\lim_{t\to\infty} \rho_t^p = \rho \geq \upsilon > 0$. ■

We also find that the export level in an ongoing partnership approaches the perfect information level in the long run.

Proposition A-3 *Let Q_t^γ be the expected volume of trade in an ongoing partnership at date t. Then, $\lim_{t\to\infty} Q_t^\gamma = Q(0;\lambda,\gamma,c)$.*

Proof. The proof of this result follows the same reasoning as in Proposition 1. By the law of large numbers, in the long run the belief θ of the exporter in an ongoing partnership with a patient distributor converges to zero with probability one. Hence the expected volume of trade in the partnership converges to $Q(0;\lambda,\gamma,c)$. Now, since the probability that the exporter stays in a partnership with a myopic distributors converges to zero, the expected volume of trade in an ongoing partnership must converge to $Q(0;\lambda,\gamma,c)$. ■

A direct implication of propositions $A-2$ and $A-3$ is that a sufficiently patient distributor will always choose to honor the contract. The reason is that, by honoring the contract, the distributor builds a good reputation with the producer. This reputation is beneficial for two reasons. First, it increases trade volumes in future interactions. Second, it reduces the probability that the producer terminates the partnership. The next lemma formalizes this claim.

Lemma A-4 *There exists a value $\underline{\beta'_d} \in (0,1)$ such that, for all $\beta_d > \underline{\beta'_d}$, the optimal choice of a patient distributor is to honor her contract.*

Proof. From Proposition 2, a lower bound on the payoff of a patient distributor who never defaults is given by

$$\sum_{k=1}^{\infty} \beta_d^{k-1} \rho\kappa = \frac{\rho\kappa}{1-\beta_d}.$$

In turn, there exists k' sufficiently large such that, an upper bound on the payoff of a patient distributor who always defaults is

$$\sum_{k=1}^{k'-1} \beta_d^t Q(0,\lambda,\gamma) + \sum_{t=k'}^{\infty} \beta_d^t \epsilon Q(0,\lambda,\gamma) = \left[\frac{1-\beta_d^{k'}}{1-\beta_d} + \beta_d^{k'} \frac{\epsilon}{1-\beta_d}\right] Q(0,\lambda,\gamma).$$

Thus, a sufficient condition for a patient distributor to always honor her contract is

$$\frac{\rho\kappa}{1-\beta_d} > \left[\frac{1-\beta_d^{k'}}{1-\beta_d} + \beta_d^{k'}\frac{\epsilon}{1-\beta_d}\right] Q(0,\lambda,\gamma),$$

which can be rewritten as

$$\rho\kappa > \left[1-\beta_d^{k'} + \beta_d^{k'}\epsilon\right] Q(0,\lambda,\gamma).$$

As agents become sufficiently patient, it suffices that $\rho\kappa > \epsilon Q(0,\lambda,\gamma)$. This condition is trivially satisfied because we can always choose k' large enough to ensure that ϵ is arbitrarily small. ■

Finally, it is immediate that the producer's behavior described in Lemma $A-1$ and the distributor's behavior described in Lemma $A-4$ are part of a sequential equilibrium.

Proposition A-5 *Consider the following strategy profile. The producer always chooses quantity Q^{γ} and forms/maintains a partnership as long as his belief is below θ^{c}. Conditional on the legal system not enforcing contracts, the myopic distributor always defaults. The patient distributor never defaults. Irrespective of her type, the distributor never terminates a partnership. This profile, together with the Bayesian updating described in equation $(A1)$, is a sequential equilibrium.*

Lastly, note that we have been assuming that, once a distributor makes a choice, he keeps the same choice over time. This assumption simplifies the analysis but precludes a study of the intertemporal incentives faced by a distributor. In particular, one can conjecture that while a patient distributor may have incentives to build a good reputation, once the good reputation is acquired she may want to deviate and default on the contract. We can show that this conjecture is false as long as the distributor is continuously faced with the need to maintain a good reputation. This can be done, for example, by introducing a small probability $\varepsilon > 0$ that the type of the distributor may change but this change is not observed by the exporter. With that addition, we can prove that, even when the distributor can change her choice at any point in time, there exists a sequential equilibrium that replicates the behavior described in Proposition $A-4$.[4]

[4] The proof is essentially an adaptation of Mailath, G. and L. Samuelson (1998), "Your reputation is who you are not, not who you would like to be", CARESS Working Paper, University of Pennsylvania.

NOT FOR PUBLICATION

A-1.2 Different assumptions after end of partnerships

The following lemma fully characterizes the behavior of producers when we assume that, after the end of a partnership, they are reunited with the pool of unmatched producers.

Lemma A-6 *There is a unique value* $\overline{\theta}' \in (0,1)$ *such that, if* $\theta_0 < \overline{\theta}'$*, a producer forms a partnership whenever he finds a business opportunity. Moreover, he chooses to maintain the partnership if and only if the distributor does not default, and exports* $Q(\theta;\lambda,c)$ *in every period when the partnership is active, where* θ *is the current belief that the distributor is myopic.*

Proof. First, since $Q(\theta;\lambda,c)$ maximizes $\pi(q,\theta;\lambda,c,\kappa)$, it must be the quantity established in any contract.

Now fix some date and consider a producer who is not in a partnership and finds a business opportunity. If he decides to take this opportunity, he obtains

$$v(\theta_0) = \pi(\theta_0) + \delta_e \left\{ \sigma \Pr(0 \mid \theta_0) v(\theta_1) + [1 - \sigma \Pr(0 \mid \theta_0)] \frac{x}{1-(1-x)\delta_e} v(\theta_0) \right\}. \tag{A-1}$$

We can rewrite $v(\theta_0)$ as

$$v(\theta_0) = \frac{\pi(\theta_0) + \sum_{i=1}^{\infty} (\delta_e\sigma)^i \prod_{j=0}^{i-1} \Pr(0 \mid \theta_j)\pi(\theta_i)}{1 - \frac{x\delta_e}{1-(1-x)\delta_e} \left\{ 1 - \sigma \Pr(0 \mid \theta_0) + \sum_{i=1}^{\infty} (\delta_e\sigma)^i [1 - \sigma \Pr(0 \mid \theta_i)] \prod_{j=0}^{i-1} \Pr(0 \mid \theta_j) \right\}}.$$

Since

$$\prod_{j=0}^{i-1} \Pr(0 \mid \theta_j) = \prod_{j=0}^{i-1} (1 - \theta_j + \theta_j\lambda) = \prod_{j=0}^{i-1} \left(\frac{1-\theta_0+\lambda^{j+1}\theta_0}{1-\theta_0+\lambda^j\theta_0} \right) = 1 - \left(1-\lambda^i\right)\theta_0$$

and

$$[1 - \sigma \Pr(0 \mid \theta_i)] \prod_{j=0}^{i-1} \Pr(0 \mid \theta_j) = 1 - \left(1-\lambda^i\right)\theta_0 - \sigma\left[1 - \left(1-\lambda^{i+1}\right)\theta_0\right],$$

after some algebraic manipulation we can further rewrite (A-1) as

$$v(\theta_0) = \frac{1}{1 - \frac{x\delta_e}{1-(1-x)\delta_e}\left[\frac{(1-\sigma)(1-\theta_0)}{1-\delta_e\sigma} + \frac{(1-\sigma\lambda)\theta_0}{1-\delta_e\sigma\lambda}\right]} \sum_{i=0}^{\infty} (\delta_e\sigma)^i \left[1 - \left(1-\lambda^i\right)\theta_0\right] \pi\left(\frac{\lambda^i\theta_0}{\lambda^i\theta_0 + 1 - \theta_0}\right).$$

Note that

$$v(0) = \frac{\pi(0)}{1 - \delta_e\sigma - \delta_e(1-\sigma)\frac{x}{1-(1-x)\delta_e}} > 0$$

and

$$v(1)=\frac{\pi\left(1\right)}{1-\delta_e\sigma\lambda-\delta_e\left(1-\sigma\lambda\right)\frac{x}{1-(1-x)\delta_e}}<0.$$

We now show that $\frac{\partial v(\theta_0)}{\partial\theta_0}<0$. First note that, for all periods $i\in\{0,1,2,...\}$,

$$\frac{\partial\pi\left(\frac{\lambda^i\theta_0}{\lambda^i\theta_0+1-\theta_0}\right)}{\partial\theta_0}=\frac{\partial\pi}{\partial\frac{\lambda^i\theta_0}{\lambda^i\theta_0+1-\theta_0}}\frac{\partial\frac{\lambda^i\theta_0}{\lambda^i\theta_0+1-\theta_0}}{\partial\theta_0}=\frac{-(1-\lambda)R[Q(\frac{\lambda^i\theta_0}{\lambda^i\theta_0+1-\theta_0};\lambda,c,\kappa)]\lambda^i}{(1-\theta_0+\lambda^i\theta_0)^2}<0.$$

Consider now a hypothetical scenario where an increase in θ_0 only impacts the probability of default, i.e. it has no impact on profits. In this case, $\pi\left(\frac{\lambda^i\theta_0}{\lambda^i\theta_0+1-\theta_0}\right)=\pi\left(\theta_0\right)$ for all $i\in\{0,1,2,...\}$ and

$$\frac{\partial v(\theta_0)}{\partial\theta_0}=\pi\left(\theta_0\right)\left[\frac{\frac{x\delta_e}{1-(1-x)\delta_e}\left[\frac{1-\sigma\lambda}{1-\delta_e\sigma\lambda}-\frac{1-\sigma}{1-\delta_e\sigma}\right]\left[\frac{1-\theta_0}{1-\delta_e\sigma}+\frac{\theta_0}{1-\frac{1}{1-\delta_e\sigma\lambda}}\right]}{1-\frac{x\delta_e}{1-(1-x)\delta_e}\left[\frac{(1-\sigma)(1-\theta_0)}{1-\delta_e\sigma}+\frac{(1-\sigma\lambda)\theta_0}{1-\delta_e\sigma\lambda}\right]}-\frac{1}{1-\delta_e\sigma}+\frac{1}{1-\delta_e\sigma\lambda}\right].$$

We obtain $\frac{\partial v(\theta_0)}{\partial\theta_0}<0$ as long as

$$\frac{\frac{x\delta_e}{1-(1-x)\delta_e}\left[\frac{1-\sigma\lambda}{1-\delta_e\sigma\lambda}-\frac{1-\sigma}{1-\delta_e\sigma}\right]}{1-\frac{x\delta_e}{1-(1-x)\delta_e}\left[\frac{(1-\sigma)(1-\theta_0)}{1-\delta_e\sigma}+\frac{(1-\sigma\lambda)\theta_0}{1-\delta_e\sigma\lambda}\right]}<\frac{\frac{1}{1-\delta_e\sigma}-\frac{1}{1-\delta_e\sigma\lambda}}{\frac{1-\theta_0}{1-\delta_e\sigma}+\frac{\theta_0}{1-\delta_e\sigma\lambda}}.$$

This inequality can be rewritten as $(1-x)\delta_e<1-x$, so it always holds. Thus, even if we impose that an increase in θ_0 increases the probability of default in every period but has no impact on profits, it is still the case that such an increase will reduce the value of entering a partnership. Now, since an increase in θ_0 actually reduces the expected profit of a partnership in every period, it must be the case that the value of entering a partnership is strictly decreasing in θ_0. As a result, there exists a unique $\overline{\theta}'\in(0,1)$ such that $v(\overline{\theta}')=0$. Thus, if $\theta_0<\overline{\theta}'$, we have $v(\theta_0)>0$ and it is always optimal to enter a partnership.

Finally, if a producer observes a default, his posterior belief becomes 1; since $v(1)<0$, he terminates the partnership. If the producer does not observe a default, he increases the belief that the distributor is patient; since $v(.)$ is strictly decreasing, he continues in the partnership. ■

This makes clear that this different assumption about the fate of distributors and producers after their partnerships terminate does not change the qualitative results of the model.

NOT FOR PUBLICATION

A-2 Supplementary empirical results

A-2.1 Restricted samples and additional controls

In Tables A-1 and A-2 we provide evidence that our findings are robust to a number of alternative specifications. We report only estimates of λ to be concise. We consider: (*i*) two alternative ways to deal with the existence and with the change over time of the threshold for reporting exports to EU countries; (*ii*) adding a dummy variable indicating whether firm i exporting to a new destination d at time t has a parent/affiliate in that market; (*iii*) adding a variable measuring the average degree of complexity of the CN 8-digit products sold by firm i when entering a new market d at time t.

In the paper we provide evidence that focusing on firms that export at least €1 million per year to either the group of EU countries or the group of non-EU countries, or to both groups, provides results that are similar to the benchmark estimations. In other words, if we apply the same €1 million threshold retrospectively both to firms selling within and outside the EU, we confirm Predictions 1, 2, and 3. The drawback of this strategy is that it forces us to consider only relatively big exporters. In Tables A-1 and A-2 we then focus on exports to destinations outside the EU, which are virtually exhaustive (value above €1,000 or a weight above 1,000 kg) and did not experience changes over time in the reporting requirements. Furthermore, we consider restricting our estimations to the period 1998-2005 during which the EU threshold has not changed.[5] Bearing in mind the substantial loss of observations we incur, results of these robustness exercises also confirm Predictions 1, 2, and 3.

Tables A-1 and A-2 show further that our findings are virtually unchanged when considering the presence of parents/affiliates and the degree of complexity of the products exported. The definition and construction of the variables involved in these robustness exercises are provided in subsection 5.5 of the paper, where we consider interactions with λ. It is worth nothing that the average measure of the complexity of the products sold by a firm is not identified in the case of firm-time fixed when analyzing entry and the initial value of exports. In the case of survival and export growth, the average complexity is truly firm-destination-time specific and is constructed as

[5] For this exercise we have completely re-built our data. Specifically, we use 1998 as starting year and identify entry into new destinations in 1999 and 2000. We then follow firms over time to pin down survival and growth for $k = 1, 2, 5$, thus fully exploiting the seven years span of data. Note that in this case we are unable to provide estimation on survival and growth for k=10.

described in subsection 5.5 of the paper. When considering entry and the initial value of exports, the average complexity is not observed for countries in which the firm could have entered but ultimately did not. We deal with this issue by calculating the average complexity of the products sold by a firm in all new export destinations and applying this firm-time specific measure to all potential destinations (both those where the firm entered and those where the firm did not). This is the reason why, being firm-time specific only, average products complexity is not identified when applying firm-time fixed effects to entry and the initial amount of exports, so results are exactly the same as those provided in the paper (which is why we do not report them here).

A-2.2 Estimates of additional controls

Table A-3 provides estimates of the additional controls not listed (to save space) in Table 4 in the paper: changes in the time-varying country variables, as well as real exchange rate changes over the time interval $[t, t+k]$. Among these new variables, the change in the GDP of the new destination market is the most significant covariate affecting firms' survival and growth, but other variables are also significant.

Table A-4 provides estimates of the additional controls not listed (to save space) in Table 6 in the paper: the same variables included in Table A-3 plus changes in firm-time controls. In the latter group, increases in firm productivity, firm size and the number of destinations served are all firmly associated with a higher probability of survival and with higher growth.

A-2.3 Rule of law in 1997

Table A-5 shows the list of all countries with non-missing values for the rule of law and their corresponding score in 1997.

NOT FOR PUBLICATION

Table A-1: Entry into a New Export Market and the Initial Value of Exports: further robustness

Dependent Variable	Entry	Value
Type	Binary	Continuous
	Robustness with respect to export threshold differences and changes	
	Sample restricted to exporters selling outside the EU	
	Firm-time fixed effects:	
λ_{dt}	0.0007^a	0.0210^b
	(0.0001)	(0.0098)
	Heckman procedure:	
λ_{dt}	0.0005^a	0.0534^a
	(0.0000)	(0.0088)
	Sample restricted to the period 1998-2005	
	Firm-time fixed effects:	
λ_{dt}	0.0014^a	0.0559^a
	(0.0001)	(0.0114)
	Heckman procedure:	
λ_{dt}	0.0008^a	0.0485^a
	(0.0001)	(0.0108)
	Adding a dummy for the presence of an affiliate/parent in country d at time t	
	Firm-time fixed effects:	
λ_{dt}	0.0003^a	0.0316^a
	(0.0001)	(0.0077)
	Heckman procedure:	
λ_{dt}	0.0005^a	0.0260^a
	(0.0001)	(0.0089)
	Adding the measure of product complexity developed by Nunn (2007)	
	Firm-time fixed effects:	
λ_{dt}	–	–
	Heckman procedure:	
λ_{dt}	0.0005^a	0.0290^a
	(0.0001)	(0.0088)

The four sets of estimations include, for the firm-year fixed effects specification, the d, and dt controls listed in Table 3 with two-way clustered (country firm) standard errors in parentheses. The Heckman specification includes the it, d, and dt controls listed in Table 5 with country-clustered standard errors. ^{abc} indicate the significance of the coefficient, ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1.

NOT FOR PUBLICATION

Table A-2: Survival in a New Export Market and the Growth Rate of Exports: further robustness

Dependent Variable	Market Survival	Export Growth	Market Survival	Export Growth	Market Survival	Export Growth	Market Survival	Export Growth
Type	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary	Continuous
Years After Entry $\equiv k$	**k = 1 Year**		**k = 2 Years**		**k = 5 Years**		**k = 10 Years**	
	Robustness with respect to export threshold differences and changes							
	Sample restricted to exporters selling outside the EU							
	Firm-time fixed effects:							
λ_{dt}	0.0095^c	-0.0215	0.0089^c	-0.0358	0.0066^c	-0.1102^a	0.0041^c	-0.0574
	(0.0055)	(0.0170)	(0.0049)	(0.0241)	(0.0037)	(0.0386)	(0.0024)	(0.0647)
	Heckman procedure:							
λ_{dt}	0.0196^a	-0.0162	0.0219^a	-0.0118	0.0149^a	-0.1652^a	0.0045^a	-0.2423^a
	(0.0036)	(0.0137)	(0.0022)	(0.0192)	(0.0016)	(0.0326)	(0.0009)	(0.0500)
	Sample restricted to the period 1998-2005							
	Firm-time fixed effects:							
λ_{dt}	0.0087	-0.0454^b	0.0038	-0.0766^a	0.0068^c	-0.1321^a	–	–
	(0.0059)	(0.0188)	(0.0050)	(0.0248)	(0.0040)	(0.0345)		
	Heckman procedure:							
λ_{dt}	0.0329^a	-0.0343^b	0.0272^a	-0.0655^a	0.0222^a	-0.1320^a	–	–
	(0.0050)	(0.0153)	(0.0035)	(0.0208)	(0.0028)	(0.0322)		
	Adding a dummy for the presence of an affiliate/parent in country d at time t							
	Firm-time fixed effects:							
λ_{dt}	0.0118^b	-0.0275^c	0.0135^a	-0.0607^a	0.0100^b	-0.1302^a	0.0051^c	-0.1397^a
	(0.0047)	(0.0164)	(0.0050)	(0.0230)	(0.0043)	(0.0364)	(0.0031)	(0.0535)
	Heckman procedure:							
λ_{dt}	0.0398^a	-0.0076	0.0385^a	-0.0080	0.0257^a	-0.1434^a	0.0085^a	-0.2634^a
	(0.0043)	(0.0133)	(0.0028)	(0.0184)	(0.0022)	(0.0293)	(0.0012)	(0.0448)
	Adding the measure of product complexity developed by Nunn (2007)							
	Firm-time fixed effects:							
λ_{dt}	0.0125^a	-0.0235	0.0137^a	-0.0537^b	0.0101^b	-0.1172^a	0.0056^c	-0.1247^b
	(0.0047)	(0.0166)	(0.0050)	(0.0236)	(0.0044)	(0.0372)	(0.0032)	(0.0534)
	Heckman procedure:							
λ_{dt}	0.0406^a	0.0005	0.0392^a	0.0027	0.0259^a	-0.1332^a	0.0086^a	-0.2392^a
	(0.0043)	(0.0134)	(0.0029)	(0.0184)	(0.0023)	(0.0294)	(0.0012)	(0.0449)

The four sets of estimations include, for the firm-year fixed effects specification, the idt (except when excluding exp^0_{idt}), d, dt controls and their changes k years after entry listed in Table 4 with two-way clustered (country firm) standard errors in parentheses. The Heckman specification includes the idt (except when excluding exp^0_{idt}), it, d, dt controls and their changes k years after entry listed in Table 6 with country-clustered standard errors. ^{abc} indicate the significance of the coefficient, ^{a} $p<0.01$, ^{b} $p<0.05$, ^{c} $p<0.1$.

NOT FOR PUBLICATION

Table A-3: Additional Controls in Table 4

Dependent Variable	Market Survival	Export Growth	Market Survival	Export Growth	Market Survival	Export Growth	Market Survival	Export Growth
Type	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary	Continuous
Years After Entry $\equiv k$	**k = 1 Year**		**k = 2 Years**		**k = 5 Years**		**k = 10 Years**	
	Additional Controls							
$\Delta^k exrate_{dt}$	0.0204	0.1232^b	0.0065	0.0040	-0.0110	-0.0658	-0.0134^b	-0.2843^b
	(0.0151)	(0.0530)	(0.0116)	(0.0517)	(0.0149)	(0.0812)	(0.0064)	(0.1220)
$\Delta^k GDP_{dt}$	0.0929^a	0.6546^a	0.0282^c	0.4385^a	0.0112	0.2912^a	0.0007	0.1935^a
	(0.0289)	(0.0991)	(0.0164)	(0.0920)	(0.0105)	(0.0770)	(0.0012)	(0.0364)
$\Delta^k EU_{dt}$	–	–	–	–	–	–	-0.0128	0.5772^a
							(0.0094)	(0.1185)
$\Delta^k OECD_{dt}$	–	–	-0.0569^b	-0.2459	-0.0167	-0.0246	-0.0128^c	-0.4770^b
			(0.0259)	(0.1724)	(0.0127)	(0.1488)	(0.0073)	(0.2359)
$\Delta^k WTO_{dt}$	0.0411^b	0.1060	0.0407^a	0.0645	0.0226^c	0.0033	0.0133^c	-0.0996
	(0.0181)	(0.0839)	(0.0145)	(0.0853)	(0.0120)	(0.0970)	(0.0080)	(0.1585)

Two-way clustered (country firm) standard errors in parentheses. ^{abc} indicate the significance of the coefficient, ^{a} $p<0.01$, ^{b} $p<0.05$, ^{c} $p<0.1$.

Table A-4: Additional Controls in Table 6

Heckman procedure	First step	Second step	First step	Second step	First step	Second step	First step	Second step
Dependent Variable	Market Survival	Export Growth	Market Survival	Export Growth	Market Survival	Export Growth	Market Survival	Export Growth
Type	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary	Continuous
Years After Entry $\equiv k$	**k = 1 Year**		**k = 2 Years**		**k = 5 Years**		**k = 10 Years**	
	Additional Controls							
$\Delta^k exrate_{dt}$	0.0119	0.0612	-0.0060	0.0064	-0.0088	-0.0220	-0.0006	-0.1254
	(0.0213)	(0.0722)	(0.0100)	(0.0560)	(0.0070)	(0.0817)	(0.0032)	(0.1371)
$\Delta^k n\_dest_{it}$	0.0920^a	0.0336^a	0.0262^a	0.0402^a	0.0097^a	0.0358^a	0.0029^a	0.0256^a
	(0.0019)	(0.0023)	(0.0005)	(0.0034)	(0.0002)	(0.0045)	(0.0001)	(0.0074)
$\Delta^k prod_{it}$	0.0108	0.2525^a	0.0135^a	0.3173^a	0.0044	0.3287^a	0.0045^b	0.3826^a
	(0.0074)	(0.0315)	(0.0048)	(0.0436)	(0.0039)	(0.0486)	(0.0022)	(0.0827)
$\Delta^k size_{it}$	0.0009	0.3277^a	0.0135^b	0.3242^a	0.0038	0.2133^a	0.0046^b	0.2150^b
	(0.0124)	(0.0495)	(0.0062)	(0.0452)	(0.0040)	(0.0518)	(0.0024)	(0.0889)
$\Delta^k cap_{it}$	0.0027	-0.0116	-0.0055^b	0.0281	-0.0047^a	0.0034	-0.0016^c	0.0472
	(0.0050)	(0.0200)	(0.0027)	(0.0193)	(0.0018)	(0.0199)	(0.0009)	(0.0327)
$\Delta^k wage_{it}$	-0.0196	0.2494^a	-0.0018	0.0713	0.0004	0.1892^a	-0.0020	0.1568
	(0.0122)	(0.0511)	(0.0073)	(0.0589)	(0.0056)	(0.0675)	(0.0032)	(0.1234)
$\Delta^k GDP_{dt}$	-0.0419	0.5260^a	-0.0289^a	0.4560^a	0.0006	0.3813^a	0.0006	0.1728^a
	(0.0270)	(0.0882)	(0.0111)	(0.0716)	(0.0049)	(0.0622)	(0.0009)	(0.0295)
$\Delta^k EU_{dt}$	–	–	–	–	–	–	-0.0059^a	0.5498^a
							(0.0019)	(0.0832)
$\Delta^k OECD_{dt}$	–	–	0.0023	0.1213	0.0047	0.1314	-0.0069	-0.0999
			(0.0320)	(0.2161)	(0.0124)	(0.1704)	(0.0049)	(0.2380)
$\Delta^k WTO_{dt}$	0.0438^b	0.0380	0.0197	0.0184	0.0084	-0.0512	0.0053	-0.1071
	(0.0206)	(0.0649)	(0.0130)	(0.0745)	(0.0071)	(0.0779)	(0.0042)	(0.1349)

Marginal effects are reported for the first step of the Heckman procedure. Country-clustered standard errors in parentheses. ^{abc} indicate the significance of the coefficient, ^{a} $p<0.01$, ^{b} $p<0.05$, ^{c} $p<0.1$.

NOT FOR PUBLICATION

Table A-5: Distribution of Rule of Law in 1997

ISO	Name	Value	ISO	Name	Value	ISO	Name	Value
CHE	Switzerland	2.08	IND	India	0.29	KGZ	Kyrgyzstan	-0.64
NOR	Norway	2.03	LTU	Lithuania	0.29	UGA	Uganda	-0.64
NZL	New Zealand	1.97	ZAF	South Africa	0.26	VNM	Viet Nam	-0.65
AUT	Austria	1.91	SVK	Slovakia	0.23	COL	Colombia	-0.67
FIN	Finland	1.90	FJI	Fiji	0.22	VEN	Venezuela	-0.68
DNK	Denmark	1.87	BHR	Bahrain	0.17	CIV	Côte d'Ivoire	-0.69
SWE	Sweden	1.84	LVA	Latvia	0.13	ZWE	Zimbabwe	-0.69
GBR	United Kingdom	1.83	MAR	Morocco	0.12	RUS	Russian Federation	-0.73
AUS	Australia	1.81	ARG	Argentina	0.11	HND	Honduras	-0.75
NLD	Netherlands	1.81	QAT	Qatar	0.10	BGD	Bangladesh	-0.77
DEU	Germany	1.79	EGY	Egypt	0.08	KAZ	Kazakstan	-0.83
CAN	Canada	1.76	GUY	Guyana	0.07	GEO	Georgia	-0.84
USA	United States of America	1.75	MNG	Mongolia	0.07	NCL	New Caledonia	-0.86
SGP	Singapore	1.74	TUR	Turkey	-0.01	BDI	Burundi	-0.88
IRL	Ireland	1.71	PHL	Philippines	-0.02	MRT	Mauritania	-0.88
ISL	Iceland	1.64	BIH	Bosnia and Herzegovina	-0.03	TCD	Chad	-0.88
LUX	Luxembourg	1.61	MDA	Moldova, Rep.of	-0.10	NER	Niger	-0.89
BEL	Belgium	1.55	BGR	Bulgaria	-0.11	MOZ	Mozambique	-0.90
JPN	Japan	1.53	ALB	Albania	-0.12	SLV	El Salvador	-0.91
FRA	France	1.47	LKA	Sri Lanka	-0.12	GTM	Guatemala	-0.92
ESP	Spain	1.35	MKD	Macedonia	-0.15	BLR	Belarus	-0.93
CHL	Chile	1.22	NPL	Nepal	-0.15	GAB	Gabon	-0.93
ISR	Israel	1.22	PAN	Panama	-0.15	AZE	Azerbaijan	-0.94
HKG	Hong Kong	1.14	ROM	Romania	-0.15	ETH	Ethiopia	-0.94
PRT	Portugal	1.14	TUN	Tunisia	-0.20	MDG	Madagascar	-0.97
ITA	Italy	0.98	BRA	Brazil	-0.21	IRN	Iran	-0.98
GRC	Greece	0.94	LBN	Lebanon	-0.22	YUG	Serbia and Montenegro	-0.98
CZE	Czech Republic	0.87	BRB	Barbados	-0.24	CUB	Cuba	-0.99
OMN	Oman	0.87	DJI	Djibouti	-0.24	UZB	Uzbekistan	-0.99
SVN	Slovenia	0.87	CHN	China	-0.25	KEN	Kenya	-1.06
TWN	Taiwan	0.85	CAF	Central African Republic	-0.28	KHM	Cambodia	-1.09
ARE	United Arab Emirates	0.84	ERI	Eritrea	-0.28	YEM	Yemen	-1.15
HUN	Hungary	0.84	BOL	Bolivia	-0.29	DZA	Algeria	-1.21
BLZ	Belize	0.79	BEN	Benin	-0.30	GNQ	Equatorial Guinea	-1.23
SWZ	Swaziland	0.79	JAM	Jamaica	-0.30	PRK	Korea, Dem. P. Rep. of	-1.23
CYP	Cyprus	0.76	LSO	Lesotho	-0.30	TKM	Turkmenistan	-1.26
MUS	Mauritius	0.76	BFA	Burkina Faso	-0.31	LBY	Libyan Arab Jamahiriya	-1.29
BHS	Bahamas	0.74	NIC	Nicaragua	-0.33	SLE	Sierra Leone	-1.30
KWT	Kuwait	0.74	IDN	Indonesia	-0.37	MMR	Burma	-1.31
PRI	Puerto Rico	0.74	GHA	Ghana	-0.39	AFG	Afghanistan	-1.34
MYS	Malaysia	0.73	SEN	Senegal	-0.39	BTN	Bhutan	-1.34
KOR	Korea	0.70	ECU	Ecuador	-0.42	NGA	Nigeria	-1.35
POL	Poland	0.64	TZA	Tanzania, United Rep. of	-0.42	TGO	Togo	-1.36
BRN	Brunei Darussalam	0.62	ARM	Armenia	-0.45	COG	Congo	-1.38
BWA	Botswana	0.62	PRY	Paraguay	-0.46	GIN	Guinea	-1.39
THA	Thailand	0.58	SYR	Syrian Arab Republic	-0.49	HTI	Haiti	-1.43
VCT	St. Vincent and the Grenadines	0.58	MEX	Mexico	-0.51	RWA	Rwanda	-1.45
CRI	Costa Rica	0.57	UKR	Ukraine	-0.54	CMR	Cameroon	-1.50
URY	Uruguay	0.56	MWI	Malawi	-0.55	AGO	Angola	-1.53
TTO	Trinidad and Tobago	0.54	DOM	Dominican Republic	-0.56	TJK	Tajikistan	-1.55
CPV	Cape Verde	0.51	HRV	Croatia	-0.56	IRQ	Iraq	-1.61
EST	Estonia	0.51	PNG	Papua New Guinea	-0.56	SDN	Sudan	-1.63
SAU	Saudi Arabia	0.45	PER	Peru	-0.58	LAO	Lao People's Dem. Rep.	-1.64
JOR	Jordan	0.44	PAK	Pakistan	-0.59	ZAR	Congo (Dem. Rep. of the)	-2.06
MLT	Malta	0.43	MLI	Mali	-0.60	SOM	Somalia	-2.10
GMB	Gambia	0.40	ZMB	Zambia	-0.60	LBR	Liberia	-2.27
NAM	Namibia	0.32	SUR	Suriname	-0.62			

Mean: -0.0737; Median: -0.2400; St.dev.: 1.0090; Range: 4.3500