Learning and the Dynamics of Exporting: Theory and Evidence from French Firms

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Preliminary and Incomplete.

February 13, 2009

Abstract

We develop and test a model where exporting requires to find a local distributor in each market. Initially, the quality of the distributor is unknown but exporters learn it as they acquire experience. As a consequence, export relations start small and grow if the relationship is successful. We show that such a model generates state dependence of exporting behavior much like a model that involves a sunk fixed cost of exporting. The intuition is that having a good partner has a value to exporters that generates persistence of exporting behavior. In addition - and differently from a standard sunk cost model - the model predicts more persistence of exporting behavior in markets with better legal institutions and for more productive exporters. We test these and other predictions on French firm level export data that include information on the destinations of individual firms' exports and find strong evidence in favor of our model.

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1 Introduction

One aim of our paper is to revisit the evidence on sunk costs to export and the dynamics of entry and exit decisions. In a reduced form estimation of these models (Roberts and Tybout (1997) and Bernard and Jensen (2004)), sunk costs generate state-dependence of export decisions - past export status is a main predictor for current export status. By using a data set which provides a new dimension for analyzing export decisions - the destinations to which each firm exports - we shed light on various new features of the dynamics of exporting. The results of this analysis and other stylized facts which we recover from our data suggest that state-dependence of exporting decisions at the firm level is likely to arise at least partially for other reasons than the existence of sunk-costs to export. Specifically, we develop a model of relationship specific trade where exporters have to find a distributor in each destination, whose type has to be learned by experience. In our model state dependence arises exclusively because of matching frictions that make exporters reluctant to give up a relation once they have found one and it is not related to a sunk cost.

We report several stylized facts that are difficult to explain with a standard heterogeneous firm model in the style of Melitz (2003), even when persistent demand- and supply shocks as well as sunk costs are introduced.

First, we find that state-dependence, measured by the coefficient of past export status, has robust country- and firm- components even when controlling for unobserved time varying heterogeneity at the firm- and destination level: it is higher in destinations with better quality of legal institutions and for more productive firms. These novel findings can be seen in Figures 1 and 2. In Figure 1 we plot the estimated marginal effect of a change in past export status from not exporting to exporting on the current probability to export against firm productivity measured as value added per worker. Clearly, past export status matters more for more productive firms. In figure 2 we plot the same marginal effect against a measure of countries' legal institutional quality (here measured by the inverse cost of legal procedures).[1] Again we find that marginal effects are larger in countries with better legal institutions. This indicates that state dependence is higher for more productive firms and in countries with better institutions.

Second, when a firm starts to export to a destination, export values are usually very small. However, they tend to increase fast as the relation matures. Figure 3 shows box-plots for export sales to each destination by age of the export-relation.[2] The figure shows nicely that median export sales are

[1] See the data section for a detailed description of the variable.

[2] The box plot shows the median of the distribution of export values, the 25th and 75th percentile as well as the minimum and maximum export value. Note that the distribution has a long right tail, with most of the mass of the

initially very small (around 10.000 euros). As relations get older export values increase substantially.[3]

Third, many export relations are destroyed shortly after their creation and export relations become more stable over time. Figure 4 plots the hazard, i.e. the probability that a relation is broken in period t conditional on having survived until period $t-1$, against time in years. In the first year of an export relation, relations are destroyed with a probability of more than 50%. After 10 years relations have become much more stable and the hazard is reduced to around 0.2.

Fourth, firms tend to simultaneously create export relations in some destinations, while destroying them in others and to increase export values in some destinations while decreasing them in others and this cannot be explained by the sum of firm- and destination- specific shocks but is mostly due to firm-destination specific ones. Figure 5 plots for each exporter the fraction of its export destinations where it starts to export against the fraction of destination to which it stops exporting. There is a clear positive correlation, so that firms simultaneously create and destroy trade relations.[4]

Explaining these facts with a standard heterogeneous firm model with sunk costs to export is challenging. The first fact - higher state dependence in destinations with better institutions - implies that if state dependence is a consequence of sunk costs to export, these costs must be larger in countries with better legal institutions, which seems implausible. The observation that state dependence is positively related to firm productivity would require that more productive firms face higher sunk fixed costs - an interpretation that is equally counterintuitive.

The second fact - small export values upon entry and gradual expansion of export values - is not in line with a standard heterogeneous firm model with sunk cost, as shown by Ruhl and Willis (2008), who calibrate a version of such a model to Colombian export data. Their model predicts that new exporters grow too much and too fast, unless they introduce a slowly growing export demand function, which could be a consequence of learning. Introducing this feature they reduce the size of the sunk entry cost by a factor of around eight.

Also the fourth fact - simultaneity of entry and exit decisions in different markets - does not square with standard sunk cost models, where dynamics are driven by firm specific productivity shocks and destination specific demand shocks, such as changes in the exchange rate. As we have shown in a previous paper Buono et al. (2008), these shocks account only for a small fraction of the dynamics of export decisions, while the bunch of changes in export decisions and export values is driven by

distribution being concentrated at very low values.

[3]Similar evidence has also been reported by Eaton, Eslava, Kugler and Tybout (2007) for Colombian exporters.

[4]We have already mentioned this observation in an earlier paper Buono, Fadinger and Berger (2008), where we also perform a more formal analysis to support this claim.

relationship specific shocks.

As an alternative, we develop a model where exporters have to find a distributor in each destination in order to sell their goods there, based on Araujo and Ornelas (2007). Initially, an exporter is uncertain whether her partner is adequate or tries to cheat if she has the opportunity to do so. This induces exporters to start relations by shipping small values in order not to put too much at stake. If the partnership is successful and distributors establish a reputation for being trustworthy exports increase. As a consequence, exports are initially small and conditional on survival, values grow over time. Hazards are initially high but decrease over time as only relations with reliable partners survive in the long run. Because of matching and informational frictions, the model features state dependence of export decisions. Once an exporter has found a partner she is unwilling to destroy the relation unless she is convinced that her partner is unreliable because starting afresh implies that she has to look for a new distributor, which is costly and implies uncertainty about the quality of the new partner. Even though there are sunk costs to search for a partner, their magnitude has no impact on the amount of state dependence. In this model, state dependence is also related to the quality of legal institutions. Better legal institutions make it more likely that contracts will be honored and therefore export relations tend to be more stable. Finally, the model is able to rationalize simultaneous positive and negative export growth of a given firm in different markets - since the success of exporting is relationship specific, a given firm may have a reliable partner in one market, where exports prosper and an unreliable one in another, where it may decide to end the export relation.

1.1 Related Literature

One of the earlier papers on trade dynamics and incomplete information is Rauch and Watson (2003), who study the sourcing decision of an importer from a developed country from suppliers located in a developing country. In their model, import relations start small because importers do not know initially whether exporters are able to satisfy a large scale order and therefore try to test them by placing small orders that reveal their type. Besedes and Prusa (2006) test several predictions of their model on detailed US product level import data by interpreting a trade relation as a continuous import episode at the product level. They find support for the hypothesis that trade relations start initially with small values and grow over time if the relation persists. In addition,trade relations tend to become more stable as they mature.

On the theoretical side, our model is based on the model of trade and reputation by Araujo and Ornelas (2007). The authors develop a model of trade where exporters have to find a partner in order

to sell goods in the foreign market and are initially uncertain about her reliability. We extend their model to endogenous entry of exporters and distributors as well as heterogeneous firms in order to obtain a richer set of predictions. The authors do not focus their analysis on the persistence of trade relations but are mainly interested in the impact of institutions on firm level and aggregate trade. Regarding the dynamics of firm level export behavior, two related papers are Ruhl and Willis (2008) and Eaton, Eslava, Krizan, Kugler and Tybout (2008). While the first paper shows that a standard heterogeneous firm model with sunk cost cannot reproduce the slow growth of firm level exports unless a slowly growing demand function is introduced, the second one develops a model of trade and learning. Initially exporters are uncertain, whether their product is attractive for consumers in a given market. They use their sales in order to infer consumers' demand for their goods and can also invest in marketing activities in order to reach new consumers. The main motivation for the model is the observation that Columbian exporters start usually with small export values and most relations stop after a short time. A few exporters, however, grow fast and contribute a significant amount to Columbian export growth in the longer run. None of these models tries to explain how informational frictions can lead to state dependence of export decisions and how local legal institutions can influence the stability of export relations.

The paper is organized as follows. Section 2 describes the model and derives several testable propositions, section 3 presents the data and provides empirical evidence in favor of the main predictions of the model. Finally, section 4 concludes.

2 A Model of Exporting and Learning

2.1 Distributors and Trade Credit

In standard trade models, exporting is not different in nature from selling in the domestic market - firms directly sell the goods they produce to consumers. Quite differently, in our environment, in order to export, firms need to find a distributor in the importing country that markets and sells the product for them. Empirically, many - especially smaller - firms use distributors to sell their goods in foreign markets. The rationale for their existence are the substantial costs that are usually involved in getting to know the local business environment. Distributors are familiar with the local legal framework, social norms and have established relations with potential customers. Felbermayr and Jung (2008) report that around half of German exporters use trade intermediators in order to export their goods. The importance of trade intermediation for exporting is also highlighted in the business literature (Peng and Ilinitch (1998), Peng and York (2001)). Eaton et al. (2008) combine Columbian firm level export

data with US import data and show that each Columbian exporter is involved in a very small number of trade relations with the US. On average, Columbian firms that export to the US have 1.4 trade relations in the US, 80% of Colombian exporters have only one relation and 90% at most two relations, providing strong support for the hypothesis that most trade is relationship-specific. In our model, we abstract from direct exports to consumers, and setting up own whole sale affiliates, an option that is viable only for very large exporters because it requires substantial amounts of fixed investments.[5]

Informational frictions about the quality and reliability of distributors are important obstacles for exporters, who want to establish in new markets. For example, the U.S. department of commerce (of Commerce (2000)) advises that "a proper channel of distribution needs to be carefully chosen for each market," warning potential exporters that they "should investigate potential representatives or distributors carefully before entering into an agreement." Some local partners may behave opportunistically if they have incentives to do so and this depends to a large extent on the quality of the local legal system. Reputation may help to overcome institutional weaknesses, but it takes time to build up.

A second ingredient to our model are credit based trade relations. We assume that in each period the exporter sends goods to the distributor who may stick to the agreed sharing of profits or try to run away with the proceeds from selling the goods if it worth to do so. Formal contracts are written but there is uncertainty whether the distributor will honor them because of an imperfectly working legal system. Specifically, we measure the probability that a distributor is able to default on a contract with $(1-\lambda)$, where λ is the strength of the local legal system. Empirically, trade credit is a very important feature in international commercial transactions, but even when relations are not based on credit, our measure λ captures more broadly how easily any kind of opportunistic or disruptive behavior can be undertaken by distributors, which will depend on the local legal environment.

2.2 Environment

Consider an economy with two countries, Home and Foreign.

In Home there is a measure one of infinitely lived producers, that discount the future at rate β_E. Producers face a constant marginal cost MC to produce, which is firm specific and drawn from a distribution $G(MC)$. They can sell goods in their domestic market directly but need to form a partnership with a distributor from Foreign if they want to export.

Since we are mainly interested in the formation of export relations and because the export decision

[5]Felbermayr and Jung (2008) report that only 4% of German exporters have wholesale affiliates.

is independent of the behavior in the domestic market (as marginal costs are constant), we disregard the activities of producers in their domestic market.

Foreign consumers' aggregate demand for each good produced by Home exporters is described by a constant price elasticity demand function $q(p) = Ap^{-\varepsilon}$, where A is a measure of Foreign market size.[6]

Foreign is populated by infinitely lived agents that can distribute goods produced by Home producers to Foreign consumers. Each of them can sell any imported good to Foreign consumers but cannot distribute more than one good simultaneously. Distributors may be of two types that differ in terms of their discount factor. There ar patient distributors with discount factor β_H and impatient distributors with discount factor β_L, where $\beta_L < \beta_H$. The type of the distributor $\in \{\beta_H, \beta_L\}$ is private information.

Distributors try to default on exporters and run away with the profits of shipped goods if this is rational. If they try to do so they are successful with probability $(1 - \lambda)$. Here λ is a measure of the quality of the local legal system. For example, it could be thought of as the probability with which a distributor manages to bribe a legal agent.

In every period exporters and distributors that are not in an export relation decide whether to look for a partner or to remain inactive. If they decide to search for a partner they are matched with a random partner according to a matching function $M(u, v)$, that is concave, increasing in both arguments and homogeneous of degree one. Here, $u \in [0, 1]$ is the measure of unmatched exporters and $v = v_L + v_H$ is the total measure of unmatched distributors, where $v_H(v_L)$ denotes the measure of (im)patient unmatched distributors in the market. Define the probability for a distributor to find a partner as $q(\eta) \equiv M(u, v)/v = M((\frac{v}{u})^{-1}, 1)$, where $\eta \equiv v/u$. Conversely, the probability for an exporter to be matched is $\eta * q(\eta) \equiv M(u, v)/u$. Search for a partner requires a fixed cost (which is sunk once the match has been formed) of z for exporters and $c(v_i)$ for distributors of type $i \in H, L$ with $c'(v_i) > 0$ and $c''(v_i) > 0$.

Before a match is formed, the exporters' marginal cost is unobservable for distributors, so that matching occurs randomly. Only once a partnership has been formed the marginal cost of their partner becomes known to distributors because they observe the quantity shipped by exporters. Exporters can decide at the beginning of each period whether to maintain the partnership or to dissolve it in order to look for a new partner.

[6]Such a demand function can be derived in an environment, where Foreign consumers love variety and have Dixit-Stiglitz preferences. We take the Foreign price index as given, implicitly assuming that the share of Home exporters in Foreign is small so that their impact on the aggregate price level in Foreign is negligible.

Since we want to focus on the role of reputation for trade relations we exclude contracts that can be used to screen between patient and impatient distributors. To keep things simple, we assume that contracts are written each period for the length of one period, specifying the quantity to be exported, a distribution of the match surplus and no side payments. The surplus of the match is shared according to a Nash-bargaining rule and consists of the revenue of exporting minus the fixed cost to distribute the product, f, that distributors face.

Finally, at the end of each period there is a positive probability of exogenous separation, $s \in (0, 1)$.

2.3 Nash Equilibrium

In this section we study a perfect Bayesian Nash-equilibrium of the game described above that involves the following considerations.

In each period t:

1. If exporters find a partner they decide optimally whether to accept the partner or to continue search given their belief on the type of the distributor and the strategies of the distributors.

2. Exporters choose the optimal quantity to export given their marginal cost, the Nash bargaining rule, their beliefs on the type of the distributor and given the strategies of the distributors.

3. At the end of each period, having observed the distributor's action, each exporter decides optimally whether to continue or terminate a relation given her beliefs about the type of the distributor.

4. If distributors find a partner they decide optimally whether to accept a match or to continue search.

5. Distributors of each type decide optimally whether to default on the exporter and run away with the proceeds from current sales or to honor the contract.

2.3.1 A Separating Equilibrium

More specifically we study a perfect Bayesian Nash equilibrium with the following properties:

1. Impatient and patient distributors accept any match.

2. Impatient distributors default on unproductive exporters but honor the contracts with sufficiently productive exporters. (they default on exporters if and only if $MC > \bar{MC}$).

3. Patient distributors always honor their contracts with any type of exporter.

4. Exporters accept any match.

5. In each period exporters choose the optimal quantity to export given the Nash bargaining rule, their beliefs on the type of distributor and the strategy of the distributors.

6. Having observed the behavior of their partners exporters update their belief on the type of the distributor at the end of the period using Bayes' rule.

7. Exporters terminate a relation if and only if they observe a default.

We determine the optimal strategies of exporters given their beliefs and the equilibrium strategies of the distributors by backward induction. Proofs of most propositions are relegated to the appendix. We start out with solving for exporters' optimal export quantities given the equilibrium strategies.

Exporters

Given the exporters' bargaining power α and the per period distribution fixed cost of f, the surplus of the match in any period is $S = Revenue - f$. As a consequence, the Nash bargaining rule assigns a fraction α of the surplus to exporters and the rest to distributors.

In a next step, in every period each exporter chooses the optimal export quantity given his type MC, his belief on the type of the distributor and the distributors' strategy. Let $\tilde{\theta}$ be the subjective probability of the exporter that the distributor is impatient and therefore might try to default. Remember that in the Nash-equilibrium we are considering here, impatient distributors default only on firms with $MC \geq \bar{MC}$ and that default is successful with probability $1 - \lambda$

The maximization problem of any exporter with $MC \geq \bar{MC}$ is therefore given by

$$\max_p \Pi(MC, \tilde{\theta}) = \max_p \alpha[\tilde{\theta} * \lambda + (1 - \tilde{\theta})]p^{1-\varepsilon}A - p^{-\varepsilon}AMC - \alpha f. \tag{1}$$

These exporters face an impatient distributor with subjective probability $\tilde{\theta}$, who will default with probability $(1 - \lambda)$.

The optimal price and quantity for these exporters are given by $p^*(MC \geq \bar{MC}) = \frac{\varepsilon}{\varepsilon-1}\frac{1}{\alpha[\tilde{\theta}\lambda+(1-\tilde{\theta})]}MC$, $q^*(MC \geq \bar{MC}) = \left(\frac{\varepsilon}{\varepsilon-1}\frac{1}{\alpha[\tilde{\theta}\lambda+(1-\tilde{\theta})]}\right)^{-\varepsilon} A$, while the optimal revenue is $Rev^*(MC \geq \bar{MC}) = \left(\frac{\varepsilon-1}{\varepsilon}\alpha(\tilde{\theta}\lambda + 1 - \tilde{\theta})\right)^{\varepsilon-1} MC^{1-\varepsilon}A$.

Note that prices are inefficiently high while export quantities and revenues are too low compared with a monopolist who can directly export his product to Foreign. This reflects the facts that exporters face the full marginal costs of production while receiving only a fraction α of revenues and their

uncertainty on the type of the distributor. Any distributor is impatient with subjective probability $\tilde{\theta}$ in which case she defaults with probability $(1-\lambda)$. Note also that $\frac{\partial q^*(MC>\bar{MC})}{\partial \theta} < 0$, so that the optimal export quantity increases as the belief that the distributor is impatient decreases.

Similarly, the maximization problem of exporters with $MC < \bar{MC}$ is

$$\max_p \Pi(MC, \tilde{\theta}) = \max_p \alpha p^{1-\varepsilon} A - p^{-\varepsilon} A MC - \alpha f \tag{2}$$

with solution $p^*(MC < \bar{MC}) = \frac{\varepsilon}{\varepsilon-1}\frac{1}{\alpha}MC$, $q^*(MC < \bar{MC}) = \left(\frac{\varepsilon}{\varepsilon-1}\frac{1}{\alpha}\right)^{-\varepsilon} A$ and $Rev^*(MC < \bar{MC}) = \left(\frac{\varepsilon-1}{\varepsilon}\alpha\right)^{\varepsilon-1} MC^{1-\varepsilon} A$.

These exporters charge lower prices and sell higher quantities than exporters with $M \geq \bar{MC}$ both because they are more productive and because they face no risk of default by impatient distributors.

When exporters with marginal cost MC have found a distributor, they have to decide whether to accept the match, which in steady state has an expected value of $E[V_{0E}(MC)]$, where expectations are over the type of distributor, or to continue search, which has value $U_{0E}(MC)$. Here $V_{0E}(MC)$ denotes the value of a match for exporters in the period the match is formed (period 0) given their marginal cost MC, while $U_{0E}(MC)$ is the value of not having a partner.

In steady state the Bellman equation for unmatched exporters can be written as $U_{0E}(MC) = -z + \beta_E[q(\eta)\eta E[V_{0E}(MC)] + (1-q(\eta)\eta)U_{0E}(MC)]$. Unmatched exporters have to pay a search cost z today. In the next period they find a partner with probability $q(\eta)\eta$, in which case they get $E[V_{0E}(MC)]$, else they stay without a partner. Solving this equation for $U_{0E}(MC)$, we have that $E[V_{0E}(MC)] \geq U_{0E}(MC) \Leftrightarrow E[V_{0E}(MC)] \geq \frac{-z+\beta_E q(\eta)\eta E[V_{0E}(MC)]}{1-\beta_E(1-q(\eta)\eta)}$, which is equivalent to $E[V_{0E}(MC)] \geq -z/(1-\beta_E)$. Hence, exporters never wait for a better match in the future since the expected value of a match is positive (else no exporters would enter), while the value of being unmatched is zero. As a consequence, exporters initially accept to match with any distributor, which leads to the following proposition.

Proposition 1: Exporters accept any match.

In equilibrium, exporters will stick to any distributor as long as they do not observe a default, because given that no default has occured, they cannot be certain, whether their partner is patient or whether she has not managed to default even though she tried, because she was prevented by legal institutions. Whenever a distributor honors the contract, the exporter become more confident that her partner is patient and increases exports, which in turn increases the value of the relation. Consequently, it does not make sense to terminate a relation before a default is observed.

The following proposition summarizes this:

Proposition 2: Exporters terminate a relation if and only if they observe a default.

Distributors

Having described the behavior of exporters, we now turn to distributors. Initially, distributors accept any partner because ex ante they do not observe the exporters' productivity and since there is free entry, the value of not having a partner is zero, which is less than the expected value of a partnership.

Proposition 3: Distributors accept any match.

In equilibrium impatient distributors honor their contracts with productive exporters and default exclusively on relatively unproductive ones. The idea is that given a sufficiently high level of patience, β_L, defaulting on productive exporters is too costly because the loss in future shared revenues is too large compared to current profits from cheating, while with less productive ones, it is more attractive to cheat in order to be able to match with a new exporter.

Proposition 4: Impatient distributors default if and only if $MC > \bar{M}C$.

Patient distributors, on the other hand, value the future sufficiently in order not to default on less productive exporters. They would default only on very unproductive producers, which do not enter the export market in equilibrium. If they were to default they would have to search for a new partner and they trade this off against the value of future exports, which are rising over time.

Proposition 5: patient distributors never default in equilibrium.

Beliefs

In equilibrium, exporters maintain a partnership as long as they are not certain that their partner is impatient. In each period they update their beliefs about the probability that their partner is impatient according to Bayes rule.

The subjective probability of an exporter that the distributor is impatient conditional on having observed a default and given the equilibrium strategies of distributors is one, $\tilde{\theta}(d) = 1$, while the probability conditional on having observed no default in the previous period is $\tilde{\theta}(nd) = \frac{Prob(impatient \cap nd)}{Prob(nd)} = \frac{\lambda\tilde{\theta}}{\lambda\tilde{\theta}+1-\tilde{\theta}} < \tilde{\theta}$.

More generally, let $\tilde{\theta}_i$ be the subjective probability of an exporter that the distributor is myopic in a relation of age i. $\tilde{\theta}_i = \frac{\lambda^i\theta_0}{\lambda^i\theta_0+1-\theta_0}$ if no default has occured for any $i \in \{0, ..., i-1\}$ and $\tilde{\theta}_i = 1$ else.

In equilibrium, beliefs must be consistent with actual probabilities to get an impatient partner, such that $\theta_0 = v_L/(v_H + v_L)$ is the true fraction of impatient distributors in the measure of distributors that are searching for an exporter.

2.4 Equilibrium

Having described the characteristics of the Nash equilibrium, we need to determine how the measure of impatient distributors that search for an exporter, v_L, the measure of patient distributors that search for an exporter, v_H, the measure of exporters that search for a distributor, u, the cutoff marginal cost from which on impatient distributors default, $\bar{MC}$, and the cutoff marginal cost from which on exporters decide to enter the export market (to start searching), $\tilde{MC}$, are simultaneously determined in general equilibrium, when distributors and exporters behave according to their equilibrium strategies. The following set of equations pins down the five endogenous variables $v_L, v_H, u, \bar{MC}, \tilde{MC}$.

Denote the distribution function of MC conditional on $MC < \tilde{MC}$ by $G(MC < \tilde{MC})$. First, the free entry condition for impatient distributors sets their expected net present value of a match equal to the expected discounted search cost.

$$E_0[V_{0L}] = \int_0^{\bar{MC}} (1-\alpha) \sum_{i=0}^{\infty} \beta_L^i (1-s)^i (Rev^*(MC < \bar{MC}) - f) dG(MC < \tilde{MC}) + \tag{3}$$
$$+ \int_{\bar{MC}}^{\tilde{MC}} (1-\alpha\lambda) \sum_{i=0}^{\infty} \beta_L^i (1-s)^i \lambda^i (Rev_i^*(MC \geq \bar{MC}) - f) dG(MC < \tilde{MC}) = \frac{c'(v_L)}{\beta_L q(\eta)}$$

The expected value of a match equals expected value of matching with an exporter with $MC < \bar{MC}$ plus the expected value of matching with an exporter with $MC \geq \bar{MC}$. For the first set of exporters impatient distributors never default. Since exporters know this, the type of the distributor does not matter and there is no learning, so that per period revenues are constant. When sticking to the agreement, distributors get a fraction $(1-\alpha)$ of revenues. Future revenues are discounted at the rate $\beta_L(1-s)$, where $(1-s)$ is the probability of no exogenous separation occuring. For the second set of exporters distributors default if they can, so there is learning and revenues change with the age of the relation. With probability $(1-\lambda)$ they default and get all the revenues and with probability λ they are not able to default and get $(1-\alpha)$ of revenues. The second equality comes from setting the value of not being matched, $U_{0L} = -c'(v_L) + \beta_L[q(\eta)E_0[V_{0L}] + (1-q(\eta))U_{0L}]$, equal to zero, which follows from free entry.

A similar free entry condition applies to patient distributors.

$$E_0[V_{0H}] = \int_0^{\bar{MC}} (1-\alpha) \sum_{i=0}^{\infty} \beta_H^i (1-s)^i (Rev^*(MC < \bar{MC}) - f) dG(MC \leq \tilde{MC}) + \tag{4}$$
$$+ \int_{\bar{MC}}^{\tilde{MC}} (1-\alpha) \sum_{i=0}^{\infty} \beta_H^i (1-s)^i (Rev_i^*(MC > \bar{MC}) - f) dG(MC < \tilde{MC}) = \frac{c'(v_H)}{\beta_H q(\eta)}$$

A third equation can be derived by setting expected profits for exporters with cutoff marginal cost $\tilde{MC}$, which are the least productive exporters that enter, equal to expected discounted search costs.

$$E_0[V_{0E}(\tilde{MC})] = \sum_{i=0}^{\infty} \beta_E^i (1-s)^i \alpha \prod_{j=0}^{i} (1-\tilde{\theta}_j + \tilde{\theta}_j \lambda)[Rev_i^*(MC > \bar{MC}) - f] = \frac{z}{\beta_E \eta q(\eta)} \tag{5}$$

Exporters with cutoff marginal cost $\tilde{MC}$ know that impatient distributors default if they can, so there is learning and revenues are time dependent. Revenues are discounted with the discount factor times the probability of no exogenous separation times the probability of no default up to period i, $\prod_{j=0}^{i}(1-\tilde{\theta}_j + \tilde{\theta}_j\lambda)$. With subjective probability $(1-\tilde{\theta}_j)$ the distributor is patient, while with probability $\tilde{\theta}_j$ she is impatient, in which case she honors the contract with probability λ. The second equality follows again from setting the value of not having a partner for exporters with marginal costs $\tilde{MC}$ equal to zero. $U_{0E}(\tilde{MC}) = -z + \beta_E[\eta q(\eta) E_0[V_{0E}(\tilde{MC})] + (1-\eta q(\eta)) U_{0E}(\tilde{MC})]$.

Furthermore, for impatient distributors the participation constraint binds at marginal cost $\bar{MC}$. If they have a partner with marginal cost $\bar{MC}$ impatient distributors are indifferent between defaulting and honoring the contract.

$$\bar{MC}^{\varepsilon-1} = \left(\frac{\varepsilon-1}{\varepsilon}\right)^{\varepsilon-1} A*$$

$$\frac{\left[(1-\alpha)\sum_{j=i}^{\infty}\beta_L^{j-i}(1-s)^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1} - (1-\alpha\lambda)\sum_{j=i}^{\infty}\beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1}\right]}{f * \left(\frac{1-\alpha}{1-\beta_L(1-s)} - \frac{(1-\alpha\lambda)}{1-\beta_L(1-s)\lambda}\right)} \tag{6}$$

Finally, a last equation relates the total measure of exporters that enter the export market to the probability to draw a marginal cost below $\tilde{MC}$. The sum of the measure of unmatched exporters, u and the measure of matched exporters, e needs to equal the total amount of exporters with a marginal cost below $\tilde{MC}$, $u + e = G(\tilde{MC})$. Applying the difference equation for the measure of matched exporters $e_{t+1} = e_t + q(\eta)\eta u_t - [s + \theta_0(1-\lambda)(G(\tilde{MC}) - G(\bar{MC}))]e_t$ and using the fact that in the steady state $e_t = e_{t+1} = e$, we get $e = \frac{\eta q(\eta) u}{s + \theta_0(1-\lambda)(G(\tilde{MC}) - G(\bar{MC}))}$.

So the last equation is:

$$u\left[1 + \frac{\eta * q(\eta)}{s + \theta_0(1-\lambda)(G(\tilde{MC}) - G(\bar{MC}))}\right] = G(\tilde{MC}) \tag{7}$$

2.5 Comparative Statics

Having described the equilibrium of the economy, in this section we derive several comparative statics results, that we will test in the empirical section of the paper.

2.5.1 Export quantities and age of relation

Proposition 6: optimal export quantities are increasing in the age of the relation as long as $MC \geq \bar{MC}$ and constant for $MC < \bar{MC}$.

The intuition for this result is that the longer exporters observe no default, the more confident they become that their partner is patient. As a consequence, they increase the quantity they export.

2.5.2 Export quantities and legal system

Proposition 7: Export quantities are increasing in the efficiency of the legal system, λ, if the age of the export relation is sufficiently small.

The intuition for this result is straightforward: if λ increases, exporters need not be so afraid that their partner will default even if she is impatient. Therefore, they increase their export quantities. If export relations are very established however, a larger λ increases the probability that the partner is still impatient even though she has not managed to default in the past by a lot compared to a situation with a low λ, potentially reversing the result.

2.5.3 State dependence

Our model predicts that the amount of state dependence, defined as the probability to export to a destination conditional on having exported there in the previous period, is systematically related to firm and destination characteristics. Econometrically, state dependence is captured by the marginal effect of a change in last period's export status (which is either one, if a firm has exported to a destination in the last period or zero otherwise) conditional on observable firm and destination characteristics.

State Dependence and Legal System

Next we derive a relation between state dependence and the quality of local legal system.

Again, conditional probabilities follow directly from our model.

$Prob(Y_{ict} = 1|Y_{ict-1} = 0, \lambda_c, MC \leq \tilde{MC}) = \eta * q(\eta)$.

$Prob(Y_{ict} = 1|Y_{ict-1} = 1, \lambda_c, MC < \bar{MC}) = (1 - s) - \eta * q(\eta)$

$Prob(Y_{ict} = 1|Y_{ict-1} = 0, \lambda_c, \geq \bar{MC} \leq MC \leq \tilde{MC}) = (1-s)[1-\theta(1-\lambda)]$, which is a positive function of λ_c.

Marginal effects are then derived by taking differences in conditional probabilities: $Prob(Y_{ict} = 1|\lambda_c, Y_{ict-1} = 1, MC < \bar{MC}) - Prob(Y_{ict} = 1|\lambda_c, Y_{ict-1} = 0, MC < \bar{MC}) = (1-s) - \eta * q(\eta)$.

$Prob(Y_{ict} = 1|\lambda_c, Y_{ict-1} = 1, \bar{MC} \leq MC \leq \tilde{MC}) - Prob(Y_{ict} = 1|\lambda_c, Y_{ict-1} = 0, \bar{MC} \leq MC \leq \tilde{MC}) = (1-s)(1-\theta(1-\lambda)) - \eta * q(\eta)$.

Again, this marginal effect is clearly a positive function of λ as long as $MC \geq \bar{MC}$, so in the regression we should observe more state dependence in destinations with better legal institutions, even if we control for firm and destination characteristics.

Proposition 8: State dependence is larger in destinations with better legal institutions.

State dependence and marginal cost

In order to derive a relation between state dependence and firm productivity, we need to define the conditional probabilities to export given firm's marginal cost. It is straightforward to derive the following:

$Prob(Y_{ict} = 1|Y_{ict-1} = 0, MC > \tilde{MC}) = 0,$

$Prob(Y_{ict} = 1|Y_{ict-1} = 0, MC \leq \tilde{MC}) = \eta * q(\eta),$

$Prob(Y_{ict} = 1|Y_{ict-1} = 1, MC, \bar{MC} \leq MC \leq \tilde{MC}) = (1-s)[1-\theta(1-\lambda)],$

$Prob(Y_{ict} = 1|Y_{ict-1} = 1, MC < \bar{MC}) = (1-s).$

Hence, the marginal effect of a change in past export status for firms with $MC < \bar{MC}$ is $Prob(Y_{ict} = 1|Y_{ict-1} = 1, MC < \bar{MC}) - Prob(Y_{ict} = 1|Y_{ict-1} = 0, MC < \bar{MC}) = (1-s) - \eta * q(\eta)$, while the marginal effect for firms with $MC \geq \bar{MC}$ is $Prob(Y_{ict} = 1|Y_{ict-1} = 1, \bar{MC} \leq MC \leq \tilde{MC}) - Prob(Y_{ict} = 1|Y_{ict-1} = 0, \bar{MC} \leq MC \leq \tilde{MC}) = (1-s)(1-\theta(1-\lambda)) - \eta * q(\eta)$. Consequently, marginal effects do depend on firm characteristics and are positively related to firm productivity, so we have established the following proposition:

Proposition 9: State dependence is larger for more productive exporters.

2.5.4 Hazard Rate

A further prediction of our model is on the hazard rate, i.e. the probability for a relation to end in period i. In order to define the hazard, note that the measure of matches of age i with impatient distributors is $\mu_{i,L} = q(\eta)v_L[Prob(MC > \bar{MC})\lambda^i(1-s)^i + (1 - Prob(MC > \bar{MC}))(1-s)^i]$, while the measure of matches of age i with patient distributors is $\mu_{i,H} = q(\eta)v_H(1-s)^i$.

Then the probability to observe a separation conditional on the age of the relation being i is

$$Prob(Separation|age=i) = \frac{q(\eta)v_L[Prob(MC>\bar{MC})\lambda^{i-1}(1-s)^{i-1}[(1-\lambda)(1-s)+s]+(1-Prob(MC>\bar{MC}))(1-s)^{i-1}s]+q(\eta)v_H(1-s)^{i-1}s}{q(\eta)v_L[(Prob(MC>\bar{MC})\lambda^{i}(1-s)^{i}+(1-Prob(MC>\bar{MC}))(1-s)^{i})]+q(\eta)v_H(1-s)^{i}}.$$

Hazard and age of relation

Proposition 10: The hazard is decreasing in the age of the relation.

The intuition for this proposition is a composition effect - since relations with impatient distributors have a higher probability of separation than those with patient ones, the larger the age of the relation, the smaller becomes the fraction of impatient distributors.

Hazard and Legal System

Proposition 11: The hazard is decreasing in the quality of the legal system for sufficiently young relations.

The intuition for this proposition is as follows. Initially, the direct effect of less defaults dominates the effect of a higher λ on the hazard. However, as relations mature, the composition effect (more impatient distributors stay in the population) becomes more important and eventually outweighs the direct effect.

Hazard and Marginal Cost

Proposition 12: The hazard is decreasing in firms' productivity.

This is because on productive exporters no distributor defaults endogenously and all separations are exogenous, while on unproductive exporters impatient distributors default. So as long as the probability of exogenous separation is sufficiently small a smaller fraction of relations involving productive exporters is terminated each period than involving unproductive ones.

3 Empirical Analysis

3.1 Data

We use a panel of 7172 French manufacturing firms that export at least once in the period from 1993 to 2005. The data set in administered by the French Statistical Agency (INSEE) and merges two data sources. One is the customs (DOUANES) data base which allows us to precisely observe the exports of each firm to any potential destination. We select those countries for which we have the additional information we need to carry out our analysis. Thus, the final data set includes 89 countries. The other source is the Bénéfices Réels Normaux (BRN) data base which provides very detailed firm level data on a variety of balance-sheet measures. This allows us to calculate and control

for different firm characteristics such as total factor productivity or various size measures. Each firm is assigned to a sector using the French NES classification system. We also use several control variables that come from other sources. Data on average real GDP and real GDP per worker for the sample period are from the Penn World Tables (Mark 6.2) and data on distance from Paris are taken from Rose (2004). Furthermore, we use several measures of the quality of legal institutions, which we take from Nunn (2007). First, we employ "rule of law" from Kaufmann, Kraay, and Mastruzzi (2003), as provided by Nunn (2007). This is a weighted average of a number of variables (perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts) that measure individuals' perceptions of the effectiveness and predictability of the judiciary and the enforcement of contracts in each country between 1997 and 1998. The variable ranges from 0 to 1 and is increasing in the quality of institutions. Second, we use "Legal quality" from Gwartny and Lawson (2003). It is an index from 1 to 10 that measures the legal structure and the security of property rights in each country in 1995. Finally, we make use of a set of variables collected by the World Bank (World (2004)). We use data on the "number of procedures", "official costs" and "time" required to collect an overdue debt. "Number of procedures" is the total number of procedures mandated by law or court regulation that demand interaction between the parties or between them and the judge or courtofficer. All these variables are scaled and transformed by Nunn (2007) in order to make them increasing in judicial quality.[7] This variable ranges from 2 to 49 in our sample. "Official costs" is the sum of attorney fees and court fees during the litigation process, divided by the country's income per capita.[8] The final variable ranges from 1 to 4.5. "Time" is a positive transformation of a variable which reports the total estimated time of the full legal procedure in calendar days. [9] In our sample this variable ranges from 41 to 1473. Basic statistics for the different institutional quality variables are reported in table 1.

3.2 State-dependence: linear analysis

In this subsection we describe our econometric methodology to measure state dependence of exporting decisions and we present our empirical results on the correlation between state dependence and country-/firm characteristics mentioned in the introduction and derived from our model. We use

[7] "number of procedures" is obtained as 60 minus the total number of procedures, thus a higher number indicates less procedures and a more efficient judicial system.

[8] Nunn's transformation of this measure is given by 6 minus the natural log of official costs so that a higher number indicates lower costs of litigation and a better legal system.

[9] It is defined as 1,500 minus the total time so that a higher number indicates a shorter duration and a better legal system

a linear probability model, which - given the three dimensional structure of our panel (firms, time and destinations)- allows to control for time varying unobserved heterogeneity at the firm- and destination-level without making assumptions on the correlation structure between the error term and observables.

As a first step we use a linear probability model to investigate if current export status depends on past export status, even when we control for firm and destination specific shocks.

Our basic regression is:

$$Y_{i,c,t} = \beta_0 + \beta_1 Y_{i,c,t-1} + \delta_{i,t} + \delta_{c,t} + \varepsilon_{i,c,t}. \tag{8}$$

Here $Y_{i,c,t}$ is a dummy that equals one whenever firm i exports to destination c in period t , whereas $\delta_{i,t}$ and $\delta_{c,t}$ are firm-time and destination-time specific fixed effects. The coefficient β_1 of equation (8) is a measure of state-dependence, since it captures the marginal effect of past export status on the probability that a firm exports to a destination today.[10] Exploiting all the dimensions of our data set we can take time-varying firm level as well as time-varying destination specific unobserved heterogeneity into account. Firm level time varying heterogeneity refers to firm characteristics such as productivity, managerial ability, or firm's strategy which may affect a firm's decision to export. Destination specific time varying unobserved heterogeneity captures country characteristics like market size, distance, openness policies, belonging to a free trade area with France or movements in the exchange rates, which may influence the probability of a firm to export to that country.[11]

To make sure that our results are robust and in order to allow for some flexibility on the effect of past export status, we consider the following regression:

$$Y_{i,c,t} = \beta_0 + \beta_1 Y_{i,c,t-1} + \beta_2 Y_{i,c,t-1} * Z_c + \delta_{i,t} + \delta_{c,t} + \varepsilon_{i,c,t}, \tag{9}$$

where Z_c is a vector of country's characteristics. Country level variables are measures of market size (as captured by log(GDP) and log(distance)) and the level of development (GDP per worker). The interaction term between past export status and country level variables allows us to check whether past export status has a different effect depending on country characteristics.

[10] Roberts and Tybout (1997) and Bernard and Jensen (2004) use similar reduced form formulations to test their sunk cost hypothesis.

[11] $\delta_{i,t}$ and $\delta_{c,t}$ disappear from the regression which we estimate by applying a double within transformation. Since the equation is demeaned by averaging over firms and destinations, our estimation method does not have problems of consistency, since also the demeaned errors are uncorrelated with the right hand side variables. Therefore, we need not use instrumental variable methods that are usually applied in dynamic linear panel estimations.

Table 2 reports the results of the previous regressions.[12] In the first column we report the results for our basic specification. The coefficient of past export status is positive and significant at the 1% level. The probability for a French firm to export to a country today is 67% higher if the firm has exported to that same country in the previous year with respect to the case in which the firm did not export to that country in the previous year.

When the market size of a country is taken into account, the conditional probability of exporting of a firm (given it exported there in the previous year) increases by 2 percentage points when we move from a country at the 25th percentile of GDP to a country at the 75th percentile.[13] Distance from France, on the other hand, has a significantly negative impact on the amount of state dependence.

In order to test the prediction that state dependence is higher in countries with better legal institutions (proposition 8) we run the following regression:

$$Y_{i,c,t} = \beta_0 + \beta_1 Y_{i,c,t-1} + \beta_2 Y_{ict-1} * IQ_c + \beta_3 Y_{i,c,t-1} * Z_c + \delta_{i,t} + \delta_{c,t} + \varepsilon_{i,c,t}, \tag{10}$$

where IQ_c is one of five alternative measures of institutional quality discussed above and Z_c is a vector of country characteristics. The results of these regressions using different sets of controls are reported in Tables 3 to 7 for different measures of the quality of legal institutions. In all regressions the interaction term between the measure of institutional quality and state dependence is of the expected sign and significant at the one percent level. In terms of economic magnitude, using the specification in the last column of Table 3 we find that, holding constant all other variables, state dependence increases by 5 percentage points, from 62% to 67%, as we move from a country whose institutional quality is at the 25th percentile to a country at the 75th percentile[14]. Tables 4 to 7 confirm the robustness of these results when using different measures of institutional quality.

Next we test the prediction that state dependence is significantly larger for more productive firms (proposition 9). We do this by running the following regression:

$$Y_{i,c,t} = \beta_0 + \beta_1 Y_{i,c,t-1} + \beta_2 Y_{ict-1} * Prod_{i,t} + \beta_3 Y_{i,c,t-1} * X_c + \delta_{i,t} + \delta_{c,t} + \varepsilon_{i,c,t}, \tag{11}$$

where $Prod_{it}$ is a measure of firm productivity - we use here value added by worker (in logs) - and X_c is a vector of country level controls including GDP, distance, GDP per worker as well as

[12] These regressions are run on our balanced panel of 12 years, 89 countries and 7172 firms, thus we have 7.659.696 observations.

[13] A country at the 25th percentile has a GDP in logs of 16.77, while a country in the 75th percentile has a GDP in logs of 19.45. Thus in the first case the estimated state dependence is of 63%= (0.46+0.01*16.77) while in the second case is of 65%=(0.46+0.01*19.45).

[14] $0.62 = 0.57 + 0.16 * 0.36$ and $0.67 = 0.57 + 0.16 * 0.66$.

different measures of institutional quality. Tables 8 and 9 report the results of these regressions. In all cases the interaction between firm productivity and past export status has the expected sign and is significant at the one percent level. The results are very stable across regressions and imply that an increase of 1 log-point in the productivity of firms increases the conditional probability to export (state-dependence) by 3.9 percentage points, holding constant all the other covariates.

3.3 State-dependence: nonlinear analysis

to be completed...

3.4 Survival analysis

Our theoretical model makes several predictions on the correlations between the duration of export relations and firm as well as country characteristics. In order to test them, we use survival analysis methods. An observation is now defined as a spell - the duration of a firm-country export relation. Before going into the details of our econometric strategy, let us discuss two features of the data we have to take care of: existence of multiple spells and right and left censoring of spells.

First, in our sample there are multiple spells, that is the same firm exports to the same country in different time intervals repeatedly and each of these relations may have a different duration. In our analysis we treat each spell as independent,[15] which is consistent with our theoretical analysis.[16] Nevertheless, we take care of the multispell problem with different robustness checks in the next sub-section.

Second, the original data are censored on both sides. There are right-censored observations because we observe data until 2005 and many relations are still active in that year. There are also left-censored observations since in the first year we cannot distinguish which relations start before that year and which ones are new. We deal with the left-censoring problem by considering only those firms that start exporting in the second year for which we have information in our database or later[17], while we take care of the right-censoring in the regression analysis by adding a dummy variable for the starting dates of relations.

[15] We treat two or more different spells of the same firm in a given country as if they were spells of a different unit of observation.

[16] Since having previously exported to a destination does not provide any advantage to a firm that wants to re-enter a destination over a firm that tries to export to a destination for the first time, since it has to find a new distributor there

[17] This procedure reduces the number of firms in the database from 7172 to 7108. The total number of relations in the sample is 177,561. Notice that in this subsection we analyze only the actual (active) relations: this is the reason why we have 177.561 observations instead of 7.659.696 potential relations like in the previous sections.

We start out with a description of the duration of trade relations. Table 10 reports the frequency of observations for each possible length of the relations' duration: 77% of all relations last less then 4 years, with 1-year relations accounting for slightly more than half of the observations. As already noticed, the majority of trade relations have a short duration.

To investigate the predictions of the model on the relation between the hazard, instutitional quality and firm productivity, we first use a descriptive analysis. Table 11 shows the Kaplan-Meier survival rates for the whole sample, for different quartiles of our main measure of institutional quality (QC) as well as for different quartiles of firm value added per worker. This descriptive analysis suggests that for countries within the highest percentiles of institutional quality and for firms within the highest productivity quartiles, the survival rates are higher at any age of the relation. The former finding is also depicted in Figure 6 that plots the Kaplan-Meier survival rates for each quartile of institutional quality. Very similar results are found when we consider different quartiles of GDP (our measure of market size): survival increases with country market size.[18]

In order to test more formally the predictions of the model on the relation between legal institutional quality and the hazard rate (proposition 11) as well as the relation between firm productivity and the hazard rate (proposition 12) we perform a set of Cox regressions.

The assumption of the Cox proportional hazard model is that the hazard is separable between a function of duration $h(t)$ and a part that depends on a vector of dependent variables X. Our specification is the following:

$$h(t, X\beta) = h(t)exp(\beta_1 GDP_c + \beta_2 IQ_c + \beta_3 TFP_i + \beta_4 X_c + \delta_t + \delta_s), \tag{12}$$

where X_c contains GDP per worker and distance as controls; δ_t is a dummy for the starting year of each relation, which is the standard treatment for right-censoring; δ_s takes care of time-invariant sector characteristics that may drive different durations of export relations Results are reported in Table 12. As predicted, the hazard is strictly decreasing in all the measures of the quality of the legal system (all variables are significant at the one percent level) and strictly decreasing in firm productitivity (also significant at the one percent level). Results are robust to introducing other control variables, like our measures of market size.[19] As for the magnitude of our results, we find that an increase of our main

[18] We do not report these results because they are very similar in magnitude to the previous ones. Results are robust to using different measures of institutional quality and when we consider the single-spell sub-sample.

[19] We cluster standard errors at the country level (in the regressions that focus on country-level dependent variables) and at the firm level (in the regressions that focus on firm-level dependent variables), and we use robust standard errors in those specifications which included both firm and country characteristics.

measure of IQ of one% decreases the hazard by 5.8%, while a one% increase in productivity decreases the hazard by 9.5% [20].

Our last prediction is that relations become more stable as they mature, so the hazard should be decreasing in the age of the relation (proposition 10). In order to test this hypothesis we estimate a parametric hazard model, since the time dependent part of the hazard is not estimated in the Cox model.

Insert results here...

3.5 Survival analysis: robustness

60% of export relationships in our data involve multiple spells. Here, we perform two robustness checks to show that the hypothesis of spell-independence is not biasing our previous results. First, we replicate our analysis using only relationships which involve single-spells. The total amount of single spells in our data set is of 73.675 and their length distribution, as well as all descriptive statistics, are very similar to the total sample. Second, we replicate the analysis adding an indicator for multi-spell observations. Results for the main coefficients of interest (different measures of IQ and firm productivity) of the Cox model for these two robustness checks are reported in Table 13. They are indeed very similar to the previous ones, thus confirming that multiple spells are not a problem in our framework.

to be completed...

3.6 Predictions on export quantities

It remains to test the predictions of the model on export quantities (propositions 6 and 7). First, our model predicts that export values should increase in the age of the export relation. Second, a further result of our model is that export values should be larger to countries that have better legal institutions.

To test these propositions, we regress the value of exports of firm i to country c in period t in logs, $Export_{i,c,t}$ on the age of the export relation, $Age_{i,c,t}$, and a vector of controls. We use two different specifications.

$$Export_{i,c,t} = \beta_0 + \beta_1 Age_{i,c,t} + \beta_2 X_{i,t} + \delta_{c,t} + \varepsilon_{i,c,t} \tag{13}$$

[20] Column (5): $5.8\% = 100 * [exp(-0.06) - 1]$ and column (8): $9.5\% = 100 * [exp(-0.10) - 1]$

$$Export_{i,c,t} = \beta_0 + \beta_1 Age_{i,c} + \beta_2 Z_c + \delta_{i,t} + \varepsilon_{i,c,t} \tag{14}$$

$X_{i,t}$ (in regression 13) is a vector of firm characteristics like labor-productivity, capital and number of workers (all in logs), Z_c (in regression 14) refers to a vector of country characteristics used in previous analysis (GDP, distance and a measure of institutional quality), $\delta_{c,t}$ and $\delta_{i,t}$ are, respectively, dummies which capture time-varying country-specific and time-varying firm-specific characteristics. According to proposition 6 we expect a positive coefficient for age. Results are reported in Table 14: export sales increases with the age of relation after controlling for firm and country characteristics. Proposition 7 is also confirmed as shown by the significant positive coefficient of legal institutions (IQ) in (13).

4 Conclusion

In this paper we have presented a model where exporting requires to find a partner in order to distribute the product in each market. Incomplete information and imperfect enforcement of contracts give room for reputation and lead to learning of exporters about the reliability of their partner. We have shown that our model leads to several interesting patterns: Export relations start small and exports grow over time if relations are successful. Moreover, search for a partner under incomplete information leads to state dependence of exporting decisions which is independent of sunk fixed costs. Instead, state dependence is larger in markets with better legal institutions and for more productive exporters. We test these and other predictions of our model by using a large panel of French exporting firms that provides information on individual firms' exports by destination. We find strong support for all the predictions of our model - specifically, export relations are more stable and there is more state dependence in countries with better legal institutions and the same is true for export relations of more productive exporters. Both of these facts are difficult explain with a standard model of firm heterogeneity and sunk costs to export and shed light on the importance of relationship specificity for explaining the dynamics of trade.

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5 Appendix

5.1 Proofs

Proposition 2: Exporters terminate a relation if and only if they observe a default.

Proof:

We show that exporters terminate any relation whenever they observe a default, provided that $\Pi(\tilde{\theta}=1,MC) = AMC^{1-\varepsilon}\left(\frac{\varepsilon-1}{\varepsilon}\alpha\lambda\right)^{\varepsilon-1}\left(\frac{\varepsilon-(\varepsilon-1)\lambda}{\varepsilon}\right) - \alpha f < 0$, which we assume to hold for $\lambda < 1$.

Note that in equilibrium defaults can only occur if $MC > \bar{M}C$. An exporter will end a partnership if and only if the value of continuing the relation conditional on believing that her partner is impatient with certainty is smaller than the value of search, $V_{iE}(MC,\tilde{\theta}=1) < E[U_{0E}(MC)]$.

Since there is no learning once the belief is $\tilde{\theta}=1$, the Bellman equation for the value of the relation conditional on $\tilde{\theta}=1$ can be written as $V_E(MC,\tilde{\theta}=1) = \Pi(\tilde{\theta}=1) + \beta_E(1-s)\lambda V_E(MC,\tilde{\theta}=1) + \beta_E(s+(1-s)(1-\lambda))E[U_{0E}(MC)]$. Then after some manipulations we obtain: $V_{iE}(MC,\tilde{\theta}=1) < E[U_{0E}(MC)] \Leftrightarrow \Pi(\tilde{\theta}=1) < (1-\beta_E)E[U_{0E}(MC)]$, which is satisfied, since $E[U_{0E}(MC)] \geq 0$ because otherwise distributors would not enter.

Proposition 3: Distributors accept any match.

Proof:

Without loss of generality, consider an impatient distributor. Let $E[V_{0L}]$ be the expected value of a match for an impatient distributor at the time of the match, when marginal costs of the exporter are unknown and let U_{0L} be the value of not being matched, which equals the value of waiting. Impatient distributors will accept any match to get $E[V_{0L}]$ if and only if $E[V_{0L}] > U_{0L}$.

In the steady state, where the value of not being matched is constant, the value of rejecting a distributor today in order to wait for another period satisfies the following Bellman equation:

$$U_{0L} = -c'(v_L) + \beta_L(q(\eta)E[V_{0L}] + (1-q(\eta))U_{0L}), \tag{15}$$

In the current period, the exporter does not have a partner and faces a marginal cost of search $c'(v_L)$, while in the next period she finds a partner with probability $q(\eta)$ and gets $E[V_{0L}]$, otherwise she will remain unmatched and gets U_{0L}.

Since there is impatient distributors can enter freely, $U_{0L} = 0$ in equilibrium. Then from (15) it follows that $E[V_{0L}] = c'(v_L)/(\beta_L q(\eta)) > 0$, so that impatient distributors accept any match.

Proposition 4: impatient distributors default if and only if $MC > \bar{M}C$

Let i denote the age of the relation and let $V_{iL}(.,MC)$ be the value of being matched with an

exporter with marginal cost MC given the strategies of exporters and distributors (default (d) or no default (nd)). Then if $\beta_L > \alpha/(1-s)$ there exists a $\bar{MC} > 0$, defined below, such that given the equilibrium beliefs and strategies: I) if $MC < \bar{MC}$ we have $V_{iL}(nd, MC) > V_{iL}(d, MC)$ and II) if $MC \geq \bar{MC}$ we have $V_{iL}(nd, MC) \leq V_{iL}(d, MC)$.

Proof:

I)

The value of honoring a contract with an exporter with $MC < \bar{MC}$ given that exporters believe that impatient distributors will honor their contracts can be derived by forward substitution into the Bellman-equation of being matched, $V_{iL}(nd, MC < \bar{MC}) = (1-\alpha)(Rev^*(MC < \bar{MC}) - f) + \beta_L[sU_{0L} + (1-s)V_{i+1L}]$ and imposing $U_{0L} = 0$:

$$\begin{aligned} V_{iL}(nd, MC < \bar{MC}) &= \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i} * (1-\alpha)(Rev^*(MC < \bar{MC}) - f) \\ &= \frac{1-\alpha}{1-\beta_L(1-s)}(Rev^*(MC < \bar{MC}) - f) \end{aligned} \tag{16}$$

In this case the type of the distributor does not matter for exporters since all distributors honor their contracts. Consequently, there are no learning effect and revenues are independent of time.

If impatient distributors deviate from their equilibrium strategy in period i and default given the strategies and beliefs of the exporters, they obtain

$$\begin{aligned} V_{iL}(d, MC < \bar{MC}) &= \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}(1-\alpha\lambda)(Rev^*(MC < \bar{MC}) - f) \\ &= \frac{1-\alpha\lambda}{1-\beta_L(1-s)\lambda}(Rev^*(MC \leq \bar{MC}) - f) \end{aligned} \tag{17}$$

In this case, if they manage to default, the relation ends given the strategies of the exporters.

Hence, impatient distributors will not default if and only if $V_{iL}(nd, MC) > V_{iL}(d, MC) \Leftrightarrow \beta_L > \alpha/(1-s)$.

II)

The value of not honoring the contract with an exporter with $MC \geq \bar{MC}$ given that exporters believe that impatient distributors will default if they can be written as

$$V_{iL}(d, MC \geq \bar{MC}) = \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}(1-\alpha\lambda)Rev_j^*(MC \geq \bar{MC}). \tag{18}$$

If impatient distributors deviate from their equilibrium strategy in period i and don't default they get

$$V_{iL}(nd, MC \geq \bar{MC}) = \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i} * (1-\alpha) Rev_j^*(MC \geq \bar{MC}). \tag{19}$$

Plugging in the expressions for $Rev_j^*(MC > \bar{MC})$ and manipulating, the condition $V_{iL}(nd, MC > \bar{MC}) \leq V_{iL}(d, MC > \bar{MC})$ becomes

$$\left(\frac{\varepsilon-1}{\varepsilon}\right)^{\varepsilon-1} A * MC^{1-\varepsilon} *$$

$$\left[(1-\alpha)\sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1} - (1-\alpha\lambda)\sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1}\right] \tag{20}$$

$$\leq f * \left(\frac{1-\alpha}{1-\beta(1-s)} - \frac{(1-\alpha\lambda)}{1-\beta(1-s)\lambda}\right)$$

It is straightforward to show that the right hand side of this expression is positive whenever $\beta_L > \alpha/(1-s)$. The left hand side is positive as long as the term in square brackets is positive, which one can show to be the case.

Hence, the cutoff $\bar{MC}$ from which on impatient distributors default in equilibrium is given by

$$MC^{\varepsilon-1} \geq \bar{MC}^{\varepsilon-1} = \left(\frac{\varepsilon-1}{\varepsilon}\right)^{\varepsilon-1} A *$$

$$\frac{\left[(1-\alpha)\sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1} - (1-\alpha\lambda)\sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1}\right]}{f * \left(\frac{1-\alpha}{1-\beta_L(1-s)} - \frac{(1-\alpha\lambda)}{1-\beta_L(1-s)\lambda}\right)} \tag{21}$$

Proposition 5: patient distributors never default

Proof: We show that in equilibrium patient distributors honor their contracts with all types of exporters.

If $\beta_H > \alpha/(1-s)$ and $\frac{1-\beta_H(1-s)(1-\lambda)+\beta_H^2(1-s)^2\lambda}{1-\beta_L(1-s)(1-\lambda)+\beta_L^2(1-s)^2\lambda} > \frac{\beta_H(1-s)-\alpha}{\beta_L(1-s)-\alpha}$ there exists a $\hat{MC} > \bar{MC}$ such that for all $MC < \hat{MC}$ we have that: I) if $MC < \bar{MC}$ $V_{iH}(nd, MC) > V_{iH}(d, MC)$ and II) if $MC \geq \bar{MC}$ $V_{iH}(nd, MC) > V_{iH}(d, MC)$.

I)

If patient distributors are matched with an exporter with $MC < \bar{MC}$, per period revenues are constant and the value of not defaulting is given by

$$V_{iH}(nd, MC < \bar{MC}) = \sum_{j=i}^{\infty} \beta_H^{j-i}(1-s)^{j-i} * (1-\alpha) Rev^*(MC \leq \bar{MC})$$
$$= \frac{1-\alpha}{1-\beta_H(1-s)} Rev^*(MC < \bar{MC}) \tag{22}$$

The value of deviating in period i and defaulting on these exporters is

$$V_{iH}(d, MC \leq \bar{MC}) = \sum_{j=i}^{\infty} \beta_H^{j-i}(1-s)^{j-i}\lambda^{j-i}(1-\alpha\lambda) Rev^*(MC \leq \bar{MC})$$
$$= \frac{1-\alpha\lambda}{1-\beta_H(1-s)\lambda} Rev^*(MC < \bar{MC}). \tag{23}$$

Hence, $V_{iH}(nd, MC < \bar{MC}) > V_{iH}(d, MC < \bar{MC}) \Leftrightarrow \beta_H > \alpha/(1-s)$.

II)

The value of respecting the contract with an exporter with $MC \geq \bar{MC}$ given exporters' beliefs and equilibrium strategies is

$$V_{iH}(nd, MC \geq \bar{MC}) = \sum_{j=i}^{\infty} \beta_H^{j-i}(1-s)^{j-i} * (1-\alpha) Rev_j^*(MC > \bar{MC}). \tag{24}$$

A deviation to defaulting in period i would give the following value:

$$V_{iH}(d, MC \geq \bar{MC}) = \sum_{j=i}^{\infty} \beta_H^{j-i}(1-s)^{j-i}\lambda^{j-i}(1-\alpha\lambda) Rev_j^*(MC > \bar{MC}) \tag{25}$$

Plugging in the expressions for $Rev_j^*(MC \geq \bar{MC})$ and manipulating, the condition $V_{iL}(nd, MC \geq \bar{MC}) \geq V_{iL}(d, MC \geq \bar{MC})$ becomes

$$MC^{\varepsilon-1} \leq \left(\frac{\varepsilon-1}{\varepsilon}\right)^{\varepsilon-1} A*$$

$$\frac{\left[(1-\alpha)\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1} - (1-\alpha\lambda)\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}\lambda^{j-i}(\tilde{\theta}_j\lambda + 1 - \tilde{\theta}_j)^{\varepsilon-1}\right]}{f * \left(\frac{1-\alpha}{1-\beta_H(1-s)} - \frac{(1-\alpha\lambda)}{1-\beta_H(1-s)\lambda}\right)} \tag{26}$$
$$\equiv \hat{MC}^{\varepsilon-1}$$

It remains to show that $\bar{MC} < \hat{MC}$ such that patient distributors would default only on extremely unproductive exporters, which in equilibrium -as we show later - never enter the export market.

To make sure that the denominator of $\bar{MC}$ is smaller than the denominator of $\hat{MC}$, it can be verified that the following condition must hold: $\frac{1-\beta_H(1-s)(1-\lambda)+\beta_H^2(1-s)^2\lambda}{1-\beta_L(1-s)(1-\lambda)+\beta_L^2(1-s)^2\lambda} > \frac{\beta_H(1-s)-\alpha}{\beta_L(1-s)-\alpha}$.

The numerator of $\hat{MC}$ is larger than the one of $\bar{MC}$ by inspection.

Therefore, the above condition is sufficient for $\bar{MC} < \hat{MC}$.

Proposition 6: optimal export quantities are increasing in the age of the relation as long as $MC \geq \bar{MC}$ and constant for $MC < \bar{MC}$.

Proof:

Note that as long as $MC \geq \bar{MC}$, $\tilde{\theta}$ is increasing in i and p^* is increasing in $\tilde{\theta}$, while q^* is decreasing in p^*. Hence, q^* is increasing in i.

For $MC < \bar{MC}$ there is no learning and therefore quantities are independent of the relation's age.

Proposition 7: export quantities are increasing in the efficiency of the legal system, λ if the age of the export relation is sufficiently small.

The intuition for this result is straightforward: if λ increases, exporters need not be so afraid that their partner will default even if she is impatient. Therefore, they increase their export quantities. If export relations are very established however, a larger λ has a big effect on the probability that the partner is impatient even though she has not managed to default in the past, potentially reversing the result.

Proof:

$$\frac{\partial Q}{\partial \lambda} = (\varepsilon - 1)\alpha \left(\frac{\varepsilon - 1}{\varepsilon} \alpha(\tilde{\theta}\lambda + (1 - \tilde{\theta})) \right)^{\varepsilon - 1} A \left(\frac{\partial \tilde{\theta}}{\partial \lambda}(\lambda - 1) + \tilde{theta} \right) \tag{27}$$

since $\frac{\partial \tilde{\theta}}{\partial \lambda} = \frac{i\lambda^{i-1}\theta_0(1-\lambda)}{[\lambda^i\theta_0+1-\theta_0]^2]} > 0$ need $\tilde{theta} > (1-\lambda)\frac{\partial \theta}{\partial \lambda}$ for derivative to be positive, which is true for sufficiently small i.

Proposition 8: the hazard is decreasing in the age of the relation.

Proof:

$$\begin{aligned}
&\frac{\partial Prob(Separation|age = i)}{\partial i} \\
&= \frac{\log(\lambda)\lambda^{i-1} v_L Prob(MC > \bar{MC})}{\left\{ v_L[(Prob(MC > \bar{MC})\lambda^i(1-s) + (1 - Prob(MC > \bar{MC}))] + v_H(1-s)^i \right\}^2} * \\
&\{[(1-s)(1-\lambda) + s][(1-s)v_L[Prob(MC > \bar{MC})\lambda^i + (1 - Prob(MC > \bar{MC}))] + v_H(1-s)] - \\
&\lambda(1-s)[v_L[Prob(MC > \bar{MC})\lambda^{i-1}[(1-\lambda)(1-s) + s] + (1 - Prob(MC > \bar{MC}))s] + v_H s]\}
\end{aligned} \tag{28}$$

If $\lim_{s \to 0}$ the expression becomes $\log(\lambda)\lambda^{i-1} v_L Prob(MC > \bar{MC})(1-\lambda)[(1 - Prob(MC > \bar{MC})) +$

$v_H] < 0$, which proves that the hazard is decreasing in the age of the relation via a composition effect if the probability of exogenous separation is sufficiently small.

Proposition 11: the hazard is decreasing in firms' productivity.

Proof:

The probability of a separation occuring conditional on the age of the relation and the marginal cost being $< \bar{MC}$ is $Prob(Separation|age = i, MC < \bar{MC}) = \frac{(1-s)^{i-1}s}{(1-s)^i} = \frac{s}{1-s}$ and conditional on $MC|geq\bar{MC}$ is $Prob(Separation|age = i, MC \geq \bar{MC}) = \frac{v_L\lambda^{i-1}[(1-\lambda)(1-s)+s]+v_H s}{v_L(1-s)+v_H(1-s)}$.

It is straightforward to show that $Prob(Separation|age = i, MC < \bar{MC}) < Prob(Separation|age = i, MC \geq \bar{MC})$ iff $s \leq 2 - 1/\lambda$.

Proposition 12: the hazard is decreasing in the quality of the legal system for sufficiently young relations.

The intuition for this proposition is as follows. Initially, the direct effect of less defaults dominates the effect of a higher λ on the hazard. However, as relations mature, the composition effect (more impatient distributors stay in the population) becomes more important and eventually outweighs the direct effect.

$$\frac{\partial Prob(Separation|age = i)}{\partial \lambda}$$
$$= \frac{\lambda^{i-2} v_L Prob(MC > \bar{MC})}{\left\{v_L[(Prob(MC > \bar{MC})\lambda^i(1-s) + (1 - Prob(MC > \bar{MC}))(1-s)] + v_H(1-s)\right\}^2} * \tag{29}$$
$$\{[(i-1)[(1-s)(1-\lambda)+s] - \lambda(1-s)][(1-s)v_L[Prob(MC > \bar{MC})\lambda^i + (1 - Prob(MC > \bar{MC}))] + v_H(1-s)]$$
$$- i\lambda(1-s)[v_L[Prob(MC > \bar{MC})\lambda^{i-1}[(1-\lambda)(1-s)+s] + (1 - Prob(MC > \bar{MC}))s] + v_H s]\}$$

For small i the derivative is clearly negative, but for larger i the composition effect may potentially increase the hazard.

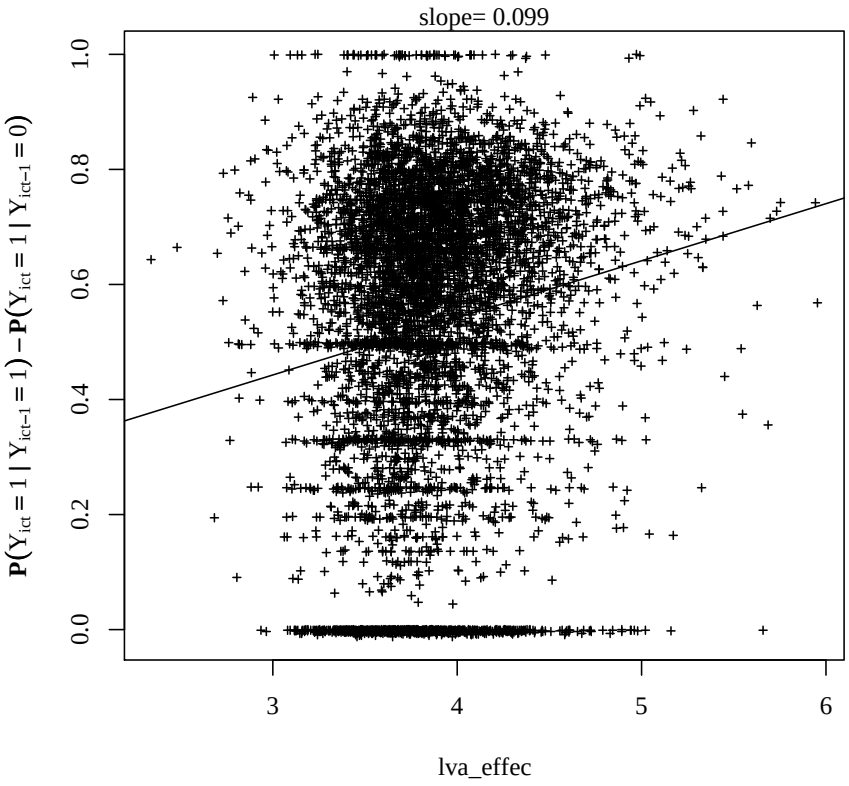

Figure 1: State dependence to be explained by firm value added per worker. The figure shows correlation between the estimated marginal effect of past export status on current export decisions with firms' log value added per worker.

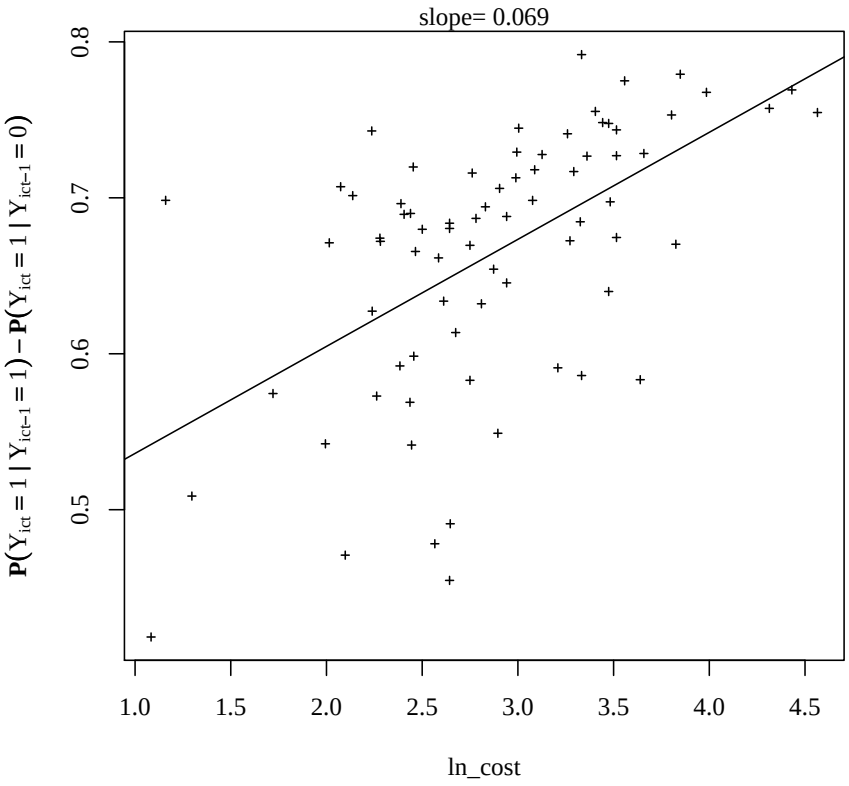

Figure 2: State dependence to be explained by legal institutions. The figure shows correlation between the estimated marginal effect of past export status on current export decisions with an inverse measure of the cost of legal procedures by country.

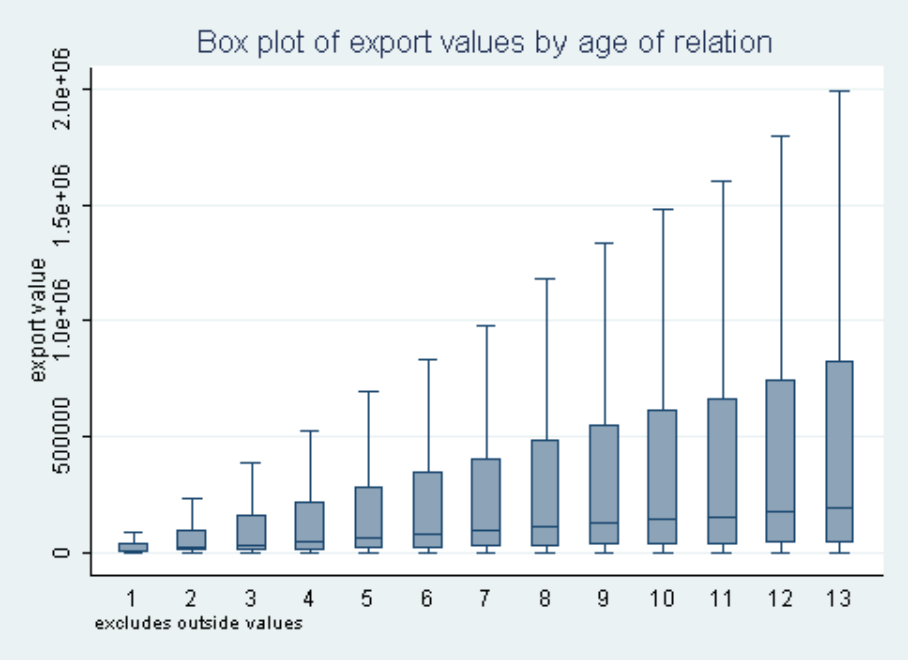

Figure 3: Export sales by relations' age

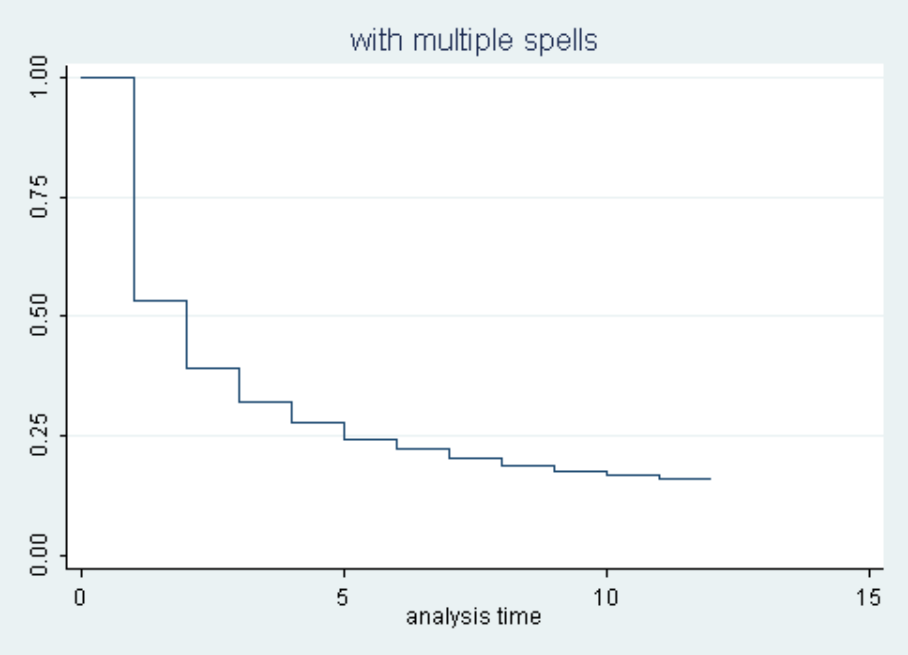

Figure 4: Kaplan-Meyer Hazard Function

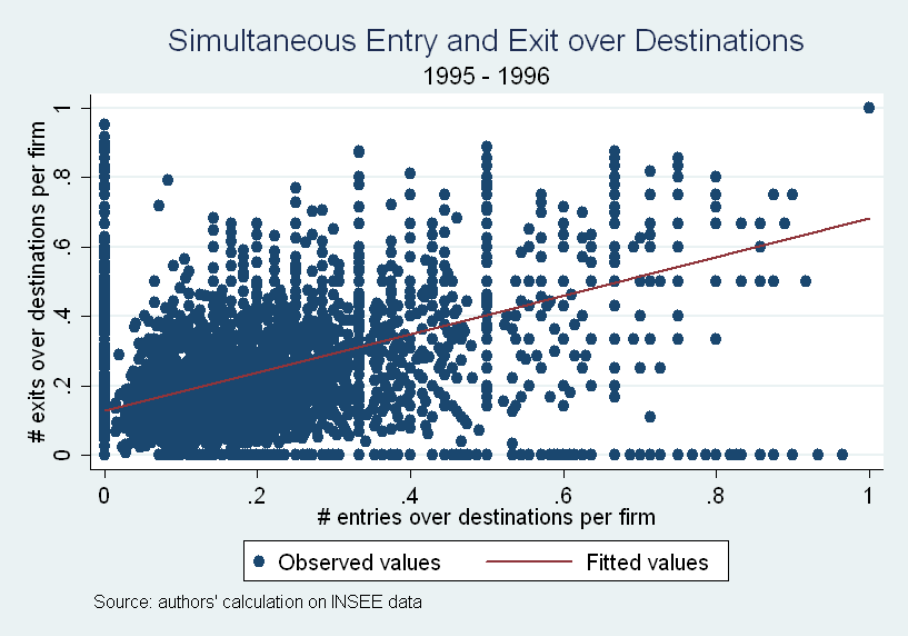

Figure 5: Entry vs. exit relative to total export destinations by firm.The figure shows the fraction of destinations where a firm newly enters plotted against the fraction of destinations to which it stops exporting.

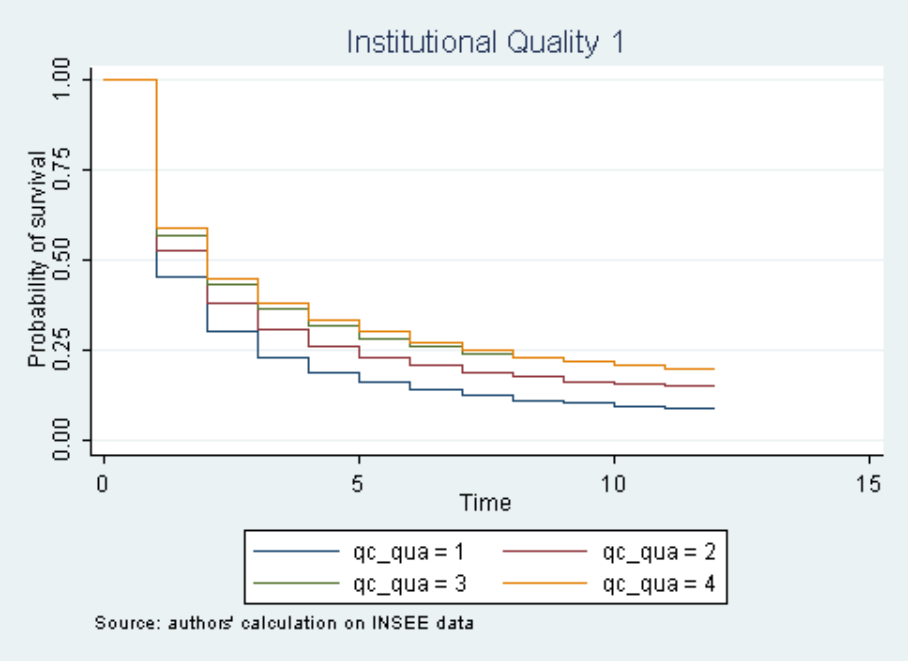

Figure 6: Kaplan-Meyer Hazard Function by Institutional Quality Quartiles

Table 1: Summary Statistics

	All sample (89 countries)					
	mean	s.d.	min	25th	75th	MAX
qc	0.5	0.2	0.2	0.3	0.6	0.9
time	1116	232	41	1015	1250	1473
num proc	29.8	11.7	2	21	38	49
ln cost	2.9	0.7	1	2.4	3.4	4.5
legal	5.7	1.7	2.3	4.6	6.6	9.2
GDP (log)	8.4	1.14	6.5	16.7	19.4	10.2
GDP per capita (log)	-1.3	1.7	-6			4.3
Distance (log)	7.9	0.8	6.1			9.3

Table 2: State dependence

variables	1	2	3	4
$Y_{i,c,t-1}$	0.67***	0.46***	0.84***	0.59***
	(0.0002)	(0.002)	(0.001)	(0.002)
$*GDP$		0.01***		0.02***
		(0.00009)		(0.0001)
$*Distance$			-0.022***	-0.04***
			(0.0002)	(0.0002)
$Country-time\ FE$	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696

Table 3: State dependence and Institutional Quality (1/5): QC

variables	1	2	3	4
$Y_{i,c,t-1}$	0.52***	0.52***	0.57***	0.57***
	(0.0007)	(0.002)	(0.002)	(0.002)
$*Institutional\ Quality$	0.23***	0.23***	0.16***	0.16***
	(0.001)	(0.002)	(0.001)	(0.002)
$*GDP\ per\ capita$		-0.00005		-0.001**
		(0.0003)		(0.0005)
$*GDP$			0.01***	0.01***
			(0.0001)	(0.0002)
$*distance$			-0.03***	-0.03***
			(0.0002)	(0.0005)
$Country-time\ FE$	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696

Table 4: State dependence and Institutional Quality (2/5): time

variables	1	2	3	4
$Y_{i,c,t-1}$	0.62***	0.39***	0.57***	0.53***
	(0.0009)	(0.001)	(0.002)	(0.002)
$*Institutional\ Quality$	0.000041***	-0.000018***	0.000044***	0.000016***
	(8.12E-7)	(8.90E-7)	(8.63E-7)	(9.17E-7)
$*GDP\ per\ capita$		0.033		0.027**
		(0.0002)		(0.0003)
$*GDP$			0.019***	0.007***
			(0.0001)	(0.0001)
$*distance$			-0.04***	-0.03***
			(0.0002)	(0.0002)
$Country-time\ FE$	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696

Table 5: State dependence and Institutional Quality (3/5): number of procedure

variables	1	2	3	4
$Y_{i,c,t-1}$	0.56***	0.41***	0.58***	0.55***
	(0.0008)	(0.002)	(0.002)	(0.002)
$*Institutional\ Quality$	0.003***	0.002***	0.002***	0.001***
	(0.00002)	(0.00003)	(0.00002)	(0.00003)
$*GDP\ per\ capita$		0.022***		0.023**
		(0.0002)		(0.0003)
$*GDP$			0.015***	0.007***
			(0.0001)	(0.0002)
$*distance$			-0.04***	-0.03***
			(0.0002)	(0.0002)
$Country-time\ FE$	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696

Table 6: State dependence and Institutional Quality (4/5): cost

variables	1	2	3	4
$Y_{i,c,t-1}$	0.51***	0.39***	0.57***	0.54***
	(0.001)	(0.002)	(0.002)	(0.002)
$*Institutional\ Quality$	0.048***	0.028***	0.034***	0.012***
	(0.0003)	(0.0003)	(0.0004)	(0.0005)
$*GDP\ per\ capita$		0.007***		0.02***
		(0.0005)		(0.0003)
$*GDP$			0.015***	0.008***
			(0.0001)	(0.0002)
$*distance$			-0.04***	-0.04***
			(0.0002)	(0.0002)
$Country-time\ FE$	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696

Table 7: State dependence and Institutional Quality (5/5): legal

variables	1	2	3	4
$Y_{i,c,t-1}$	0.50***	0.47***	0.56***	0.55***
	(0.0009)	(0.002)	(0.002)	(0.002)
$*Institutional\ Quality$	0.024***	0.021***	0.016***	0.011***
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
$*GDP\ per\ capita$		0.007***		0.01***
		(0.0003)		(0.0002)
$*GDP$			0.012***	0.009***
			(0.0001)	(0.0001)
$*distance$			-0.03***	-0.03***
			(0.0002)	(0.0002)
$Country-time\ FE$	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696

Table 8: State Dependence and Firm Productivity (1/2)

variables	1	2	3	4	5	6	7
$Y_{i,c,t-1}$	0.549***	0.439***	0.417***	0.424***	0.431***	0.413***	0.409***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$*Productivity$	0.031***	0.038***	0.039***	0.038***	0.038***	0.038***	0.039***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
$*GDP$		0.020***	0.011***	0.019***	0.015***	0.015***	0.012***
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$*Distance$		-0.041***	-0.032***	-0.043***	-0.038***	-0.040***	-0.033***
		(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
$*QC$			0.164***				
			(0.001)				
$*time$				0.00004***			
				(8.627e-7)			
$*numproc$					0.002***		
					(0.00002)		
$*lncost$						0.033***	
						(0.0004)	
$*legal$							0.016***
							(0.0001)
$Country-time\ FE$	YES	YES	YES	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696

Table 9: State Dependence and Firm Productivity (2/2)

variables	1	2	3	4	5
$Y_{i,c,t-1}$	0.417***	0.424***	0.431***	0.413***	0.409***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$*Productivity$	0.039***	0.039***	0.039***	0.039***	0.039***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
$*GDP$	0.012***	0.007***	0.007***	0.008***	0.009***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$*GDPpercapita$	-0.001***	0.027***	0.023***	0.024***	0.011***
	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
$*Distance$	-0.031***	-0.038***	-0.036***	-0.038***	-0.033***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
$*QC$	0.169***				
	(0.002)				
$*time$		0.00001***			
		(9.168e-7)			
$*numproc$			0.001***		
			(0.00002)		
$*lncost$				0.011***	
				(0.0005)	
$*legal$					0.011***
					(0.0002)
$Country-time\ FE$	YES	YES	YES	YES	YES
$Firm-time\ FE$	YES	YES	YES	YES	YES
R^2	0.45	0.45	0.45	0.45	0.45
$Number\ observations$	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696

Table 10: Frequency of Spells

length of the spell	percentage
1	52.0
2	16.8
3	8.3
4	5.3
5	3.9
6	3.0
7	2.4
8	2.0
9	1.8
10	1.6
11	1.5
12	1.3

Table 11: Kaplan-Meier survival rates by quartiles

lenght of the spell	All sample	Institutional Quality quartiles				Productivity quartiles			
		1	2	3	4	1	2	3	4
1	0.53	0.45	0.52	0.57	0.58	0.50	0.52	0.54	0.56
2	0.39	0.30	0.38	0.43	0.45	0.36	0.37	0.40	0.43
3	0.32	0.23	0.30	0.36	0.38	0.29	0.30	0.32	0.35
4	0.27	0.19	0.26	0.31	0.33	0.24	0.26	0.28	0.31
5	0.24	0.16	0.23	0.28	0.30	0.21	0.23	0.25	0.27
6	0.22	0.14	0.20	0.26	0.27	0.19	0.21	0.23	0.25
7	0.20	0.12	0.19	0.24	0.25	0.17	0.19	0.21	0.23
8	0.18	0.11	0.17	0.23	0.23	0.16	0.18	0.20	0.21
9	0.17	0.10	0.16	0.21	0.21	0.15	0.16	0.19	0.20
10	0.16	0.09	0.15	0.20	0.20	0.14	0.16	0.18	0.19
11	0.16	0.09	0.15	0.20	0.20	0.13	0.15	0.17	0.19
12	0.16	0.09	0.15	0.20	0.20	0.13	0.15	0.17	0.19

All statistics are significant at the 1% level.

Table 12: Cox Regressions

variables	1	2	3	4	5	6	7	8
GDP	-0.07***	-0.07***			-0.04***	-0.04***	-0.04***	-0.04***
	(0.004)	(0.004)			(0.001)	(0.001)	(0.001)	(0.001)
distance		0.13***			0.11***	0.11***	0.10***	0.11***
		(0.01)			(0.003)	(0.003)	(0.003)	(0.003)
IQ			-0.36***		-0.06***			
			(0.04)		(0.013)			
num proc						-0.03***		
						(0.004)		
legal							-0.08***	
							(0.013)	
cost								-0.04***
								(0.005)
GDP per capita					-0.05***	-0.06***	-0.05***	-0.05***
					(0.005)	(0.003)	(0.004)	(0.004)
Productivity				-0.072***	-0.10***	-0.10***	-0.10***	-0.10***
				(0.09)	(0.005)	(0.005)	(0.005)	(0.005)
Number Observations	117.982	117.982	117.982	117.982	117.982	117.982	117.982	117.983
cluster	countries	countries	countries	firms				
robust	YES	YES	YES	YES	YES	YES	YES	YES
start	YES	YES	YES	YES	YES	YES	YES	YES
sector FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 13: Cox Regressions

variables	(5)	(6)	(7)	(8)	Number Observations
measures of IQ	-0.11***	-0.04***	-0.13***	-0.07***	73.675
	(0.02)	(0.006)	(0.01)	(0.07)	
Productivity	-0.18***	-0.18***	-0.18***	-0.18***	
	(0.008)	(0.008)	(0.008)	(0.008)	
Specification with single spells					
measures of IQ	-0.07***	-0.03***	-0.08***	-0.05***	117.982
	(0.005)	(0.004)	(0.012)	(0.005)	
Productivity	-0.12***	-0.12***	-0.12***	-0.12***	
	(0.005)	(0.005)	(0.005)	(0.005)	
dummy multi-spell	0.80***	0.80***	0.80***	0.80***	
	(0.04)	(0.04)	(0.04)	(0.04)	
Specification with all sample and multi spell dummy					
robust	YES	YES	YES	YES	
start	YES	YES	YES	YES	
sector FE	YES	YES	YES	YES	

GDP, GDP per capita and Distance are included but coefficients are not reported

Table 14: Age Regressions

	(1)	(2)	(3)
age	0.25***	0.25***	0.25***
	(0.03)	(0.0009)	(0.0009)
productivity	0.42***		
	(0.006)		
capital	0.20***		
	(0.006)		
workers	0.32***		
	(0.005)		
GDP		0.36***	0.36***
		(0.001)	(0.001)
distance		-0.30***	-0.30***
		(0.002)	(0.002)
IQ			0.12***
			(0.015)
Number Observations	1.160.241	1.095.972	1.047.429
R^2	0.26	0.18	0.18
Fixed Effects	country-time	firm-time	firm-time