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

Romain Aeberhardt *

Ines Buono §

Harald Fadinger ¶

Preliminary and Incomplete.

May 22, 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.

*INSEE, Timbre G220, 15 Boulevard Gabriel Péri, 92240 Malakoff, Paris, France . E-mail:romain.aeberhardt@insee.fr. The views expressed are those of the author and do not necessarily reflect those of Insee.

§Banca d'Italia, via Nazionale 91, 00184, Rome, Italy. E-mail: ines.buono@upf.edu. The views expressed are those of the authors and do not necessarily reflect those of the Bank of Italy.

¶Department of Economics, University of Vienna, Hohenstaufengasse 9, A-1010 Vienna, Austria. E-mail: harald.fadinger@univie.ac.at

1 Introduction

The aim of our paper is to provide micro foundations for the dynamics of exporting. As a motivation, we revisit the previous 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 dataset 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 informational frictions that make exporters reluctant to give up a relation once they have found a reliable partner 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 depicts the median of the distribution of export values, the 25th and 75th percentile as well as 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 cummulative survival probability of relations against time in years. 50% of export relations are destroyed after the first year. If relations survive for longer than one year, survival probabilities go up fast. After 10 years relations have become extremely stable as can be seen from the cummulative survival probabilities that are virtually constant in that region.

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.[5]

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.

The third fact - hazards that are declining in the age of the relation - are also compatible with the standard heterogeneous firm model as emphasized by Ruhl and Willis (2008). In these models firms enter when they experience extremely good shocks which make it worthwile to pay the sunk costs. So in expectations firm productivity decreases after entry and the hazard should increase over time.

minimum and maximum export value. Note that the distribution has a long right tail, with most of the mass of the 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.

[5]In the Appendix we provide a formal argument for this claim.

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 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 reliable 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 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 the longer the relation lasts, the more valuable it becomes. State dependence arises even though exporters do not face any sunk costs because the time spent in an relation reveals information about the quality of the match and this has a value for the exporter. In that sense, the informational friction is similar to a sunk cost that has to be payed once and for all at entry, because exporters would be willing to pay a positive amount in order to get informed immediately about the type of the distributor. faIn 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 even by unrealiable distributors and therefore export relations tend to be more stable in countries with better legal institutions.

To some extent, reputation and legal institutions are substitutes in the model. On the one hand, if institutions work perfectly, all contracts are enforced and there is no role for learning because exporters do not care about the type of their partner. On the other hand, if institutions are very bad, reputation becomes crucial and having a good partner is valuable. Still, state dependence is larger when legal institutions are better because the probability for a given relation to survive to the next period is larger the higher the quality of the legal system.

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 initially do not know 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 heterogeneity in the productivity of exporters in order to obtain a richer set of predictions. The authors do not focus their analysis on the persistence of trade relations and the interplay between institutions, productivity and state dependence 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 costs 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 usually start 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 wholesale affiliates, an option that is viable only for very large exporters because it requires substantial amounts of fixed investments.[6]

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

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

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 c to produce, which is firm-specific and drawn from a distribution $G(c)$ with support $(0, \infty)$. 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 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.[7]

Foreign is populated by a measure one of 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 are 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. The fraction of impatient distributors in the population is θ_0.[8]

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.

[7] 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.

[8] We have also solved a version of the model under the assumption of free entry of distributors and endogenous matching probabilities. This complicates the analysis somewhat but leaves results essentially unaffected.

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 with exogenous probability x.

Before a partnership is formed, the exporters' marginal cost is unobservable to distributors, so that matching occurs randomly. Only once a partnership has been formed the marginal cost of their partner becomes known to distributors. Exporters and distributors can decide at the beginning of each period whether to maintain the partnership or to dissolve it. If they decide to dissolve it both exporters and distributors cease to be active and are replaced by another exporter/distributor of the same type.[9]

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 current period's match surplus and no side payments. Exporters receive an exogenous fraction α of the current surplus and the remaining fraction goes to distributors. The surplus consists of 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 potential exporters decide whether to enter the export market and search for a distributor. If an unmatched exporter meets a distributor she decides optimally whether to accept the partner or to continue search given her belief on the type of the distributor and the strategies of the distributors. An exporters that has decided to accept a distributor chooses the optimal quantity to export given her marginal cost c, the exogenous distribution of the current surplus, her beliefs on the type of the distributor and given the strategies of the distributors. At the end of each period, having observed the distributor's action, each exporter that is in an export relation decides optimally whether to continue exporting or to terminate the relation given her belief about the type of the distributor.

[9]The assumption that exporters and distributors cannot reenter the pool of unmatched firms simplifies some of the analysis but is innocuous given that in equilibrium the pool of available distributors and exporters deteriorates weakly over time, so that distributors and exporters never have an incentive to wait for a better partner or break a relation because the available pool of partners has improved.

Distributors face a similar set of decisions. If a distributor meets an exporter she decides optimally whether to accept this match and form an export relation or to continue search given her belief on the exporter's type and exporters' strategies. Once distributors of each type have formed an export relation they decide optimally whether to default on the exporter and run away with the proceeds from current sales or to honor the contract given the type of the exporter and her strategies.

Even though in this infinite-horizon setup many perfect Bayesian Nash equilibria exist, we focus on a particular equilibrium that is especially plausible because of its simplicity. This equilibrium is static apart from the fact that exporters optimally update their beliefs on the type of the distributor and is characterized as follows:

Impatient and patient distributors as well as exporters initially accept any match. Once a match is formed, impatient distributors try to default on unproductive exporters but honor the contracts with sufficiently productive exporters - they default on exporters if and only if $c > \bar{c}_t$. Patient distributors, on the other hand, always honor their contracts with any type of exporter. Exporters who have a partner choose the optimal quantity to export given the distribution of the surplus, their beliefs on the type of distributor and the strategy of the distributors. 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. Finally, exporters terminate a relation if and only if they observe a default.

These equilibrium strategies and beliefs imply that sufficiently productive exporters are indifferent to the type of their partner, while less productive exporters fear that an impatient partner will default if she has the chance. Since exporters cannot distinguish between patient and impatient distributors unless they observe a default, they stick to the distributor as long as no default occurs. The longer distributors have honored their contracts the more confident exporters become that their partner is patient.

We now analyze this kind of equilibrium in more detail. Most proofs are relegated to the Appendix. We start out with the evolution of beliefs.

Beliefs

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

Let $\tilde{\theta}$ be the subjective probability of the exporter that the distributor is impatient and therefore might try to default. The subjective probability of an exporter with $c > \bar{c}$ 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 $\tilde{\theta}(nd) = \frac{Prob(impatient \cap nd)}{Prob(nd)} = \frac{\lambda\tilde{\theta}}{\lambda\tilde{\theta}+1-\tilde{\theta}} < \tilde{\theta}$, since impatient distributors honor their contracts with exporters with $c\,\bar{c}$ with probability λ. The subjective probability for an exporter with $c \leq \bar{c}$ that the distributor is impatient can in principle be anything, since defaults on these exporters do not occur in equilibrium, so we assume that this probability equals one, which sustains maximal cooperation. If no default occurs this does not reveal any information to the exporter, so $\tilde{\theta}(nd) = \tilde{\theta}$.

More generally, let $\tilde{\theta}_{it}$ be the subjective probability of an exporter with $c > \bar{c}$ that the distributor is impatient in a relation of age i that started in period t, then $\tilde{\theta}_{it} = \frac{\lambda^i\tilde{\theta}_{0t}}{\lambda^i\tilde{\theta}_{0t}+1-\tilde{\theta}_{0t}}$ if no default has occured for any $i \in \{0, ..., i-1\}$ and $\tilde{\theta}_{it} = 1$ else.

In equilibrium, beliefs must be consistent with actual probabilities to get an impatient partner, such that initial subjective probabilities equal the true fraction of impatient distributors in the measure of distributors that are searching for an exporter, $\tilde{\theta}_{0t} = \theta_{0t}$.

Next, we solve for exporters' optimal export quantities and determine their optimal strategies given the strategies of distributors and exporters' beliefs.

Exporters

In every period each exporter chooses the optimal export quantity given her type c, her belief about the type of the distributor and the distributors' strategy. Remember that in the Nash equilibrium we are considering here, impatient distributors default only on firms with $c \geq \bar{c}_t$ and that default is successful with probability $1 - \lambda$.

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

$$\max_p \Pi(\tilde{\theta}, c \geq \bar{c}_t) = \max_p \alpha[\tilde{\theta} * \lambda + (1 - \tilde{\theta})]p^{1-\varepsilon}A - p^{-\varepsilon}Ac - \alpha f. \tag{1}$$

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 $p^*(c \geq \bar{c}_t) = \frac{\varepsilon}{\varepsilon-1}\frac{1}{\alpha[\tilde{\theta}\lambda+(1-\tilde{\theta})]}c$, $q^*(c \geq \bar{c}_t) = \left(\frac{\varepsilon}{\varepsilon-1}\frac{c}{\alpha[\tilde{\theta}\lambda+(1-\tilde{\theta})]}\right)^{-\varepsilon} A$.

Total revenue is $Rev^*(c \geq \bar{c}_t) = \left[\frac{\varepsilon-1}{\varepsilon}\alpha(\tilde{\theta}\lambda + 1 - \tilde{\theta})\right]^{\varepsilon-1} c^{1-\varepsilon}A$.

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. A distributor is impatient with subjective probability $\tilde{\theta}$ in which case she defaults with probability $(1 - \lambda)$. Note also that $\frac{\partial q^*(c>\bar{c}_t)}{\partial\tilde{\theta}} < 0$, so that the optimal

export quantity increases as the subjective probability that the distributor is impatient decreases.

We assume that for all $\lambda < 1$ we have that $\Pi(d, \tilde{\theta} = 1, c) = Ac^{1-\varepsilon}\left(\frac{\varepsilon-1}{\varepsilon}\alpha\lambda\right)^{\varepsilon-1}\left(\frac{\alpha\lambda}{\epsilon}\right) - \alpha f < 0$, so that exporters expect to make losses in every period if their subjective probability that their partner is impatient equals one and distributors default if they can. We also make the assumption that there exists a $c^* > \bar{c}_t$ such that for all $c \leq c^*$ it holds that $\Pi(\tilde{\theta} = 0, c \leq c^*) = Ac^{1-\varepsilon}\left(\frac{\varepsilon-1}{\varepsilon}\alpha\right)^{\varepsilon-1}\left(\frac{\alpha\lambda}{\epsilon}\right) - \alpha f \geq 0$, so that sufficiently productive exporters make profits in each period when they believe that distributors are patient with probability one.

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

$$\max_p \Pi(c < \bar{c}_t, \tilde{\theta}) = \max_p \alpha p^{1-\varepsilon} A - p^{-\varepsilon} Ac - \alpha f \tag{2}$$

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

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

The least productive exporter that enters the export market and starts searching makes zero expected profits. This defines a cutoff marginal cost $\tilde{c}_t$, such that exporters enter the exporters if and only if $c \leq \tilde{c}_t$.

Since distributors default on exporters with $\tilde{c}_t \geq \bar{c}_t$, the cutoff productivity level is implicitly defined by the following zero profit condition:

$$V_E(\tilde{c}_t, \tilde{\theta}_{0t}) = \Pi(\tilde{c}_t, \tilde{\theta}_{0t}) + \sum_{i=1}^{\infty}(\beta_E(1-s))^i \Pi(\tilde{c}_t, \tilde{\theta}_{it}) \prod_{j=0}^{i-1}(1 - \tilde{\theta}_{jt} + \tilde{\theta}_{jt}\lambda) = 0, \tag{3}$$

where $\prod_{j=0}^{i-1}(1 - \tilde{\theta}_{jt} + \tilde{\theta}_{jt}\lambda)$ is the subjective probability that distributors do not cheat before the relation reaches age i.

This means that the least productive firms that enter are willing to incur initial losses because if distributors do not cheat export revenues grow over time and allow these firms to break even in expectations. The following Lemma summarizes this observation.

Lemma 1: *Given equilibrium strategies and beliefs there is a $\tilde{c}_t \geq \bar{c}_t$ such that exporters enter the export market and search for a distributor if and only if $c \leq \tilde{c}_t$.*

In addition, since per period profits, $\Pi(\tilde{c}_t, \tilde{\theta}_{it})$, and the probability for the relation to survive until age i, $\prod_{j=0}^{i-1}(1 - \tilde{\theta}_{jt} + \tilde{\theta}_{jt}\lambda)$, are decreasing in $\tilde{\theta}_{0t}$, we can establish that:

Lemma 2: *Let $\tilde{\theta}_{0t}$ be non-decreasing in t then the cuto marginal cost $\tilde{c}_t$ is non-increasing in t.*

Next, define $\theta^*(c)$ as the level of θ such that exporters with $c \geq \bar{c}_t$ make zero per period profits given their marginal cost c: $\Pi(c, \theta^*(c)) = 0$. Then we can state the following Lemma:

Lemma 3: *Let $\tilde{\theta}_{0t}$ be non-decreasing in t. Then given the distributors' equilibrium strategies and equilibrium beliefs there is a unique value $\bar{\theta}(c) \in [\theta^*(c), 1)$ such that for all t an exporter with marginal cost $c > \bar{c}_t$ accepts any partner whenever she meets a distributor and $\tilde{\theta}_{0t} < \bar{\theta}(c)$. Moreover, she maintains a partnership if and only if the distributor does not default. Exporters with $c \leq \bar{c}_t$ accept any partner for $\tilde{\theta}_{0t} \in [0, 1]$ and maintain a partnership as long as the distributor does not default given distributors' equilibrium strategies and equilibrium beliefs.*

Lemma 3 says that given her marginal cost exporters only enter if their belief on the probability of meeting an impatient distributor is sufficiently low. If the exporters' subjective probability at the beginning of the relation that the distributor is impatient is weakly increasing over time, it never pays off to wait for a better partner, since the expected value of finding a partner in the future is lower than the one of finding a partner today because exporters' per period profits and the probability for the relation to survive are decreasing in $\tilde{\theta}$. In addition, an exporter sticks to any distributor as long as she does not observe a default, because as long as no default occurs, she cannot be certain whether her partner is patient or whether the distributor has not managed to default even though he tried because he was prevented by legal institutions. Each time a distributor honors the contract, the exporter becomes 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. Very productive exporters with $c < \bar{c}$, on the other hand, do not fear any default by impatient distributors and therefore their beliefs about the probability that their partner is impatient do not influence their decision to form a relation. Given that tomorrow they face the same situation as today they prefer to accept any partner in order not to foregoe current period's profits.

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 because the value of waiting is always smaller than the value of accepting a partner today. The reason is that the expected value of a match is decreasing over time. This is caused by two observations: First, the surplus of any relation becomes lower the later it starts because exporters' subjective probability that the distributor is impatient increases. Second, the quality of available exporters, as measured by expected marginal costs $E_t(c)$ deteriorates, because impatient distributors default only on unproductive exporters. Lemma 4 formally states this behavior:

Lemma 4: *Let $\tilde{\theta}_{0t}$ be non-decreasing in t and let $E_t(c)$ be non-decreasing in t. Then, given the equilibrium strategies and beliefs distributors initially accept any partner.*

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 of future shared revenues is too large compared to current profits from cheating. When impatient distributors face a less productive partner, future surplus from the relation is not not large enough to outweigh impatience, so they try to cheat.

Lemma 5: *Given the equilibrium strategies and beliefs impatient distributors default if and only if* $c > \bar{c}_t$.

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.

Lemma 6: *Given the equilibrium strategies and beliefs patient distributors never default in equilibrium.*

2.4 Equilibrium

Finally, we need to determine how the measure of impatient distributors that search for an exporter, v_{Lt}, and the measure of patient distributors that search for an exporter, v_{Ht}, evolve over time since they determine θ_{0t} and therefore agents' beliefs. In addition, we have to define the evolution of the distribution of unmatched exporters that are searching for a distributor, $G_t^u(c)$.

The law of motion for the measure of impatient distributors that are searching for an exporter is given by:

$$v_{Lt+1} = (1-x)v_{Lt} + [s + (1-s)(1-\lambda)Pr(c \geq \bar{c}_t)](\theta_0 - v_{Lt}), \tag{4}$$

where $Pr(c \geq \bar{c}_t) = 1 - G_t^m(\bar{c}_t)$ is the probability to have a partner with $c \geq \bar{c}_t$ and where $G_t^m(\bar{c}_t)$ is the distribution function of matched exporters. A fraction $(1-x)$ of the population of currently unmatched impatient distributors v_{Lt} does not find an exporter and therefore remains inactive. In addition a proportion s of the measure of matched impatient distributors is dissolved exogenously and of the remaining proportion $(1-s)$ of the relations that involve exporters with marginal cost $c \geq \bar{c}_t$, a fraction $(1-\lambda)$ is dissolved endogenously.

A similar equation describes the evolution of the measure of unmatched patient distributors:

$$v_{Ht+1} = (1-x)v_{Ht} + s(1 - \theta_0 - v_{Ht}) \tag{5}$$

It is easy to show that v_{Lt+1} and v_{Ht+1} are both strictly decreasing sequences that converge to $v_L = \frac{(1-\lambda)(1-s)Pr(c\geq\bar{c})+s}{x+s+(1-\lambda)(1-s)Pr(c\geq\bar{c})}\theta_0$ and $v_H = \frac{s}{x+s}(1-\theta_0)$ respectively.

Given the laws of motion (4) and (5), one can show that $\theta_t = \frac{v_{Lt}}{v_{Lt}+v_{Ht}}$ is weakly increasing over time. The intuition is that relations with impatient distributors are dissolved both for exogenous and endogenous reasons, while relations with patient distributors are dissolved exclusively exogenously, so that the proportion of impatient in the population of unmatched distributors increases over time.

Lemma 7: *θ_t is weakly increasing in t.*

Let $G_t^u(c \leq \tilde{c}_t)$ be the distribution function of unmatched exporters in period t conditional on $c \leq \tilde{c}_t$. This distribution evolves according to

$$G_{t+1}^u(c \leq \tilde{c}_{t+1}) = (1-x)G_t^u(c \leq \tilde{c}_t) + sG_t^m(c \leq \tilde{c}_t) + \tag{6}$$
$$(1-s)(1-\lambda)[G_t^m(\tilde{c}_t) - G_t^m(\bar{c}_t)] + [G_t^u(\tilde{c}_{t+1}) - G_t^u(\tilde{c}_t)]$$

A fraction $(1-x)$ of the measure of currently unmatched exporters G_t^u does not find a distributor and remains inactive, while a fraction s of the measure of currently matched exporters G_t^m dissolves for exogenous reasons and a fraction $(1-s)(1-\lambda)$ of the relations with marginal costs between $\bar{c}_t$ and $\tilde{c}_t$ is dissolved endogenously. The last term on the right hand side accounts for the additional exporters that leave the export market because the cutoff $\tilde{c}_t$ moves over time. Let $1 - G_t^u(c \leq \tilde{c}_t)$ be the probability that the marginal cost of unmatched exporters is larger than c. Assume for a moment that $\tilde{c}$ and $\bar{c}$ are independent of time. Then if becomes clear, that the pool of available exporters is worsening over time, because the relative mass of unproductive exporters - which face endogenous separations - is increasing over time. This conclusion continues to hold even if $\tilde{c}_t$ and $\bar{c}_t$ move over time, unless $\tilde{c}_t$ decreases sufficiently that in the future the least productive firms that search for a partner are much more productive than in the current period. We exlude this case by assumption.

Then the average marginal cost of unmatched exporters, $E_t(c) = \int_0^{\tilde{c}_t} c dG_t^u(c \leq \tilde{c}_t)$, is increasing in t, provided that the effect that $\tilde{c}_t$ is decreasing in t does not dominate the effect that the probability mass in G_t^u is shifting to the right tail, which we assume.

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 1: *Export quantities are increasing in the age of the relation as long as* $c \geq \bar{c}_t$ *and constant for* $c < \bar{c}_t$.

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. For firms with $c < \bar{c}$ learning plays no role because even impatient distributors do not default on these exporters.

2.5.2 Export quantities and legal system

Proposition 2: *Export quantities are increasing in the e ciency of the legal system,* λ*, if the age of the export relation is su ciently 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 an export relation is relatively old however, a larger λ increases the probability that the distributor is impatient even though she has not managed to default in the past by a lot compared to a situation with a low λ, where relations with an impatient distributor dissolve early. This potentially reverses the result for established relations because for these relations this indirect effect may dominate the direct effect of an improved legal system on the probability to default.

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 firm and destination characteristics.

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

Again, conditional probabilities follow directly from our model.

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 0, \lambda, c \leq \tilde{c}) = x.$

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 1, \lambda, c, < \bar{c}) = (1 - s)$

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 0, \lambda, \bar{c}_t \leq c \leq \tilde{c}_t) = (1 - s)[1 - \theta_{0t}(1 - \lambda)]$, which is a positive function of λ.

Marginal effects are then derived by taking differences in conditional probabilities: $Pr(Y_{ikt} = 1|\lambda, Y_{ikt-1} = 1, c < \bar{c}_t) - Pr(Y_{ikt} = 1|\lambda_c, Y_{ikt-1} = 0, c < \bar{c}) = (1 - s) - x.$

$Pr(Y_{ikt} = 1|\lambda, Y_{ikt-1} = 1, \bar{c} \leq c \leq \tilde{c}) - Pr(Y_{ikt} = 1|\lambda, Y_{ikt-1} = 1, \bar{c} \leq c \leq \tilde{c}) = (1-s)(1-\theta_{0t}(1-\lambda)) - x$.

Again, this marginal effect is clearly a positive function of λ as long as $c \geq \bar{c}$, 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. A better legal system increases the probability that a given relation survives from one period to the other and therefore makes the past export status a better predictor for current export status. Hence, we have the following testable prediction:

Proposition 3: *State dependence is larger in destinations with better legal institutions.*

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:

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 0, c > \tilde{c}_t) = 0$,

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 0, c \leq \tilde{c}_t) = x$,

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 1, \bar{c}_t \leq c \leq \tilde{c}_t) = (1-s)[1-\theta_{0t}(1-\lambda)]$,

$Pr(Y_{ikt} = 1|Y_{ikt-1} = 1, c < \bar{c}_t) = (1-s)$.

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

Proposition 4: *State dependence is larger for more productive exporters.*

The idea is that even impatient distributors do not try to cheat on very productive exporters and therefore higher productivity of the exporter increases the chance that a relation will survive from one period to the next.

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[10] $\mu_{i,L} = v_L x[Pr(c > \bar{c})\lambda^i(1-s)^i + (1-Pr(c > \bar{c}))(1-s)^i]$, while the measure of matches of age i with patient distributors is $\mu_{i,H} = v_H x(1-s)^i$.

[10] In this section we assume that the economy has reached the steady state.

Then the probability to observe a separation conditional on the age of the relation being i is $Pr(Separation|age = i) = \frac{v_L x[Pr(c>\bar{c})\lambda^{i-1}(1-s)^{i-1}[(1-\lambda)(1-s)+s]+(1-Pr(c>\bar{c}))(1-s)^{i-1}s]+v_H x(1-s)^{i-1}s}{v_L x[(Pr(c>\bar{c})\lambda^i(1-s)^i+(1-Pr(c>\bar{c}))(1-s)^i)]+v_H x(1-s)^i}$.

Hazard and age of relation

Proposition 5: *The hazard is decreasing in the age of the relation.*

The mechanism behind this result 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 6: *The hazard is decreasing in the quality of the legal system for su ciently 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 7: *The hazard is decreasing in rms' 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.[11] 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.[12] 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. [13] 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

[11] "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.

[12] 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.

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

use 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:

$$Y_{ikt} = \beta_0 + \beta_1 Y_{ikt-1} + \delta_{it} + \delta_{kt} + \varepsilon_{ikt}. \tag{7}$$

Here Y_{ikt} is a dummy that equals one whenever firm i exports to destination k in period t , whereas δ_{it} and δ_{kt} are firm-time- and destination-time-specific fixed effects. The coefficient β_1 of equation (7) 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.[14] 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 rate, which may influence the probability of a firm to export to that country.[15]

To make sure that our results are robust and in order to allow for some flexibility on the effect of past export status, we allow for an interaction of state dependence with country characteristics:

$$Y_{ikt} = \beta_0 + \beta_1 Y_{ikt-1} + \beta_2 Y_{ikt-1} * Z_k + \delta_{it} + \delta_{kt} + \varepsilon_{ikt}, \tag{8}$$

where Z_k is a vector of country 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.

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

[15] δ_{it} and δ_{kt} 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.[16] 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.[17] Distance from France, on the other hand, has a significantly negative impact on the amount of state dependence.

Let us now test the prediction that state dependence is higher in countries with better legal institutions (Proposition 3). To this end we run the following regression:

$$Y_{ikt} = \beta_0 + \beta_1 Y_{ikt-1} + \beta_2 Y_{ict-1} * IQ_k + \beta_3 Y_{ikt-1} * Z_k + \delta_{it} + \delta_{kt} + \varepsilon_{ikt}, \tag{9}$$

where IQ_k is one of five alternative measures of institutional quality discussed above and Z_k is a vector of country controls. 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[18]. 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 4). We do this by running the following regression:

$$Y_{ikt} = \beta_0 + \beta_1 Y_{ikt-1} + \beta_2 Y_{ict-1} * Prod_{it} + \beta_3 Y_{ikt-1} * X_c + \delta_{it} + \delta_{kt} + \varepsilon_{ikt}, \tag{10}$$

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

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

[17] 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).

[18] $0.62 = 0.57 + 0.16 * 0.36$ 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,[19] which is consistent with our theoretical analysis.[20] 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[21], while we take care of the right-censoring in the regression analysis by adding a dummy variable for the starting dates of relations.

[19] 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.

[20] 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

[21] 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 (Propositions 6 and 7), 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.[22]

In order to test more formally the predictions of the model on the relation between legal institutional quality and the hazard rate (Proposition 6) as well as the relation between firm productivity and the hazard rate (Proposition 7) 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:

$$h(t, X\beta) = h(t)exp(\beta_0 + \beta_1 IQ_k + \beta_3 TFP_i + \beta_4 X_k + \delta_t + \delta_s), \tag{11}$$

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.[23] As for the magnitude of our results, we find that an increase of our main

[22] 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.

[23] We cluster standard errors at the country-evel (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% [24].

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, $Export_{ikt}$ on the age of the export relation, Age_{ikt}, and a vector of controls. We use two different specifications.

$$Export_{ikt} = \beta_0 + \beta_1 Age_{ikt} + \beta_2 X_{it} + \delta_{ct} + \varepsilon_{ikt} \tag{12}$$

$$Export_{ikt} = \beta_0 + \beta_1 Age_{ikt} + \beta_2 Z_c + \delta_{it} + \varepsilon_{ikt} \tag{13}$$

X_{it} (in regression 12) is a vector of firm characteristics like labor-productivity, capital and number of workers (all in logs), Z_c (in regression 13) refers to a vector of country characteristics used in previous analysis (GDP, distance and a measure of institutional quality), δ_{ct} and δ_{it} are, respectively,

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

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 (12).

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.

References

Araujo, Luis and Emanuel Ornelas, "Trust Based Trade," *CEP Discussion Paper*, 2007, *820.*

Bernard, Andrew and Bradford Jensen, "Why Some Firms Export," *Review of Economics and Statistics*, 2004, *86*, 561–569.

Besedes, Tibor and Thomas J. Prusa, "Product Differentiation and Duration of US Import Trade," *Journal of International Economics*, 2006, *70* (2), 339–358.

Buono, Ines, Harald Fadinger, and Stefan Berger, "The Micro Dynamics of Exporting - Evidence from French Firms," *mimeo, University of Vienna*, 2008.

Eaton, Jonathan, Marcela Eslava, C. J. Krizan, Maurice Kugler, and James Tybout, "A Search and Learning Model of Export Dynamics," *mimeo*, 2008.

_ , _ , Maurice Kugler, and James Tybout, "The Margins of Entry into Export Markets: Evidence from Colombia," *NBER Working paper*, 2007, *13531.*

Felbermayr, Gabriel and Benjamin Jung, "Endogenous Export Modes: Trade Intermediation Versus Wholesale FDI in General Equilibrium," *in P. Mosslechner and E. Gnan (eds.): International Trade and Domestic Growth: Determinants, Linkages and Challenges*, 2008.

Gwartny, James and Robert Lawson, "Economic Freedom of the World: 2003 Annual Report," *mimeo, Fraser Institute*, 2003.

Melitz, Marc, "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 2003, *71*, 695–1725.

Nunn, Nathan, "Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade," *Quarterly Journal of Economics*, 2007, *122* (2), 569–600.

of Commerce, US Department, "A Basic Guide to Exporting," *Novato, World Trade Press*, 2000.

Peng, Mike and Anne Y. Ilinitch, "Export Intermediary Firms: A Note on Export Development Research," *Journal of International Business Studies*, 1998, *29* (3), 609–620.

_ and Anne Y. York, "Behind Intermediary Performance in Export Trade: Transactions, Agents and Resources," *Journal of International Business Studies*, 2001, *32* (2), 327–346.

Rauch, James E. and Joel Watson, "Starting Small in an Unfamiliar Environment," *International Journal of Industrial Organization*, 2003, *87*, 545–564.

Roberts, Mark and James Tybout, "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs," *American Economic Review*, 1997, *87*, 545–564.

Rose, Andrew K., "Do We Really Know That the WTO Increases Trade?," *American Economic Review*, 2004, *94* (1).

Ruhl, Kim and Jonathan Willis, "New Exporter Dynamics," *mimeo, New York University*, 2008.

World, Bank, "Doing Business in 2004: Understanding Regulation," *Washington, D.C.: World Bank and Oxford University Press, 2004*, 2004.

5 Appendix

5.1 Proof of claim that sunk cost model does not deliver predictions on state-dependence and firm or destination charateristics.

To see this consider the following dynamic model of exporting: Let Y_{ikt} denote an indicator equal to one if firm i exports to destination k in period t and zero otherwise and denote firm's marginal cost in period t by c_{it}. A firm that did not export in period $t-1$ enters in destination k in period t if $\Pi(c_{it})+\beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=1)] \geq \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=0)] + f_{ik}$, where $\Pi(c_{it})$ are current period period profits from exporting to destination c , $V_{it}(.)$ is the value function conditional on the export status and f_{ik} is the sunk cost of entering destination k. On the other hand, a firm that exported in $t-1$ continues to export if $\Pi(c_{it}) + \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=1)] \geq \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=0)]$. Then the probabilities to observe positive exports of firm i to destination k conditional on last period's export status are $Pr(Y_{ikt}=1|c_{it}, Y_{ikt-1}=1) = Pr(\Pi(c_{it}) + \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=1)] - \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=0)] \geq 0)$ and $Pr(Y_{ikt}=1|c_{it}, Y_{ikt-1}=0) = Pr(\Pi(c_{it}) + \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=1)] - \beta E_t[V_{it+1}(c_{it+1}, Y_{ikt}=0) - f_{ik}] \geq 0)$. Econometrically, state dependence is measured by the marginal effect of a change in last period's export status , $Pr(Y_{ikt}=1|X_{ikt}, Y_{ikt-1}=1) - Pr(Y_{ikt}=1|X_{ikt}, Y_{ikt-1}=0)$. The above model implies that $\frac{\partial[Pr(Y_{ikt}=1|c_{it}, Y_{ikt-1}=1) - Pr(Y_{ikt}=1|c_{it}, Y_{ikt-1}=0)]}{\partial c_{it}} = 0$, so the marginal effect is independent of productivity, unless f_{ik} is a function of firm productvitiy c_{it} . The same conclusion holds regarding destination specific effects.

5.2 Proofs

Lemma 3: *Let $\tilde{\theta}_{0t}$ be non-decreasing in t. Then given the distributors' equilibrium strategies and equilibrium beliefs there is a unique value $\bar{\theta}_t(c) \in [\theta^*(c), 1)$ such that for all t an exporter with marginal cost $c > \bar{c}_t$ accepts any partner whenever she meets a distributor and $\tilde{\theta}_{0t} < \bar{\theta}(c)$. Moreover, she maintains a partnership if and only if the distributor does not default. Exporters with $c \leq \bar{c}_t$ accept every partner for any $\tilde{\theta}_{0t} \in [0,1]$ and maintain a partnership as long as the distributor does not default given distributors' equilibrium strategies.*

Let $Pr(0|c)_{it}$ be the subjective probability that no default occurs for a relation of age i that started in period t given firm's marginal cost c, so that $Pr(0|c < \bar{c}_t)_{it} = 0$ and $Pr(0|c \geq \bar{c}_t)_{it} = (1 - \tilde{\theta}_{it} + \lambda\tilde{\theta}_{it})$.

Then $\tilde{V}_E(\tilde{\theta}_{0t}, c) = \max\{V(\tilde{\theta}_{0t}, c), \beta_E W_E(\tilde{\theta}_{0t+1}, c)\}$, where $V_E(\tilde{\theta}_{0t}, c) = \Pi(\tilde{\theta}_{0t}, c) + \beta_E(1-s)Pr(0|c)_{0t}V(\tilde{\theta}_{1t}, c)$ is the expected value of entering a partnership and $W_E(\tilde{\theta}_{0t+1}, c) = \tilde{V}_E(\tilde{\theta}_{0t+1}, c)x + W_E(\tilde{\theta}_{0t+2}, c)(1-x)$ is the expected value of not entering the partnership in period t and waiting for a new business opportunity in the next period.

Proof: By substituting recursively, $V_E(\tilde{\theta}_t, c)$ can be written as

$$V_E(\tilde{\theta}_{0t}, c) = \Pi(\tilde{\theta}_{0t}, c) + \sum_{i=1}^{\infty} \beta_E^i (1-s)^i \Pi(\tilde{\theta}_{it}, c) \prod_{j=0}^{i-1} Pr(0|c)_{jt},$$

Then $\frac{\partial V_E(\tilde{\theta}_{0t}, c \geq \bar{c}_t)}{\partial \tilde{\theta}_{0t}} < 0$, since $\frac{\partial \Pi(\tilde{\theta}_{it}, c \geq \bar{c}_t)}{\partial \tilde{\theta}_{0t}} = \frac{\partial \Pi(\tilde{\theta}_{it}, c \geq \bar{c}_t)}{\partial \tilde{\theta}_{it}} \frac{\partial \tilde{\theta}_{it}}{\partial \tilde{\theta}_{0t}} < 0$ and $\frac{\partial Pr(0|c \geq \bar{c}_t)_{jt}}{\tilde{\theta}_{0t}} = \frac{(1-\tilde{\theta}_{it}+\lambda\tilde{\theta}_{it})}{\partial \tilde{\theta}_{0t}} < 0$. At the same time $\frac{\partial V_E(\tilde{\theta}_{0t}, c < \bar{c}_t)}{\partial \tilde{\theta}_{0t}} = 0$ since no distributor cheats on these exporters. Hence, since $\tilde{\theta}_{0t}$ is non-decreasing in t it is always worth to accept a partner immediately, since rejecting a partner and starting a partnership tomorrow has a weakly lower expected value.

Consequently, we can write $\tilde{V}_E(\tilde{\theta}_{0t}, c) = \max\{V_E(\tilde{\theta}_{0t}, c), 0\}$. Now, since by assumption $V_E(\tilde{\theta}_{0t} = 0, c) = \frac{\Pi(\tilde{\theta}_{0t}=0, c)}{1-\beta_E(1-s)} \geq 0$ for all $c \leq c^*$ and $V_E(\tilde{\theta}_{0t} = 1, c) = \frac{\Pi(\tilde{\theta}_{0t}=1, c)}{1-\lambda\beta_E(1-s)} < 0$ for all $c > \bar{c}$ and since $V(\tilde{\theta}_{0t})$ is strictly decreasing in θ_{0t}, we have that for all $c > \bar{c}$ there is a unique $\bar{\theta}(c)$ such that $\tilde{V}_E(\tilde{\theta}_{0t}, c) \leq 0$ if $\tilde{\theta}_{0t} \geq \bar{\theta}(c)$ and $\tilde{V}(\tilde{\theta}_{0t}, c) > 0$ if $\tilde{\theta}_{0t} < \bar{\theta}(c)$. Similarly, for exporters with $c \leq \bar{c}$, if a default occurs, they set $\tilde{\theta}_{it} = 1$ and expect profits $V_E(\tilde{\theta}_{it} = 1, c) = \frac{\Pi(\tilde{\theta}_{it}=1, c)}{1-\lambda\beta_E(1-s)} < 0$. Hence exporters stay in a partnership as long as there is no default.

Lemma 4: Let $\tilde{\theta}_{0t}$ be non-decreasing in t and $E_t(c)$, the expected marginal cost of unmatched exporters, non-decreasing in t. Then distributors initially accept any partner given the equilibrium strategies.

Proof:

Let $\tilde{V}_L(\tilde{\theta}_{0t}) = \max\{V_L(\theta_{0t}), \beta_L W_L(\tilde{\theta}_{0t+1}, c)\}$, where $V_L(\tilde{\theta}_{0t}) = (1-\alpha)E(Rev(\tilde{\theta}_{0t}, c)|c > \bar{c}_t)Pr(c > \bar{c}_t) + (1-\alpha\lambda)E(Rev(c)|c \leq \bar{c})Pr(c \leq \bar{c}_t) - (1-\alpha)f + \beta_L(1-s)[Pr(c \leq \bar{c}_t)E(V_L(\tilde{\theta}_{1t}, c)|c \leq \bar{c}_t) + (1-\lambda)Pr(c > \bar{c}_t)E(V(\tilde{\theta}_{1t}, c)|c > \bar{c}_t)]$ is the expected value of entering a partnership and $W_L(\tilde{\theta}_{0t+1}, c) = x\tilde{V}_L(\tilde{\theta}_{0t+1}) + (1-x)W_L(\tilde{\theta}_{0t+2})$ is the expected value of not entering the partnership in period t and waiting for a new business opportunity in the next period. Then it is straightforward to show that $\tilde{V}_L(\tilde{\theta}_{0t})$ is decreasing in t. The first reason is that $\tilde{\theta}_{0t}$ is weakly increasing in t, which reduces export revenues $Rev(\tilde{\theta}_{0t})$ for a given c . The second reason is that $E_t(c)$ is weakly increasing in t and this reduces expected revenues as well. Hence, it is always optimal to accept a given partner.

Similarly, for a patient distributor we have $\tilde{V}_H(\tilde{\theta}_{0t}) = \max\{V_H(\tilde{\theta}_{0t}), \beta_H W_H(\tilde{\theta}_{0t+1})\}$, where $V_H(\tilde{\theta}_{0t}) = (1-\alpha)[E(Rev(\tilde{\theta}_{0t}, c)) - f] + \beta_H(1-s)E(V_H(\tilde{\theta}_{1t}, c))$ is the expected value of entering a partnership and $W_H(\tilde{\theta}_{0t+1}) = x\tilde{V}_H(\tilde{\theta}_{0t+1}) + (1-x)W_H(\tilde{\theta}_{0t+2})$ is the expected value of not entering the partnership in period t and waiting for a new business opportunity in the next period. Patient distributors accept any partner for the same reason as impatient ones. Waiting does not pay off because the average revenue of exporters is weakly decreasing in t both because θ_{0t} is weakly decreasing in t and the pool of available exporters weakly deteriorates over time.

Lemma 5: Impatient distributors default if and only if $c > \bar{c}_t$.

Let i denote the age of the relation and let $V_L(.,\tilde{\theta}_{it}, c)$ be the value of being matched with an exporter with marginal cost c given the strategies of exporters and distributors (default (d) or no default (nd)). Then there exists a $\bar{c}_t > 0$, defined below, such that given the equilibrium beliefs and strategies: I) if $c < \bar{c}_t$ we have $V_L(nd, \tilde{\theta}_{it}, c) \geq V_L(d, \tilde{\theta}_{it}, c)$ and II) if $c \geq \bar{c}_t$ we have $V_L(nd, \tilde{\theta}_{it}, c) \leq V_L(d, \tilde{\theta}_{it}, c)$.

Proof:

I)

The value of honoring a contract with an exporter with $c < \bar{c}_t$ given that exporters believe that impatient distributors will honor their contracts can be derived by forward substitution into the Bellman-equation of being matched, $V_L(nd, \tilde{\theta}_{it}, c < \bar{c}_t) = (1-\alpha)(Rev^*(c < \bar{c}) - f) + \beta_L(1-s)V_L(nd, \tilde{\theta}_{i+1t}, c < \bar{c}_t)$.

$$\begin{aligned} V_L(nd, \tilde{\theta}_{it}, c < \bar{c}_t) &= \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i} * (1-\alpha)(Rev^*(c < \bar{c}_t) - f) \\ &= \frac{1-\alpha}{1-\beta_L(1-s)}(Rev^*(c < \bar{c}_t) - f) \end{aligned} \tag{14}$$

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 $t+i$ and default given the strategies and beliefs of the exporters, they obtain

$$\begin{aligned} V_L(d, \tilde{\theta}_{it}, c < \bar{c}_t) &= \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}[(1-\alpha\lambda)Rev^*(c < \bar{c}_t) - (1-\alpha)f] \\ &= \frac{1-\alpha\lambda}{1-\beta_L(1-s)\lambda}Rev^*(c \leq \bar{c}_t) - \frac{f(1-\alpha)}{1-\beta_L(1-s)\lambda} \end{aligned} \tag{15}$$

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 $V_L(nd, \tilde{\theta}_{it}, c) \geq V_L(d, \tilde{\theta}_{it}, c) \Leftrightarrow c^{\epsilon-1} \leq \frac{[\beta_L(1-s)-\alpha]\left(\frac{\alpha(\varepsilon-1)}{\varepsilon}\right)^{\varepsilon-1}A}{f(1-\alpha)\beta_L(1-s)} \equiv \ddot{c}^{\varepsilon-1}$.

II)

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

$$V_L(d, \tilde{\theta}_{it}, c \geq \bar{c}_t) = \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}[(1-\alpha\lambda)Rev_j^*(c \geq \bar{c}_t) - f]. \tag{16}$$

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

$$V_L(nd, \tilde{\theta}_{it}, c \geq \bar{c}_t) = \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}(1-\alpha)[Rev_j^*(c \geq \bar{c}_t) - (1-\alpha)f]. \tag{17}$$

Plugging in the expressions for $Rev_j^*(c > \bar{c}_t)$ and manipulating, the condition $V_L(nd, \tilde{\theta}_{it}, c > \bar{c}_t) \leq V_L(d, \tilde{\theta}_{it}, c > \bar{c}_t)$ can be written as:

$$c^{\varepsilon-1} \geq \bar{c}_t^{\varepsilon-1} = \left(\frac{\alpha(\varepsilon-1)}{\varepsilon}\right)^{\varepsilon-1} A* \tag{18}$$
$$\frac{\left[\sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}(\tilde{\theta}_{jt}\lambda + 1 - \tilde{\theta}_{jt})^{\varepsilon} - \frac{(1-\alpha\lambda)}{(1-\alpha)} \sum_{j=i}^{\infty} \beta_L^{j-i}(1-s)^{j-i}\lambda^{j-i}(\tilde{\theta}_{jt}\lambda + 1 - \tilde{\theta}_{jt})^{\varepsilon}\right]}{f\left(\frac{1}{1-\beta_L(1-s)} - \frac{1}{1-\beta_L(1-s)\lambda}\right)}$$

A sufficient condition for the difference in square brackets to be positive is $\beta_L > \frac{\frac{1-\alpha\lambda}{1-\alpha} - (\theta_{0t}\lambda + 1 - \theta_{0t})^{\varepsilon}}{(1-s)\left[\frac{1-\alpha\lambda}{1-\alpha} - \lambda(\theta_{0t}\lambda + 1 - \theta_{0t})^{\varepsilon}\right]}$. This can be derived by setting $\tilde{\theta}_{jt} = \theta_{0t}$ in the first sum (an upper bound for $\tilde{\theta}_{jt}$) and $\tilde{\theta}_{jt} = 0$ (a lower bound) in the second sum.

Finally, with some algebra it is straightforward to show that $\ddot{c} > \bar{c}_t$, so that the condition in I) is never binding.

Lemma 6: Given equilibrium strategies and beliefs patient distributors never default.

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

There exists a $\hat{c}_t > \bar{c}_t$ such that for all $c < \hat{c}_t$ we have that: I) if $c < \bar{c}_t$ $V_H(nd, \tilde{\theta}_{it}, c) \geq V_H(d, \theta_{it}, c)$ and II) if $c \geq \bar{c}t$ $V_H(nd, \tilde{\theta}_{it}, c) > V_H(d, \tilde{\theta}_{it}, c)$.

I)

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

$$\begin{aligned} V_H(nd, \tilde{\theta}_{it}, c < \bar{c}_t) &= \sum_{j=i}^{\infty} \beta_H^{j-i}(1-s)^{j-i} * (1-\alpha)(Rev^*(c \leq \bar{c}_t) - f) \\ &= \frac{1-\alpha}{1-\beta_H(1-s)}(Rev^*(c < \bar{c}_t) - f) \end{aligned} \tag{19}$$

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

$$V_H(d,\tilde{\theta}_{it},c\leq\bar{c}_t)=\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}\lambda^{j-i}[(1-\alpha\lambda)Rev^*(c\leq\bar{c}_t)-(1-\alpha)f$$
$$=\frac{1-\alpha\lambda}{1-\beta_H(1-s)\lambda}Rev^*(c<\bar{c}_t)-\frac{(1-\alpha)f}{1-\beta_H(1-s)\lambda}. \quad (20)$$

Hence, $V_H(nd,\tilde{\theta}_{it},c<\bar{c}_t)\geq V_H(d,\tilde{\theta}_{it},c<\bar{c}_t)\Leftrightarrow c^{\epsilon-1}\leq\frac{[\beta_H(1-s)-\alpha]\left(\frac{\alpha(\varepsilon-1)}{\varepsilon}\right)^{\varepsilon-1}A}{f(1-\alpha)\beta_H(1-s)}\equiv\breve{c}^{\varepsilon-1}$.

Note that $\breve{c}>\bar{MC}_t$, as can be verified by differentiating the expression for $\bar{c}_t$ with respect to β_i.

II)

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

$$V_H(nd,\tilde{\theta}_{it},c\geq\bar{c}_t)=\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}*(1-\alpha)(Rev_j^*(c>\bar{c}_t)-f). \quad (21)$$

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

$$V_H(d,\tilde{\theta}_{it},c\geq\bar{c}_t)=\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}\lambda^{j-i}[(1-\alpha\lambda)Rev_j^*(c>\bar{c}_t)-(1-\alpha)f] \quad (22)$$

Plugging in the expressions for $Rev_j^*(c\geq\bar{c}_t)$ and manipulating, the condition $V_L(nd,\tilde{\theta}_{it},c\geq\bar{c}_t)\geq V_L(d,\tilde{\theta}_{it},c\geq\bar{c}_t)$ becomes

$$c^{\varepsilon-1}\leq\hat{c}_t^{\varepsilon-1}=\left(\frac{\alpha(\varepsilon-1)}{\varepsilon}\right)^{\varepsilon-1}A* \quad (23)$$
$$\frac{\left[\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}(\tilde{\theta}_{jt}\lambda+1-\tilde{\theta}_{jt})^{\varepsilon}-\frac{(1-\alpha\lambda)}{(1-\alpha)}\sum_{j=i}^{\infty}\beta_H^{j-i}(1-s)^{j-i}\lambda^{j-i}(\tilde{\theta}_{jt}\lambda+1-\tilde{\theta}_{jt})^{\varepsilon}\right]}{f\left(\frac{1}{1-\beta_H(1-s)}-\frac{1}{1-\beta_H(1-s)\lambda}\right)}$$

It remains to show that $\bar{c}_t<\hat{c}_t$ such that patient distributors would default only on extremely unproductive exporters, which in equilibrium never enter the export market, i.e. we assume that $\hat{c}_t>\tilde{c}_t$. It is easy to show that the denominator of $\bar{c}_t$ is larger than the denominator of $\hat{c}_t$. A sufficient condition for the numerator of $\hat{c}_t$ to be larger than the one of $\bar{c}_t$ is $\tilde{\theta}_{0t}<\frac{\frac{1-\alpha\lambda}{1-\alpha}\frac{s}{1-(1-s)\lambda}-1}{\lambda-1}$. This can be derived by differentiating the difference with respect to β and requiring the derivative to be positive for $\tilde{\theta}_{jt}=\tilde{\theta}_{0t}$ in the first term and $\tilde{\theta}_{jt}=0$ in the second term of the sum.

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

Lemma 7: θ_t is weakly increasing in t.

Proof:

to be completed

Proposition 1: Export quantities are increasing in the age of the relation as long as $c \geq \bar{c}_t$ and constant for $c < \bar{c}_t$.

Proof:

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

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

Proposition 2: 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:

$$\frac{\partial q^*(c)}{\partial \lambda} = \frac{(\varepsilon - 1)\alpha}{c} \left(\frac{\varepsilon - 1}{\varepsilon} \alpha(\tilde{\theta}\lambda + (1 - \tilde{\theta})) \frac{1}{MC} \right)^{\varepsilon - 1} A \left(\frac{\partial \tilde{\theta}}{\partial \lambda}(\lambda - 1) + \tilde{\theta} \right) \tag{24}$$

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

Proposition 5: The hazard is decreasing in the age of the relation.

Proof:

Note that with some manipulations the hazard can be written as

$$Pr(Separation|age = i) = \frac{s}{1 - s} + \frac{v_L P \lambda^{i-1}(1 - \lambda)}{(1 - s)[v_L(P\lambda^i + (1 - P)] + v_H},$$

where $P \equiv Pr(c > \bar{c})$.

Using this expression it is straightforward to show that

$$\frac{\partial Pr(Separation|age = i)}{\partial i} = \frac{v_L P \lambda^{i-1}(1 - \lambda)(1 - s)\log(\lambda)(v_H + v_L(1 - P)}{DEN^2} < 0,$$

where DEN stands for denominator.

Proposition 6: 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.

$$\frac{\partial Pr(Separation|age=i)}{\partial \lambda} = \frac{(1-s)v_L P\lambda^{i-1}(1-\lambda)[P\lambda^{i-1}v_L(1-i)+v_L\lambda^{-1}(1-P)+v_H\lambda^{-1}]}{DEN^2}$$

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

Proposition 7: 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 smaller than $\bar{c}$ is $Pr(Separation|age = i, c < \bar{c}) = \frac{s}{1-s}$ and conditional on $c \geq \bar{c}$ is $Pr(Separation|age = i, c \geq \bar{c}) = \frac{s}{1-s} + \frac{v_L\lambda^{i-1}(1-\lambda)}{v_L\lambda^i+v_H}$.

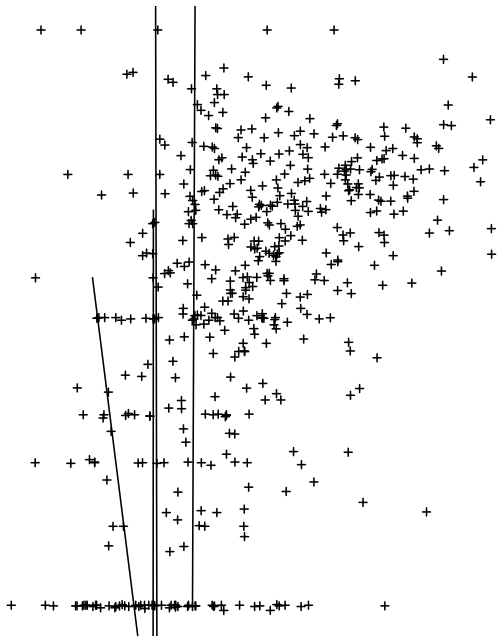

Figure 1: State dependence to be explained by firm productivity. The figure shows correlation between the estimated marginal effect of past export status on current export decisions with firms' log total exports.

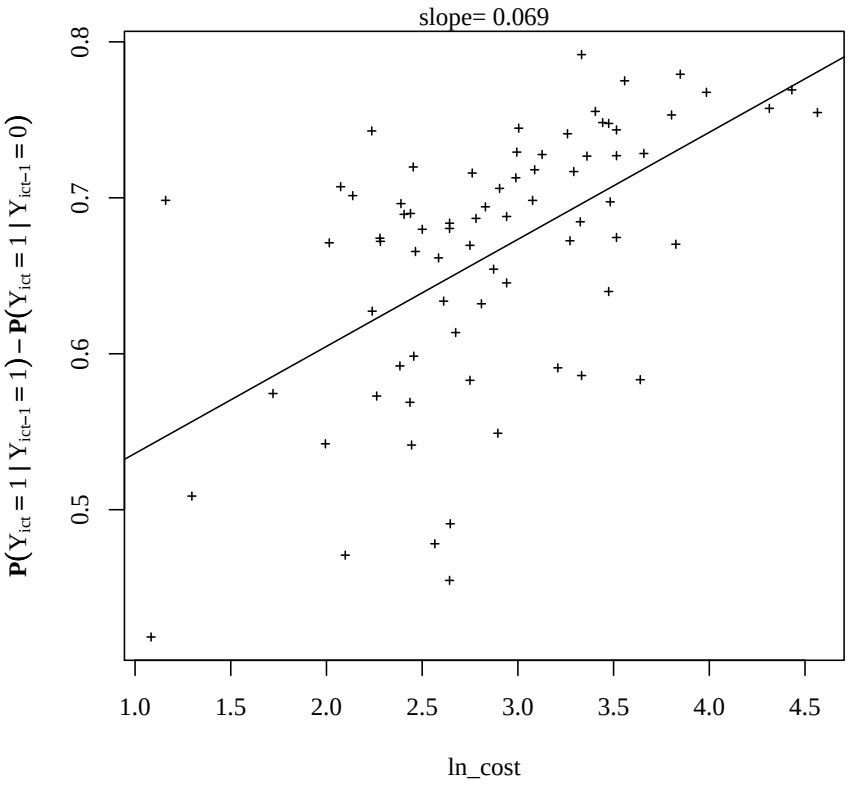

Figure 2: State dependence to be explained by legal institutions. The figure shows correlation between the estimated marginal effect of past export status on current export decisions with an inverse measure of the cost of legal procedures by country.

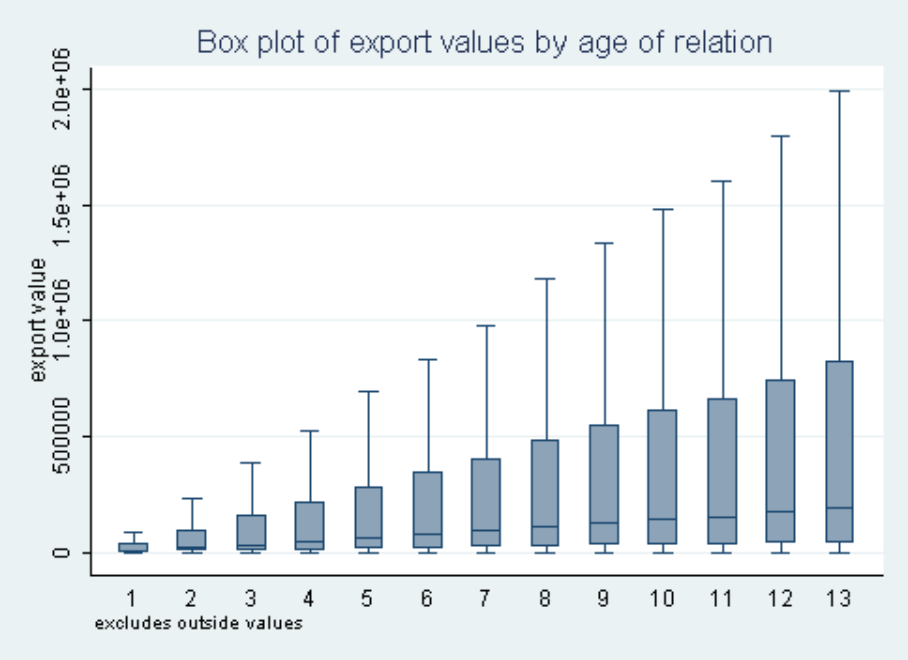

Figure 3: Export sales by relations' age

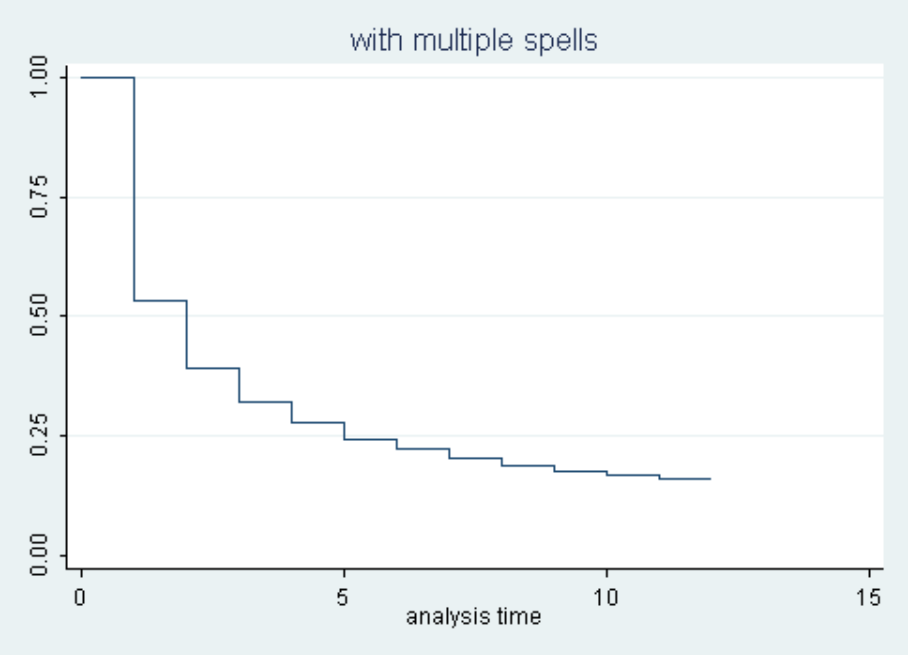

Figure 4: Cummulative Survival Probability

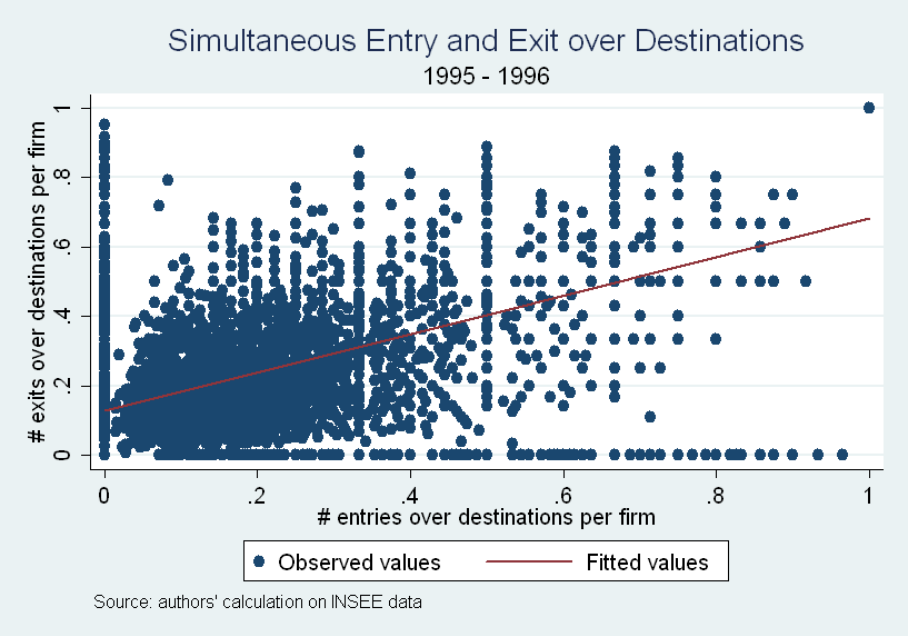

Figure 5: Entry vs. exit relative to total export destinations by firm.The figure shows the fraction of destinations where a firm newly enters plotted against the fraction of destinations to which it stops exporting.

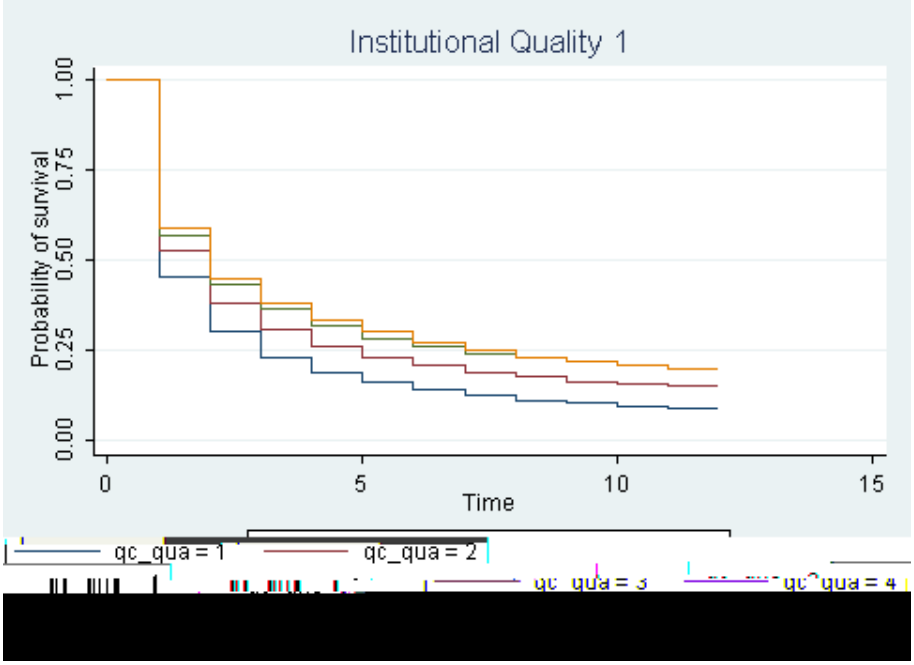

Figure 6: Cummulative Survival Probabilities by Institutional Quality Quartiles

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_{ikt-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_{ikt-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_{ikt-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_{ikt-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_{ikt-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_{ikt-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_{ikt-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_{ikt-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