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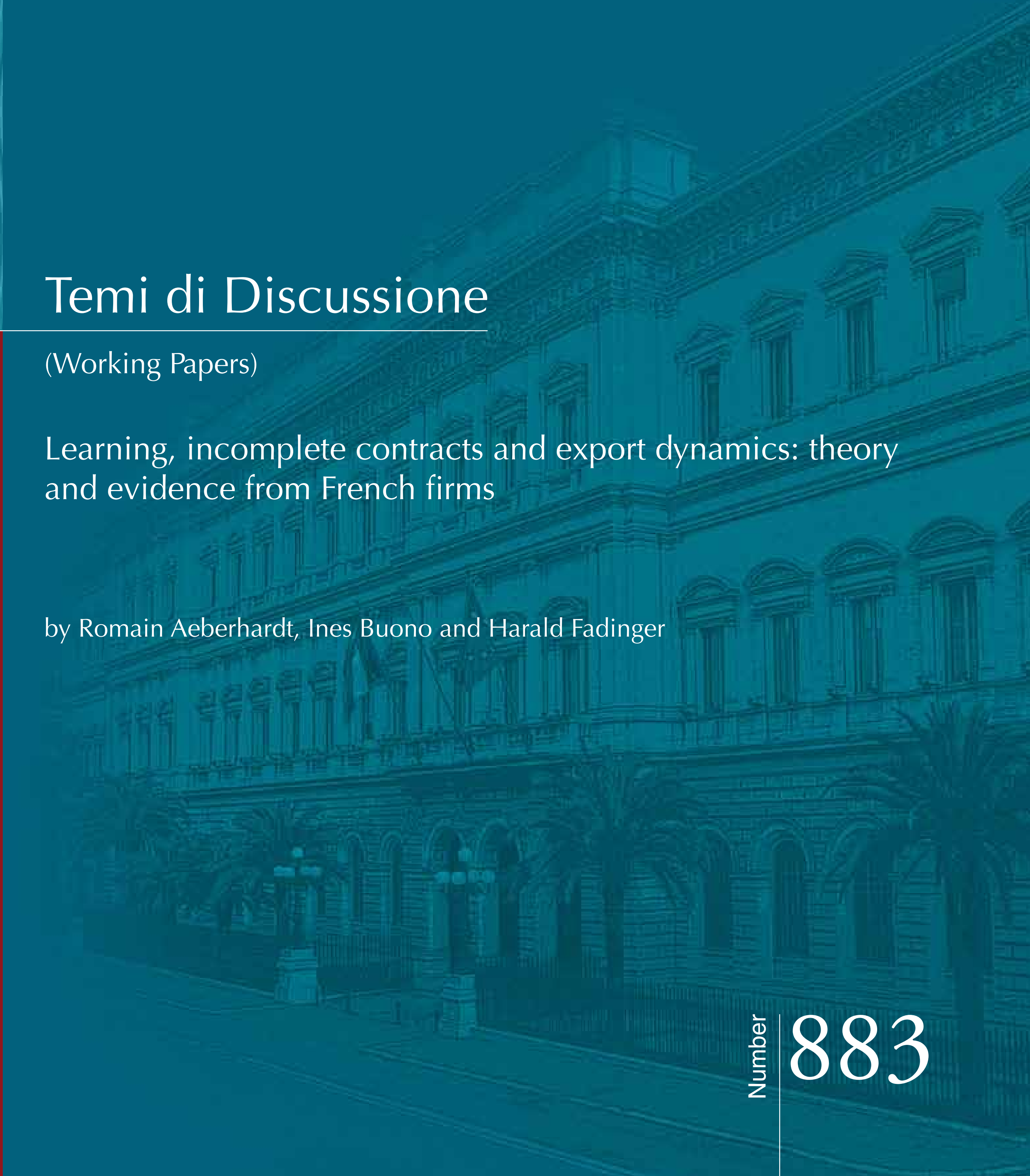

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(Working Papers)

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LEARNING, INCOMPLETE CONTRACTS AND EXPORT DYNAMICS: THEORY AND EVIDENCE FROM FRENCH FIRMS

by Romain Aeberhardt*, Ines Buono** and Harald Fadinger***

Abstract

Using French firm-level trade data, we provide empirical support for a heterogeneous firm model in which exporting requires finding a local partner in each market: contracts are incomplete, exporters must learn the reliability of their partners through experience, and export behaviour is state-dependent due to matching frictions. As predicted by our theoretical model, we find that better legal institutions ease contracting frictions especially in sectors with serious contracting problems. This increases state dependence by more in those sectors. Finally, hazard rates depend on the quality of local legal institutions and decline with the age of the relationship, as unreliable partners are weeded out.

JEL Classification: F12, F14, L14.
Keywords: trade dynamics, learning, institutions, state dependence, firm-level trade data.

Contents

* CREST; romain.aeberhardt@ensae.fr.

** Bank of Italy, Economic Research and International Relations; ines.buono@bancaditalia.it.

*** University of Vienna, Department of Economics; harald.fadinger@univie.ac.at.

1 Introduction[1]

How do firms establish new export relations and what determines the dynamics of exports at the firm level? The most prominent models of export dynamics rely on sunk fixed costs to enter the export market. Such costs can explain why only a few very productive firms export (Melitz, 2003), why firms' export statuses are very persistent over time and why the probability that a firm exports is determined primarily by its past export status (see Roberts and Tybout, 1997, among others). However, a growing number of micro studies on export dynamics (Eaton, Eslava, Kugler and Tybout, 2007; Buono, Fadinger and Berger, 2008; Lawless, 2009) have revealed evidence that is at odds with this view.

First, export values are usually small when a firm breaks into a new market. Second, most export flows have a very short duration (one or two years), few survive for a longer period and these grow fast. This leads to hazard rates – defined as the probability for an export flow to stop conditional on having survived for t years– that sharply decrease over time and fast growing export values conditional on survival. Finally, a novel stylized fact, which we uncover in the present paper, is the positive relation between persistence of export flows and the quality of legal institutions in the destination country.

We argue that it is crucial to consider that exports at the firm level are relationship-specific in order to explain these observations. Most exporters neither sell a perfectly homogeneous good that can be sold in an organized exchange nor own a distribution network in the export destination. As a result, exporters need to rely on partners in each market. These are either trade intermediaries, distributors that locally market the exporter's product, or foreign firms that import the exporter's product to use it as an intermediate input.

In the model, firms that want to start exporting to a specific country have to search for a partner in that destination. When an exporter is matched with an importer, she is initially uncertain about the importer's reliability. Contracts are incomplete, so that some partners may try to hold up the exporter. Whether an importer has incentives to do so depends on the

[1]The views expressed are those of the authors and do not necessarily reflect those of the Bank of Italy or CREST. We thank Andrew Bernard, Paola Conconi, Alejandro Cunat, Jonathan Eaton, Pauline Givord, Michael Greinecker, Kala Krishna, Isabelle Méjean, Peter Neary and Sandro Shelegia for helpful suggestions and participants at seminars at INSEE, Institute for Advanced Studies, University of Sussex, WIIW and in the 2009 CEPR-ERWIT, the 2009 SED meeting, the 2009 ESEM, the 2009 ETSG annual meeting and the 2010 IFO-GEP conference for comments.

value of the short term gains from holding up the partner relative to the value of maintaining a long term relationship. This depends – among other things – on the importer's type (patient or impatient), the exporter's productivity, the extent of sectoral contracting frictions and the quality of legal institutions in the destination country. Patient importers sufficiently value future profits from any relationship to respect contracts with all exporters. On the other hand, impatient importers try to renegotiate contracts *ex post* if contracting frictions are severe (the payoff from renegotiation is large), legal institutions are weak (the opportunity to renegotiate is strong) and exporters are relatively unproductive (the expected value of future profits is low). Since exporters have to learn their partners' type through experience, uncertainty is initially large and thus export values are small. As an exporter observes that the contract is respected she becomes more confident that her partner is reliable and the value of exports grows.

The combination of these ingredients leads to several interesting patterns. Here, we focus on the more important ones. First, matching frictions generate persistence (state dependence) in export decisions, even though there are no sunk costs in the model. An exporter is unwilling to give up a partner unless she is sure that the importer is unreliable. Second, better legal institutions make it more likely that a given relation survives from one period to the next. As a consequence, better legal quality leads to more state dependence and reduced hazard rates. Moreover, this effect is larger the more severe contracting frictions are in a given sector. Similarly, larger destination market size or higher exporter productivity imply that a given relationship is more valuable for importers and thus makes it more likely that they will honor the contract. Hence, state dependence is larger (and hazards are lower) in destinations with larger markets and for more productive exporters. Moreover, hazard rates decrease with the age of the relationship because partnerships involving unreliable importers are sorted out, while relations with reliable partners survive in the long run.

We use a panel of roughly 6,600 French manufacturing exporters over 13 years to test these predictions.[2] First, we find that there is strong evidence for state dependence of export decisions that is positively related to institutional quality. Figure 1 illustrates this point. It presents a plot of the estimated effect of past export status on today's export probability by destination country against a measure of the legal quality of the destination country.[3] It is apparent that the

[2]Similar datasets have recently been used by Berthou and Fontagné (2012) and Berman, Mayer and Martin (2012) among others.

[3]We use a linear probability model and regress the current export status of each plant on the export status

coefficients of past export status are larger for countries with higher quality legal institutions. Second, we find that hazard rates of trade flows are negatively correlated with the destination countries' legal quality and strongly decrease with the age of the relationship. Figure 2 visualizes these observations by plotting a non-parametric estimate of the hazard for different quartiles of legal quality. The hazard has a strongly negative slope. While the probability that a trade flow stops is around 20 percent in the beginning, for trade flows that survive for 9 years the hazard drops to around five percent. Moreover, note that the hazard is lower for higher quartiles of legal quality. Third, export values are initially small and grow with the age of the relationship. In Figure 3 we depict box plots by age of the relationship.[4] The figure shows nicely that median export sales are initially very small (around 10,000 euros). As relationships get older export values increase substantially.[5]

We now turn to a discussion of the related literature. While there is a growing body of research on the firm-level dynamics of exporting, we are not aware of an alternative explanation that can explain all the empirical facts emphasized in this paper. A large empirical literature, which builds on the classical hysteresis models by Baldwin and Krugman (1989) and Dixit (1989), focuses on sunk costs as the main reason for state dependence of exporting decisions. The seminal contribution is Roberts and Tybout (1997) using data on Colombian exporters, followed, among other studies, by similar evidence for the US by Bernard and Jensen (2004). These papers estimate reduced form models for export decisions and show that past export status is an important predictor for current export status. In an influential study, Das, Roberts and Tybout (2007) perform a structural estimation of a model with heterogeneous firms and sunk costs to quantify the size of sunk entry costs to start exporting. They estimate these costs to be substantial for Colombian exporters (around $US 400,000). More recently, Ruhl and Willis (2008) show that the standard model of firm heterogeneity with sunk costs predicts export values which are too large upon entry and hazard rates that increase over time, which is at odds with the empirical evidence.

A more recent line of research is motivated by the empirical observations that: entry into

in the previous year by destination country. This figure is meant to be purely illustrative. We provide more formal econometric evidence for this relation in the empirical section of this paper.

[4]The box plot depicts the median and the 25th and 75th percentiles of the distribution of export values, as well as the minimum and maximum export value. Note that the distribution has a long right tail, with most of the mass of the distribution being concentrated at very low values.

[5]Similar evidence has also been reported by Eaton et al. (2007) for Colombian exporters.

export markets usually occurs with small values; and that hazards decline with the age of the relationship. To explain these facts, Eaton, Eslava, Krizan, Kugler and Tybout (2012) develop a model of Bayesian learning. In this setting, firms are initially uncertain about their demand in the export market and therefore start small. If they discover that demand is large they spend resources in order to reach more consumers and their exports grow fast. This idea is related to our paper but – since firms sell directly to consumers – their model remains silent on the role of institutions and contractual frictions for export dynamics.[6]

Our paper is also very strongly connected to the literature on relationship-specific trade. In Rauch and Watson (2003) importers are uncertain about the reliability of foreign suppliers. They test the waters by initially placing small orders, which are followed by large orders if the test is successful. This leads to small import values at the beginning of the import relationship that grow as the relationship matures. Besedes and Prusa (2006) find empirical support for this using highly disaggregated product-level import data for the US.[7]

The papers most closely related to ours are Araujo and Ornelas (2007) and Araujo, Mion and Ornelas (2012). They consider a model where exporters have to match with a distributor, whose type is unknown and has to be learned through experience. Some distributors run away with exported goods if they can. As a consequence, export values are initially small and increase as exporters become more confident about the reliability of their partners. They also derive results on the role of institutions on firm-level and aggregate trade flows but they do not investigate their model's predictions regarding state dependence.

Our theoretical contribution is to extend their homogeneous firm model to a setting with heterogeneous firms, which is important for bringing the model to the data because many of our comparative statics results depend on firm heterogeneity. For example, the predictions that state dependence is larger in larger markets and for more productive firms, or that institutional quality is less important for more productive firms are consequences of firm heterogeneity. In addition, we focus on an incomplete contract interpretation of their setup and we allow sectors to differ in the extent of their contracting frictions.[8] This affords us the prediction that the

[6]Other papers that emphasize learning about local demand are Arkolakis and Papageorgiou (2009), as well as Segura-Cayuela and Vilarrubia (2008) and Albornoz, Pardo, Corcos and Ornelas (2012), who focus on learning from other exporters (export destinations).

[7]Other recent papers that study the role of information frictions for trade are Allen (2011) and Antras and Foley (2011).

[8]Felbermayr and Jung (2011) study the role of importers and incomplete contracts in a model with hetero-

impact of legal institutions on state dependence or hazard rates is larger in sectors that are more exposed to contracting frictions and allows us to also exploit the cross-sectoral variation of our data in the empirical section.

However, our main contribution is to perform the first empirical analysis of the impact of institutions on export dynamics, with a focus on the implications for state dependence and hazard rates. More recently, Araujo et al. (2012) have provided further evidence complementing our results. They test several other predictions of their related model, finding that export relationships start with higher values and survive for longer in countries with better institutions, while export growth rates decrease with institutional quality conditional on survival.

Summing up, we provide a micro-foundation for the dynamics of exporting at the firm level that highlights the importance of both informational and contracting frictions. The model generates state dependence of exporting decisions without relying on sunk costs, while also being consistent with other stylized facts about exporting dynamics. In addition, the model has implications for the interaction between state dependence/hazard rates and the quality of legal institutions that differentiate it from alternative explanations. We show that these predictions are strongly supported by empirical evidence.

In the next section we motivate our assumptions on the relationship-specificity of exports and discuss the model. We also derive a set of testable predictions. In section 3 we present the data and test the predictions derived in the theory section. The final section concludes.

2 A Model of Exporting and Learning

In standard trade models exporting is not different in nature from being active in the domestic market – firms can directly sell their goods to consumers. In reality, however, exporters usually sell their products to a very small number of importers in each foreign market. These are either distributors who locally market and sell the exporters' products, trade intermediaries, or foreign firms that use these products as intermediate inputs.

Empirically, many – especially smaller – exporters use importers to sell their goods in foreign markets. Few products are sufficiently standardized in order to be sold on an organized market. Thus, if an exporter wants to penetrate a foreign market she can either market the product

geneous firms and a choice of different export modes but they do not investigate export dynamics.

herself – which entails substantial costs for getting to know the local business environment and setting up a distribution network – or she has to rely on a local partner. Hence, trade is relationship-specific, since it involves a bilateral relation between an exporter and an importer.

Regarding evidence on the relationship-specificity of trade, Eaton et al. (2012) combine Colombian firm-level export data with US import data and show that each Colombian exporter is involved in a very small number of trade relationships with the US. On average, Colombian firms that export to the US have 1.4 trade relationships in the US, 80% of Colombian exporters to the US have only one relationship and 90% at most two relationships, providing strong support for the hypothesis that most trade is relationship-specific. Blum, Claro and Horstmann (2012) provide similar evidence for Chilean exporters linked to Colombian importers – the median exporting firm from Chile has only one importer in Colombia. In the model, we abstract from direct exports to consumers, setting up a distribution network and other forms of intra-firm trade, an option that is viable only for very large exporters because it requires substantial amounts of fixed investments.[9]

2.1 Setup

Here, we only provide an informal description of the model, which is an extension of the setup of Araujo and Ornelas (2007) to heterogeneous firms. The formal model and all proofs can be found in the Appendix.

Consider an economy with two countries, Home and Foreign, and many sectors $j = 1, ..., J$. In Home there is a measure one of infinitely lived producers in each sector j, which 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 on $[c_{min}, \infty)$. Each firm produces a differentiated variety and is a monopolist for that specific variety. If a producer wants to export she cannot sell her goods directly to Foreign consumers but needs to form a partnership with an importer located in Foreign.[10]

In each sector, Foreign aggregate demand for each variety produced by a Home exporter is described by a constant price elasticity demand function $q(p) = Ap^{-\varepsilon}$, where A is a summary

[9]Felbermayr and Jung (2011) report that only 4% of German exporters have wholesale affiliates.

[10]Since we are mainly interested in the formation of export relationships and because the export decision is independent of behavior in the domestic market (as marginal costs are constant), we disregard the activities of producers in their domestic market.

measure of Foreign market size in sector j and $\varepsilon = 2$ is the price elasticity of demand.[11] In a given sector, Foreign is populated by a large measure of infinitely lived firms that can distribute goods produced by Home producers to Foreign consumers, which we call importers.[12] Each of them can sell any imported good in that sector to Foreign consumers but cannot distribute more than one good simultaneously.[13] Importers may be of two types that differ in terms of their discount factor.[14] There are patient importers, indexed by H, with discount factor β_H and impatient importers, indexed by L, with discount factor β_L, where $\beta_L < \beta_H$. The type of the importer $\in \{H, L\}$ is private information. The fraction of impatient importers in the population is θ_0 in each sector and is given exogenously.

In every period, exporters and importers that are not in an export relationship decide whether to look for a partner or to remain inactive. If exporters search for a partner they find one with exogenous probability x. Before a partnership is formed, exporters' marginal cost is unobservable to importers, so that matching occurs randomly. Only once matched, the importer discovers the marginal cost of her partner. At the beginning of every period, matched exporters and importers can then both decide whether to maintain the partnership or to dissolve it. If they decide to dissolve it, both the exporter and the importer cease to be active and are replaced by another set of firms of the same type.

If they decide to continue the relationship for another period the partners write a simple one-period contract. The contract specifies an export quantity and an exogenous split of the current period's surplus.[15] The exporter receives an exogenous fraction α of the current surplus and the remaining fraction goes to the importer. The surplus consists of the revenue of exporting minus the fixed cost to export, f. In the next stage, exporters produce the quantity of goods specified

[11] We set $\varepsilon = 2$ for analytical convenience. All results hold for $\varepsilon > 1$.

[12] Alternatively, importers can be interpreted as Foreign manufacturing firms that import intermediate inputs.

[13] The predictions of the model would not change if importers could distribute more than one good as long as exporters cannot observe the success of other exporters matched with a particular importer. If exporters could infer the importer's reliability by observing other exporters they would try to match with importers that are successful with other firms. This would mitigate uncertainty and reduce the role of contracting frictions. Thus, our model can be seen as an extreme case of uncertainty.

[14] Several interpretations of this assumption are possible. One explanation is credit market frictions – if some importers are credit constrained and face higher borrowing costs they discount future profits at a higher interest rate than importers who do not need to rely on external funds. Alternatively, one could model importers with different levels fixed distribution costs, which are unobserved by exporters, obtaining identical predictions (see Araujo et al. (2012)).

[15] Since we want to focus on the role of reputation for trade relationships we do not allow for contracts that can be used to screen between patient and impatient importers.

in the contract and pay the fixed cost, and importers make a transfer equal to their fraction of the fixed cost. After that, the importer may try to hold up the exporter by renegotiating the split of current revenues if it pays to do so. Importers can make a take-it-or-leave-it offer in order to appropriate an additional sector-specific fraction $\gamma_j \in [0,1]$ of the part of current revenues that the contract originally assigned to the exporter. γ_j measures how sensitive a sector is to hold-up problems. This depends on whether the good has been specifically designed for the export market. The exporter's outside option is to sell the good through a partner in the domestic market with the same revenue split but for a fraction $(1-\gamma_j)$ of the original price. The lower price in the domestic market reflects the extent to which the good has been tailored to the export market.that the exporter always accepts the importer's proposal since she is indifferent between accepting and her outside option.

Moreover, the possibility to renegotiate the contract also depends crucially on the quality of the Foreign legal system, $\lambda \in [\underline{\lambda}, 1]$, where $\underline{\lambda} > 0$. Importers are ex ante uncertain whether they will find an opportunity to renegotiate. They are able to do so with probability $(1-\lambda)$. For example, they may need to bribe a public official in order to get around the conditions stipulated in the contract and they are unsure whether they can do this successfully. If renegotiation occurs it is observed by the exporter.

In the last stage, the exporter ships the quantity of goods specified in the contract, goods are sold and the importer transfers a fraction of revenues to the exporter. Finally, at the end of each period there is a positive probability of exogenous separation, $s \in [0,1]$.

2.2 Nash Equilibrium

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

In each period t potential exporters decide whether to enter the export market in order to search for a partner. If an unmatched exporter meets an importer she decides optimally whether to accept the partner or to continue the search given her marginal cost, her belief about the partner's type and the strategies of the importers. Any exporter that has a partner decides at the beginning of each period whether to continue the relationship for another period or to terminate it given her beliefs about the type of the importer. If she decides to continue the relationship, she chooses the optimal quantity to export given her marginal cost c, her beliefs about the type of the importer and the strategies of the importers.

Importers face a similar set of decisions. If an importer meets an exporter she decides optimally whether to accept this match and form an export relation or to continue the search given her belief about the partner's type and exporters' strategies. An importer that has a partner decides optimally whether to try to renegotiate or to honor the contract given her type, the exporter's marginal cost and her strategy.

Even though in this infinite-horizon setup many perfect Bayesian Nash equilibria exist, we focus on a Markov-perfect equilibrium, which is especially plausible because of its simplicity. In any period, beliefs about the importers' type, which follow a Markov process due to Bayesian updating, are sufficient to describe the current state. The equilibrium strategies of exporters and importers depend only on current beliefs and on current actions.

Given this setup, we show that the equilibrium is characterized as follows: exporters enter the export market as long as they expect to make non-negative profits. This free entry condition, which implies that the least productive firm that enters makes zero expected profits in equilibrium, defines a cutoff cost value $\tilde{c}$. Then, impatient and patient importers as well as exporters initially accept any match. Once a match is formed, impatient importers try to renegotiate contracts with unproductive exporters and honor contracts with sufficiently productive exporters; they try to renegotiate the contract if and only if $c \geq \bar{c}$. The intuition is that future profits from respecting the contract with a productive exporter are so large that they discipline impatient importers. Differently, violating the contract, which gives large one time gains, is tempting if exporters are not sufficiently productive. Patient importers, on the other hand, always honor their contracts with any type of exporter. Exporters who have a partner choose the optimal quantity to export. Having observed the behavior of their partners, exporters update their belief about the type of the importer at the end of the period using Bayes' rule. Finally, exporters terminate a relationship if and only if they observe that the contract has been renegotiated.

These equilibrium strategies and beliefs imply that sufficiently productive exporters are indifferent to the type of their partner, while less productive exporters with $c \geq \bar{c}$ fear that an impatient partner will hold them up if she has the chance. Since exporters cannot distinguish between patient and impatient importers unless they observe that the contract is renegotiated successfully, they stick to the importer as long as the contract is respected. The longer importers have honored their contracts, the more confident exporters become that their partner is patient. As a result, optimal export quantities increase as the relationship matures for exporters with $c \geq \bar{c}$, while learning plays no role for exporters with $c < \bar{c}$, since all importers respect contracts with these firms.

2.3 Theoretical Predictions

Having described the Nash equilibrium, we now derive a number of theoretical predictions that we will test in the empirical section of the paper. Our main interest is to relate export dynamics to firm characteristics (productivity), industry characteristics (the severity of sectoral contracting frictions), destination characteristics (legal institutions, market size) and their interactions. Thus, we now interpret our model as applying to a world with many export destinations. We investigate the effect of firm, industry and destination characteristics on the state dependence of export decisions and on hazard rates.

2.3.1 State Dependence

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

Since importers always honor contracts with sufficiently productive exporters, while there are endogenous separations from exporters with high marginal costs, the model implies that state dependence is larger for exporters with low marginal costs (with $c \in [c_{min}, \bar{c})$) than for those with high marginal costs (with $c \in [\bar{c}, \tilde{c}]$).

Proposition 1: *State dependence is larger for exporters with lower marginal costs.*

Proof: See Appendix.

Next, we establish how state dependence is affected by the export destinations' market size. In fact, state dependence increases according to the market size of the destination. The reason is that $\bar{c}$ – the cutoff cost level from which on impatient importers violate contracts – is increasing in market size (A). This is because a larger market increases the value of a given export relationship and therefore makes it easier to sustain cooperation. As a consequence, a given level of c is more likely to lie below the level $\bar{c}$. Thus, a given relationship is more likely to survive from one period to the next. We summarize this result in the following proposition.

Proposition 2: *State dependence is increasing in the market size of the export destination.*

Proof: See Appendix.

We now derive a relation between state dependence and the destinations' legal quality λ. An improvement in legal quality reduces the probability that renegotiation is successful and thus increases the probability that a given relationship survives. Moreover, the quality of legal institutions only matters for state dependence for those relationships which involve less productive exporters – contracts with sufficiently productive exporters are honored by both types of importers independently of institutional quality. These points are summarized by the following proposition:

Proposition 3: *State dependence is increasing in the quality of the export destinations' legal institutions. Moreover, the impact of legal institutions on state dependence is larger for exporters with higher marginal costs.*

Proof: See Appendix.

Finally, we compare the impact of an improvement in legal institutions for two sectors that differ in the extent of their contracting frictions γ. To consider an extreme case, if $\gamma = 0$, importers cannot extract anything from the exporters' share of the surplus. Thus, they always honor contracts independently of legal quality and an increase in λ has no effect on their equilibrium strategies and on state dependence. If, however, γ is large this implies a low value of $\bar{c}$, the level of marginal costs from which on violating the contract becomes attractive. As a consequence, many relationships are affected by endogenous separation and an increase in λ, which reduces the probability that a contract violation occurs, implies a large increase in state dependence. The following proposition makes this point more generally:

Proposition 4: *The positive impact of legal institutions on state dependence is larger in sectors with larger contracting frictions (sectors with higher levels of γ).*

Proof: See Appendix.

2.3.2 Hazard Rate

The model also has several interesting implications for the relation between the conditional hazard rate, i.e., the probability that a relationship ends at age i conditional on the exporter's marginal cost, and firm, country and sector characteristics.

First, since relationships with impatient importers have a higher separation probability than those with patient ones as long as $c \geq \bar{c}$, the older the relationship, the smaller becomes the fraction of surviving relationships that involve impatient importers. This implies that the hazard is decreasing in the age of the relationship.

Proposition 5: *The conditional hazard is decreasing in the age of the relationship for $c \geq \bar{c}$.*

Proof: See Appendix.

Note also that the hazard rate is lower for more productive exporters. This is because importers do not violate contracts with productive exporters and all separations from these exporters are exogenous, while impatient importers try to violate contracts with unproductive exporters, so that there are both exogenous and endogenous separations. Thus, we can state the following proposition:

Proposition 6: *The conditional hazard is increasing in firms' marginal cost.*

Proof: See Appendix.

We can also establish that the conditional hazard is lower in larger markets. The reason is that in these markets, relationships with any given exporter have a larger value because demand is higher. Thus, the larger the market, the more likely are impatient importers to honor contracts for a given marginal cost of the exporter. This reduces the probability of endogenous separation for a given level of c and therefore decreases the hazard.

Proposition 7: *The conditional hazard is decreasing in the market size of the export destination.*

Proof: See Appendix.

The next proposition establishes a relation between the hazard and the destination country's legal institutions.

Proposition 8: *The conditional hazard is decreasing in the quality of the export destination's legal institutions for sufficiently young relationships. Moreover, for these relationships an increase in the quality of legal institutions leads to a larger decrease in the conditional hazard in sectors with larger contracting problems.*

Proof: See Appendix.

The intuition for this proposition is as follows. An increase in λ reduces the probability of successful contract violation for a given relationship with $c \geq \bar{c}$. However, there is also a composition effect that works in the opposite direction – more relationships with impatient importers survive because impatient importers are less likely to cheat and this increases the hazard. This effect dominates for sufficiently old relationships. To understand the mechanism behind the second part of the proposition note that when γ is zero (importers cannot appropriate any of the exporters' revenue share), institutions have no impact on firms' strategies and thus no effect on the hazard. When γ becomes positive, this is no longer true. In particular, the higher γ, the more likely an exporter is to be affected by endogenous separations for a given marginal cost. As a consequence – since better legal institutions reduce the probability of contract violations for exporters with $c \geq \bar{c}$ – an increase in λ has a particularly strong negative effect on the hazard in high γ sectors. Having stated our testable predictions, we now turn to the empirical analysis.

3 Empirical Analysis

3.1 Data

We use a panel of 6,557 French manufacturing firms that exist continuously and export at least once in the period from 1993 to 2005. The dataset is administered by the French Statistical Institute (INSEE) and merges two data sources. One is the customs (Douanes) database which allows us to precisely observe the exports of each firm to any potential destination.[16] The customs data include records of the value (measured in euros) of all the extra EU shipments and all the intra EU trade of French firms above a certain value by firm, destination country and year. Because the reporting threshold for intra-EU trade changed several times over the sample period, we exclude EU destinations from our main sample to avoid spurious results but we include them in robustness checks.[17] We select the destination countries for which we have the additional information we need to carry out our analysis. Thus, the final data set includes 75 countries. The other source is the Bénéfices Réels Normaux (BRN) database, which provides very detailed firm-level data on a variety of balance-sheet measures. This allows us to calculate and control for firm characteristics such as labor productivity, constructed as value added per worker. Each firm is assigned to one of 55 manufacturing sectors using the French NES classification system.[18] Table A-1 reports descriptive statistics of the firm-level variables for our sample. Median exports flows by firm to a given destination in a given year are around 33,000 euros ($\approx exp(10.4)$) and the median firm in our sample exports to 4 destinations in a given year. Note that our sample is representative for the set of all potential exporters to non-EU destinations, since we include all firms with the necessary balance sheet information that exist continuously and export at least once to a non-EU destination during the 13 year sample period.

We also use several control variables that come from other sources. Data on average real GDP, real GDP per worker and bilateral real exchange rates 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. First, as our main measure of legal institutions, we employ *rule of law* by Kaufmann, Kraay and Mastruzzi (2006),

[16]Regrettably, we do not have information whether trade flows are intra-firm.

[17]The reporting threshold for intra EU trade changed several times in the sample period. It went from 250,000 FF to 650,500 FF in 2001 and then was changed to 100,000 euros in 2002. For extra EU trade, the threshold is close to 1000 euros.

[18]Our data source is the same as that of Eaton, Kortum and Kramarz (2004) and Eaton, Kortum and Kramarz (2011). They report 34,035 exporters for the year 1986 that sell to 113 destinations outside France. We have less exporters in our dataset for several reasons. First, we exclude intra-EU trade. Second, we require exporters to exist continuously during the sample period. Third, we have less export destinations. Fourth, we drop exporters for whom the sector information was missing and we require firms to be both in the Douanes and in the BRN database and to have info on value added and employment. Finally, we focus on manufacturing and drop a number of manufacturing sectors for which we are not able to construct the sector-specific variables discussed below.

as given in Nunn (2007).[19] Second, we use *legal quality* by Gwartney and Lawson (2003).[20] Finally, we make use of a set of variables collected by the World Bank (World Bank, 2004). We use data on *number of procedures* and *official costs* required to collect an overdue debt. Both variables are scaled and transformed in order to make them increasing in judicial quality.[21] Basic statistics for the different institutional quality variables are reported in Table A-2.

Moreover, we construct two measures of sectoral relationship-dependence. The first measure uses data collected by Rauch (1999), who classifies the output of different sectors according to its standardization. Rauch assigns the goods produced by each 4-digit-SITC sector to one of the three following categories: traded on an organized exchange, reference priced, or neither. Nunn (2007) argues that this classification is a good measure for the severity of hold-up problems in a sector, since goods that are neither traded on an organized exchange nor reference priced are likely to be tailor-made for a specific partner and have little value outside this relationship. The second measure comes from Nunn (2007) and measures the fraction of inputs used by a sector that are neither reference priced nor traded on an organized exchange at the 3-digit ISIC level. This is a measure of relationship-dependence of sectoral inputs rather than outputs, but sectors that use a lot of specific inputs tend to also produce strongly differentiated outputs[22] and Nunn's measure has more variation. We convert both measures to the French NES classification (58 manufacturing sectors). Table A-3 lists both measures of relationship-dependence by NES sector.

[19] 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, increasing according to the quality of the institutions.

[20] This index, which ranges from 1 to 10, measures the legal structure and the security of property rights in each country in 1995.

[21] *Number of procedures* is the total number of procedures mandated by law or court regulation that require interaction between the parties or between them and the judge or court office. It is obtained as 60 minus the total number of procedures, thus a higher number indicates less procedures and a more efficient judicial system. 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 per capita income. The transformed variable ranges from 1.1 to 4.6.

[22] The correlation between Rauch's and Nunn's measure in our sample is 0.66. For example, most subcategories of both *Textile Products* and *Electrical Equipment NEC* fall into Rauch's category "neither" (this fraction is 0.76 in both sectors with Rauch's classification), even though electric equipment is probably more likely to be made specifically for a trade partner than a carpet, so the hold up problem should be more severe in the first case (Nunn's measure for the fraction of differentiated inputs is 0.76 for *Electrical Equipment NEC* against 0.48 for *Textile Products* at the NES level.).

3.2 State Dependence

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

In our main specification, we use a dynamic linear probability model to estimate state dependence. The main difficulty when estimating the impact of the past export status on the current one, is to disentangle the true state dependence from the spurious one. Indeed, when the residuals are auto-correlated, a naive regression of the export status on its past value would essentially capture the persistence of unobservables rather than a true effect of the past export status. One reason for auto-correlated residuals is unobserved heterogeneity at the firm or country level that is constant over time, such as firms' average productivity or the market size of the export destination.[23] Exploiting the three-dimensional nature (firms, destinations, time) of our dataset we can also take time-varying firm-level as well as time-varying destination-specific unobserved heterogeneity into account. Firm-level time-varying unobserved heterogeneity refers to firm-level supply shocks, such as changes in 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 changes in market size, openness policies, movements in the exchange rate, or other demand shifts which may influence the probability of a firm exporting to a given country.

As a first step we investigate whether current export status depends on past export status, even when we control for firm- and destination-specific shocks. Our basic specification is:

$$Pr(Y_{fkt} = 1 | Y_{fkt-1}, X_{fkt}) = E(Y_{fkt} | Y_{fkt-1}, X_{fkt}) = \beta_0 + \beta_1 Y_{fkt-1} + \delta_{ft} + \delta_{kt}. \tag{1}$$

Here Y_{fkt} is a dummy that equals one whenever firm f exports to destination k in period t, whereas δ_{ft} and δ_{kt} are firm-time- and destination-time-specific fixed effects. The coefficient β_1 of equation (1) is a measure of state dependence, since it captures the marginal effect of past

[23]Previous articles, which only had information on firms' aggregate export status available, have dealt with this problem in different ways. For example Bernard and Jensen (2004) estimated a linear probability model in first differences using the Arellano-Bond panel IV procedure. Others, such as Roberts and Tybout (1997) instead used a dynamic random effect probit strategy.

export status on the probability that a firm currently exports to a destination.

We estimate the model with a standard fixed effect panel estimator, clustering standard errors at the firm-year level in order to allow for correlation of the error terms across destinations for a given firm. Still, to gain intuition for the econometric identification strategy, it is useful to think in terms of the within transformation. Let K_{ft} be the total number of destinations of firm f in period t, let F_{kt} be the total number of firms that export to destination k in period t, let K be the total number of possible destinations and let F be the total number of firms. Moreover, let $\bar{Y}_{ft} = 1/K \sum_{k=1}^{K} Y_{fkt} = K_{ft}/K$ be the probability that firm f exports to an average destination in period t, let $\bar{Y}_{kt} = 1/F \sum_{f=1}^{F} Y_{fkt} = F_{kt}/F$ be the probability of exporting to destination k for an average firm in period t and let $\bar{\bar{Y}}_t = 1/(FK) \sum_{k=1}^{K} \sum_{f=1}^{F} Y_{fkt} = R_t/(FK)$, be the average probability of exporting in period t, where R_t is the total number of relationships at time t. Then define $\ddot{Y}_{fkt} \equiv Y_{fkt} - \bar{Y}_{ft} - \bar{Y}_{kt} + \bar{\bar{Y}}_t = Y_{fkt} - K_{ft}/K_t - F_{kt}/F_t + R_t/(F_t K_t)$. This transformed variable measures the export status of firm f to destination k in period t as a deviation from firm f's probability of exporting to an average destination and the probability of exporting to destination k for an average firm, adding the average probability to export in the same period. Applying this transformation to all variables eliminates δ_{ft} and δ_{kt} from specification (1).[24] Note that identification comes from firms that export to at least one destination (but not all of them) in a given year and the variation of their past export status across destinations.

Observe that sample selection is not an issue in the state dependence regressions because they are estimated on the full sample of firms, which is representative for the set of all French potential exporters that export at least once to at least one of the 75 non-EU destinations during the 13 year sample period. For each of these 6,557 firms we code $Y_{fkt} = 1$ if a given firm exports to a given destination in a given year and zero otherwise, for a total of 5,901,300 observations. As can be seen from the first row of Table A-1, there are 503,336 positive export flows in the sample, which means that more than 90 percent of observations are zero. We confirm in robustness checks that results are similar when also including EU destinations in the sample.

The first column of Table 1 tests for state dependence. Indeed, $\hat{\beta}_1$ is positive and significant

[24] Note that since we do not rely on the time dimension of the panel for our transformation, the lagged dependent variable does not cause any problems for consistency and we need not use a dynamic panel estimator.

at the one-percent level. Having exported to a destination in the previous period increases the probability of exporting in the current period by 64 percentage points compared to a firm that did not export there in the previous period, even when controlling for unobserved effects at the firm-time and destination-time level.

We now test our hypotheses regarding the relation between state dependence and the quality of legal institutions, market size and firm productivity. According to Proposition 1, state dependence is higher for more productive firms. Proposition 2 states that state dependence is increasing in market size, so we expect GDP to have a positive and distance to have a negative impact on state dependence. Finally, Proposition 3 implies that state dependence is increasing in legal quality. We thus specify the following empirical model:

$$Pr(Y_{fkt} = 1|Y_{fkt-1}, X_{fkt}) = \beta_0 + \beta_1 Y_{fkt-1} + \beta_2 Y_{fkt-1} * Prod_{ft} + \beta_3 Y_{fkt-1} * A_k + \beta_4 Y_{fkt-1} * IQ_k + \delta_{ft} + \delta_{kt}. \tag{2}$$

Here, $Y_{fkt-1} * Prod_{ft}$ is the interaction between last period's export status and firm productivity (measured as the log of value-added per worker), $Y_{fkt-1} * A_k$ is the interaction between past export status and effective market size proxies – GDP and distance[25] (all in logs) and $Y_{fkt-1} * IQ_k$ is the interaction between last period's export status and one of the measures of the quality of legal institutions. We also control for an interaction between past export status and GDP per capita (in logs) to avoid omitted variable problems, since GDP per capita and legal quality are highly correlated.

Columns (2) to (5) of Table 1 present results for regression (2). Each specification employs a different measure of institutional quality. Turning first to the effect of firm productivity on state dependence, we find that $\hat{\beta}_2$ is always positive and significant at the one percent level. In economic terms, moving from the 10th to the 90th percentile of productivity increases the marginal effect of the past export status by around 5.4 percentage points.[26] As for the interactions of past export status and the market size controls, distance has a significantly (at the one-percent level) negative impact on the effect of past export status, while GDP has a

[25] It is straightforward to incorporate transport costs, which have a negative effect on effective market size, into the model.

[26] The 90th percentile of log labor productivity is 4.42, the 10th percentile is 3.37 and $\hat{\beta}_2 = 0.051$, thus $0.054 \approx 0.051 * (4.42 - 3.37)$.

significantly positive effect (also at the one percent level).

In all specifications, $\hat{\beta}_4$, the coefficient of the interaction term between past export status and the different measures of legal institutions, is positive and significant at the one-percent level. In terms of economic magnitudes, the effect of institutions on state dependence is also sizeable. For example, moving from the 10th percentile of *rule of law* (a country like Albania) to the 90th percentile (a country like Japan) increases the effect of past export status on the probability of exporting in the current period by roughly 6.2 percentage points.[27] This effect is not negligible for an average exporter but we show below that the effect is much larger for small exporters. Note also, that the level of development (measured by *log(GDP per capita))* has a significantly positive impact on state dependence.

In columns (6) to (9) of Table 1 we add triple interaction terms between past export status, the different measures of legal quality and firm productivity. According to Proposition 3 we expect this interaction term to be negative since legal institutions should have a smaller impact on state dependence if exporters are more productive. Indeed, we find that in all specifications the interaction terms are negative and significant at the one-percent level, supporting our hypothesis. Note that the interaction term of past export status and legal quality, which now measures the marginal effect of legal quality for a firm with labor productivity of one (log productivity is zero), increases by a factor of three. Thus, for these very low productivity firms moving from the 10th to the 90th percentile of *rule of law* increases the effect of past export status by approximately 14.6 percentage points.[28] Thus, good legal institutions in the destination country are particularly important for the survival of low productivity firms. The other coefficients remain largely unaffected, apart from the coefficient of past export status, which now turns negative for some specifications. Note, however, that when we evaluate all the explanatory variables at their sample mean, past export status still has a large and significant positive effect on current export status.

Next, we test the prediction of Proposition 4, which states that the effect of legal quality on state dependence is larger in sectors that are more relationship-dependent. To this end, we

[27]The 90th percentile of rule of law is 0.846, the 10th percentile is 0.305 and $\hat{\beta}_4 = 0.114$, so the change in the effect of past export status is given by $0.114(0.846 - 0.305) \approx 0.062$.

[28]$0.146 \approx 0.27(0.846 - 0.305)$. For firms at the 10th percentile of the productivity distribution this effect is around half as big: $0.078 \approx (0.27 - 0.037 * 3.37)(0.846 - 0.305)$

specify the following econometric model:

$$
\begin{aligned}
Pr(Y_{fkt} = 1|Y_{fkt-1}, X_{fkt}) &= \beta_0 + \beta_1 Y_{fkt-1} + \beta_2 Y_{fkt-1} * IQ_k + \beta_3 Y_{fkt-1} * RD_j + \\
&+ \beta_4 Y_{fkt-1} * IQ_k * RD_j + \beta_5 Y_{fkt-1} * X_k + \beta_6 Y_{fkt-1} * X_k * RD_j + \delta_{ft} + \delta_{kt},
\end{aligned} \tag{3}
$$

where $Y_{fkt-1} * RD_j$ is the interaction between last period's export status and our measures of sectoral relationship-dependence and $Y_{fkt-1} * IQ_k * RD_j$ is the triple interaction between last period's export status, legal quality and relationship-dependence. Finally, $Y_{fkt-1} * X_k$ is the interaction between past export status and other country controls and $Y_{fkt-1} * X_k * RD_j$ is the triple interaction between last period's export status, other country controls and relationship-dependence.

This specification implies that $\frac{\partial Pr(Y_{fkt}=1|Y_{fkt-1}=1,X_{fkt}) - Pr(Y_{fkt}=1|Y_{fkt-1}=0,X_{fkt})}{\partial IQ_k} = \beta_2 + \beta_4 RD_j$, so we expect $\beta_2 > 0$ and $\beta_4 > 0$. An additional advantage of this specification is that it is less likely to suffer from some form of omitted variable bias than the regressions that only use explanatory variables at the destination level interacted with past export status. Even if there are omitted country-specific variables that are correlated with institutional quality, there is no reason to expect $\beta_4 > 0$, unless such an omitted variable has a larger effect in relationship-dependent sectors. To exclude even this unlikely possibility, we interact the sector-specific effect of past export status with other country controls, such as *log(GDP per capita)*.

Table 2 presents the results for these regressions using both Rauch's and Nunn's measure of relationship-dependence and our two main measures of the quality of legal institutions, *rule of law* and *legal quality*. The first two specifications use *rule of law* and do not control for the triple interaction with other country variables. Again, $\hat{\beta}_2$, that measures the direct effect of institutions on state dependence when RD_j is zero, is positive and strongly significant. Also, $\hat{\beta}_3$, that measures the impact of relationship-dependence on state dependence when *rule of law* is zero, is negative as expected. More importantly, the coefficient of the triple interaction, $\hat{\beta}_4$, is positive and significant at the one percent level. This implies that legal institutions have a larger positive impact on state dependence in more relationship-dependent sectors. In columns (3) and (4) we add a triple interaction with *log(GDP per capita)* as an additional control variable. While $\hat{\beta}_2$ maintains its positive and significant sign only in column (4), $\hat{\beta}_4$ remains positive and significant at the one percent level in both specifications. Finally, columns (5)-(8) repeat the previous specifications using *legal quality*. Results are robust to using this alternative measure of legal institutions.

3.2.1 Robustness Checks State Dependence Regressions

In this section, we perform a number of robustness checks. First, we add EU destinations to the sample to check if results are robust to using the full sample of exporters. In columns (1)-(4) of Table 3 we present results for specification (2). All results continue to hold and the interactions of past export status with legal institutions, market size and productivity remain positive and highly significant and similar in terms of size. Note, however, that the direct effect of past export status increases substantially compared to Table 1, which points to a sample selection issue due to the fact that the reporting threshold is much larger for intra-EU trade than for extra-EU trade: reported exports for the sample including EU destinations are much more likely to survive than those to other destinations. This finding is in line with our model, which suggests that contracts with larger exporters are more likely to be respected.

In columns (5)-(8) we add sector interactions and present results for specification (3). Again, the double interactions between past export status and sectoral characteristics and institutions, as well as the triple interactions between past export, legal institutions and relationship dependence have the expected signs, remain similar in magnitude to the extra EU sample and are highly significant. Thus, our results are completely robust to including EU destinations.[29]

As a further robustness check, we estimate a dynamic random effect probit model. The advantage of non-linear models, such as probit, over linear probability models is that they guarantee fitted values that lie in the unit interval and that marginal effects are not constant. On the other hand, their disadvantage is that they require stronger assumptions regarding the form of the unobserved heterogeneity. We specify

$$Pr(Y_{fkt} = 1|Y_{fkt-1}, \mathbf{X}_{fkt}) = \Phi(\beta_0+\beta_1 Y_{fkt-1}+\beta_2 Y_{fkt-1}*IQ_k+\beta_3 Y_{fkt-1}*X_{fkt}+\beta_4 X_{fkt}+\delta_{fk}), \quad (4)$$

where $\Phi(.)$ is the normal cdf, $\mathbf{X}_{fkt} = [IQ_k, X_{fkt}]$ is a vector of covariates and δ_{fk} is unobserved heterogeneity at the firm-destination level. Since any non-linear estimator needs to integrate out

[29] The remaining specifications of table (1) and (2) are not shown due to space but are also consistent with the results for the non-EU destinations. Results are available on request.

the unobserved heterogeneity, the question is how to treat the observations in the initial period. We follow Wooldridge (2005) and estimate the joint distribution of $(Y_{fk1}, ..., Y_{fkT})$, conditional on the initial conditions Y_{fk0} and observables $\mathbf{X}_{fk} = (\mathbf{X}_{fk1}, ..., \mathbf{X}_{fkT})$ with conditional maximum likelihood methods. We thus need to specify a density h for δ_{fk} given Y_{fk0} and $\mathbf{X}_{fk}$, to obtain the density

$$f(Y_1, Y_2, ..., Y_T|Y_0, \mathbf{X}, \beta) = \int_{-\infty}^{\infty} f(Y_1, ..., Y_T|Y_0, \mathbf{X}, \delta, \beta,)h(\delta|Y_0, \mathbf{X}, \beta)d\delta. \quad (5)$$

Following Mundlak (1978), we assume that the unobserved heterogeneity follows a Normal distribution with expectation $\delta_{fk} = \delta_0+\delta_1 Y_{fk0}+\delta_2 Y_{fk0}*IQ_k+\delta_3 Y_{fk0}*X_{fk0}+\delta_4 IQ_k+\delta_5\bar{X}_f+\delta_6\bar{X}_k$ and variance σ^2. The vector X_{fkt} contains value added per worker, the bilateral real exchange rate, time dummies and market size proxies, $\bar{X}_f$ is the time average of firm productivity and $\bar{X}_k$ are time averages of our market size proxies. This implies that Y_{fkt} given $(Y_{fkt-1}, ..., Y_{fk0}, \mathbf{X}_{fk})$ follows a Probit model.

$$\begin{aligned} &Pr(Y_{fkt} = 1|Y_{fkt-1}, Y_{fk0}, \mathbf{X}_{fkt}) = \\ &\Phi\left(\dot{\beta}_0 + \dot{\beta}_1 Y_{fkt-1} + \dot{\beta}_2 Y_{fkt-1} * IQ_k + \dot{\beta}_3 Y_{fkt-1} * X_{fkt} + \dot{\beta}_4 X_{fkt} + \dot{\delta}_{fk}\right), \end{aligned} \quad (6)$$

where the superscripts denote multiplication by $(1 + \hat{\sigma}^2)^{-1/2}$. Results for this specification are presented in Table 4. Note that the sign of the interaction term between past export status and institutional quality is given by the sign of $\dot{\beta}_2$.[30] From Table 4 we find that the interaction with all our proxies for legal institutions are positive and highly significant. Similarly, interactions with firm productivity and GDP are positive and significant. Only the interaction with transport costs, which is also positive and significant, does not have the expected sign. We conclude that, overall, there is very strong support for state dependence being larger in countries with better legal institutions.[31]

[30]Note that the part of IQ_k that is part of unobserved heterogeneity must be held constant when computing partial effects. Thus $\frac{\partial Pr(Y_{fkt}=1|Y_{fkt-1}=1,Y_{fk0},\mathbf{X}_{fkt})}{\partial IQ_k} - \frac{\partial Pr(Y_{fkt}=1|Y_{fkt-1}=0,Y_{fk0},\mathbf{X}_{fkt})}{\partial IQ_k} = \phi(Y_{fkt-1} = 1, Y_{fk0}, \mathbf{X}_{fkt})\dot{\beta}_2$.

[31]We have also experimented with using an Arellano-Bond dynamic panel IV estimator (Arellano and Bond, 2001), which not only allows to control for firm-time and destination-time specific unobserved effects but also takes firm-destination specific (relationship-specific) unobserved heterogeneity into account. Results were largely consistent but due to the fact that lagged values of export status and its interactions had to be instrumented using further lags and these instruments were often weak, coefficients were not always significant. Results are

3.3 Survival Analysis

Our theoretical model makes several predictions on the relation between hazard rates of export relationships and firm as well as country characteristics, which are closely related to the predictions on state dependence. 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 relationship. Note that survival analysis is complementary to the state dependence regressions even though both approaches test very similar predictions. The advantage of the first over the latter is that it allows to analyze the evolution of a given export relationship over time. However, this comes at the cost of less econometric sophistication. In particular, controlling for unobserved heterogeneity in duration models is difficult (see, e.g, Wooldridge (2002)). Still, to the extent that both types of analysis give similar results, one can be confident that the specific method of analysis is not influencing our results. Before going into the details of our econometric strategy, let us discuss three features of the data that we have to take care of: selection, existence of multiple spells and right and left censoring of spells.

First, we observe an export spell only conditional on exporting. However, as derived from our theoretical model, the probability to export is determined by firm and destination characteristics, such as market size, the quality of legal institutions and productivity. To the extent that selection depends only on observables, controlling for them is enough to remove the sample selection problem.

Second, there are many multiple spells in our sample, i.e., the same firm exports to a given country repeatedly in different time intervals and each of these relationships may have a different duration. In our analysis we treat each spell as independent, which is consistent with our theoretical analysis.[32]

Third, the original data are censored on both sides. There are right-censored observations because we observe data until 2005 and many relationships are still active in that year. There are also left-censored observations since in the first year in our sample we cannot distinguish between relationships which start before that year and new ones. We deal with the left-censoring problem by considering only those firms that start exporting in the second year for which we

available on request.

[32]In the model, 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 importer. Nevertheless, we take care of the multi-spell problem in the robustness checks.

have information in our database or later. We take care of the right-censoring in the regression analysis by adding a dummy variable for the starting date of the relationship.

We start out with a description of the duration of trade relationships. In total we observe 79,459 export spells. Table A-4 reports the frequency of observations for each possible length of the relationships' duration: 77% of all relationships last less than 4 years, with one-year relationships accounting for slightly more than half of the observations. This confirms that the majority of trade relationships have a short duration.

In order to test the predictions of the model on the relation between firm productivity and the hazard rate (Proposition 6), market size and the hazard rate (Proposition 7), as well as the relation between legal quality and the hazard rate (Proposition 8), we perform a set of Cox regressions. The assumption of the Cox proportional hazard model is that the hazard is separable between an arbitrary function of time, $h(t)$, and a part that depends on a vector of explanatory variables, X. Our specification is the following:

$$h(t, X\beta) = h(t)exp(\beta_0 + \beta_1 Prod_f + \beta_2 A_k + \beta_3 IQ_k + \delta_t + \delta_j), \tag{7}$$

where $Prod_f$ is the firm average of log value added per worker, the vector A_k contains the logs of GDP, GDP per capita and distance. IQ_k is again one of our measures of legal institutions (measured in logs); δ_t is a dummy for the starting year of each relationhip, which is the standard treatment for right-censoring; δ_j takes care of time-invariant sector characteristics that may drive different durations of export relationships. Note that since the log of the hazard is linear and the explanatory variables are measured in logs, coefficients can be interpreted as elasticities.

Results for these regressions are reported in Table 5. As predicted, the hazard is strictly decreasing in all the measures of the quality of the legal system (all variables except *rule of law* are significant at the one-percent level) and strictly decreasing in firm productivity (also significant at the one percent level)[33]. We also find that the market size proxies have the expected sign and are strongly significant. As for the magnitude of our results, we find that an increase of *legal quality* by 100% decreases the hazard by roughly 5%, while a 100% increase in productivity decreases the hazard by around 10%.

Next, we turn to the second part of Proposition 8, which states that the negative impact

[33]We report standard errors robust to heteroscedasticity.

of legal institutions on the hazard should be larger in more relationship-dependent sectors. In order to test this prediction we specify the following hazard:

$$h(t, X\beta) = h(t)exp(\beta_0 + \beta_1 Prod_f + \beta_2 A_k + \beta_3 IQ_k + \beta_4 RD_j * IQ_k + \delta_t + \delta_j), \qquad (8)$$

where RD_j is again one of our measures of sectoral relationship dependence. In this case the marginal effect of IQ_k on the log-hazard is $\beta_3 + \beta_4 RD_j$, so we expect $\beta_3 < 0$ and $\beta_4 < 0$. Table 6 presents the results for these regressions using our main measures of legal institutions, *rule of law* and *legal quality* and both Nunn's and Rauch's measure of relationship-dependence.[34] In the first two columns we just use sector and start dummies as additional controls. $\hat{\beta}_3$ is negative and significant at the one-percent level, while $\hat{\beta}_4$ is negative but only significant with Nunn's measure. When adding additional country and firm controls in columns (3) and (4), $\hat{\beta}_3$ remains negative but becomes insignificant, while the interaction term $\hat{\beta}_4$ remains stable and becomes significant at the 5% level for both measures of relationship-dependence. Results remain similar but are somewhat less significant when using *legal quality* instead of *rule of law* (columns (5)-(8)).

Our last prediction on hazard rates is that relationships become more stable as they mature, so the hazard should be decreasing with the age of the relationship (Proposition 5). Since the Cox method for estimating the parameters of the proportional hazard model does not require the specification of the time dependent part of the hazard, there is no parameter that pins down time dependence. Thus we refer to Figure 4, which plots a kernel smoothing of the estimated hazard contributions derived from (7) against time. Clearly, the estimated hazard is decreasing over time. We conclude that the probability for a trade relationship to be destroyed indeed decreases with the age of the relationship.[35]

3.3.1 Robustness Checks Survival Regressions

Finally, we show in that results are robust to including EU destinations and to estimating the model only with single spells.

[34] We report standard errors clustered at the country-sector level.

[35] We have also estimated parametric duration models, such as the Weibull model. These models gave very similar results for the impact of institutional quality and productivity on the hazard, and estimates implied mostly negative time dependence. Results are available on request.

In Table 7 we provide results for the sample including EU destinations, which consists of 117,982 export spells. Columns (1)-(4) present results for the baseline specification (7). All variables have the expected signs, are similar in magnitude to the sample without EU destinations and are strongly significant. In columns (5)-(8), we add interactions with relationship-dependence. Again, all interactions between institutional variables and relationship-dependence exhibit the correct sign, remain similar in magnitude and are even more significant than for the non-EU sample.

Around 60% of export relationships in our data involve multiple spells. As a final robustness check we confirm that the assumption of spell-independence is not biasing our previous results. Thus, we replicate our analysis using only relationships which involve single spells. The total number of single spells in our data set is of 49,479 and their length distribution, as well as all other descriptive statistics, are very similar to the total sample. Results for specifications (7) (columns (1)-(4)) and (8) (columns (5)-(8)) using only single spells are reported in Table 8. It is apparent that they are indeed very similar to those using the full sample, thus confirming that multiple spells are not a problem in our framework.

3.4 Discussion

One may wonder to what extent our empirical findings can be explained by alternative mechanisms rather than one-to-one matching between exporters and importers with incomplete information. If exporters can match with more than one importer, this should reduce the influence of institutions on state dependence and hazard rates, since firms can continue to export even when relationships with one specific partner break up. As Blum et al. (2012) show, one-to-many matching is only relevant for big exporters. Our finding that institutions matter less for state dependence and hazards if exporters are more productive is thus also consistent with one-to-many matching. Alternatively, this result could be explained by the fact that big exporters are more likely to have their own distribution network and do not need to rely on local partners in each market (Felbermayr and Jung (2011)). Thus, their export flows should be more persistent and should depend less on local institutions.

State dependence that is increasing in institutional quality could also potentially be a result of sunk entry costs that are increasing in institutional quality. Still, besides the fact that it would be difficult to come up with an intuition as to why it should be more costly to enter a market with better legal institutions (rather than cheaper), a model with sunk costs would imply that hazard rates should be increasing over time instead of decreasing. State dependence of export decisions and hazard rates that are decreasing over time are also consistent with models of learning about local demand (Eaton et al., 2012; Arkolakis and Papageorgiou, 2009; Albornoz et al., 2012). However, these models have nothing to say about the role of institutions and contracting frictions. Finally, one may be concerned that trade flows stop because trade is replaced by horizontal FDI, which we can not observe in our data. If this mechanism were important for trade dynamics, however, we would observe hazard rates that would be increasing over time instead of decreasing. Moreover, horizontal FDI is only relevant for big exporters, while we emphasize the importance of institutions for small, less productive exporters. Thus, overall, the empirical evidence lends strong support for the specific mechanism emphasized in the model.

4 Conclusions

In this paper we have explored the links between export dynamics, on the one hand, and destination countries' institutional quality, firm productivity and sector-specific contracting frictions, on the other, based on the observation that exporting requires firms to find a partner in each market. Incomplete information and imperfect enforcement of contracts give room for reputation and lead to learning by exporters about the reliability of their partners.

This framework leads to several interesting patterns. Matching frictions imply state dependence of exporting decisions in the absence of sunk fixed costs. State dependence is larger and hazard rates are lower in markets with better legal institutions. Moreover, the impact of legal institutions on state dependence and on hazard rates is larger in sectors that are more exposed to hold-up problems. We test these predictions using a large panel of French exporters that provides information on individual firms' exports by destination country. Overall, we find strong support for our model – specifically, export relationships are more stable and there is more state dependence in countries with better legal institutions, and these effects are larger in sectors with more severe contracting frictions. These facts shed light on the importance of relationship-specificity for explaining the dynamics of trade.

References

Albornoz, Facundo, Héctor Calvo Pardo, Gregory Corcos, and Emanuel Ornelas, "Sequential Exporting," *Journal of International Economics*, 2012, *forthcoming.*

Allen, Treb, "Information Frictions in Trade," *mimeo*, 2011.

Antras, Pol and C. Fritz Foley, "Poultry in Motion: A Study of International Trade Finance Practices," *mimeo*, 2011.

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

_, Giordano Mion, and Emanuel Ornelas, "Institutions and Export Dynamics," *CEPR Discussion Paper*, 2012, *8809.*

Arellano, Manuel and Steve Bond, "Some Specification Tests for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 2001, *58*, 277–298.

Arkolakis, Konstantinos and Theodore Papageorgiou, "Selection, Growth and Learning," *mimeo*, 2009.

Baldwin, Richard and Paul Krugman, "Persistent Trade Effects of Large Exchange Rate Shocks," *Quarterly Journal of Economics*, 1989, *419*, 635–654.

Berman, Nicolas, Thierry Mayer, and Phillipe Martin, "How Do Different Exporters React to Exchange Rate Changes? Theory, Empirics and Aggregate Implications," *Quarterly Journal of Economics*, 2012, *127*, 437–492.

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

Berthou, Antoine and Lionel Fontagné, "How Do Multi-product Exporters React to a Change in Trade Costs?," *Scandinavian Journal of Economics*, 2012, *forthcoming.*

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

Blum, Bernardo, Sebastian Claro, and Ignatius Horstmann, "Intermediation and the Nature of Trade Costs: Theory and Evidence," *mimeo*, 2012.

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

Das, Sanghamitra, Mark Roberts, and James Tybout, "Market Entry Cost, Producer Heterogeneity and Export Dynamics," *Econometrica*, 2007, *75* (3), 837–873.

Dixit, Avinash, "Hysteresis, Import Penetration, and Exchange Rate Pass-Through," *Quarterly Journal of Economics*, 1989, *1003* (2), 205–228.

Eaton, Jonathan, Marcela Eslava, C. J. Krizan, Maurice Kugler, and James Tybout, "A Search and Learning Model of Export Dynamics," *mimeo*, 2012.

__ , __ , Maurice Kugler, and James Tybout, "Export Dynamics in Columbia: Firm-Level Evidence," *NBER Working paper*, 2007, *13531.*

__ , Samuel Kortum, and Francis Kramarz, "Dissecting Trade: Firms, Industries and Export Destinations," *American Economic Review, Papers and Proceedings*, 2004, *94*, 150–154.

__ , __ , and __ , "An Anatomy of International Trade: Evidence from French Firms," *Econometrica*, 2011, *79*, 1453–1498.

Felbermayr, Gabriel and Benjamin Jung, "Trade Intermediation and the Organization of Exporters," *Review of International Economics*, 2011, *19*, 634–648.

Gwartney, James and Robert Lawson, *Economic Freedom in the World: 2003 Annual Report*, mimeo, Fraser Institute, 2003.

Hendon, Ebbe, Hans Jorgen Jacobsen, and Birgitte Sloth, "The One-Shot-Deviation Principle for Sequential Rationality," *Games and Economic Behavior*, 1996, *12*, 274–282.

Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi, "Governance matters V: aggregate and individual governance indicators for 1996 - 2005," *World Bank Policy Research Working Paper Series*, 2006, *4012.*

Lawless, Martina, "Firm Export Dynamics and the Geography of Trade," *Journal of International Economics*, 2009, *77*, 245–254.

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

Mundlak, Yair, "On the Pooling of Time Series and Cross Section Data," *Econometrica*, 1978, *46*, 69–85.

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

Rauch, James, "Networks Versus Markets in International Trade," *Journal of International Economics*, 1999, *48*, 7–35.

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, "Do We Really Know That the WTO Increases Trade?," *American Economic Review*, 2004, *94*, 98–114.

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

Segura-Cayuela, Ruben and Josep Vilarrubia, "Uncertainty and Entry into Export Markets," *Banco de Espana working paper*, 2008, *0811.*

Wooldridge, Jeffrey, *Econometric Analysis of Cross Section and Panel Data*, MIT Press, 2002.

_ , "Simple Solutions to the Initial Conditions Problem in Dynamic, Nonlinear Panel Data Models with Unobserved Heterogeneity," *Journal of Applied Econometrics*, 2005, *20*, 39–54.

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

5 Appendix

5.1 Nash Equilibrium

In what follows, we provide a formal definition of the Perfect Bayesian Nash equilibrium described verbally in the main text.

5.1.1 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 $\tilde{\theta}_{it}$ be the subjective probability of an exporter that the importer is impatient in a relationship of age i that started in period t, for exporters with $c \geq \bar{c}$. Then $\tilde{\theta}_{it} = \frac{\lambda^i \tilde{\theta}_{0t}}{\lambda^i \tilde{\theta}_{0t} + 1 - \tilde{\theta}_{0t}}$ if no renegotiation has occurred for any $i \in \{0, ..., i-1\}$ and $\tilde{\theta}_{it} = 1$ otherwise.

The subjective probability for an exporter with $c < \bar{c}$ that the importer is impatient if the contract is not respected can in principle be anything, since contracts with these exporters are always respected in equilibrium. Hence, we assume that this probability equals one, which sustains maximal cooperation. Differently, if no renegotiation occurs $\tilde{\theta}_{i+1t} = \tilde{\theta}_{it}$. In equilibrium, beliefs must be consistent with the actual probabilities of getting an impatient partner, such that initial subjective probabilities equal the true fraction of impatient importers in the number of unmatched importers that are searching for an exporter, i.e. $\tilde{\theta}_{0t} = \theta_0$.

5.1.2 Exporters

In every period, each exporter chooses the optimal export quantity given her type c, her belief about the type of the importer and the importers' strategies.
The maximization problem of any exporter with $c \geq \bar{c}$ is therefore given by

$$\max_p \Pi(c \geq \bar{c}, \tilde{\theta}) = \max_p \alpha\{\tilde{\theta}[\lambda + (1-\lambda)(1-\gamma)] + (1-\tilde{\theta})\}p^{-1}A - p^{-2}Ac - \alpha f. \tag{9}$$

These exporters face an impatient importer with subjective probability $\tilde{\theta}$, who does not respect the contract with probability $(1-\lambda)$. If the importer does not stick to the contract she can appropriate a fraction γ of the exporter's share of revenues. Variable production costs and a fraction α of the fixed costs always have to be incurred by the exporter. The optimal price and quantity for these exporters are given by $p^*(c \geq \bar{c}, \tilde{\theta}) = \frac{2c}{\alpha[1-\tilde{\theta}\gamma(1-\lambda)]}$, $q^*(c \geq \bar{c}, \tilde{\theta}) = \left\{\frac{1}{2}\frac{\alpha[1-\tilde{\theta}\gamma(1-\lambda)]}{c}\right\}^2 A$. Revenue is given by $Rev^*(c \geq \bar{c}, \tilde{\theta}) = \frac{\alpha}{2}[1-\tilde{\theta}\gamma(1-\lambda)]c^{-1}A$, while exporters' profits are $\Pi^*(c \geq \bar{c}, \tilde{\theta}) = \frac{\alpha}{2}[1-\tilde{\theta}\gamma(1-\lambda)]Rev^*(c \geq \bar{c}, \tilde{\theta}) - \alpha f$.
Similarly, the maximization problem of exporters with $c < \bar{c}$ is

$$\max_p \Pi(c < \bar{c}) = \max_p \alpha p^{-1}A - p^{-2}Ac - \alpha f, \tag{10}$$

with solution $p^*(c < \bar{c}) = \frac{2c}{\alpha}$, $q^*(c < \bar{c}) = \left(\frac{1}{2}\frac{\alpha}{c}\right)^2 A$, total revenues $Rev^*(c < \bar{c}) = \frac{\alpha}{2}c^{-1}A$ and profits $\Pi^*(c < \bar{c}) = \frac{\alpha}{2}Rev^*(c < \bar{c}) - \alpha f$. The implication of incomplete information is that the longer exporters with $c \geq \bar{c}$ observe no contract violation, the more confident they become that their partner is patient. As a consequence, they put more at stake and increase the quantity they export. At the same time, for firms with $c < \bar{c}$, learning plays no role because even impatient importers honor their contracts with these exporters. Thus, we can state the following lemma.

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

Proof:
Note that as long as $c \geq \bar{c}$, $\tilde{\theta}_i$ is decreasing in i and revenues are decreasing in $\tilde{\theta}_i$. Hence, revenues are increasing in i. For $c < \bar{c}$ there is no learning and therefore revenues are independent of the age of the relationhip. ■

Lemma 2: *Given the importers' equilibrium strategies and equilibrium beliefs there is a unique value $\bar{\theta}(c) \in [\theta^*(c), 1)$ such that an exporter with marginal cost $c \geq \bar{c}$ accepts any partner whenever she meets an importer and $\tilde{\theta}_0 \leq \bar{\theta}(c)$. Moreover, she maintains a partnership if and only if the importer respects the contract. Exporters with $c < \bar{c}$ accept every partner for any $\tilde{\theta}_0 \in [0,1]$ and maintain a partnership as long as the importer respects the contract given importers' equilibrium strategies.*

Proof:

The proof of Lemma 2 requires the following assumptions: For all $\lambda < 1$, $\gamma > 0$ and $c \in [c_{min}, \infty)$ exporters expect to make losses in every period if their subjective probability that their partner is impatient equals one and impatient importers violate contracts if they can: $\Pi(v, c, \tilde{\theta} = 1) = Ac^{-1}[\lambda + (1-\lambda)(1-\gamma)]^2 \left(\frac{\alpha}{2}\right)^2 - \alpha f < 0$. We also assume that there exists a $c^* > 0$ such that for all $c \leq c^*$ it holds that $\Pi(r, c \leq c^*, \tilde{\theta} = 0) = Ac^{-1}\left(\frac{\alpha}{2}\right)^2 - \alpha f \geq 0$. This means that sufficiently productive exporters make profits in each period when they believe that importers are patient with probability one and patient importers respect contracts.

Let $Pr(r|c)_{it}$ be the subjective probability that the contract is respected for a relationship of age i that started in period t given firm's marginal cost c, so that $Pr(r|c < \bar{c})_{it} = 1$ and $Pr(r|c \geq \bar{c})_{it} = (1 - \tilde{\theta}_{it} + \lambda\tilde{\theta}_{it})$. Then the value of a match in period t is $\tilde{V}_E(c, \tilde{\theta}_{0t}) = \max\{V_E(c, \tilde{\theta}_{0t}), \beta_E W_E(c, \tilde{\theta}_{0t+1})\}$, where $V_E(c, \tilde{\theta}_{0t}) = \Pi(c, \tilde{\theta}_{0t}) + \beta_E(1-s)Pr(r|c)_{0t}V_E(c, \tilde{\theta}_{1t})$ is the expected value of entering a partnership and $W_E(c, \tilde{\theta}_{0t+1}) = \tilde{V}_E(c, \tilde{\theta}_{0t+1})x + W_E(c, \tilde{\theta}_{0t+2})(1-x)$ is the expected value of not entering the partnership in period t and waiting for a new partner in the next period. By substituting recursively, $V_E(c, \tilde{\theta}_{0t})$ can be written as:

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

Note that $\frac{\partial V_E(c \geq \bar{c}, \tilde{\theta}_{0t})}{\partial \tilde{\theta}_{0t}} < 0$, since $\frac{\partial \Pi(\tilde{c} \geq \bar{c}, \theta_{it})}{\partial \tilde{\theta}_{0t}} = \frac{\partial \Pi(c \geq \bar{c}, \tilde{\theta}_{it})}{\partial \tilde{\theta}_{it}} \frac{\partial \tilde{\theta}_{it}}{\partial \tilde{\theta}_{0t}} < 0$ (note that $\frac{\partial \tilde{\theta}_{it}}{\partial \tilde{\theta}_{0t}} = \frac{\lambda^i}{[\lambda^i \theta_0 + 1 - \theta_0]^2} > 0$) and $\frac{\partial Pr(r|c \geq \bar{c})_{jt}}{\tilde{\theta}_{0t}} = \frac{(1 - \tilde{\theta}_{it} + \lambda\tilde{\theta}_{it})}{\partial \tilde{\theta}_{0t}} = \frac{\lambda^i(\lambda - 1)}{[\lambda^i \theta_0 + 1 - \theta_0]^2} < 0$. At the same time, $\frac{\partial V_E(c < \bar{c}, \tilde{\theta}_{0t})}{\partial \tilde{\theta}_{0t}} = 0$, since no importer cheats on these exporters.

Since in equilibrium beliefs must be consistent, it must hold that in any period t $\tilde{\theta}_{0t} = \tilde{\theta}_0 = \theta_0$ and thus the value of a relationship is independent of t. Therefore, it is always worth accepting a partner immediately because rejecting a partner just means to forego current profits. Consequently, $\tilde{V}_E(c, \tilde{\theta}_0) = \max\{V_E(c, \tilde{\theta}_0), 0\}$. Now, since by assumption $V_E(c, \tilde{\theta}_0 = 0) = \frac{\Pi(c, \tilde{\theta}_0 = 0)}{1 - \beta_E(1-s)} \geq 0$ for all $c \leq c^*$ and $V_E(c, \tilde{\theta}_0 = 1) = \frac{\Pi(c, \tilde{\theta}_0 = 1)}{1 - \lambda\beta_E(1-s)} < 0$ for all $c \geq \bar{c}$ and since $V_E(c, \tilde{\theta}_0)$ is decreasing in $\tilde{\theta}_0$ for $c \geq \bar{c}$, we have that for all $c \geq \bar{c}$ there is a unique $\bar{\theta}(c)$ such that $\tilde{V}_E(c, \tilde{\theta}_0) \leq 0$ if $\tilde{\theta}_0 \geq \bar{\theta}(c)$ and $\tilde{V}_E(c, \tilde{\theta}_0) > 0$ if $\tilde{\theta}_0 < \bar{\theta}(c)$. Thus, exporters never deviate to maintaining the relationship in any period $t + i$ if $\tilde{\theta}_i = 1$ and return to their equilibrium strategy in the following period because they would make losses in the deviation period $t + i$, since $\Pi(c, \tilde{\theta}_i = 1) < 0$. Moreover, they would also not deviate to ending the relationship as long as $\tilde{\theta}_i < \bar{\theta}(c)$ because they would forego positive profits.

Similarly, for exporters with $c < \bar{c}$, if a renegotiation occurs, they set $\tilde{\theta}_i = 1$, $Pr(r|c < \bar{c}) = 0$ and expect profits $V_E(c, \tilde{\theta}_i = 1) = \frac{\Pi(c, \tilde{\theta}_i = 1)}{1 - \lambda\beta_E(1-s)} < 0$. Hence exporters stay in a partnership if and only if there is no renegotiation.

■

Lemma 3: *Given equilibrium strategies and beliefs there is a $\tilde{c}$ such that exporters enter the export market if and only if $c \leq \tilde{c}$.*

Proof: The least productive exporter that enters the export market and accepts an importer makes zero profits in expected terms. This defines a cutoff marginal cost $\tilde{c}$ such that $\tilde{\theta}_0 = \bar{\theta}(\tilde{c})$. Thus exporters accept a match if and only if $c \leq \tilde{c}$. We assume that $\tilde{c} > \bar{c}$. Since impatient importers try to violate contracts with exporters with $c \geq \bar{c}$, the cutoff marginal cost level is implicitly defined by the following zero profit condition:

$$V_E(\tilde{c},\tilde{\theta}_0) = \Pi(\tilde{c},\tilde{\theta}_0) + \sum_{i=1}^{\infty}(\beta_E(1-s))^i\Pi(\tilde{c},\tilde{\theta}_i)\prod_{j=0}^{i-1}Pr(r|\tilde{c})_i = 0. \tag{11}$$

■

5.1.3 Importers

Lemma 5: *Given the equilibrium strategies and beliefs, importers initially accept any partner.*

Proof:

Impatient importers that have to decide whether to accept the current match face the following problem. Let $G(c)$ be the cdf of costs in the population of exporters and let $G^u(c)$ be the cdf of costs of unmatched exporters. Moreover, let $\tilde{V}_L(\tilde{\theta}_{0t}) = \max\{V_L(\tilde{\theta}_{0t}), \beta_L W_L(\tilde{\theta}_{0t+1})\}$, where $V_L(\tilde{\theta}_{0t}) = [\lambda(1-\alpha) + (1-\lambda)(1-\alpha+\alpha\gamma)]E(Rev(c,\tilde{\theta}_{0t})|\bar{c} \leq c \leq \tilde{c})(1-G^u(\bar{c})) + (1-\alpha)E(Rev(c)|c < \bar{c})G^u(\bar{c}_t) - (1-\alpha)f + \beta_L(1-s)[G^u(\bar{c})E(V_L(c,\tilde{\theta}_{1t})|c < \bar{c}) + \lambda(1-G^u(\bar{c}))E(V(c,\tilde{\theta}_{1t})|\bar{c} \leq c \leq \tilde{c})]$ is the expected value of entering a relationship in period t and $W_L(\tilde{\theta}_{0t+1}) = xG(\tilde{c})\tilde{V}_L(\tilde{\theta}_{0t+1}) + (1 - xG(\tilde{c}))W_L(\tilde{\theta}_{0t+2})$ is the expected value of not entering the relationship in period t and waiting for a new business opportunity in the next period. Then, since in equilibrium $\tilde{\theta}_{0t} = \theta_0$ the value of a relationship and the value of waiting are independent of the period t. Hence, it is always optimal to accept a given partner because waiting just implies foregoing the current surplus from the relationship.
Similarly, for a patient importer we have $\tilde{V}_H(\tilde{\theta}_{0t}) = \max\{V_H(\tilde{\theta}_{0t}), \beta_H W_H(\tilde{\theta}_{0t+1})\}$, where $V_H(\tilde{\theta}_{0t}) = (1-\alpha)[E(Rev(c,\tilde{\theta}_{0t})) - f] + \beta_H(1-s)E(V_H(c,\tilde{\theta}_{1t}))$ is the expected value of entering a partnership and $W_H(\tilde{\theta}_{0t+1}) = xG(\tilde{c})\tilde{V}_H(\tilde{\theta}_{0t+1}) + (1 - xG(\tilde{c}))W_H(\tilde{\theta}_{0t+2})$ is the expected value of not entering the partnership in period t and waiting for a new business opportunity in the next period. Patient importers accept any partner for the same reason as impatient ones. Waiting does not pay off because it just means to forego the current surplus. ■

Lemma 6: *Given the equilibrium strategies and beliefs and if β_L is sufficiently large, impatient importers try to violate contracts if and only if $c > \bar{c}$.*

The strategy of impatient importers is:

1. to honor contracts for $c < \bar{c}$. At $\bar{c}$ they are indifferent between violating and honoring contracts given these beliefs. Thus, we assume that impatient importers deviate to violating them.

2. to violate contracts for $c \geq \bar{c}$. At $\bar{c}$ they are indifferent between violating contracts and honoring them given these beliefs. Thus, we assume that impatient importers violate them.

Proof of part 1:

Consider a deviation to violating a contract in period t, and playing the equilibrium strategy in all other periods given that exporters play their equilibrium strategy and have their equilibrium beliefs.[36] Such a deviation

[36]This is the one stage deviation principle for dynamic games. This principle applies also to games with incomplete information (see Hendon, Jacobsen and Sloth, 1996).

is not profitable whenever $V_t(r,c) \geq \lambda(1-\alpha)Rev_t(c)+(1-\lambda)(1-\alpha+\alpha\gamma)Rev_t(c)-(1-\alpha)f+\beta_L(1-s)\lambda V_{t+1}(r,c)$. Since $V_t(r,c) = (1-\alpha)(Rev_t(c)-f)+\beta_L(1-s)V_{t+1}(r,c)$, we can write the previous condition as $\beta_L(1-s)V_{t+1}(r,c) \geq \alpha\gamma Rev_t(c)$. Because $V_{t+1}(r,c) = \frac{(1-\alpha)(Rev_t(c)-f)}{1-\beta_L(1-s)}$ and using the expression $Rev_t(c) = \frac{1}{2}\alpha Ac^{-1}$, we can express this condition as $c \leq \bar{c} = \frac{1}{2}\alpha A[\frac{\beta_L(1-s)(1-\alpha+\alpha\gamma)-\alpha\gamma}{\beta_L(1-s)(1-\alpha)f}]$. Note that $\bar{c}$ is independent of λ and that $\bar{c} > 0$ if and only if $\beta_L > \frac{\alpha\gamma}{(1-s)(1-\alpha+\alpha\gamma)}$. ■

Proof of part 2:

Consider a deviation to honoring the contract in period t and playing the equilibrium strategy in all other periods given that exporters play their equilibrium strategy and have their equilibrium beliefs. Such a deviation is not profitable whenever $V_t(v,c,\tilde{\theta}_t) \geq (1-\alpha)(Rev_t(c,\tilde{\theta}_t)-f)+\beta_L(1-s)V_{t+1}(v,c,\tilde{\theta}_t)$. Since $V_t(v,c,\tilde{\theta}_t) = (1-\lambda)(1-\alpha+\alpha\gamma)Rev_t(c,\tilde{\theta}_t)+\lambda(1-\alpha)Rev_t(c,\tilde{\theta}_t)-(1-\alpha)f+\beta_L(1-s)\lambda V_{t+1}(v,c,\tilde{\theta}_t)$, we have that $\alpha\gamma Rev_t(c,\tilde{\theta}_t) \geq \beta_L(1-s)V_{t+1}(v,c,\tilde{\theta}_t)$. Note that $V_{t+1}(v,c,\tilde{\theta}_t) = \sum_{i=0}^{\infty}\beta_L^i(1-s)^i\lambda^i\{[(1-\alpha)+(1-\lambda)\alpha\gamma]Rev_{t+1+i}(c,\tilde{\theta}_{t+i+i})-(1-\alpha)f\}$ and $Rev_{t+1+i}(c,\tilde{\theta}_{t+1+i}) = \frac{1}{2}\alpha A[1-\tilde{\theta}_{t+1+i}\gamma(1-\lambda)]c^{-1}$. Substituting this, the previous condition becomes $\alpha\gamma\left(\frac{1}{2}\alpha\right)A[1-\tilde{\theta}_t\gamma(1-\lambda)]c^{-1} \geq \beta(1-s)\left(\frac{1}{2}\alpha\right)A[(1-\alpha)+(1-\lambda)\alpha\gamma]\sum_{i=0}^{\infty}\beta_L^i(1-s)^i\lambda^i[1-\tilde{\theta}_{t+1+i}\gamma(1-\lambda)]c^{-1} - \frac{\beta_L(1-s)(1-\alpha)f}{1-\beta_L(1-s)\lambda}$.

Solving for c, we obtain

$$c \geq \bar{c}_t = \left[\frac{1-\beta_L(1-s)\lambda}{\beta_L(1-s)(1-\alpha)f}\right]\left(\frac{1}{2}\alpha\right)A*$$
$$\left[\beta_L(1-s)[(1-\alpha)+(1-\lambda)\alpha\gamma]\sum_{i=0}^{\infty}\beta_L^i(1-s)^i\lambda^i[1-\tilde{\theta}_{t+1+i}\gamma(1-\lambda)]-\alpha\gamma[1-\tilde{\theta}_t\gamma(1-\lambda)]\right].$$

Note that the first term in square brackets on the right hand side is the inverse of the net present value of fixed cost and the second term in square brackets is the difference between future profits from cheating and current profits from cheating. Moreover, observe that a sufficient condition for the term in brackets to be positive can be found by setting $\tilde{\theta}_{t+1+i} = \tilde{\theta}_t$. Sufficient is $\beta_L > \frac{\alpha\gamma}{(1-s)(1-\alpha+\alpha\gamma)}$, which is the same condition as for $\bar{c}$.

Thus, an increase in the future profits of cheating relative to the current profits of cheating and a decrease in the net present value of fixed costs all increase $\bar{c}_t$, the minimum cost for which deviations to respecting contracts are not profitable.

A sufficient condition for $\bar{c}_t$ to be increasing in t is $\beta_L > \frac{\alpha\gamma}{(1-s)\underline{\lambda}(1-\alpha+\alpha\gamma)}$. To see this, note that $\tilde{\theta}_{t+1+i} - \tilde{\theta}_{t+2+i} = \frac{\lambda^{t+1+i}\theta_0(1-\theta_0)(1-\lambda)}{(\lambda^{t+1+i}\theta_0+1-\theta_0)(\lambda^{t+2+i}\theta_0+1-\theta_0)} > 0$. This is greater or equal in absolute value than $\frac{\lambda^{t+i+1}\theta_0(1-\theta_0)(1-\lambda)}{(\lambda^{t+1}\theta_0+1-\theta_0)(\lambda^{t+2}\theta_0+1-\theta_0)}$. Hence, computing the difference $\bar{c}_{t+1}-\bar{c}_t$, we find that sufficient for $\bar{c}_t$ to be increasing in t is that $-\beta_L(1-s)[(1-\alpha)+(1-\lambda)\alpha\gamma]\gamma(1-\lambda)\frac{(1-\lambda)\lambda^t\theta_0(1-\theta_0)}{(\lambda^{t+1}\theta_0+1-\theta_0)(\lambda^{t+2}\theta_0+1-\theta_0)}\sum_{i=0}^{\infty}\beta_L^i(1-s)^i\lambda^{2i+1}+\alpha\gamma^2(1-\lambda)\frac{(1-\lambda)\lambda^t\theta_0(1-\theta_0)}{(\lambda^{t+1}\theta_0+1-\theta_0)(\lambda^{t+2}\theta_0+1-\theta_0)} > 0$. Rearranging, and setting $\lambda = \underline{\lambda}$ we obtain the previous condition on β_L. Moreover note that $\lim_{t\to\infty}\bar{c}_t = \bar{c}$. Thus $\bar{c}_t$ increases in t and reaches $\bar{c}$ in the limit. This proves that $\bar{c}_t \leq \bar{c}$. Thus, there exists an equilibrium such that for all $c < \bar{c}$ contracts are respected and for all $c \geq \bar{c}$ contracts are violated. ■

Lemma 7: *Given equilibrium strategies and beliefs, patient importers always honor their contracts.*

Proof:

We show that in equilibrium patient importers honor their contracts with all types of exporters, that is, there exists a $\breve{c} > \bar{c}$ such that for all $c < \breve{c}$ profits from honoring the contract forever are larger than those of a one period deviation from the equilibrium strategy. The proof is analogous to the first part of Lemma 6. It is straightforward to show that $\breve{c} > \bar{c}$. Since $\bar{c}$ is increasing in β and $\beta_H > \beta_L$, we have that $\breve{c} > \bar{c}$. Moreover, we assume that parameters are such that $\breve{c} > \tilde{c}$, so that patient importers honor contracts with all exporters that enter. ■

5.2 Derivation of Theoretical Predictions

Lemma A1: *$\bar{c}$ is increasing in A.*

Proof:

The proof is straightforward from inspecting the expression for $\bar{c}$, which is increasing in A. ■

Lemma A2: *$\bar{c}$ is decreasing in γ.*

Proof:

We want to show: $\gamma > \gamma' \Leftrightarrow \bar{c}(\gamma) < \bar{c}(\gamma')$.

Consider the expression for $\bar{c}$. Note that the term $[1 - \tilde{\theta}_{t+1+i}\gamma'(1-\lambda)] > [1 - \tilde{\theta}_{t+1+i}\gamma(1-\lambda)]$ and the distance between the terms converges to zero as i goes to infinity. Hence, a sufficient condition for $\bar{c}(\gamma) < \bar{c}(\gamma')$ is that it satisfied as when $\tilde{\theta}_{t+1+i} = 0$ and thus:

$\frac{\beta_L(1-s)[1-\alpha+(1-\lambda)\alpha\gamma]}{1-\beta_L(1-s)\lambda} - \alpha\gamma[1-\theta_0\gamma(1-\lambda)] < \frac{\beta_L(1-s)[1-\alpha+(1-\lambda)\alpha\gamma']}{1-\beta_L(1-s)\lambda} - \alpha\gamma'[1-\theta_0\gamma'(1-\lambda)]$

Rearranging, we obtain the condition $\theta_0 < \frac{1-\beta_L(1-s)}{(\gamma-\gamma')[1-\beta_L(1-s)\lambda]}$. Thus, $\theta_0 < \frac{1-\beta_L(1-s)}{\gamma[1-\beta_L(1-s)\lambda]}$ is sufficient. ■

Lemma A3: *$\tilde{c}$ is increasing in A.*

Proof:

Note that $\tilde{c}$ is defined by:

$$V_E(\tilde{c},\tilde{\theta}_0) = \Pi(\tilde{c},\tilde{\theta}_0) + \sum_{i=1}^{\infty}(\beta_E(1-s))^i\Pi(\tilde{c},\tilde{\theta}_i)\prod_{j=0}^{i-1}Pr(r|c \geq \bar{c})_j = 0.$$

We have that $\Pi(\tilde{c},\tilde{\theta}_i) = \left(\frac{\alpha}{2}\right)^2[1-\tilde{\theta}(1-\lambda)\gamma]^2c^{-1}A - \alpha f$. Thus, $\Pi(\tilde{c},\tilde{\theta}_i)$ increases in A and hence $V_E(\tilde{c},\tilde{\theta}_0)$ increases in A . ■

Lemma A4: *$\tilde{c}$ is increasing in λ.*

Proof: Consider the value function $V_E(c,\tilde{\theta}_0)$ for an exporter with cost c and beliefs $\tilde{\theta}_0$. $V_E(c,\tilde{\theta}_0)$ is decreasing in c. If $V_E(c,\tilde{\theta}_0)$ is increasing in λ then $\tilde{c}$ is also increasing in λ.

The exporter's value function can be written as

$$V_E(c,\tilde{\theta}_0) = \left(\frac{\alpha}{2}\right)^2[1-\tilde{\theta}_0\gamma(1-\lambda)]^2c^{-1}A - \alpha f + \beta_E(1-s)\left[1-\tilde{\theta}_0(1-\lambda)\right]V_E(c,\tilde{\theta}_1).$$

Hence,

$$\left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_0} = \left(\frac{\alpha}{2}\right)^2 \tilde{\theta}_0\gamma[1-\tilde{\theta}_0\gamma(1-\lambda)]c^{-1}A + \beta_E(1-s)\left[\tilde{\theta}_0 V_E(\tilde{\theta}_1) + [1-\tilde{\theta}_0(1-\lambda)]\left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_1}\frac{\partial \tilde{\theta}_1}{\partial \lambda}\right],$$

where $\frac{\partial \tilde{\theta}_1}{\partial \lambda} = \frac{\tilde{\theta}_0(1-\tilde{\theta}_0)}{[1-\tilde{\theta}_0(1-\lambda)]^2}$. Substituting, we obtain:

$$\left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_0} = \frac{\alpha^2 A}{c}\tilde{\theta}_0\gamma[1-\tilde{\theta}_0\gamma(1-\lambda)] + \beta_E(1-s)\left[\tilde{\theta}_0 V_E(c,\tilde{\theta}_1) + \left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_1}\frac{\tilde{\theta}_0(1-\tilde{\theta}_0)}{[1-\tilde{\theta}_0(1-\lambda)]}\right]$$

Similarly, we have that

$$\left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_1} = \frac{\alpha^2 A}{c}\tilde{\theta}_1\gamma[1-\tilde{\theta}_1\gamma(1-\lambda)] + \beta_E(1-s)\left[\tilde{\theta}_1 V_E(c,\tilde{\theta}_2) + \left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_2}\frac{\tilde{\theta}_1(1-\tilde{\theta}_1)}{[1-\tilde{\theta}_1(1-\lambda)]}\right]. \tag{12}$$

Iterating forward, we obtain:

$$\begin{aligned}\left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_0} &= \frac{\alpha^2 A}{c}\tilde{\theta}_0\gamma[1-\tilde{\theta}_0\gamma(1-\lambda)] + \beta_E(1-s)\tilde{\theta}_0 V_E(c,\tilde{\theta}_1) + \beta_E(1-s)\frac{\tilde{\theta}_0(1-\tilde{\theta}_0)}{[1-\tilde{\theta}_0(1-\lambda)]}\frac{\alpha^2 A}{2c}\tilde{\theta}_1\gamma[1-\tilde{\theta}_1\gamma(1-\lambda)]+\\ &+ \beta_E^2(1-s)^2\frac{\tilde{\theta}_0(1-\tilde{\theta}_0)}{[1-\tilde{\theta}_0(1-\lambda)]}\tilde{\theta}_1 V_E(c,\tilde{\theta}_2) + \ldots + \\ &+ \lim_{i\to\infty}\beta_E^i(1-s)^i\frac{\tilde{\theta}_0(1-\tilde{\theta}_0)}{[1-\tilde{\theta}_0(1-\lambda)]}\frac{\tilde{\theta}_1(1-\tilde{\theta}_1)}{[1-\tilde{\theta}_1(1-\lambda)]}\cdots\frac{\tilde{\theta}_{i-1}(1-\tilde{\theta}_{i-1})}{[1-\tilde{\theta}_{i-1}(1-\lambda)]}\cdot\left.\frac{\partial V_E}{\partial \lambda}\right|_{\tilde{\theta}_i}\frac{\tilde{\theta}_i(1-\tilde{\theta}_i)}{[1-\tilde{\theta}_i(1-\lambda)]}\end{aligned}$$

This expression is positive because the last term on the right hand side is zero since $\lim_{i\to\infty}\frac{\tilde{\theta}_i(1-\tilde{\theta}_i)}{[1-\tilde{\theta}_i(1-\lambda)]} = 0$ and $\lim_{i\to\infty}\frac{\partial V}{\partial \lambda}|_{\tilde{\theta}_i}$ is bounded and since all other terms on the right hand side are positive.

■

Lemma A5: *$\tilde{c}$ is decreasing in γ.*

Proof: Since $\Pi(\tilde{c},\tilde{\theta}_i) = \left(\frac{\alpha}{2}\right)^2[1-\tilde{\theta}(1-\lambda)\gamma]^2 c^{-1}A - \alpha f$, we have that $\frac{\partial \Pi(\tilde{c},\tilde{\theta}_i)}{\partial \gamma} = \left(\alpha\frac{1}{2}\right)^2 c^{-1}2A[1-\tilde{\theta}(1-\lambda)\gamma][-\tilde{\theta}(1-\lambda)] < 0$. Note that all other terms in $V_E(\tilde{c},\tilde{\theta}_0)$ are independent of γ and thus it follows that $\frac{\partial V_E(\tilde{c},\tilde{\theta}_0)}{\partial \gamma} < 0$. ■

5.2.1 The Steady State Distribution of Exporters

Let $G^u(c)$, $G^L(c)$ and $G^H(c)$ be, respectively, the distributions of exporters which are unmatched, matched with patient importers and matched with impatient importers. In the steady state, the distribution of exporters matched with patient importers is described by $G^H(c) = sG^u(c) + (1-s)G^H(c)$, thus $G^u(c) = G^H(c)$. The distribution of exporters matched with impatient importers is more complex because of endogenous separations. There is a fraction s of exporters which have been replaced after exogenous separation, with a distribution $G^u(c)$; the remaining fraction $(1-s)$ of exporters were not exogenously separated. Of those $(1-s)(1-G^L(\bar{c}))$ have $c < \bar{c}$ and thus have no endogenous separations. The remaining fraction of exporters, $(1-s)G^L(\bar{c})$, have $c \geq \bar{c}$ and thus also face endogenous separations. These can be further split into those replaced after an endogenous separation $(1-s)G^L(\bar{c})(1-\lambda)$ with distribution $G^u(c)$, and those who did not face separations: $(1-s)G^L(\bar{c})\lambda$. It follows that for exporters with $c < \bar{c}$ we have that $G^L(c) = sG^u(c)+(1-s)G^L(c)+(1-s)(1-G^L(\bar{c}))(1-\lambda)G^u(c)$, while for exporters with $c \geq \bar{c}$: $G^L(c) = sG^u(c)+(1-s)G^L(\bar{c})+(1-s)(1-G^L(\bar{c}))(1-\lambda)G^u(c)+(1-s)\lambda(G^L(c)-G^L(\bar{c}))$.

Finally, we can write the population distribution as a weighted average of the distribution of the three types of exporters. With probability $1-x$ exporters are not matched, and have a distribution $G^u(c)$; with probability $x(1-\theta_0)$ they are matched with a patient importer, and have a distribution $G^H(c)$; with probability $x\theta_0$ they are matched with an impatient importer, and have a distribution $G^L(c)$. Thus:

$$\begin{aligned} G(\bar{c}) =& x\theta_0 G^L(\bar{c}) + x(1-\theta_0)G^H(\bar{c}) + (1-x)G^u(\bar{c}) \\ =& x\theta_0 G^L(\bar{c}) + (1-x\theta_0)G^u(\bar{c}) \end{aligned} \tag{13}$$

At $\bar{c}$ we have that $G^H(\bar{c}) = G^u(\bar{c})$, $G^L(\bar{c}) = \frac{G^u(\bar{c})[s+(1-s)(1-\lambda)]}{s+(1-s)(1-\lambda)G^u(\bar{c})}$. Substituting this into (13), we obtain

$$G^u(\bar{c})^2[(1-x\theta_0)(1-s)(1-\lambda)] + G^u(\bar{c})[s+(1-s)(1-\lambda)(x\theta_0 - G(\bar{c}))] - G(\bar{c})s = 0.$$

It follows that

$$\frac{\partial G^u(\bar{c})}{\partial \lambda} = \frac{G^u(\bar{c})^2(1-x\theta_0)(1-s) + G^u(\bar{c})(1-s)(x\theta_0 - G(\bar{c}))}{(1-s)(1-\lambda)(2-x\theta_0-G(\bar{c}))+s},$$

where $x\theta_0 > G(\bar{c})$ is sufficient for this derivative to be positive. Moreover,

$$\frac{\partial G^u(\bar{c})}{\partial \gamma} = \frac{[G^u(\bar{c})(1-s)(1-\lambda)+s]g(\bar{c})\frac{\partial \bar{c}}{\partial \gamma}}{(1-s)(1-\lambda)(2-x\theta_0-G(\bar{c}))+s} < 0, \tag{14}$$

and

$$\frac{\partial G^u(\bar{c})}{\partial A} = \frac{[G^u(\bar{c})(1-s)(1-\lambda)+s]g(\bar{c})\frac{\partial \bar{c}}{\partial A}}{(1-s)(1-\lambda)(2-x\theta_0-G(\bar{c}))+s} > 0. \tag{15}$$

5.2.2 Derivation of State Dependence

We have that $P(Y_t = 1|Y_{t-1} = 0) = x$, $P(Y_t = 1|Y_{t-1} = 1, c, c < \bar{c}) = 1-s$. Thus, $P(Y_t = 1|Y_{t-1} = 1, c, c < \bar{c}) - P(Y_t = 1|Y_{t-1} = 0, c, c < \bar{c}) = 1-s-x$. Moreover, $P(Y_t = 1|Y_{t-1} = 1, \bar{c} \leq c \leq \tilde{c}) = P(Y_t = 1|Y_{t-1} = 1, \bar{c} \leq c \leq \tilde{c}, H)P(H|Y_{t-1} = 1, \bar{c} \leq c \leq \tilde{c}) + P(Y_t = 1|Y_{t-1} = 1, \bar{c} \leq c \leq \tilde{c}, L)P(L|Y_{t-1} = 1, \bar{c} \leq c \leq \tilde{c})$. Note that $P(Y_t = 1|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c}, H) = 1-s$, $P(Y_t = 1|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c}, L) = 1-(s+(1-s)(1-\lambda))$, $P(H|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c}) = \frac{P(c, \bar{c} \leq c \leq \tilde{c}|Y_{t-1}=1, H)P(H|Y_{t-1}=1)}{P(c, \bar{c} \leq c \leq \tilde{c}|Y_{t-1}=1)} = \frac{g^u(c)(1-\theta_0)}{g^L(c)\theta_0 + g^u(c)(1-\theta_0)}$, since $P(c, \bar{c} \leq c \leq \tilde{c}|Y_{t-1} = 1, H) = g^u(c)$, $P(H|Y_{t-1} = 1) = (1-\theta_0)$ and $P(c, \bar{c} \leq c \leq \tilde{c}|Y_{t-1} = 1) = \theta_0 g^L(c) + (1-\theta_0)g^u(c)$. Similarly $P(L|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c}) = \frac{g^L(c)\theta_0}{g^L(c)\theta_0 + g^u(c)(1-\theta_0)}$. Thus, combining and simplifying, we obtain $P(Y_t = 1|Y_{t-1} =$

$1, c, \bar{c} \leq c \leq \tilde{c}) - P(Y_t = 1|Y_{t-1} = 0, c, \bar{c} \leq c \leq \tilde{c}) = \frac{(1-s)[(1-\theta_0)+\lambda\theta_0 \frac{g^L(c)}{g^u(c)}]}{(1-\theta_0)+\theta_0 \frac{g^L(c)}{g^u(c)}} - x$.
Observe that for $c \geq \bar{c}$ we have that $G^L(c) = sG^u(c) + (1-s)G^L(\bar{c}) + (1-s)(1-G^L(\bar{c}))(1-\lambda)G^u(c) + (1-s)\lambda(G^L(c) - G^L(\bar{c}))$. Differentiating, it follows that $\frac{g^L(c)}{g^u(c)} = \frac{s+(1-s)(1-\lambda)(1-G^L(\bar{c}))}{1-(1-s)\lambda}$. Thus, the probability to be matched with an impatient relative to a patient importer increases in the probability to be above the cutoff, $1 - G^L(\bar{c})$.

Proposition 1: *State dependence is larger for exporters with lower marginal costs.*

Proof:

This follows directly from the expressions for state dependence:

$$P(Y_t = 1|Y_{t-1} = 1, c, c < \bar{c}) - P(Y_t = 1|Y_{t-1} = 0, c, c < \bar{c}) = 1 - s - x$$

$$P(Y_t = 1|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c}) - P(Y_t = 1|Y_{t-1} = 0, c, \bar{c} \leq c \leq \tilde{c}) = \frac{(1-s)[(1-\theta_0) + \lambda\theta_0 \frac{g^L(c)}{g^u(c)}]}{(1-\theta_0) + \theta_0 \frac{g^L(c)}{g^u(c)}} - x$$

■

Proposition 2: *State dependence is increasing in the market size of the export destination.*

Proof:
We have shown in Lemmas A.1 and A.3 that $\bar{c}$ and $\tilde{c}$ are increasing in market size (A). Let us compare two destinations, k and k', with $A_k > A'_k$. Without loss of generality, assume that the following ordering holds: $\bar{c}_{k'} < \bar{c}_k < \tilde{c}_{k'} < \tilde{c}_k$. Then we can compare state dependence across intervals.
Firms with $c < \bar{c}_{k'}$ face only exogenous separations in both countries, thus:
$P(Y_t = 1|Y_{t-1} = 1, c, c < \bar{c}_{k'}) - P(Y_t = 1|Y_{t-1} = 0, c, c < \bar{c}_{k'}) = 1 - s - x$ for k, k'.
Firms with $c \in [\bar{c}_{k'}, \bar{c}_k)$ experience both endogenous and exogenous separations in the small country k', while they face only exogenous separations in the large country k:
$P(Y_t = 1|Y_{t-1} = 1, c, c \in [\bar{c}_{k'}, \bar{c}_k)) - P(Y_t = 1|Y_{t-1} = 0, c, c \in [\bar{c}_{k'}, \bar{c}_k)) = 1 - s - x$ for k,
$P(Y_t = 1|Y_{t-1} = 1, c, c \in [\bar{c}_{k'}, \bar{c}_k)) - P(Y_t = 1|Y_{t-1} = 0, c, c \in [\bar{c}_{k'}, \bar{c}_k)) = \frac{(1-s)[(1-\theta_0)+\lambda\theta_0 \frac{g^L(c)}{g^u(c)}]}{(1-\theta_0)+\theta_0 \frac{g^L(c)}{g^u(c)}} - x$ for k'.
Firms with $c \in [\bar{c}_k, \tilde{c}_{k'}]$ have endogenous and exogenous separations in both countries:
$P(Y_t = 1|Y_{t-1} = 1, c, c \in [\bar{c}_k, \tilde{c}_{k'}]) - P(Y_t = 1|Y_{t-1} = 0, c, c \in [\bar{c}_k, \tilde{c}_{k'}]) = \frac{(1-s)[(1-\theta_0)+\lambda\theta_0 \frac{g^L(c)}{g^u(c)}]}{(1-\theta_0)+\theta_0 \frac{g^L(c)}{g^u(c)}} - x$ for k, k'.
Firms with $c \in (\tilde{c}_{k'}, \tilde{c}_k]$ only export to the large country and thus state dependence is not defined in the small country for $c > \tilde{c}_{k'}$ because $P(Y_t = 1|Y_{t-1} = 1, c, c > \tilde{c}_{k'}) = \frac{P(Y_t=1 \& Y_{t-1}=1, c, c>\tilde{c}_{k'})}{P((Y_{t-1}=1|c, c>\tilde{c}_{k'}))} = \frac{0}{0}$. Thus, state dependence cannot be compared for those firms that do not export to both destinations.
As we can see from the above expressions, for any firm c state dependence is either identical in both markets or discretely larger in the bigger market. Moreover, state dependence is also increasing in A within the interval

$(\bar{c}, \tilde{c}]$:

$$\frac{\partial P(Y_t = 1|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c})}{\partial A} = \frac{(1-s)\theta_0(1-\theta_0)(\lambda-1)}{\left[1-\theta_0+\theta_0\frac{g^L(c)}{g^u(c)}\right]^2}\frac{\partial\left(\frac{g^L(c)}{g^u(c)}\right)}{\partial A} > 0$$

since

$$\frac{\partial\frac{g^L(c)}{g^u(c)}}{\partial A} = \frac{(1-s)(\lambda-1)}{1-(1-s)\lambda}\frac{\partial G^L(\bar{c})}{\partial A} < 0,$$

because $\frac{\partial G^L(\bar{c})}{\partial A} > 0$. This follows since we have already established that $G^u(\bar{c})$ is increasing in A and because $G^L(\bar{c}) = \frac{G^u(\bar{c})[s+(1-s)(1-\lambda)]}{s+(1-s)(1-\lambda)G^u(\bar{c})}$ is increasing in $G^u(\bar{c})$.

An increase in A increases the probability the conditional probability of exporting for a given $c \in [\bar{c}, \tilde{c}]$ because it increases the probability to be matched with a patient relative to an impatient importer. This is, because an increase in A increases the mass of exporters that enter and this increases the pdf of unmatched exporters (which in steady state equals the one of exporters matched with patient importers) relative to those matched with impatient importers. ■

Proposition 3: *State dependence is increasing in the quality of the export destinations' legal institutions. Moreover, the impact of legal institutions on state dependence is larger for exporters with higher marginal costs.*

Proof of part 1:

We compare two destinations k and k' with $\lambda_k < \lambda_{k'}$. Note that $\bar{c}$ is independent of λ and that $\tilde{c}$ is increasing in λ. Thus, without loss of generality, assume that $\bar{c} < \tilde{c}_{k'} < \tilde{c}_k$.

Firms with $c < \bar{c}$ face only exogenous separations in both destinations. Thus,

$P(Y_t = 1|Y_{t-1} = 1, c, c < \bar{c}) - P(Y_t = 1|Y_{t-1} = 0, c, c < \bar{c}) = 1 - s - x$ for k, k'

Firms with $c \in [\bar{c}, \tilde{c}_{k'})$ face both endogenous and exogenous separations.

$P(Y_t = 1|Y_{t-1} = 1, c, c \in [\bar{c}, \tilde{c}_{k'}]) - P(Y_t = 1|Y_{t-1} = 0, c, c \in [\bar{c}, \tilde{c}_{k'}]) = \frac{(1-s)[(1-\theta_0)+\lambda\theta_0\frac{g^L(c)}{g^u(c)}]}{(1-\theta_0)+\theta_0\frac{g^L(c)}{g^u(c)}} - x$

Firms with $c \in (\tilde{c}_{k'}, \tilde{c}_k]$ export only to country k. Thus, state dependence cannot be compared across destinations for firms with $c > \tilde{c}_{k'}$ because state dependence is not defined for those firms in country k' (see proof of Proposition 2).

For the impact of λ on state dependence within a given interval $c \in [\bar{c}, \tilde{c}]$, note that

$$\frac{\partial P(Y_t = 1|Y_{t-1} = 1, c, \bar{c} \leq c \leq \tilde{c})}{\partial \lambda} = \frac{\theta_0\left(\frac{g^L(c)}{g^u(c)}\right)(1-s)[1-\theta_0+\left(\frac{g^L(c)}{g^u(c)}\right)] - (1-s)\theta_0(1-\theta_0)(1-\lambda)\frac{\partial\left(\frac{g^L(c)}{g^u(c)}\right)}{\partial\lambda}}{\left[1-\theta_0+\frac{g^L(c)}{g^u(c)}\right]^2}$$

The first part in the numerator is the direct (positive) impact of higher λ on the probability for a given relationship to survive, the second (ambiguous) part in the numerator is the impact of higher λ on the relative probability to be matched with an impatient importer. Here,

$$\frac{\partial \frac{g^L(c)}{g^u(c)}}{\partial \lambda} = \frac{s(1-s)G^L(\bar{c}) - (1-s)(1-\lambda)\frac{\partial G^L(\bar{c})}{\partial \lambda}}{[1-(1-s)\lambda]^2}$$

and

$$\frac{\partial G^L(\bar{c})}{\partial \lambda} = \frac{s\frac{\partial G^u(\bar{c})}{\partial \lambda}[s+(1-s)(1-\lambda)] - sG^u(\bar{c})(1-G^u(\bar{c}))]}{[s+(1-s)(1-\lambda)G^u(\bar{c})]^2}$$

Overall, the sign of $\frac{\partial \frac{g^L(c)}{g^u(c)}}{\partial \lambda}$ is indeterminate because it is unclear how it affects the relative probability to be matched with an impatient importer. A sufficient condition for $\frac{\partial P(Y_t=1|Y_{t-1}=1,c,\bar{c}\leq c\leq \tilde{c})}{\partial \lambda} > 0$ is that $\left(\frac{g^L(c)}{g^u(c)}\right)(1-s)[1-\theta_0+\left(\frac{g^L(c)}{g^u(c)}\right)] > |(1-s)(1-\theta_0)\frac{\partial\left(\frac{g^L(c)}{g^u(c)}\right)}{\partial \lambda}|$. These observations imply that state dependence is increasing in λ within a given interval. This proves that for any given firm state dependence is larger in countries with higher λ. ■

Proof of part 2:

For the second part of the proposition, note that λ only matters for state dependence via its impact on the probability of surviving as long as $c \geq \bar{c}$ and has no impact on state dependence for $c < \bar{c}$. ■

Proposition 4: *The positive impact of legal institutions on state dependence is larger in sectors with larger contracting frictions (sectors with higher levels of γ).*

Proof:

We compare the impact of a small improvement in legal institutions (from $\lambda_{k'}$ to λ_k) for two sectors that differ in the extent of their contracting frictions. Suppose that we compare state dependence for two sectors: sector j' with large contracting frictions (high γ) and sector j with small contracting frictions (low γ). We have shown that $\bar{c}$ and $\tilde{c}$ are both decreasing functions of γ . Hence, we have that $\bar{c}_{j'} < \bar{c}_j$ and $\tilde{c}_{j'} < \tilde{c}_j$. Moreover, $\tilde{c}$ is increasing in λ. Without loss of generality, suppose that the ordering of cutoffs is such that $\bar{c}_j < \bar{c}_{j'} < \tilde{c}_{j'k'}$.
Firms with $c < \bar{c}_{j'}$ face only exogenous separations before and after the change in λ. Thus, a change in λ has no impact on state dependence in any of the two sectors.
Firms in $[\bar{c}_{j'}, \bar{c}_j)$: In sector j' (large contracting frictions) firms face endogenous separations, while in sector j (low contracting frictions) they face only exogenous separations and the change in λ has no impact on state dependence.
Firms in $[\bar{c}_j, \tilde{c}_{j'k'}]$: In both sectors firms face endogenous separations both before and after the change in λ and thus there is an increase in the probability of survival due to higher λ.
Finally, firms with $c > \tilde{c}_{j'k'}$ do not export in sector j' before the increase in λ. Thus state dependence is not defined for those firms and changes in state dependence cannot be compared across sectors for $c > \tilde{c}_{j'k'}$. ■

5.2.3 Derivation of the Hazard Rate

The hazard rate is defined as the ratio between the measure of relationships which are dissolved and the measure of relationships at risk. The measure of relationships of age $i-1$ at risk between exporters with cost c, with $c \geq \bar{c}$, and impatient importers is $x\theta_0 g^u(c)\lambda^{i-1}(1-s)^{i-1}$, while the measure of relationships at risk between these exporters and patient importers is $x(1-\theta_0)g^u(c)(1-s)^{i-1}$. At the same time, the measure of relationships of age i that are dissolved in period i between exporters with cost c, with $c \geq \bar{c}$ and impatient importers is $\theta_0 x g^u(c)\lambda^{i-1}(1-s)^{i-1}[(1-s)(1-\lambda)+s]$ and the measure of dissolved relationships of age i between those exporters and patient importers is $(1-\theta_0)xg^u(c)(1-s)^{i-1}s$.

Thus, the hazard conditional on c for $c < \bar{c}$ is:

$$H(c, c < \bar{c}) = \frac{\theta_0 x g^u(c)(1-s)^{i-1}s + (1-\theta_0)xg^u(c)(1-s)^{i-1}s}{\theta_0 x g^u(c)(1-s)^{i-1} + (1-\theta_0)xg^u(c)(1-s)^{i-1}} = s.$$

Similarly, the hazard conditional on c for $c \geq \bar{c}$ is:

$$\begin{aligned} H(c, c \geq \bar{c}) &= \frac{\theta_0 x g^u(c)[(1-s)(1-\lambda)+s](1-s)^{i-1}\lambda^{i-1} + (1-\theta_0)xg^u(c)(1-s)^{i-1}s}{\theta_0 x g^u(c)(1-s)^{i-1}\lambda^{i-1} + (1-\theta_0)xg^u(c)(1-s)^{i-1}} \\ &= \frac{\theta_0[(1-s)(1-\lambda)+s]\lambda^{i-1} + (1-\theta_0)s}{\theta_0\lambda^{i-1} + (1-\theta_0)} = s + \frac{\theta_0(1-s)(1-\lambda)\lambda^{i-1}}{\theta_0\lambda^{i-1} + (1-\theta_0)}. \end{aligned}$$

Proposition 5: *The hazard is decreasing in the age of the relationship for $c \geq \bar{c}$.*

Proof:

Note that $H(c, c \geq \bar{c}) = s + \frac{\theta_0(1-\lambda)(1-s)}{\theta_0 + \frac{(1-\theta_0)}{\lambda^{i-1}}}$. Since λ^{i-1} is decreasing in i, $H(c, c \geq \bar{c})$ is decreasing in i.

■

Proposition 6: *The conditional hazard is increasing in firms' marginal cost.*

Proof: This follows directly from the expressions of the hazard rate. ■

Proposition 7: *The conditional hazard is decreasing in the destination country's market size.*

Proof:

Since $\bar{c}$ and $\tilde{c}$ is increasing in A, for a given c compare two destinations with $A_k > A_{k'}$. Thus, without loss of generality assume that $\bar{c}_{k'} < \bar{c}_k < \tilde{c}_{k'} < \tilde{c}_k$.

Then for $c < \bar{c}_{k'}$: $H(c) = s$ for k, k'.

For $c \in [\bar{c}_{k'}, \bar{c}_k)$: $H(c) = s + \frac{\theta_0(1-\lambda)(1-s)\lambda^{i-1}}{\theta_0\lambda^{i-1}+(1-\theta_0)}$ for k'; $H(c) = s$ for k.

For $c \in [\bar{c}_k, \tilde{c}_k]$: $H(c) = s + \frac{\theta_0(1-\lambda)(1-s)\lambda^{i-1}}{\theta_0\lambda^{i-1}+(1-\theta_0)}$ for k, k'.

Finally, the hazard is not defined in destination k' for $c > \tilde{c}_k$ and thus cannot be compared across destinations.

■

Proposition 8: *The conditional hazard is decreasing in the quality of the legal system for sufficiently young relationships. Moreover, for those relationships an increase in the quality of the legal system leads to a larger decrease in the conditional hazard in sectors with larger contracting problems.*

Proof of part 1:

Since $\bar{c}$ is independent of λ and $\tilde{c}$ is increasing in λ, for a given c compare two destinations with $\lambda_k > \lambda_{k'}$. Without loss of generality, assume that $\bar{c} < \tilde{c}_{k'} < \tilde{c}_k$.

Then for $c < \bar{c}$: $H(c) = s$ for k, k'.

For $c \in [\bar{c}, \tilde{c}_{k'}]$: $H(c) = s + \frac{\theta_0(1-\lambda)(1-s)\lambda^{i-1}}{\theta_0\lambda^{i-1}+(1-\theta_0)}$ for k'; $H(c) = s$ for k.

Finally, the hazard rate is not defined for firms with $c > \tilde{c}_{k'}$ in country k and thus cannot be compared.

Moreover, within an interval note that $H(c, c \geq \bar{c})$ is decreasing in λ for age i sufficiently small.

$$\frac{\partial H(c, c \geq \bar{c})}{\partial \lambda} = \frac{\theta_0(1-s)\{(1-\lambda)(i-1)\lambda^{i-2}(1-\theta_0)(1-\lambda^{i-1}) - \lambda^{i-1}[(1-\theta_0)+\theta_0\lambda^{i-1}]\}}{[\theta_0\lambda^{i-1}+(1-\theta_0)]^2} \tag{16}$$

$$\frac{\partial H(c, c \geq \bar{c})}{\partial \lambda} < 0 \Leftrightarrow i < \bar{i}(\lambda) = 1 + \frac{\lambda}{1-\lambda}\frac{1-\theta_0+\theta_0\lambda^{i-1}}{(1-\theta_0)(1-\lambda^{i-1})} \tag{17}$$

There are two effects of λ on the hazard: First, the direct (negative) effect is to reduce the hazard for a given fraction of patient and impatient relationships because of less contract violations. This effect prevails for small i. Second, the indirect (positive) effect, which increases the fraction of relationships involving impatient partners that survive. This effect prevails for large enough i. ■

Proof of part 2:

We compare the impact of a small improvement in legal institutions (from $\lambda_{k'}$ to λ_k) for two sectors that differ in the extent of their contracting frictions. Suppose that we compare state dependence for two sectors: sector j' with large contracting frictions (high γ) and sector j with low contracting frictions (low γ). We have shown that $\bar{c}$ and $\tilde{c}$ are both decreasing functions of γ and that $\tilde{c}$ is increasing in λ. Hence, we have that $\bar{c}_{j'} < \bar{c}_j$ and $\tilde{c}_{j'} < \tilde{c}_j$. Without loss of generality, suppose that the ordering of cutoffs is such that $\bar{c}_{j'} < \bar{c}_j < \tilde{c}_{j'k'}$.

For $c < \bar{c}_{j'}$: there is no effect of a change in λ in sectors j and j', since $H(c, c < \bar{c}_{j'}) = s$.

For $c \in [\bar{c}_{j'}, \bar{c}_j)$: in sector j' (large contracting frictions) $H(c) = s + \frac{\theta_0(1-\lambda)(1-s)\lambda^{i-1}}{\theta_0\lambda^{i-1}+(1-\theta_0)}$ and thus an increase in λ reduces the hazard for sufficiently small i. In sector j (low contracting frictions) $H(c) = s$ and there is no effect on the hazard.

For $c \in [\bar{c}_j, \tilde{c}_{j'k'}]$: $H(c) = s + \frac{\theta_0(1-\lambda)(1-s)\lambda^{i-1}}{\theta_0\lambda^{i-1}+(1-\theta_0)}$ in both sectors.

Finally, for $c > \tilde{c}_{j'k'}$ the hazard is not defined in sector j' for $\lambda_{k'}$ and thus changes in hazard rates cannot be compared. ■

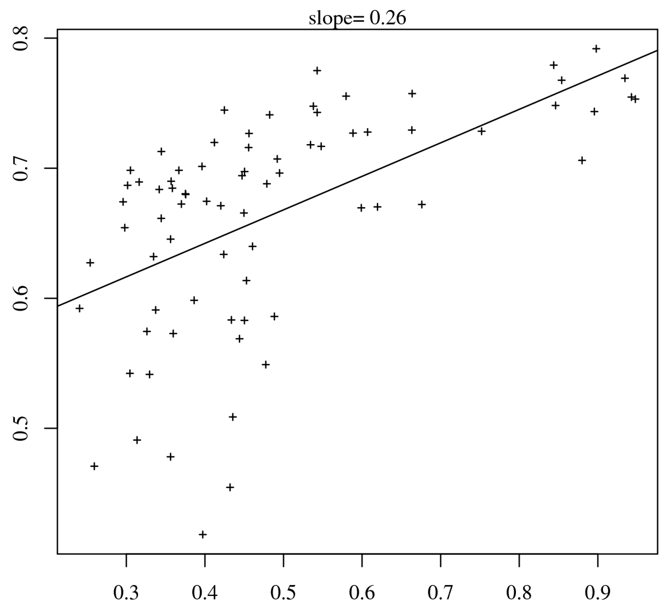

Figure 1: State dependence to be explained by legal institutions.
The figure shows the correlation between the estimated marginal effect of past export status on current export decisions with *rule of law* from Kaufmann et al. (2006). For each export destination, marginal effects of past export status are estimated from a linear probability model with current export status as dependent variable, controlling for exporter-time effects.

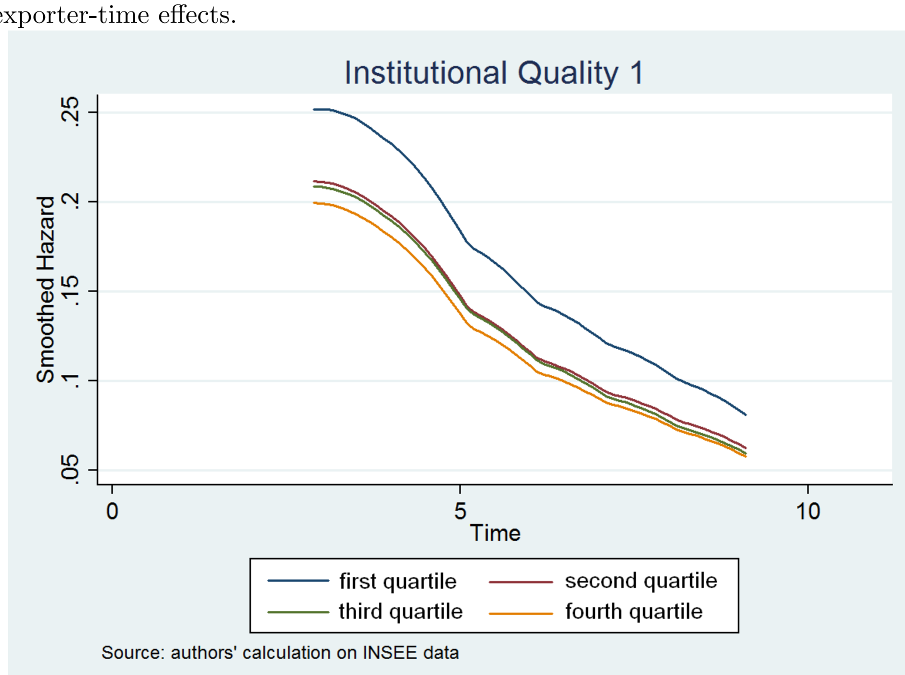

Figure 2: Hazard rate by institutional quality quartile
The figure shows non-parametric estimates of the hazard rates of (firm-destination) export relationships as a function of duration. Destinations are ordered according to the quality of legal institutions. The legal quality variable is from Gwartney and Lawson (2003). This index, which ranges from 1 to 10, measures the legal structure and the security of property rights in each country in 1995.

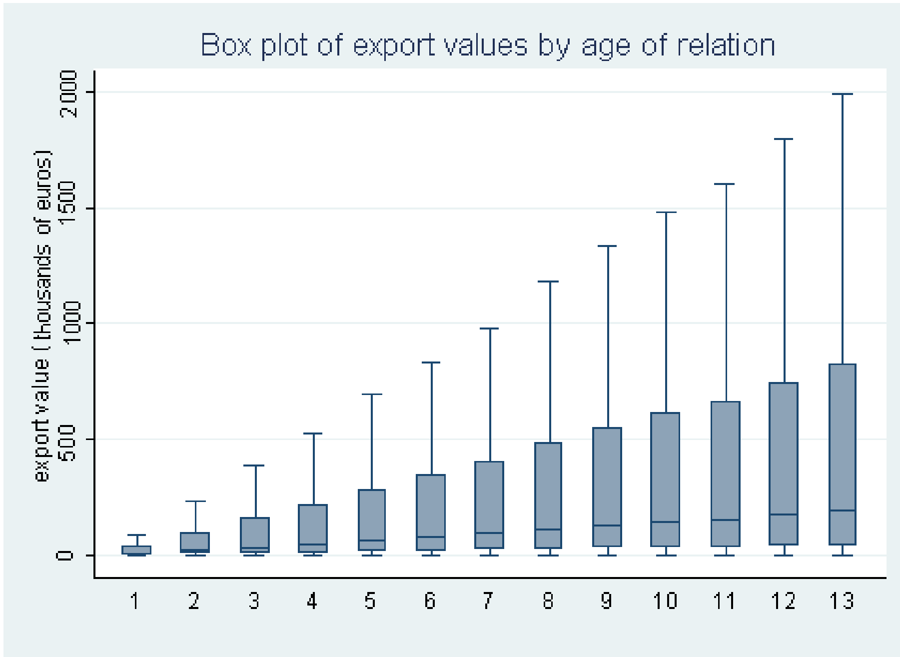

Figure 3: Nominal export values by age of the relationship.
The figure depicts box plots (median, 25th, 75th percentiles, minimum, maximum export value) on the vertical axis and the age of (firm-destination) export relationships on the horizontal axis.

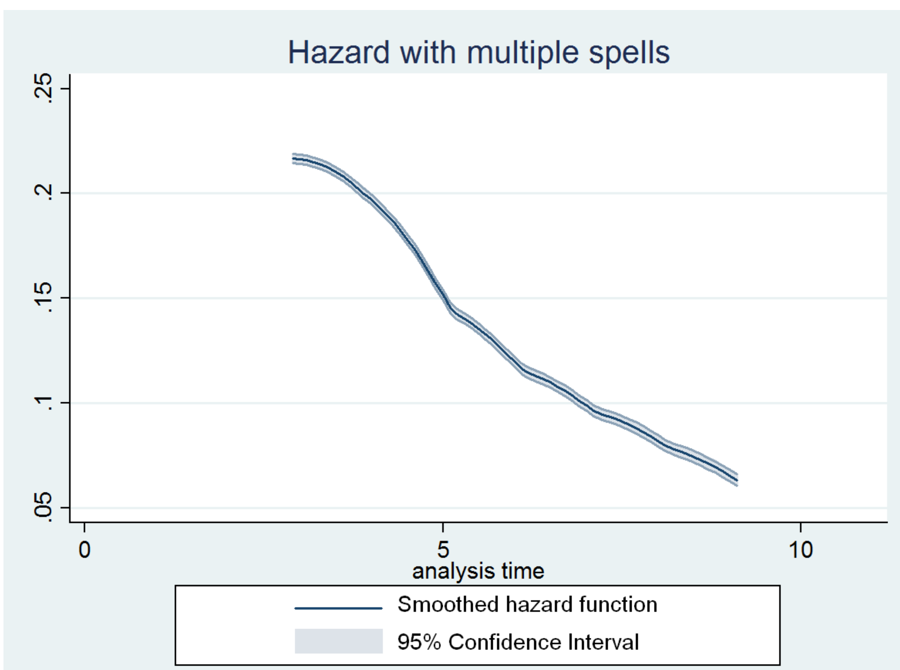

Figure 4: Hazard rate: Nonparametric estimate
The figure plots a kernel-smoothed non-parametric estimate of the hazard function of (firm-destination) export relationships (on the y-axes) against duration (on the x-axes). The hazard function is derived from the Cox model (specification 7) and controls for labor productivity, GDP, distance, rule of law, sector and time dummies. The figure shows that the the probability for an export flow to stop conditional on having survived for less than five years is much bigger (around 20%) than the probability to stop after surviving eight years (around 5%)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Y_{ikt-1}	0.641***	0.096***	0.031***	0.005	0.050***	0.007	-0.050***	-0.105***	-0.068**
	(0.0009)	(0.014)	(0.013)	(0.013)	(0.013)	(0.027)	(0.019)	(0.030)	(0.022)
$Y_{ikt-1} \times rule\ of\ law$		0.118***				0.269***			
		(0.006)				(0.025)			
$Y_{ikt-1} \times number\ procedures$			0.0009***				0.0034***		
			(0.00007)				(0.0004)		
$Y_{ikt-1} \times cost$				0.014***				0.048***	
				(0.001)				(0.008)	
$Y_{ikt-1} \times legal$					0.009***				0.028***
					(0.0006)				(0.002)
$Y_{ikt-1} \times log(VA/worker)$		0.051***	0.051***	0.051***	0.051***	0.073***	0.071***	0.078***	0.081***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.007)	(0.005)
$Y_{ikt-1} \times log(GDP)$		0.017***	0.014***	0.015***	0.016***	0.017***	0.014***	0.015***	0.015***
		(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
$Y_{ikt-1} \times log(GDP\ p.c.)$		0.014***	0.031***	0.030***	0.024***	0.014***	0.031***	0.030***	0.024***
		(0.001)	(0.0009)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$Y_{ikt-1} \times log(distance)$		-0.022***	-0.020***	-0.019***	-0.021***	-0.022***	-0.020***	-0.018***	-0.021***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)
$Y_{ikt-1} \times rule\ of\ law \times log(VA/worker)$						-0.037***			
						(0.005)			
$Y_{ikt-1} \times number\ procedures \times log(VA/worker)$							-0.0006***		
							(9e-5)		
$Y_{ikt-1} \times cost \times log(VA/worker)$								-0.008***	
								(0.001)	
$Y_{ikt-1} \times legal \times log(VA/worker)$									-0.005***
									(0.0006)
Observations	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300
Country-time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm-time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cluster	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time
R^2	0.52	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53

Table 1: State dependence: linear probability model (specifications (1), (2)) .
Dependent variable is firm-destination export status. Explanatory variables are past (firm-destination) export status and interactions of past export status with different measures of legal institutions, GDP, per capita GDP, distance and value added per worker (all in logs). Destination-time and firm-time effects included. Robust standard errors clustered at the firm-time level are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Y_{ikt-1}	0.653***	0.608***	0.459***	0.43***	0.640***	0.596***	0.495***	0.421***
	(0.008)	(0.006)	(0.031)	(0.022)	(0.009)	(0.007)	(0.026)	(0.019)
$Y_{ikt-1} \times rule\ of\ law$	0.091***	0.143***	-0.036*	0.023***				
	(0.011)	(0.008)	(0.021)	(0.015)				
$Y_{ikt-1} \times legal$					0.011***	0.016***	0.001'	0.002
					(0.001)		(0.002)	(0.001)
$Y_{ikt-1} \times\ Nunn$	-0.222***		-0.28***		-0.228***		-0.375***	
	(0.013)		(0.047)		(0.014)		(0.041)	
$Y_{ikt-1}\ \times Rauch$		-0.138***		-0.223***		-0.147***		-0.242***
		(0.008)		(0.031)		(0.009)		(0.027)
$Y_{ikt-1} \times\ rule\ of\ law\ \times Nunn$	0.196***		0.149***					
	(0.018)		(0.033)					
$Y_{ikt-1} \times rule\ of\ law \times Rauch$		0.105***		0.05**				
		(0.011)		(0.021)				
$Y_{ikt-1} \times legal \times Nunn$					0.02***		0.076***	
					(0.002)		(0.003)	
$Y_{ikt-1} \times\ legal \times Rauch$						0.012***		0.005**
						(0.001)		(0.002)
$Y_{ikt-1} \times\ log(GDP\ p.c.)$			0.031***	0.028***			0.024***	0.029***
			(0.005)	(0.003)			(0.004)	(0.003)
$Y_{ikt-1} \times\ log(GDP\ p.c.) \times Nunn$			0.01				0.026***	
			(0.007)				(0.006)	
$Y_{ikt-1} \times\ log(GDP\ p.c.) \times Rauch$				0.013***				0.016***
				(0.005)				(0.004)
Observations	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300	5,901,300
Country-time FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm-time FE	YES	YES	YES	YES	YES	YES	YES	YES
Cluster	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time
R^2	0.468	0.468	0.468	0.468	0.468	0.468	0.468	0.468

Table 2: State dependence: linear probability model, sector regressions (specification (3)).
Dependent variable is firm-destination export status. Explanatory variables are past export status and interactions of past export status with different measures of legal institutions, per capita GDP, and sectoral measures of contracting frictions. Destination-time and firm-time effects included. Robust standard errors clustered at the firm-time level are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Y_{ikt-1}	0.417*** (0.002)	0.431*** (0.002)	0.413*** (0.002)	0.409*** (0.002)	0.632*** (0.007)	0.595*** (0.005)	0.614*** (0.008)	0.579*** (0.006)
$Y_{ikt-1} \times$ *rule of law*	0.169*** (0.002)				0.150*** (0.009)	0.175*** (0.007)		
$Y_{ikt-1} \times$ *number procedures*		0.001*** (0.00002)						
$Y_{ikt-1} \times$ *cost*			0.011*** (0.0005)					
$Y_{ikt-1} \times$ *legal*				0.011*** (0.0002)			0.017*** (0.001)	0.019*** (0.001)
$Y_{ikt-1} \times$ *Nunn*					-0.208*** (0.011)		-0.252*** (0.043)	
$Y_{ikt-1} \times$ *Rauch*						-0.138*** (0.007)		-0.223*** (0.031)
$Y_{ikt-1} \times$ *rule of law* $\times$ *Nunn*					0.157*** (0.014)			
$Y_{ikt-1} \times$ *rule of law* $\times$ *Rauch*						0.112*** (0.009)		
$Y_{ikt-1} \times$ *legal* $\times$ *Nunn*							0.016*** (0.002)	
$Y_{ikt-1} \times$ *legal* $\times$ *Rauch*								0.012*** (0.001)
$Y_{ikt-1} \times log(VA/worker)$	0.039*** (0.0004)	0.039*** (0.0004)	0.039*** (0.0004)	0.039*** (0.0004)				
$Y_{ikt-1} \times log(GDP)$	0.012*** (0.0001)	0.007*** (0.0001)	0.008*** (0.0001)	0.009*** (0.0001)				
$Y_{ikt-1} \times log(GDP\ p.c.)$	-0.001*** (0.0005)	0.023*** (0.0003)	0.024*** (0.0003)	0.011*** (0.0004)				
$Y_{ikt-1} \times log(distance)$	-0.031*** (0.0002)	-0.036*** (0.0002)	-0.038*** (0.0002)	-0.033*** (0.0002)				
Observations	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696	7,659,696
$Country - time\ FE$	YES	YES	YES	YES	YES	YES	YES	YES
$Firm - time\ FE$	YES	YES	YES	YES	YES	YES	YES	YES
Cluster	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time	firm-time
R^2	0.45	0.45	0.45	0.45	0.468	0.468	0.468	0.468

Table 3: State dependence robustness I: Sample including EU-destinations (specifications (2), (3)).

Dependent variable is firm-destination export status. Explanatory variables are past (firm-destination) export status and interactions of past export status with different measures of legal institutions, GDP, per capita GDP, distance, value added per worker (all in logs) and sectoral measures of contracting frictions. Destination-time and firm-time effects included. Robust standard errors clustered at the firm-time level are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)
Y_{ikt-1}	0.163***	0.178***	0.045	0.165***
	(0.053)	(0.053)	(0.054)	(0.053)
$Y_{ikt-1}\times log(VA/worker)$	0.059***	0.059***	0.060***	0.059***
	(0.006)	(0.006)	(0.006)	(0.006)
$Y_{ikt-1}\times log(GDP)$	0.017***	0.014***	0.012***	0.017***
	(0.002)	(0.002)	(0.002)	(0.002)
$Y_{ikt-1}\times log(distance)$	0.048***	0.050***	0.057***	0.047***
	(0.005)	(0.005)	(0.005)	(0.005)
$Y_{ikt-1}\times rule\ of\ law$	0.073***			
	(0.018)			
$Y_{ikt-1}\times number\ procedures$		0.002***		
		(0.0003)		
$Y_{ikt-1}\times cost$			0.060***	
			(0.006)	
$Y_{ikt-1}\times legal$				0.009***
				(0.002)
Observations	5,901,300	5,901,300	5,901,300	5,901,300
Time FE	YES	YES	YES	YES
Real exchange rate	YES	YES	YES	YES
Productivity	YES	YES	YES	YES
Market size proxies	YES	YES	YES	YES
Country-Firm unobserved heterogeneity *à* la Mundlak	YES	YES	YES	YES
Initial conditions *à* la Wooldridge	YES	YES	YES	YES

Table 4: State dependence Robustness II: Dynamic Random Effect Probit estimator (specification (6)).

Individual dimension: country-firm; time dimension: time. Dependent variable is firm-destination export status. Explanatory variables are past export status and interactions of past export status with different measures of legal institutions, GDP, distance, value added per worker (all in logs). Additional controls: time dummies and real exchange rate. Country-firm heterogeneity modeled à la Mundlak (1978), i.e, including time averages of the country and firm-specific variables; Initial conditions modeled à la Wooldridge (2005), i.e., including interactions of the initial export status with the other explanatory variables. Robust standard errors are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)
log(rule of law)	-0.04			
	(0.027)			
log(number procedures)		-0.03***		
		(0.005)		
log(legal)			-0.05***	
			(0.014)	
log(cost)				-0.05***
				(0.006)
log(VA/worker)	-0.10***	-0.10***	-0.10***	-0.10***
	(0.007)	(0.007)	(0.007)	(0.007)
log(GDP)	-0.05***	-0.04***	-0.05***	-0.05***
	(0.002)	(0.002)	(0.002)	(0.002)
log(GDP p.c.)	-0.05***	-0.05***	-0.05***	-0.03***
	(0.006)	(0.004)	(0.005)	(0.005)
log(distance)	0.06***	0.06***	0.06***	0.05***
	(0.005)	(0.005)	(0.005)	(0.005)
Observations	79,549	79,549	79,549	79,549
Robust	YES	YES	YES	YES
Start	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES

Table 5: Duration: Cox regressions (specification (7)).
Explanatory variables are different measures of legal institutions, GDP, per capita GDP, distance and value added per worker (all in logs). Dummies for the starting year of the relationship and sector dummies included. Robust standard errors are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(rule of law)	-0.12***	-0.15***	0.03	0.01				
	(0.04)	(0.03)	0.04	0.03				
log(rule of law) × *Nunn*	-0.15**		-0.13**					
	(0.06)		(0.06)					
log(rule of law) × *Rauch*		-0.09*		-0.09**				
		(0.047)		(0.03)				
log(legal)					-0.14***	-0.17***	0.02	0.02
					(0.05)	(0.04)	(0.05)	(0.04)
log(legal) × *Nunn*					-0.14*		-0.12	
					(0.08)		(0.07)	
log(legal) × *Rauch*						-0.10		-0.10**
						(0.07)		(0.04)
log(VA/worker)			-0.10***	-0.10***			-0.10***	-0.10***
			(0.007)	(0.008)			(0.007)	(0.008)
log(GDP)			-0.05***	-0.05***			-0.05***	-0.05***
			(0.003)	(0.003)			(0.003)	(0.003)
log(GDP p.c.)			-0.04***	-0.04***			-0.05***	-0.05***
			(0.008)	(0.009)			(0.006)	(0.007)
log(distance)			0.06***	0.06***			0.06***	0.06***
			(0.006)	(0.007)			(0.007)	(0.007)
Observations	79,549	79,549	79,549	79,549	79,549	79,549	79,549	79,549
Cluster	country-sector	country-sector	country-sector	country-sector	country-sector	country-sector	country-sector	country-sector
Start	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 6: Duration: sectoral Cox regressions (specification (8)).
Explanatory variables are different measures of legal institutions, GDP, per capita GDP, distance, value added per worker (all in logs) and interactions with sectoral measures of contracting frictions. Dummies for the starting year of the relationship and sector dummies included. Robust standard errors clustered at the country-sector level are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(rule of law)	-0.06***				-0.01	-0.01		
	(0.013)				(0.039)	(0.028)		
log(number procedures)		-0.03***						
		(0.004)						
log(legal)			-0.08***				-0.03	-0.03
			(0.013)				(0.069)	(0.049)
log(cost)				-0.04***				
				(0.005)				
log(rule of law)×Nunn					-0.09*			
					(0.05)			
log(rule of law)×Rauch						-0.08**		
						(0.033)		
log(legal)×Nunn							-0.18*	
							(0.099)	
log(legal)×Rauch								-0.176***
								(0.065)
log(VA/worker)	-0.10***	-0.10***	-0.10***	-0.10***	-0.10***	-0.10***	-0.159***	-0.159***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.009)	(0.009)
log(GDP)	-0.04***	-0.04***	-0.04***	-0.04***	-0.05***	-0.05***	-0.075***	-0.075***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)	(0.004)
log(GDP p.c.)	-0.05***	-0.06***	-0.05***	-0.05***	-0.05***	-0.05***	-0.087***	-0.087***
	(0.005)	(0.003)	(0.004)	(0.004)	(0.007)	(0.009)	(0.010)	(0.011)
log(distance)	0.11***	0.11***	0.10***	0.11***	0.11***	0.11***	0.162***	0.162***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)
Observations	117,982	117,982	117,982	117,982	117,982	117,982	117,982	117,982
Robust	YES	YES	YES	YES	NO	NO	NO	NO
Cluster	NO	NO	NO	NO	country-Sector	country-Sector	country-Sector	country-Sector
Start Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 7: Duration robustness I: Cox regressions (specifications (7), (8)): Sample including EU-destinations.
Explanatory variables are different measures of legal institutions and their interactions with sectoral measures of contracting frictions, as well as GDP, per capita GDP, distance and value added per worker (all in logs). Dummies for the starting year of the relationship and sector dummies included. Robust standard errors are in parentheses denoting *** 1%, **5%, and *10% significance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(rule of law)	-0.16***				0.06	0.03		
	(0.04)				(0.06)	(0.05)		
log(number procedures)		-0.05***						
		(0.007)						
log(legal)			-0.12***				0.05	-0.03
			(0.02)				(0.07)	(0.06)
log(cost)				-0.08***				
				(0.009)				
log(rule of law)×Nunn					-0.27***			
					(0.09)			
log(rule of law)×Rauch						-0.11*		
						(0.06)		
log(legal)×Nunn							-0.28***	
							(0.11)	
log(legal)×Rauch								-0.14*
								(0.07)
log(VA/worker)	-0.16***	-0.16***	-0.16***	-0.16***	0.16***	-0.16***	-0.16***	-0.16***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)
log(GDP)	-0.03***	-0.08***	-0.08***	-0.08***	-0.08***	-0.08***	-0.08***	-0.08***
	(0.003)	(0.003)	(0.003)	(0.009)	(0.004)	(0.004)	(0.004)	(0.004)
log(GDP p.c.)	-0.05***	-0.07***	-0.05***	-0.04***	-0.04***	-0.04***	-0.05***	-0.05***
	(0.009)	(0.005)	(0.007)	(0.006)	(0.01)	(0.01)	(0.004)	(0.01)
log(distance)	0.12***	0.12***	0.12***	0.11***	0.12***	0.12***	0.12***	0.12***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	49,479	49,479	49,479	49,479	49,479	49,479	49,479	49,479
Robust	YES	YES	YES	YES	YES	YES	YES	YES
Cluster	NO	NO	NO	NO	country-sector	country-sector	country-sector	country-sector
Start	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 8: Duration robustness II: Cox regressions (specifications (7), (8)), only single spells.

Explanatory variables are different measures of legal institutions, GDP, per capita GDP, distance and value added per worker (all in logs). Dummies for the starting year of the relationship and sector dummies included. Robust standard errors are in parentheses denoting *** 1%, **5%, and *10% significance.

	Level	N	Mean	SD	Min	25th Pct.	Med.	75th Pct.	Max
export value (log)	firm - year - country	503,336	10.6	2.2	0	8.9	10.4	12.0	21.1
export value (log)	firm - year	63,040	12.2	2.6	1.9	10.3	12.2	14.1	21.4
export value (log)	firm	6,557	13.9	3.1	4.8	11.8	14.1	16.1	23.5
number of countries	firm - year	63,040	8.0	9.7	0	2	4	10	75
number of countries	firm	6,557	14.6	14.7	1	3	9	21	75
productivity (log)	firm - year	63,040	3.9	0.5	-3.2	3.6	3.9	4.2	11.7

Table A-1: Summary statistics I: firm variables, sample without EU destinations.

Sample without EU countries (75 countries)						
	Mean	SD	Min	25th Pct.	75th Pct.	Max
rule of law	0.5	0.2	0.2	0.4	0.6	0.9
number procedures	28.4	11.9	2	19	37	49
cost	2.9	0.7	1.1	2.4	3.4	4.6
legal	5.3	1.5	2.4	4.5	5.8	9.2
GDP (log)	8.2	1.1	6.5	7.2	8.8	10.3
GDP p.c. (log)	-1.6	1.8	-6.1	-2.6	-0.4	4.4
distance (log)	8.2	0.6	6.8	7.9	8.7	9.4

Table A-2: Summary statistics II: country variables, sample without EU destinations.

NES sector name	Rauch	Nunn
Production, processing and preserving of meat and meat products	0.00	0.36
Man. of dairy products	0.00	0.36
Man. of beverages	0.33	0.73
Man. of grain mill products, starch products, prepared animal feeds	0.50	0.33
Man. of other food products	0.33	0.35
Man. of tobacco products	0.00	0.32
Man. of wearing apparel; dressing and dyeing of fur	0.90	0.73
Man. of leather and leather products and footwear	0.63	0.57
Publishing, printing and reproduction of recorded media	0.56	0.73
Man. of pharmaceuticals, medicinal chemicals and botanical products	0.50	0.69
Man. of soap and detergents, perfumes and toilet preparations	0.50	0.52
Man. of furniture	1.00	0.52
Man. of jewelery and musical instruments	1.00	0.60
Man. of sports goods, games, toys and others n.e.c	0.73	0.56
Man. of domestic appliances	0.75	0.68
Man. of television and radio receivers, sound or video recording	1.00	0.82
Man. of optical instruments, photographic equipment, watches and clocks	0.89	0.83
Man. of motor vehicles, bodies and trailers	1.00	0.79
Man. of parts and accessories for motor vehicles	0.50	0.67
Building and repairing of ships and boats	0.57	0.75
Man. of railway and tramway locomotives and rolling stock	0.67	0.68
Man. of aircraft and spacecraft	1.00	0.89
Man. of motorcycles, bicycles and other transport equipment n.e.c	0.57	0.84
Man. of structural metal products	1.00	0.53
Man. of tanks, containers of metal, central heating radiators, boilers, steam generators	1.00	0.61
Man. of machinery for the production and use of mechanical power	0.44	0.82
Man. of other general purpose machinery	0.71	0.78
Man. of agricultural and forestry machinery	1.00	0.63
Man. of machine tools	0.89	0.84
Man. of other special purpose machinery	0.85	0.80
Man. of weapons and ammunition	1.00	0.68
Man. of office machinery and computers	1.00	0.85
Man. of electric motors, generators and transformers	1.00	0.82
Man. of television and radio transmitters and apparatus for line telephony and line telegraphy	1.00	0.82
Man. of medical and surgical equipment and orthopaedic appliances	1.00	0.78
Man. of industrial process control equipment, instruments for measuring, navigating	1.00	0.84
Man. of glass and glass products	0.85	0.58
Man. of other non-metallic mineral products	0.57	0.43
Preparation and spinning of textile fibers, weaving and finishing of textiles	0.50	0.38
Man. of textile articles, except apparel	0.86	0.48
Man. of knitted and crocheted fabrics and articles	1.00	0.38
Man. of wood and wood products	0.57	0.52
Man. of pulp, paper and paperboard	0.25	0.38
Man. of articles of paper and paperboard	0.17	0.46
Man. of basic inorganic chemicals	0.00	0.27
Man. of basic organic chemicals	0.15	0.27
Man. of agro-chemical products, paints and other chemical products	0.89	0.50
Man. of man-made fibers	0.00	0.33
Man. of rubber products	0.60	0.58
Man. of plastic products	0.67	0.37
First processing of iron and steel	0.00	0.44
Man. of basic precious and non-ferrous metals	0.06	0.23
Casting of metals	0.00	0.27
Industrial services for treatment of metals	0.43	0.38
Man. of fabricated metal products	0.90	0.62
Recycling	0.80	0.39
Man. of electrical equipments and apparatus n.e.c.	0.86	0.76
Man. of electronic valves, tubes and other electronic components	1.00	0.82

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Table A-3: Sector characteristics.
Fraction of final goods (Rauch)/ intermediate inputs (Nunn) not sold in organized exchanges and not reference priced by NES sector.

length of the spell	percentage
1	55.9
2	16.7
3	8.0
4	5.0
5	3.6
6	2.6
7	2.1
8	1.6
9	1.4
10	1.2
11	1.0
12	0.9
Total	100

Table A-4: Frequency of spells.
The table lists the frequency of export spells (defined as the duration of a firm-destination export relationship) by the number of years they last.

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2009

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F. BALASSONE, D. FRANCO and S. ZOTTERI, *The reliability of EMU fiscal indicators: risks and safeguards*, in M. Larch and J. Nogueira Martins (eds.), Fiscal Policy Making in the European Union: an Assessment of Current Practice and Challenges, London, Routledge, **TD No. 633 (June 2007).**

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L. ARCIERO, C. BIANCOTTI, L. D'AURIZIO and C. IMPENNA, *Exploring agent-based methods for the analysis of payment systems: A crisis model for StarLogo TNG,* Journal of Artificial Societies and Social Simulation, v. 12, 1, **TD No. 686 (August 2008).**

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2010

A. PRATI and M. SBRACIA, *Uncertainty and currency crises: evidence from survey data*, Journal of Monetary Economics, v, 57, 6, pp. 668-681, **TD No. 446 (July 2002).**

L. MONTEFORTE and S. SIVIERO, *The Economic Consequences of Euro Area Modelling Shortcuts,* Applied Economics, v. 42, 19-21, pp. 2399-2415, **TD No. 458 (December 2002).**

S. MAGRI, *Debt maturity choice of nonpublic Italian firms* , Journal of Money, Credit, and Banking, v.42, 2-3, pp. 443-463, **TD No. 574 (January 2006).**

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F. ALTISSIMO, R. CRISTADORO, M. FORNI, M. LIPPI and G. VERONESE, *New Eurocoin: Tracking Economic Growth in Real Time,* Review of Economics and Statistics, v. 92, 4, pp. 1024-1034, **TD No. 631 (June 2007).**

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2011

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P. ANGELINI, A. NOBILI e C. PICILLO, *The interbank market after August 2007: What has changed, and why?*, Journal of Money, Credit and Banking, v. 43, 5, pp. 923-958, **TD No. 731 (October 2009).**

L. FORNI, A. GERALI and M. PISANI, *The Macroeconomics of Fiscal Consolidation in a Monetary Union: the Case of Italy*, in Luigi Paganetto (ed.), Recovery after the crisis. Perspectives and policies, VDM Verlag Dr. Muller, **TD No. 747 (March 2010).**

A. DI CESARE and G. GUAZZAROTTI, *An analysis of the determinants of credit default swap changes before and during the subprime financial turmoil*, in Barbara L. Campos and Janet P. Wilkins (eds.), The Financial Crisis: Issues in Business, Finance and Global Economics, New York, Nova Science Publishers, Inc., **TD No. 749 (March 2010).**

A. LEVY and A. ZAGHINI, *The pricing of government guaranteed bank bonds*, Banks and Bank Systems, v. 6, 3, pp. 16-24, **TD No. 753 (March 2010).**

G. GRANDE and I. VISCO, *A public guarantee of a minimum return to defined contribution pension scheme members,* The Journal of Risk, v. 13, 3, pp. 3-43, **TD No. 762 (June 2010).**

P. DEL GIOVANE, G. ERAMO and A. NOBILI, *Disentangling demand and supply in credit developments: a survey-based analysis for Italy,* Journal of Banking and Finance, v. 35, 10, pp. 2719-2732, **TD No. 764 (June 2010).**

G. BARONE and S. MOCETTI, *With a little help from abroad: the effect of low-skilled immigration on the female labour supply,* Labour Economics, v. 18, 5, pp. 664-675, **TD No. 766 (July 2010).**

A. FELETTIGH and S. FEDERICO, *Measuring the price elasticity of import demand in the destination markets of italian exports,* Economia e Politica Industriale, v. 38, 1, pp. 127-162, **TD No. 776 (October 2010).**

S. MAGRI and R. PICO, *The rise of risk-based pricing of mortgage interest rates in Italy*, Journal of Banking and Finance, v. 35, 5, pp. 1277-1290, **TD No. 778 (October 2010).**

M. TABOGA, *Under/over-valuation of the stock market and cyclically adjusted earnings*, International Finance, v. 14, 1, pp. 135-164, **TD No. 780 (December 2010).**

S. NERI, *Housing, consumption and monetary policy: how different are the U.S. and the Euro area?*, Journal of Banking and Finance, v.35, 11, pp. 3019-3041, **TD No. 807 (April 2011).**

V. CUCINIELLO, *The welfare effect of foreign monetary conservatism with non-atomistic wage setters*, Journal of Money, Credit and Banking, v. 43, 8, pp. 1719-1734, **TD No. 810 (June 2011).**

A. CALZA and A. ZAGHINI, *welfare costs of inflation and the circulation of US currency abroad*, The B.E. Journal of Macroeconomics, v. 11, 1, Art. 12, **TD No. 812 (June 2011).**

I. FAIELLA, *La spesa energetica delle famiglie italiane*, Energia, v. 32, 4, pp. 40-46, **TD No. 822 (September 2011).**

R. DE BONIS and A. SILVESTRINI, *The effects of financial and real wealth on consumption: new evidence from OECD countries,* Applied Financial Economics, v. 21, 5, pp. 409–425, **TD No. 837 (November 2011).**

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F. CINGANO and A. ROSOLIA, *People I know: job search and social networks*, Journal of Labor Economics, v. 30, 2, pp. 291-332, **TD No. 600 (September 2006).**

G. GOBBI and R. ZIZZA, *Does the underground economy hold back financial deepening? Evidence from the italian credit market*, Economia Marche, Review of Regional Studies, v. 31, 1, pp. 1-29, **TD No. 646 (November 2006).**

S. MOCETTI, *Educational choices and the selection process before and after compulsory school*, Education Economics, v. 20, 2, pp. 189-209, **TD No. 691 (September 2008).**

A. ACCETTURO and G. DE BLASIO, *Policies for local development: an evaluation of Italy's "Patti Territoriali",* Regional Science and Urban Economics, v. 42, 1-2, pp. 15-26, **TD No. 789 (January 2006).**

F. BUSETTI and S. DI SANZO, *Bootstrap LR tests of stationarity, common trends and cointegration*, Journal of Statistical Computation and Simulation, v. 82, 9, pp. 1343-1355, **TD No. 799 (March 2006).**

S. NERI and T. ROPELE, *Imperfect information, real-time data and monetary policy in the Euro area*, The Economic Journal, v. 122, 561, pp. 651-674, **TD No. 802 (March 2011).**

A. ANZUINI and F. FORNARI, *Macroeconomic determinants of carry trade activity,* Review of International Economics, v. 20, 3, pp. 468-488, **TD No. 817 (September 2011).**

R. CRISTADORO and D. MARCONI, *Household savings in China*, Journal of Chinese Economic and Business Studies, v. 10, 3, pp. 275-299, **TD No. 838 (November 2011).**

A. FILIPPIN and M. PACCAGNELLA, *Family background, self-confidence and economic outcomes,* Economics of Education Review, v. 31, 5, pp. 824-834, **TD No. 875 (July 2012).**

FORTHCOMING

M. BUGAMELLI and A. ROSOLIA, *Produttività e concorrenza estera*, Rivista di politica economica, **TD No. 578 (February 2006).**

P. SESTITO and E. VIVIANO, *Reservation wages: explaining some puzzling regional patterns*, Labour, **TD No. 696 (December 2008).**

P. PINOTTI, M. BIANCHI and P. BUONANNO, *Do immigrants cause crime?*, Journal of the European Economic Association, **TD No. 698 (December 2008).**

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Y. ALTUNBAS, L. GAMBACORTA, and D. MARQUÉS-IBÁÑEZ, *Bank risk and monetary policy,* Journal of Financial Stability, **TD No. 712 (May 2009).**

G. BARONE and S. MOCETTI, *Tax morale and public spending inefficiency,* International Tax and Public Finance, **TD No. 732 (November 2009).**

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I. BUONO and G. LALANNE, *The effect of the Uruguay Round on the intensive and extensive margins of trade,* Journal of International Economics, **TD No. 835 (February 2011).**

G. BARONE, R. FELICI and M. PAGNINI, *Switching costs in local credit markets,* International Journal of Industrial Organization, **TD No. 760 (June 2010).**

E. COCOZZA and P. PISELLI, *Testing for east-west contagion in the European banking sector during the financial crisis,* in R. Matoušek; D. Stavárek (eds.), Financial Integration in the European Union, Taylor & Francis, **TD No. 790 (February 2011).**

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S. FEDERICO, *Industry dynamics and competition from low-wage countries: evidence on Italy*, Oxford Bulletin of Economics and Statistics, **TD No. 877 (settembre 2012).**