Risk and Financial development: A matter of survival for Africa agri-food exports

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Abstract

Surviving in the export market is not just about entering into, but also about not exiting from foreign markets. The rapidly growing literature on international trade at the level of individual firms has mainly focused on the role of fixed costs and firms' characteristics- productivity and financial constraints- on exporting status. Empirical evidence on the relevance of these determinants on firms' ability to sustain once they entered is rather scarce. This is rather surprising given that sustained trade relationships are the driving force of firms export performances and subsequent economic growth. In this paper we try to fill this void of the literature and investigate how credit constraint affect the ability of firms operating in developing countries to keep exporting to foreign markets. Specifically, we examine channels through which financial development promotes the survival of firms' agri-food exports in foreign markets. We estimate a proportional hazard model using firm level data for five African countries - Ghana, Mali, Malawi, Senegal and Tanzania. We find that firms' exports of agri-food products that require more access finance, either from domestic or from foreign banks, indeed sustain longer in foreign markets if they are located in more financially developped countries. As our measure of agri-food product financial dependence we use the Product Risk Index developped by Cadot and al., 2009. The index reflects the propensity of product to fail safety and health controls and thus, captures the demand for financing to complying with such regulations.

Keywords: Financial Development, Financial Dependence, Agri-food trade, SPS regulation, Product Risk Index Duration of trade

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1 Introduction

In recent years, developing countries exports in high-value food products to developed-country markets have expanded considerably in response to changing consumer tastes and with the support of advances in production, transport, and other supply chain technologies. These products – including fresh and processed fruits and vegetables, fish, live animals and meat, nuts, and spices – are characterized by relatively high income elasticities of demand and lower price volatility than many traditional developing country export commodities. Thus, trade in such products has emerged as a potentially major source of export growth for many African countries.

In order to market their Agri-food products internationally, small and medium enterprises, which predominate in sub-saharan African economies, need to increase their supply capacity, quality and more importantly conformity with product standards in destination markets. The proliferation of standards is occurring both at the public level and at the private level through supply chain requirements. They are subject to frequent changes and are, ultimately, often costly to meet. In a World Bank survey conducted on firms in five sub-saharan African countries, on the question: "What are the main supply constraints to the expansion of your exports?" All firms cited the inability to access the finance necessary to support their activity. On the multiple choice question " Were any of the following cost a reason why your company stopped exporting?" 25% of the respondent firms operating in agriculture, cited the costs relating to complying with sanitary, phytosanitary and technical regulation. Changes in importers supply chain requirements impose additional sunk, fixed and operating costs along the firms' export life, "pricing out" producers that cannot comply.

The existence of these costs calls for a potential role of credit constraints in shaping the duration of trade relationships on foreign markets. This paper investigates the role of financial development in facilitating firms' export performances by relaxing constraints on their access to finance. The negative effects of credit constraints vary with the development of domestic financial systems and the extent to which an industry depends on external finance. As the industry's dependence on external funds increase the availability of outside capital become more relevant and the degree of financial development more important. Well-developped financial markets by facilitating firms access to finance would allow them to survive demand shocks in foreign markets and maintain long-standing trade relationships. We empirically test this prediction by examining the export survival of different Agri-food products from firms operating in five African countries to the world. Establishing a separate role for financial development is difficult

since it tends to be highly correlated with many domestic institutional features that might also affect the survival of exporting firms. In the paper we focus on the financial systems' ability to reduce the cost of external finance to firms and thus facilitate their access to funds. We establish an independent financial channel following the methodology of Rajan and Zingales (1998). Using a measure of risk at the product level as a measure for agri-food products external finance dependence, we find robust evidence for our hypothesis. Firms operating in countries with better developped financial systems have longer trade relationships in risky products – that rely more heavily on external finance. Our risk measure is taken from Cadot and al., 2009. The Product Risk Index developped by the authors, reflects the propensity of products to fail health and safety controls on the Europeqn Union (EU) market. Thus, it captures the need for investments to comply with the quality requirements on the EU market. Owing to the comprehensive nature of the EU regulation, by extension, the risk index reflects the external finance dependence of product with regards to developped countries markets.

Our paper is related to three different strands of the litterature. The first, on financial development growth and trade, studies the effect of access to finance on firms' export performance (see Manova, 2008, Berman 2008, Bugamelli and Schivardi 2008, Görg and Spaliara 2009). The second, recent and growing empirical litterature on trade duration, looks into the dynamics of trade using survival models (Besedes and Prusa, 2006; Nitsch, 2007; Brenton, 2009). Rauch and Watson (2003) provide a theoretical foundation for the duration patterns found in empirical studies. Finally, the food safety standards and trade litterature, has focused on the quantitative assessment of the trade effects of standards essentially by including standards as explanatory variables in gravity equations (Otsuki et al. 2001, Moenius 2006, Disdier et al. 2008).

To preview our main results, we find that firms' exports of high-value agri-food products sustain longer in foreign markets if firms are located in more financially developped countries. Financially developped markets by increasing the availability of finance help disproportionately more exports of products that require financing to keep up with food safety regulation. Our results are robust to the inclusion of firm and product fixed effects and a set of controls including institutional characteristics. Our findings are particularly relevant for developing countries for whom access to international markets is a mean to achieve higher economic growth. Higher export performance is to be expected from the securing (survival) and deepening of existing trade flows rather than the creation of new ones (Besedes and Prusa, 2006; Brenton and Newfarmer 2007; Brenton et al. 2009). Additionally, they emphasize the importance of financial sector development for economic development and therefore increases the priority for policy makers to address

credit failures. That is, relaxing the credit constraints that limit firms ability to exploit export oportunities through improvement in quality and increase in productivity.

The remainder of the paper is organized as follows. The next section reviews the empirical evidence that motivated our empirical framework. Section 3 introduces the empirical strategy. Section 4 presents our African firm-level data and gives some descriptive statistics. Section 5 reports the main estimation results. Section 6 shows some robustness checks. And finally section 7 concludes.

2 Motivation

In this section we briefly discuss some key features of the data that motivate our empirical framework. We highlight on the one hand, the link between access to finance and trade duration and on the other hand, the link between standards, cost of compliance and the associated need for external finance.

2.1 Access to finance and trade duration

The theroretical literature shapes a role for finance on trade mainly at the time of entry, when access to financing is the most critical (Das et al., 2007; Berman 2008). The prominence of firms entry and subsequent exit from export markets suggests that initial entry costs are not as high as theoretical models predict. The high proportion of failures in trade relationships, past the first two years of exporting, can be explained by the high costs of sustaining in the export market (Besedes and Prusa 2007), thus calling for a role of access to finance along the life of the trade relationships. Long lasting trade relations depend on a well-functioning financial system both in the origin and destination country. In 2006, the average ratio of private credit to GDP was 110 percent in the OECD, 31 percent in Latin America – notoriously under-banked – and only 20 percent in Africa. The latter is most certainly biased upwards since a large number of African countries do not report any data. Additionally, the majority of firms located in these five countries are small and medium sized firms, for which the lack of technical qualification and necessary capital investment constrain their ability to remain and expand on foreign export markets.

We use firm-level survey data to futher show the relevance of access to finance for firms export survival. We use answers from surveyed exporters in Ghana, Mali, Malawi, Senegal and Tanzania. The data comes from the World Bank International Trade Department. In each country around 100 firms provided answers to the questions. The questions are designed such that each firm can give multiple answers to each of the

questions. Therefore percentage do not add up to 100. The first question investigates what are the main supply constraints to the expansion of the company exports. Among current exporters one answer largely dominates. 34% of current exporters cite the lack of finance as a main obstacle for the expansion of the company production to the larger scale. And 34 % of current exporters cite the lack of finance as a main obstacle for improving the quality of the company's products. Among past exporters – exporters that at the time of the interview had ceased activities – 47% cite the lack of finance as a main obstacle for surviving in the exporting activity. The second question futher considers the costs relating to exporting as potential constraints to the company sales expansion abroad. The answer that dominated among companies operating in agriculture is the costs related to complying with SPS regulation (25% of the respondents).

2.2 Standards, cost of compliance and trade duration

Trade in agri-food is governed by a growing array of standards. Not only are food standards stringent, but they are increasingly so. Standards relate to the products themselves and to the processes by which they are produced and handled.To enter foreign markets African agri-food exports have to satisfy both stingent public and private quality and safety standards. The EU being the main destination for sub-sharan African agricultural exports, the EU legislation remains of primary importance for these countries. Table 1 highlights the large dependency of our five African countries exports on the EU market. The EU new comprehensive food safety policy (EC R 178/2002) was developed following recent food crisis to guarantee food safety from "farm to fork". It involves the adoption of an integrated approach covering all aspects of the food chain, from primary on-farm production, on-farm and off-farm storage, processing, transport and sale-procedure based on Hazard Analysis and Critical Control Points (HACCP) principle. Traceability implies that EU food companies have to document from/to whom they are buying/selling produce such that products can be traced back to their origin in case of food safety problems. While, they are limited to a "one step forward, one step back" principle within the EU, with no obligations to keep records in third countries, in practice, however, EU buyers are going beyond the strict legal requirements. Complete traceability throughout the chain up to the level of overseas producers forms parts of many private standards, including of the EurepGAP.

Additionally, Regulation 178/2002 sets up an improved and broadened Rapid Alert System covering Food and Feed (RASFF). The RASFF[1] is a system of notification

[1]The EU RASFF has been operating since 1979 and is managed by the European Commission . Whenever a member of the network has any information relating to the existence of a serious direct

and information exchange among the Member States and some EFTA countries on risks to human health, deriving from food or feed produced in and imported to the EU. Following product inspections, shipments that do not conform to EU markets food safety requirements are rejected and an alert is notified into the RASFF database. Consecutive failures to comply with food safety standards may lead to complete exclusion from EU markets. Repeated rejections are costly since shipments are either destroyed or re-expedited at the exporters' expenses. Additionally firms experiencing border rejections are likely to experience either increased number of controls and tests on subsequent shipments, or bans if the hazard is deemed sufficiently serious. More importantly, it put pressures on exporters to stay up to date with the changing legislation and make additional investments for compliance.

Exporting adequate quality products requires producers to invest in production infrastructure, establish internal systems of food safety management in the production and marketing processes, revise their practices through staff training and implement traceability systems. Several studies provide evidence that these compliance costs are non trivial and may be sufficient to disrupt firms trade relationships. Maskus et al., (2005) use firm-level data from 16 developing countries in the World Bank Technical Barriers to Trade (TBT) Survey Database. Their findings indicate that standards do increase short-run production costs by requiring additional inputs of labor and capital. They show that a one percent increase in investment to meet compliance costs in importing countries raises variable production costs by between 0.06 and 0.13 percent. Additionally, they find that the fixed costs of compliance are significant and amount approximately $425,000 per firm, or about 4.7 percent of value added on average.

In a study prepared for the UNCTAD, the costs of agri-food safety and SPS compliance for tropical fruits in three sub-saharan African countries – including United Republic of Tanzania, Mozambique and Guinea – are calculated using compliance with the EurepGap protocol[2] as a case study. The EurepGap was designed to accommodate the requirements set out by international standards as well as EU regulations. For these reasons, it is a good proxy to estimate the necessary costs of complying with standards and providing safe – non rejected – products. Estimated costs of compliance for fruits and vegetables producers in Tanzania are shown in table 2. These requirements imply high inital investment costs in terms of infrastructure – including construction and

or indirect risk to human health, the information is immediately notified and transmited to the other members of the network.

[2]The key retailer protocol, EurepGap, was developed by the Euro-retailer produce working group (Eurep), a group formed by 22 of the more demanding retailers, especially British, Scandinavian and Swiss, together with large-scale fresh produce suppliers and producers. It sets the standards for the production of fruits and vegetables at the farm level.

upgrading of structures such as toilets and baths, chemical stores. It also involves reccuring costs with the adaptation of the EurepGap checklist and systems development, recruitment of qualified staff and training in the implementation of the protocol and safety issues. While these costs may be born publicly and/or privately, in practice, the lack of technical and administrative capacities in developing countries implies that the cost burden may fall onto individual firms. Their ability to secure sufficient liquidity to make the necessary compliance investments is essential to profitably remain on the market. The relative under-development of financial systems in sub-saharan African countries may constrain African firms ability to access capital. The next two sections present our choice of empirical strategy and the data.

3 Empirical strategy

This paper investigates the link between export survival of agri-food products and financial development. Our hypothesis is that financial developement differentially affects the survival of exports across products based on their need of external finance. We propose a test for the role of financial development by examining whether exports of products that are relatively more risky survive longer when financial markets in the exporting country are more developped.

This differential effect of financial development calls for a difference-in-difference approach initially proposed by Rajan and Zingales (1998). In their paper Rajan and Zingales examine whether financial development facilitates economic growth by reducing the costs of external finance to firms. They find that industrial sectors that are relatively more in need of external finance develop faster if they are located in more developed financial countries. The force of the paper lies in the methodology used. To capture the differential effect of financial development across industries, they interact the country level of financial development with the industry level of external finance dependence and control for industry and country fixed effects. This allows to isolate the impact of financial development on industry growth after controlling for cross-country and within-country differences as well as omitted variable bias. While Rajan and Zingales (1998) show that reliance of agri-food industries on external finance is relatively low – 0.14 compared to 1.14 for Plastic goods – the standards and trade empirical litterature suggests high costs of compliance for high-value food products. We build on their work, and take as our measure of product external finance dependence for agri-food products, a measure of sanitary risk computed at the 8-digit level of the HS classification and taken from Cadot et al. (2009).

3.1 The Risk index a proxy for external finance dependence

Following Cadot et al. (2009), the index captures the distance of product revealed quality to standard quality. The index is computed using data from the EU Rapid Alert System for Food and Feed (RASFF). The RASFF database reports all agri-food shipments to the EU between 2001 and 2008, that have suffered rejection due to food safety reasons. The database provides rejections by product, exporting country, importing country (EU member state) and year.

The index is the coefficient on the product dummy, δ_k in the following regression:

$$A_{ik} = f(\beta Controls_{ik} + \delta_i + \delta_k + \varepsilon_{ik})$$

For a product k and an exporter i, the dependent variable is the combined count of notifications from all EU member states between 2001 and 2008[3]. The unit of observation is an exporter*product pair and the regression is cross-sectional. To insure we are not picking up on a product particularity generated by countries' volume of exports, protectionism or limited competition we include as control variables, exporter i share in EU imports of product k in the year 2000 (one year before the sample start), the ad-valorem equivalent of the EU's MFN tariff on product k, a dummy variable indicating whether product k is affected by a quota during the sample period, a dummy variable indicating whether product k has been the object of a dispute at the WTO between the EU and any other country. We also include, a dummy variable indicating whether exporter i is affected by a ban on product k during the sample period. It controls for decreases in the incidence of notifications resulting from reduced imports rather than reduced risk. We also control for the initial value of EU imports of product k in the year 2000, as products imported in large volumes are likely to be inspected (and therefore to fail inspections) more often than others. Finally, the inclusion of a country fixed effect controls for all supplier's characteristics that may affect the quality of the product. Because the number of notifications is a count (with a huge proportion of zeroes), estimation is by Negative Binomial – alternatively Poisson.

In this set up, the product dummy captures the share of alerts due to product characteristics after controlling for exporters' characteristics and other variables that may affect the probability of being rejected. A high Risk index reflects a high sensitivity to food safety issues. Rejection occurs when a product does not comply with the safety

[3]There is indeed, consistent differences in the number of notifications among notifying EU states. In an average year, Germany with 25% of notifications is among the top notifying countries, while Ireland only account of 0.61% of notifications. Aggregating the number of notifications across all importing (notifying) countries and all years, smooths temporal fluctuations and reduces the effects of outliers.

requirements set in the regulation. Thus, the index can be interpreted as the gap between standard and actual product quality. Product with a high risk index are products far away from the standard.

Distance to the standard increases if the regulation is constantly changing and if current production technologies do not allow to attain required quality. Laying far away from the standard has important consequences on the trading costs for exporting firms. Compliance require important investments as shown in section 2.2. Thus, the risk index captures the need – at the product level – for investment to comply with EU markets food safety requirements. That is, the risk index acts as a proxy for product external finance dependence. It is worth noting that our measure of risk is not time varying. Consequently, the external finance dependence does not vary over time. This may not be the case, however, it should not be a concern since the ranking across sectors will not change.

Finally, we ask the question whether the Risk index computed using the EU market food safety requirements as a benchmark is a good proxy? The EU regulation is in line with the requirements set out by international standards as well as other domestic regulations – high income countries mostly. Moreover the EU is a major destination market for our African countries' exports. Thus, it makes sense to account for the requirements in their main destination market. All together, we believe the measure can be taken as exogeneous and is a good proxy for external finance dependence at the product level.

Table 3 provides a list of the CN2 agri-food sector associated with the highest risk indices, both according to the number of risky products – product with a positive risk index – and the average risk. Not surprisingly, fishery products, spices, fruits and nuts emerge as the most risky sectors, and thus, the sectors that use the most external finance. All together, 373 CN8 codes out of the 2146 have a non zero risk index. The table also gives the total number of alerts for each sector between 2001 and 2008 as well as the most frequent reason for rejection. The majority of rejections are due to contamination level above the authorised threshold in products inspected.

3.2 Trade duration and Difference in difference approach

Our empirical strategy consists of incorporating the Rajan and Zingales (1998) methodogy into the survival analysis framework. Our focus is on the long run survival of products in foreign markets. We depart from previous works on finance and trade, where the focus is on the short-term year-to-year changes in export status of products or firms (Manova, 2008; Berman and Héricourt forth). This survival analysis is therefore probably the most

suitable tool to study the impact of financial development on the longer-term exporting status of trade relationships. While our data is initially a four dimensional panel data (we observe export by firm -destimation country-product over time), we reduce the panel dimensions to three, to study the length of trade relationships. This highly detailled level of information is particularly suitable for survival analysis as aggregation may introduce considerable bias, essentially hiding failures. A trade relationship is defined as a firm-product-destination triplet, and the duration of a trade relationship is defined as the time (in years) a triplet has been in existence without interruption. Our variable of interest is the survival-time of firm export relationships – the time until a trade relationship ends – across products in five African countries. Ordinary Least Squares (OLS) are not suitable for duration data, essentially because survival-times are restricted to be positive and thus have a skewed distribution. Therefore, we model the survival of trade relationships using a Cox proportional hazard model. We assume that the duration of exports of product k from firm f operating in country i to destination country j, depends upon a set of variables X_{f_ijk}. Specifically we model the hazard function of a trade relationship as a multiplicative function between an unspecified time-dependent baseline hazard function, and an exponential function of country and sector fixed effects, an interaction term between our measure of risk with the level of financial development, a set of controls and the unobserved effects. In the Cox PH model, the inclusion of fixed effects, result in a shift of the baseline hazard function. We further allow, for the shape of the baseline hazard function $h_0(t)$ to vary across products – HS8-digit – by fitting a stratified Cox PH model. Stratification according to the product indicator variable η_k with K the number of agri-food products, adds more flexibility to the model and allows to estimate the effect of the X_{f_ijk} on the hazard rate within-product. Thus, the empirical model we estimate is as follow:

$$h(t|X_{f_ijk}, \eta_k) = h_k(t) \exp(\alpha(Fin\_Dev_i * Risk_k) + \beta Controls_{f_ijk} + \delta_{f_i} + \delta_j + \delta_t + \varepsilon_{f_ijk}) \quad (1)$$

where Fin_Dev_i is the level of financial development of country i, $Risk_k$ the risk index of product k. δ_{f_i} is a firm fixed effect, δ_j is a destination country fixed effect, ε_{f_ijk} is an unobserved effect. We follow Rajan and Zingales (1998) methodology. To capture the differential effect of financial development across products, we interact the country level of financial development with the product level of external finance dependence and control for product and country fixed effects. This allows to isolate the impact of financial development on product survival after controlling for omitted variable bias

at the country and product level. The level of financial development is taken at the initiation of the sample period for each exporting country. That is the year we first have export data[4]. All explanatory variables take value at the initiation of the trade relationship. Our vector of $Controls_{f_ijk}$ includes traditional bilateral gravity variables as well as various product and firm characteristics. We control for the value of export in US dollars in log terms, $log(initial\_export_{f_ijk})$. This reflects the level of confidence the importer has in the profitability of its trading partners. Additionally, we include the total number of destinations a firm exports to, $NDest_{f_ijk}$. This allows to control for the exporting firm's experience in supplying product k. We control for the degree of export diversification of the firm, incorporating the total number of products a firm exports, $NProduct_{f_ijk}$. Finally we account for trade relationships with multiple spells, including a multiple spell dummy that take value one if the spell is a higher order spell, $multiple\_spell_{f_ijk}$. Table 4 provides summary statistics of the main variables used in our analysis.

Equation (1) is estimated under partial likelihood *(Cox, 1972).* Since there may be unobserved variation across exporter-sector pairs – to avoid biasing the standard errors downwards – in all tables we report robust standard errors clustered at the exporter-sector (HS4) level. The coefficients can be interpreted as semi-elasticities, as they measure the percentage point change in the hazard rate as a result of a unit change in the rigth-hand side variables.

A common feature of survival data is censoring. First, we observe flows in the first year of our sample but do not know how long they have been in existence. Second, we observe flows in the final year of our sample but do no know how long they will continue to exist. The problem of rigth-censoring is accounted for in the Cox estimation procedures. Left-censoring presents a more serious problem. Given the short time span, our approach is simply to ignore left censoring in our main estimations. As a robustness test we drop all observations which are left-censored and determine the sensitivity of our results to left-censoring. Finally, if a firm*destination*product triplet enters more than once in the dataset, we say it exhibits multiple spells of service. Spells within a given trade relationship may not be independent. The first exit may make the second one more likely to occur or inversely, a firm might learn from the initial failure and manages to stay in a relationship afterwards. In our main estimations we consider each spell individually, we treat them as independent but use a dummy variable to account for higher order spells.

[4]We do this due to the short time span of our sample, and the poor reliability of the data for African countries. Additionally, we used the average level of fianancial development over the sample period for each country, and results remain qualitatively the same.

4 Data

4.1 African firm data

Our analysis relies on a novel dataset collected within the frame of the Export Survival Project, implemented by the International Trade Department of the World Bank. The dataset combines firm level export data collected by customs authorities in five African reporting countries – Ghana, Mali, Malawi, Senegal and Tanzania. The dataset provides trade flows for more than 5,000 HS 8-digit products to 253 countries, between 2000-2008[5]. In the following, we consider only exports of agri-food products excluding beverages, animal feed and tobacco. This corresponds to chapters 1 to 21 of the HS classification, and restricts our sample to 845 product lines. Exports flows are reported annually in values (US dollars) and quantities (tons). Among the reporting firms almost 50% only appear once in the dataset. That is, they export only one product to one destination one year. As such observations are very likely to be mis-reports, we exclude them from the analysis. Among these observations we find a large proportion of individuals, for example, "MR OMART FRANCOIS KOUBLANOU", "MR. JOHN AMEFU". Or inconsistent exports such as "AIRLINES GHANA LTD" exporting wood logs. Additionally, we exclude from the analysis exports flows from international organizations and embassies, 3% of the observations, since such exports are not driven by profit motives and might bias our results[6]. Finally the data show that 3.5% of export flows are realised by trading companies. Since our analysis focuses on agri-food products, for which changing food safety regulation may impose additional production and or transaction costs, we are concerned with producing firms. In a robustness test we drop observations from trading companies and estimate the sensitivity of our results to the exlcusion of these observations.

4.2 Additional data sources

The data on financial development is taken from the Beck, Demirguc-Kunt, and Levine (2006) database, which contains various indicators of financial development across countries and over time. We use the private credit to GDP as a proxy for country's financial depth. The variable ranges from 0.21 for Senegal in 2008 to 0.052 for Malawi in 2004. The annual data for GDP per capita is taken from the World Development Indicator report 2006, and is reported in constant 2000 US dollars. Financial development and

[5] Senegal from 2000 till 2008; Mali repors data from 2005 to 2008. Malawi and Ghana report data from 2004 till 2008; Tanzania from 2003 till 2009.

[6] Including these exporters results hold in a similar way. Results are available upon request.

GDP per capita are correlated at 78% in our sample.

Additionally we use the level of outstanding short-term credit in U.S. dollars as reported in the Global Development Finance (GDF)[7] as a share of GDP, as a proxy for trade finance. Local financial markets are not the only source of finance for exporters. Firms operating in countries with poorly developed financial markets may rely on trade finance provided by institutions in the destination country. There is also evidence of capital flows from multinational firm to affiliates as potential channels to overcome imperfections in local capital markets (Desai, Folay and Hines, 2004). However, our index does not account for trade financing associated with intra-firm trade by multinational corporations or trade related to foreign direct investment. Finally we proxy the quality of financial systems in the exporting country using the Getting Credit Index. The index ranks countries according to the strength of legal rights and the depth of credit information.

We control for the quality of the business environment in the exporting country relying on the Ease of Doing Business index. A country's ranking on the index is based on the average of ten subindices – including starting a business, dealing with licenses, hiring and firing workers etc... More specifically, to capture the complexity of customs procedures faced by exporters we use the Trading Across Borders index. The index accounts for the number of documents, the number of signatures and time necessary to export and import. Data for the Getting Credit, Ease of Doing Business and Trading Across Borders indices is taken from the World Bank Doing Business Survey data for the year 2004[8].

We account for exporting countries' capacity to efficiently move goods and connect with international markets using the Logistics Performance Index (LPI). The index is a weighted average of the country scores on six key dimensions – including efficiency of the clearance process, competence and quality of logistics services, ease of arranging competitively priced shipments etc... We control for the quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology) using the Infrastucture index which enters the overall LPI index. The data comes from the World Bank Logistic Performance Indicator database for the year 2007[9].

Transport costs are proxied with the bilateral distance between origin and destination countries. These distances are extracted from the CEPII database and are calculated as the sum of the distances between the biggest cities of both countries, weighted by the

[7] This includes short-term credit for trade in dollars as reported by the OECD and the international banks' short-term claims as reported by the BIS.

[8] This is the only available year.

[9] This is the only available year.

share of the population living in each city. We also include a dummy variable "Common border" (*cbord*) that equals one if importing and exporting countries share a border. Bilateral trade can be fostered by countries' cultural proximity. Similarity in culture can indeed increase the quality of the match between varieties produced in exporting country i and tastes of consumers in the destination country. We control for this proximity by introducing two dummies, respectively equal to one if a language is spoken by at least 9% of the population in both countries (*clang*) or if both partners have had a colonial relationship (*col*). Data come from the previously mentioned CEPII database. To insure that our risk measure is not picking up on other product characteristics that may affect their survival, we include as a control variable, a perishability index. The index takes value one if the product cannot be stored without refrigerator facilities, zero otherwise. Perishable products typically include, meat, fishery products, fruits ad vegetables. Correlation between our risk index and the perishability index is 0.15.

4.3 Descriptive statistics

Table 5 reports some statistics at the firm level for each exporting country. Risky products account for an important share of firms total exports in all our five countries. Additionally, risky firms – firms exporting at least one risky product – represent around half of the total firm population. Non risky firms are firms that export no risky products at all. Table 6 reports some statistics for our survival data. Considering firms in all countries the average spell duration is about one year and four months and the median duration is only one year. This is in line with previous empirical studies, where developing countries exports exhibit a high mortality rate. Almost 40% of the spells are right censored, and 17% are left censored. Considering each country individually, Senegal exhibit the highest average spell duration, followed by Malawi, Tanzania and Mali. Ghana has the lowest average spell duration. Dropping all spells with initial trade value inferior to 10'000 dollars (100'000, or 1'000'000 dollars) increase the average and median spell duration. The higher the initial trade value the higher the probability to survive (table 7). Again these results are in line with previous findings (Besedes and Prusa, 2008). A large proportion of spells, 56%, start with trade values lower than 10'000 dollars, 13% are initiated with trade values higher than 100'000 dollars and only 3% start with initial trade values greater than 1'000'000 dollars.

We now move on to characterize the duration of trade relationships non parametrically, by estimating the survival function using the Kaplan-Meier estimator (see Appendix \ for technical details). In order to analyze the pattern of survival for product in different risk categories, we split our sample into two groups. Agri-food products in the

top 25th percentile of the risk index distribution, the risky products, and the rest of the product, the non risky ones[10]. The survival functions of risky versus non risky products are presented in Figure 1. As expected, the less risky products (risk=0) survive longer than the riskier ones (risk=1). The tests on equality of the survival functions reject the null hypothesis at a 1% level of significance (Logrank, Cox, Wilcoxon, and Tarone Ware). The general pattern remains unchanged if we plot the survival functions for individual countries (Figure 2). Finally, we plot the survival functions for each risk category for Senegal and Tanzania, the countries with the highest and lowest level of financial development in our sample (Figure 3). It can be seen that risky products survive longer in Senegal than in Tanzania. Senegal has relatively better developed financial markets, with the highest ratio of private credit to GDP among the five countries. These results support our hypothesis that financial development helps exports of risky products survive longer. We now turn to the empirical results.

5 Empirical results

5.1 Trade survival and Financial development

In table 8 we report the effect of financial development on export survival for our baseline specification incorporting various combinations of fixed effects. The dependent variable is the probability of exiting the destination country j for product k from firm f operating in country i. Our main variable of interest is the interaction term between the product risk measure and the ratio of bank credits to GDP. It captures the differentiated effect of financial development across products. In column (1) we estimate the direct effect of risk\ and financial development on the probabilty to exist foreign markets. We stratify by HS4 to allow the hazard function to vary across sub-sectors. In addition, we include destination market fixed effects as the ability to survive may vary from one destination market to another. Year fixed effects account for global shocks affecting all trade relationships. Moving to results, we find that risky products survive significantly less that non risky ones, and the level of financial development in the exporting country helps firms survive longer. Both coefficients enter statistically significant at the 1% level. Our variable of interest is negative and significant at the 5% level, showing that financial development helps disproportionately more risky products to survive. In column (2) we add firm fixed effects controlling for unobserved time invariant firm characteristics. We stratify by HS4*exporter and allow the baseline hazard function to vary across each HS4-exporting country pair (430 pairs). In this way, we control for cross country differences

[10] The split is dictated by the high proportion of zero risk products.

in specialisation patterns. The effect of financial development alone is absorbed. The coefficient on the risk measure remains positive and statistically significant. However the coefficient on the interaction term is not significant anymore. This is not surprising due to the strigency of the control. In column (3) and (4), we further control for possible bilateral aid to trade programs, or domestic trade oriented policies at the sector level, including respectively HS2*importer fixed effects and HS2*importer*exporter fixed effects. Our coefficent of interest remains of expected sign but looses its significant in column (4). In column (5) we include product (HS8 digit) level fixed effects to control for any product time invariant characteristics that may influence the survival of trade relationships. The coefficient on risk alone is absorbed. The coefficient on our interaction term is negative as expected and strongly significant. This specification is the closest to the original Rajan and Zingales methodology, and therefore, our prefered. We use it for all subsequent robustness checks unless specified otherwise.\ In the last column of table 8, we estimate an even more rigourous specification, including HS8*destination fixed effects. This allows to control for any destination-product specific time invariant characteristics – quota, tarrifs bans etc. The coefficient on our main variable is negative and significant at the 10% level.

The classical determinants of trade survival have expected signs and are statistically significant in almost all specifications. Distance as a proxy for trade costs increases the hazard rate. Sharing a common border, colonial links and a common language decrease the hazard rate. Firm level characteristics such as the initial export value ($log(initial\_export_{f_ijk})$, the number of destination countries ($NDest_{f_ijk}$) and the number of products ($NProduct_{f_ijk}$) all decrease the hazard rate. The coefficient of our variable of interest is negative for all specifications. This suggests that domestic financial development increases survival of risky products in foreign markets. The comparison between columns shows that the magnitude and significance on the interaction term $Fin\_Dev_i * Risk_k$ is affected by the choice of the fixed effects and stratification variable. The coefficient varies from -0.45 to -0.10, taking the lowest value of -0.45 when controlling for HS8*destination country fixed effects and the higest value of -0.10 when controlling for HS2 x origin coutry fixed effects.

6 Robustness Checks

6.1 Alternative measures of financial development

In table 9 we report result using alternative measures of risk (column (2)) and financial development (column (3) to (5)). Column (1) reports our prefered baseline specification

for the sake of comparison. In column (2) we use an alternative measure of risk – constructed by Cadot and al (2009) using a Poisson model instead of a Negative Binomial. Results remain qualitatively the same. Column (3) and (4) report results using alternative measures of access to financing. Local financial markets are not the only source of finance for exporters. Firms operating in countries with poorly developed financial markets may rely on trade finance provided by institutions in the destination country. The interaction term between our risk measure and the measure of short term credit from the BIS banks is negative and statistically significant at the 10% level. The coefficient is negative but not significant when using the ratio of trade insurance to GDP as an alternative measure of access to finance interacted with risk. These results are not surprising given the fact that loans from the BIS banks comprise mostly trade credits which are used to cover short term operational needs of exporters while our risk index reflects the needs of products for long term financing. Column (5) reports results when using the "Ease_to_get_credit " variable from the World Bank doing business survey database. The Ease_to_get_credit variable captures the quality of domestic financial institutions. The interaction with our risk measure comes out negative and significant at the 5% level.

6.2 Controlling for alternative channels

As in standard OLS, the identification of our main coefficient relies on the assumption of orthogonality between the interaction term and the residual. Given the inclusion of firm, country and product fixed effects, our estimation strategy is not sensitive to the exclusion of controls that are not correlated with financial development or risk. However, we are concerned with variable potentially correlated with financial development and that may impact the survival of products differentially. Financial development may be correlated with other characteristics of the country, such as quality of the infrastructure, complexity of the customs procedures, business regulations etc. In order to check for alternative channels that may affect the survival of firms, we add to our baseline specification (column (5) in table 8) the interaction term of our product risk index with these country variables. Results are shown in table 10. The coefficient on our main variable of interest has expected sign and remains significant in all specifications. The coefficient of the interaction term between our product risk index and GPD per capita is positive and significant at the 5% level. This most probably signal a colinearity problem between both interaction terms included in the regression (column (1))[11]. In column (2) we include

[11] We run the regression with the interaction term of GDP per capita with risk alone. The coefficient is negative and significant at the 5\% level. This suggests that the overall level of economic development

the interaction between our risk measure and the ease of doing business index. We control for favourable business conditions in the exporting country that may positively influence exports survival. The coefficient is positive and not significant. Column (3), (4) and (5) report results when controlling for respectively, the overall logistic performance, the quality of the trading infrastructure, and the trading procedures complexity in the exporting country. The coefficient on the interaction terms of our measure of risk with these variables has the expected signs but fails to be statistically significant[12].

6.3 Destination markets demand for quality

In this section we provide evidence that our risk measure is not specific to the EU market (table 11). Columns with odd numbers report results controlling for firm destination and year fixed effects and stratifying across HS4. This allows us to recover the main effect of our risk index. Columns with even numbers report our prefered specification (column (5) in table 8). Column (1) and (2) report results for non european destination markets only. Column (3) and (4) show results for high income destination countries only. Column (5) and (6) consider low income countries as destination markets only. Finally, in column (7) and (8) we present results for the African destination countries only. Results show that, first, our risk measure is not capturing characteristics of the EU market for food safety only since the coefficient on our interaction term is negative and significant at the 1matters for developped countries markets. The coefficient on the risk and its interaction with financial development are non significant when we consider only low income or African countries as destination markets. This reflects consumers associated institutions in developped economies concerns for human health. These results find support in the trade and quality litterature (Baldwin and Harrigan, 2007). Hallak (2006) finds some evidence that richer countries have relatively greater demand for high quality, measured by unit values.

6.4 Firms' type and Survival

Among our exporting firms 17% are only exporting to African destination markets. Obviously such firms face very different quality requirements in comparison to firms servicing developped countries. We re-estimate our main specification considering firms that export only to Africa (column (1)). Then, in column (2) we rerun estimation dropping those firms from the sample. The coefficients on our interaction terms suggest

act in a similar way as financial development.

[12]When running seperate regressions with the interaction term of each of these variables with risk alone. the coefficient are of expected sign and statistically significant.

that the level of financial development does not matter for firms that only export to the African region, since they do not face stringent food safety requirements in these destination markets. However it does matter for firms that export their product to other regions. The coefficient on the interaction term after dropping the "only-Africa" exporters increases nearly twofold in magnitude (from to -0.26 to -0.46).

Additionally, we are concerned that our results may be driven by the presence in our sample of multinational or large trading companies[13]. To verify this is not the case, we alternatively drop them from our sample and re-estimate our preferred specification. There is evidence of capital flows from multinational firm to affiliates as potential channels to overcome imperfections in local capital markets (Desai, Folay and Hines, 2004). Additionally, large trading companies may enjoy facilitated access to trade credit. Results are reported in column (3) and (4) of table 12 and show that our findings are not driven by multinationals or trading companies.

Finally, we drop higher order spells from our sample. Firms exhibiting multiple spells trade relationships may spread the investement costs to come to compliance with food safety requirements in a destination market over different spells. Our results (column (5)) show that this is not the case.

6.5 Perishable versus risky products

Lastly, to insure that our risk measure is not picking up on other product characteristics that may affect their survival, we include as a control variable, a perishability index. We expect perishable products – products that cannot be stored without refrigerator facilities – to survive less. We estimate our specification including an interaction term between the perishable index and financial development. Column (1) and (2) in table 13, report results controling for firm destination and year fixed effects and stratifying across HS4. In column (3) and (4) we stratify across HS8. Results support our intuition. Perishable products survive less (column (1)). However the level of financial development does not seem to matter. After controlling for the perishable nature of product, our coefficients on risk and risk interacted with financial development remains significant and of expected signs.

[13] We identify multinational companies based on their names; for example "NESTLE", or "COLGATE" are identified as multinationals. Trading compapnies are identified using search for keyword in the firms' names; for example "EXPORT TRADING CO. LTD."

7 Concluding Remarks

This paper documents the importance of access to finance either from domestic and foreign sources in determining the survival of risky agri-food products for African firms. Our analysis relies on a novel dataset collected within the frame of the Export Survival Project implemented by the International Trade Department of the World Bank. The dataset combines firm level export data collected by customs authorities of five African reporting countries - Ghana, Malawi, Mali, Senegal and Tanzania- between 2000 and 2008. We estimate a proportional hazard model. This econometric technique is probably the most suitable tool to identify the longer-term exporting success of trade relationships. In order to identify the differentiated effect of access to financing across products of different risk category- we combine the econometric framework of survival analysis with the methodology introduced by Rajan and Zingales (1998). This allows us to control for omitted variable bias. We use the Product Risk Index developped by Cadot and al., 2009. The index reflects the propensity of product to fail health and safety controls on the EU market. Thus, it captures the demand for finance to comply with food safety requirements in foreign markets and is used as a proxy for the external financing needs. The interaction of the Product Risk Index with the level of financial development in the exporting country enables us to look for a specific channel through which financial development promotes export survival of high-value food products while controlling for exporting country, destination and product fixed effects.

We find that firms' exports of high-value agri-food products – that require more finance either from domestic or from foreign banks – indeed sustain longer in foreign markets if they are located in more financially developped countries. Financially developped markets by increasing the availability of finance help disproportionately more exports of products that require financing to keep up with food safety regulations. Our results are robust to the inclusion of firm fixed effects and a set of controls to account for possible effect of domestic institutional characteristics. These results are in line with previous findings of the trade and finance literature (Beck, 2002; Manova, 2005).

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8 Tables and Figures

Table 1. Average export share (%) by region in an average year

VARIABLES	Ghana	Mali	Malawi	Senegal	Tanzania
Africa	2	71	51	52	19
America	15	0	4	1	4
Asia	15	6	8	3	34
Europe	72	24	34	46	43
Pacific	0	0	0	0	1

Table 2. Micro costs of EurepGap compliance – Tanzania

	EUREPGAP Requirements	Set Up Costs (US$)	On Going Costs (US$)
1	Traceability	4'300	100
2	Record keeping and self-inspection	6'000	3'600
3	Site management	900	0
4	Risk assessments	1'500	300
5	Technical services	0	2'000
6	Laboratory analysis	0	3'000
7	Soil and substrate management	1'000	100
8	Fertilizer use	2'500	750
9	Crop protection	10'400	1'250
10	Irrigation/fertirrigation	600	0
11	Harvesting	9'800	200
12	Produce handling	11'300	100
13	Waste & pollution management	800	50
14	Worker health, safety and welfare	47'490	4'250
15	Environmental issues	1'100	200
16	Certification costs	1'000	2'000
17	EurepGap procedures	0	2'600
	Total costs	98'690	20'500

Table 3. The Risk Index, some descriptive statistics

CN2 Code	Description	# Risky products	Risk Index*	# Alerts (total 2001-2008)	Most frequent cause for rejection
01	Live animals	0	0	1	Heavy metals
02	Meat and edible meat offal	17	0.24	498	Pathogenic micro-organisms
03	Fish and crustaceans, molluscs and other aquatic invertebrates	108	0.95	2641	Residues of veterinary medicinal products
04	Dairy produce	0	0.03	367	Residues of veterinary medicinal products
05	Products of animal origin, not elsewhere specified	3	0.48	40	Residues of veterinary medicinal products
06	Live trees and other plants	0	0	3	
07	Edible vegetables and certain roots and tubers	27	0.65	441	Pesticide residues (triazophos)
08	Edible fruit and nuts	53	0.71	3210	Mycotoxins
09	Coffee, tea, mate and spices	38	2.07	934	Composition (colour Sudan)/ Mycotoxins
10	Cereals	0	0	158	GMO / Novel food/ Mycotoxins
11	Products of the milling industry	0	0	36	Food additives (sulphites)
12	Oil seeds and oleaginous fruits	25	1.04	1491	Mycotoxins
13	Lac	0	0	1	Food additives
14	Vegetable plaiting materials	1	0	1	Labelling absent/incomplete/incorrect
15	Animal or vegetable fats and oils	7	0.18	247	Composition/ Industrial contaminants
16	Preparations of meat, of fish or of crustaceans	32	1.29	309	Residues of veterinary medicinal products
17	Sugars and sugar confectionery	5	0.49	221	Food additives/ mycotoxins
18	Cocoa and cocoa preparations	4	0.57	20	Allergens
19	Preparations of cereals, flour, starch or milk	2	0.16	167	Radiation
20	Preparations of vegetables, fruit or nuts	44	0.54	677	Mycotoxins
21	Miscellaneous edible preparations	7	0.85	185	Food additives

Total number of CN8 codes:2146 , Total number of CN8 codes with positive risk index: 373

*Average risk index over all CN8 product per CN2 sector

Table 4. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Nproduct	14870	28.1	31.6	1	137
Ndest	14870	14.3	12.6	1	54
Distance	14870	8.3	0.89	5.04	9.6
Fin_Dev	14870	0.09	0.03	0.04	0.18
GDPpc	14870	369.7	59.1	194.4	510
Insured_credit	14870	0.11	0.027	0.033	0.13
Trade_credit	14870	0.18	0.06	0.055	0.23
Risk	14870	2.71	4.24	0	21.6
LPI	14870	2.16	0.08	2.08	2.42
Infrastructure	14870	2.16	0.11	1.9	2.25
Ease_to_do_Business	14870	104.7	23	87	166
Ease_to_get_Credit	14870	104.7	16.8	84	145
Time_exp_tr	14870	20.6	4.6	14	45
Fin_Dev*Risk	14870	0.27	0.46	0	3.13
GDPpc*Risk	14870	1027	1669	0	11039
LPI *Risk	14870	5.8	9.2	0	51.2
Ease_to_do_Business*Riskk	14870	280.6	453.1	0	3222
Ease_to_get_credit*Risk	14870	290.4	472.8	0	3136
Infrustructure*Risk	14870	5.9	9.3	0	48.6
Trade_credit*Risk	14870	0.5	0.87	0	5.04
Insured_credit*Risk	14870	0.3	0.48	0	2.78
Time_exp_tr*Risk	14870	54.1	84.2	0	950
log (Export)	14870	8.5	2.9	-6.94	20.21

Table 5: Descriptive Statistics

Country	Number of "Risky" products	Number of products	Export Value Risky products	Total Export Value ('000 $)	Share of "Risky Products"	Number of "Safe" firms	Number of "Risky" firms
GHA	2	4	276'009	2'663'712	45%	760	581
MLI	2	2	138'172	224'918	61%	46	20
MWI	2	2	254'607	1'025'106	65%	75	36
SEN	2	3	422'751	893'963	65%	122	83
TZA	2	2	692'777	1'931'762	52%	331	145

Table 6: Descriptive Statistics

failure d:died==1
analysis time$_t$:(spellend-origin)
origin:time spellbegin
id:index

Category	total	mean	min	median	max
no. of subjects	14870				
no. of records	14870	1	1	1.00000	1
(first) entry time		0	0	0	0
(final) exit time		1.367586	1	1	9
subjects with gap	0				
time on gap if gap	0	.	.	.	.
time at risk	20336	1.367586	1	1.000	9
failures	8479	0.5702085	0	1	1

Table 7: Duration analysis

Country	Obs	Mean	Std Deviation	Min	Max
GHA	9074	1.20	0.63	1	5
MLI	63	1.38	0.58	1	3
MWI	301	1.62	1.00	1	4
SEN	1262	1.72	1.42	1	9
TZA	4170	1.60	1.17	1	7

Length of the spell

Country	Obs	Mean	Std Deviation	Min	Max
gExport<1000	4615	1.17	0.56	1	7
gExport>=1000& gExport<10000	3723	1.30	0.79	1	9
gExport>=10000& gExport<100000	4107	1.39	0.96	1	9
gExport>=100000& gExport<1000000	1970	1.71	1.30	1	9
gExport>1000000	455	2.08	1.63	1	9

Table 8. Trade survival and Financial Development, Main results

	(1)	(2)	(3)	(4)	(5)	(6)
	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM
VARIABLES	Hazard rate	Hazard rate	Hazard rate	Hazard rate	Hazard rate	Hazard rate
Fin_Dev*Risk	-0.141716**	-0.114490	-0.109835*	-0.077637	-0.263724**	-0.458736*
	(0.069)	(0.095)	(0.066)	(0.072)	(0.107)	(0.252)
Risk	0.018198***	0.017351*	0.015685**	0.013472*		
	(0.007)	(0.009)	(0.006)	(0.007)		
Fin_Dev	-3.557757***					
	(0.726)					
log(Export)	-0.075122***	-0.094051***	-0.094749***	-0.095269***	-0.088984***	-0.096284***
	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.010)
Nproduct	-0.003698***	-0.005223**	-0.003669	-0.002971	-0.004918**	-0.009306**
	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)
Ndest	-0.024892***	-0.057057***	-0.060267***	-0.062886***	-0.057002***	-0.065745***
	(0.004)	(0.008)	(0.008)	(0.008)	(0.009)	(0.014)
Contiguity	-0.087706	-0.152112			-0.150870	-0.190981
	(0.090)	(0.099)			(0.105)	(0.251)
Com_language	-0.249909***	-0.123589***			-0.126151***	-0.123450
	(0.040)	(0.041)			(0.040)	(0.101)
Colony	0.123174	-0.155354			-0.086102	0.122387
	(0.089)	(0.099)			(0.084)	(0.197)
log(Distance)	0.095250**	0.057927			0.090201*	0.319012**
	(0.044)	(0.045)			(0.049)	(0.147)
Fixed Effects						
firm	no	yes	yes	yes	yes	yes
destination-country	yes	yes	no	no	yes	no
destination*exporter	no	no	yes	no	no	no
destination*Exporter*HS2	no	no	no	yes	no	no
year	yes	yes	yes	yes	yes	yes
HS4	yes	no	no	no	no	no
HS8	no	no	no	no	yes	no
HS2*Exporting-country	no	no	yes	no	yes	yes
HS4*Exporting-country	no	yes	no	no	no	no
HS8*destination-country	no	no	no	no	no	yes
Observations	14870	14870	14870	14870	14870	14870

Robust standard errors in parentheses, clustered by exporter*hs4

*** p<0.01, ** p<0.05, * p<0.1

Table 9. Robustness Check, Alternative Measures of Financial Development

	(1)	(2)	(3)	(4)	(5)
	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM
VARIABLES	Hazard rate	Hazard rate	Hazard rate	Hazard rate	Hazard rate
Fin_Dev*Risk	-0.263724**				
	(0.106523)				
log(Export)	-0.088984***	-0.088999***	-0.088945***	-0.089157***	-0.089144***
	(0.007184)	(0.007183)	(0.007184)	(0.007173)	(0.007175)
Nproduct	-0.004918**	-0.004926**	-0.004922**	-0.004965**	-0.004948**
	(0.002487)	(0.002487)	(0.002488)	(0.002483)	(0.002484)
Ndest	-0.057002***	-0.057020***	-0.057098***	-0.057070***	-0.056985***
	(0.008813)	(0.008818)	(0.008826)	(0.008824)	(0.008813)
Contiguity	-0.150870	-0.151566	-0.147062	-0.147467	-0.150999
	(0.104662)	(0.104670)	(0.105273)	(0.105094)	(0.104557)
Com_language	-0.126151***	-0.126230***	-0.126359***	-0.126487***	-0.126120***
	(0.039949)	(0.039954)	(0.039915)	(0.039935)	(0.039972)
Colony	-0.086102	-0.086367	-0.093726	-0.094112	-0.086352
	(0.084054)	(0.084048)	(0.085057)	(0.085198)	(0.084143)
log(Distance)	0.090201*	0.089567*	0.092112*	0.090922*	0.089259*
	(0.048829)	(0.048819)	(0.048916)	(0.048854)	(0.048790)
Fin_Dev*Alternative_Risk		-0.202913**			
		(0.088961)			
Trade_credit*Risk			-0.118578*		
			(0.062256)		
Insured_credit*Risk				-0.138927	
				(0.120707)	
Ease_to_get_credit*Risk					-0.000352**
					(0.000167)
Fixed effects					
firm	yes	yes	yes	yes	yes
destination-country	yes	yes	yes	yes	yes
year	yes	yes	yes	yes	yes
HS8	yes	yes	yes	yes	yes
HS2*Exporting-country	yes	yes	yes	yes	yes
Observations	14870	14870	14870	14870	14870

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses

Table 10. Robustness Check, Institutional development controls

	(1)	(2)	(3)	(4)	(5)
Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM
VARIABLES	Hazard rate	Hazard rate	Hazard rate	Hazard rate	Hazard rate
GDPpc*Risk	0.000167*				
	(0.000100)				
Fin_Dev*Risk	-0.590186**	-0.257084**	-0.291124**	-0.169833*	-0.345932***
	(0.243377)	(0.099910)	(0.146989)	(0.101274)	(0.130812)
log(Export)	-0.088864***	-0.088799***	-0.088957***	-0.088792***	-0.088996***
	(0.007190)	(0.007192)	(0.007184)	(0.007193)	(0.007183)
Nproduct	-0.004866*	-0.004884**	-0.004919**	-0.004870*	-0.004895**
	(0.002494)	(0.002492)	(0.002487)	(0.002494)	(0.002490)
Ndest	-0.057133***	-0.057059***	-0.056991***	-0.057100***	-0.057073***
	(0.008834)	(0.008819)	(0.008812)	(0.008827)	(0.008828)
Contiguity	-0.150597	-0.149181	-0.150684	-0.148874	-0.151492
	(0.104786)	(0.104909)	(0.104638)	(0.104977)	(0.104591)
Com_language	-0.125489***	-0.126129***	-0.126346***	-0.125682***	-0.125593***
	(0.039964)	(0.039919)	(0.039967)	(0.039942)	(0.040002)
Colony	-0.089269	-0.088520	-0.086179	-0.089159	-0.087218
	(0.084415)	(0.084390)	(0.084085)	(0.084436)	(0.084138)
log(Distance)	0.090495*	0.091849*	0.090582*	0.091635*	0.089492*
	(0.048803)	(0.048978)	(0.048878)	(0.048940)	(0.048763)
Ease_to_do_Business*Risk		0.000177			
		(0.000130)			
LPI *Risk			0.012009		
			(0.036859)		
Infrastructure*Risk				-0.052745	
				(0.033968)	
Time_exp_tr*Risk					-0.000746
					(0.000581)
Fixed Effects					
firm	yes	yes	yes	yes	yes
destination-country	yes	yes	yes	yes	yes
year	yes	yes	yes	yes	yes
HS8	yes	yes	yes	yes	yes
HS2*Exporting-country	yes	yes	yes	yes	yes
Observations	14870	14870	14870	14870	14870

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Robustness Check, Survival and different destination markets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM	Cox PHM
Sample	non EU	non EU	High Inc	High Inc	Low Inc	Low Inc	AF	AF
Fin_Dev*Risk	-0.104202	-0.267053**	-0.294482*	-0.381101**	0.021301	0.026620	0.017192	0.003556
	(0.076)	(0.116)	(0.174)	(0.167)	(0.098)	(0.130)	(0.092)	(0.117)
Risk	0.012114*		0.039250**		-0.000153		0.001360	
	(0.007)		(0.019)		(0.009)		(0.008)	
log(Export)	-0.086481***	-0.084324***	-0.098690***	-0.092964***	-0.090472***	-0.099042***	-0.084685***	-0.087770***
	(0.007)	(0.007)	(0.009)	(0.011)	(0.011)	(0.011)	(0.009)	(0.010)
Nproduct	-0.002044	-0.002284	-0.010618***	-0.011400***	0.006381***	0.007505***	0.002923	0.004706*
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Ndest	-0.049320***	-0.047043***	-0.051819***	-0.055078***	-0.038532***	-0.033469***	-0.039642***	-0.031661***
	(0.008)	(0.009)	(0.007)	(0.010)	(0.008)	(0.010)	(0.007)	(0.009)
Contiguity	-0.120036	-0.113761			-0.192867	-0.163378	-0.095853	-0.097253
	(0.100)	(0.108)			(0.127)	(0.133)	(0.108)	(0.119)
Com_language	-0.096541**	-0.105012*	-0.044069	-0.065628	-0.218924***	-0.284088***	-0.200314***	-0.236681***
	(0.048)	(0.054)	(0.062)	(0.063)	(0.052)	(0.058)	(0.048)	(0.053)
log(Distance)	0.088052*	0.116552**	0.212442***	0.233183**	0.019712	0.070586	0.097574*	0.122611*
	(0.048)	(0.056)	(0.075)	(0.095)	(0.066)	(0.067)	(0.055)	(0.064)
Colony			-0.184122**	-0.158575*				
			(0.090)	(0.094)				
Fixed Effects								
firm	yes	yes	yes	yes	yes	yes	yes	yes
destination-country	yes	yes	yes	yes	yes	yes	yes	yes
year	yes	yes	yes	yes	yes	yes	yes	yes
HS4	yes	no	yes	no	yes	no	yes	no
HS8	no	yes	no	yes	no	yes	no	yes
HS2*Exporting-country	yes	yes	yes	yes	yes	yes	yes	yes
Observations	7831	7831	10220	10220	3010	3010	3690	3690

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12. Robustness Check, Survival and Financial development and Firms' type

VARIABLES	(1) Cox PHM Hazard rate	(2) Cox PHM Hazard rate	(3) Cox PHM Hazard rate	(4) Cox PHM Hazard rate	(5) Cox PHM Hazard rate
Sample	firms exporting to Africa only	firms exporting to different regions	no International companies	no Trading companies	only first spell
Fin_Dev*Risk	0.018181	-0.461666***	-0.243690**	-0.235888**	-0.237414**
	(0.142)	(0.151)	(0.108)	(0.107)	(0.118)
log(Export)	-0.087598***	-0.094125***	-0.089854***	-0.089639***	-0.093994***
	(0.015)	(0.008)	(0.007)	(0.008)	(0.007)
Nproduct	0.010359***	-0.016191***	-0.004005	-0.002295	-0.006142**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Ndest	-0.033987***	-0.046895***	-0.057469***	-0.060894***	-0.055204***
	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)
Contiguity	-0.085626	-0.204893	-0.086484	-0.152108	-0.110789
	(0.155)	(0.170)	(0.125)	(0.109)	(0.102)
Com_language	-0.225277***	-0.074524	-0.072461	-0.124098***	-0.113970***
	(0.065)	(0.048)	(0.045)	(0.044)	(0.043)
Colony		-0.123189	-0.166651**	-0.076033	-0.103809
		(0.088)	(0.083)	(0.085)	(0.104)
log(Distance)	0.109803	0.066230	0.141220***	0.085759*	0.121161***
	(0.084)	(0.064)	(0.052)	(0.050)	(0.047)
Fixed Effects					
firm	yes	yes	yes	yes	yes
destination-country	yes	yes	yes	yes	yes
year	yes	yes	yes	yes	yes
HS8	yes	yes	yes	yes	yes
HS2*Exporting-country	yes	yes	yes	yes	yes
Observations	2494	12376	14163	13522	13191

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

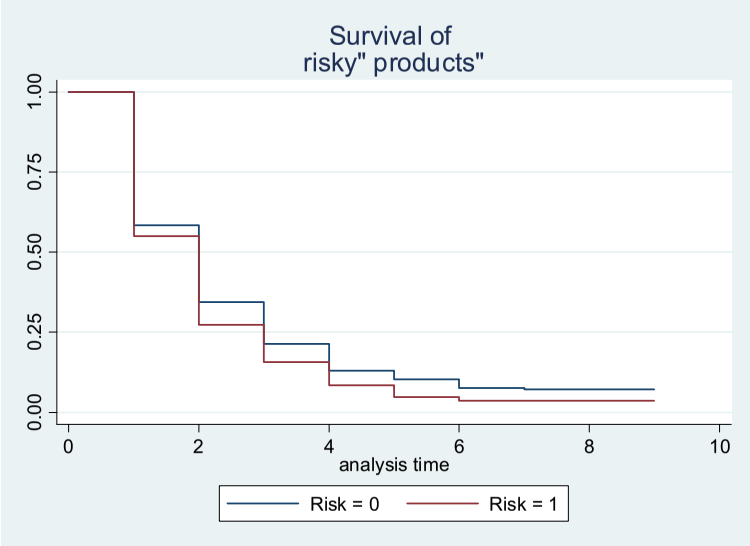
Table 13: Robustness Check, persihable versus risky products

	(1)	(2)	(3)	(4)
	Cox PHM	Cox PHM	Cox PHM	Cox PHM
VARIABLES	Hazard rate	Hazard rate	Hazard rate	Hazard rate
Risk* FinDev		-0.154965**		-0.263405**
		(0.073)		(0.108)
Fin_Dev*Pershable	-0.537398	-0.321777	0.703376	0.978276
	(0.897)	(0.890)	(0.927)	(0.915)
Risk		0.020828***		
		(0.007)		
Perishable	0.296858**	0.279755**		
	(0.135)	(0.131)		
log(Export)	-0.094179***	-0.094127***	-0.089359***	-0.088992***
	(0.007)	(0.007)	(0.007)	(0.007)
Nproduct	-0.003856	-0.003777	-0.004910**	-0.004856**
	(0.002)	(0.002)	(0.002)	(0.002)
Ndest	-0.057310***	-0.057502***	-0.056599***	-0.056476***
	(0.008)	(0.008)	(0.009)	(0.009)
Npartn_nonEU	-0.168395*	-0.172531*	-0.148588	-0.150413
	(0.098)	(0.098)	(0.104)	(0.103)
Com_language	-0.115387***	-0.114964***	-0.129888***	-0.129342***
	(0.040)	(0.040)	(0.040)	(0.040)
Colony	-0.151394*	-0.148864*	-0.088377	-0.083096
	(0.083)	(0.083)	(0.085)	(0.084)
log(Distance)	0.043521	0.043255	0.090999*	0.091897*
	(0.043)	(0.044)	(0.048)	(0.048)
Fixed Effects				
firm	yes	yes	yes	yes
destination-country	yes	yes	yes	yes
year	yes	yes	yes	yes
HS4	yes	yes	no	no
HS8	no	no	yes	yes
Observations	14870	14870	14870	14870

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses

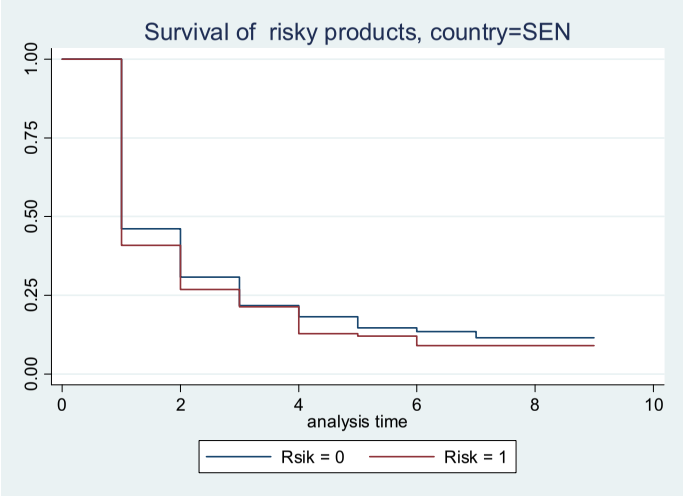
Figure 1:
Survival of Risky versus nonRisky products all countries

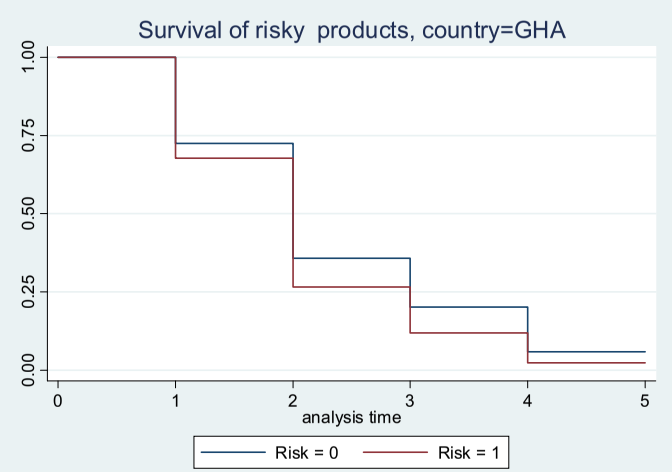


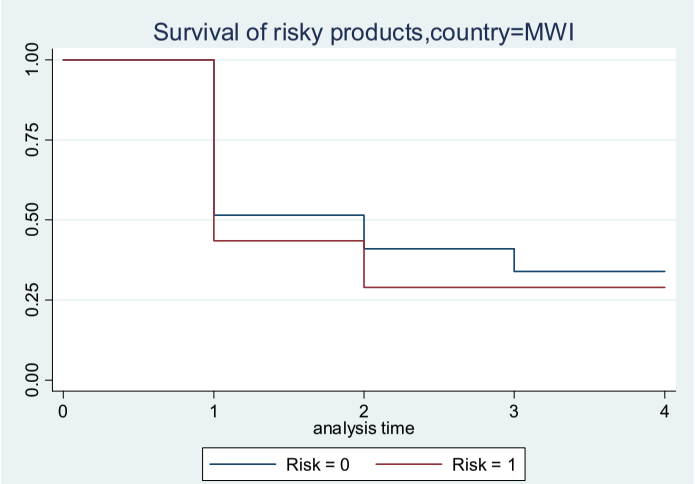
Test on Equality of Survival Functions

	Chi2 (1)	Pr>chi2	Null Hypothesis on Equality Survival Functions
Cox regression-based test for equality of survival curves	24.87	0	rejected at 1% level of significance
Wilcoxon (Breslow) test for equality of survivor functions	28.28	0	rejected at 1% level of significance
Tarone-Ware test for equality of survivor functions	34.3	0	rejected at 1% level of significance
Log-rank test for equality of survivor functions	47.87	0	rejected at 1% level of significance

Figure 2:
Survival of Risky versus nonRisky products per country







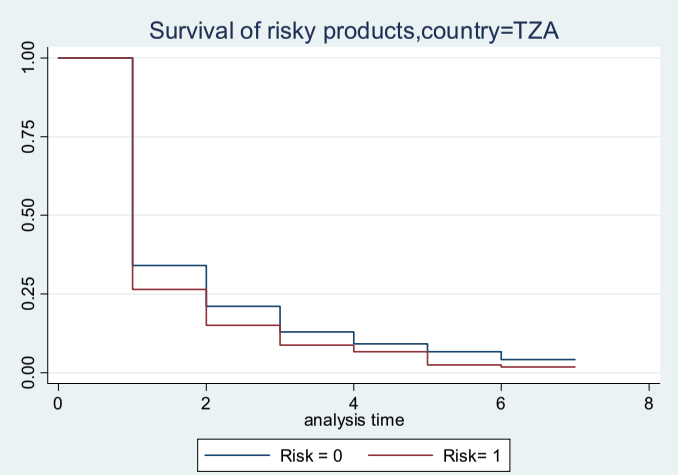
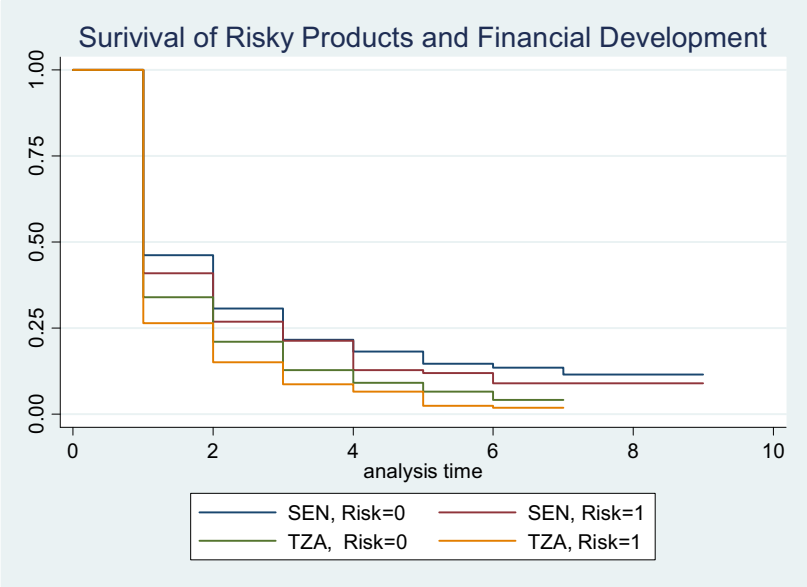


Figure 3:
Survival of Risky versus nonRisky products, Senegal and Tanzania
Dummy Risky =1 if Product Risk Index above median



9 Appendices

9.1 The Kaplan-Meier Extimator

In discrete time, the survivor function is defined as the probability that an individual survives at least to time t:

$$S(t) = P(T \geq t) \quad t = 1, 2, ...$$

The Kaplan-Meier estimator of the survivor function at time t is defined as:

$$\hat{S}(t) = \prod_{t_i \leq t} [n_i - d_i/n_i]$$

where t_i, $i = 1, 2...$ is the ordered failure times, n_i denotes the number of spells alive (at risk) just before time t_i, including those who will die at time t_i. Let d_i denote the number of failures (deaths) at time t_i[14].

9.2 The Cox Proportional Hazard Model

Our approach utilizes a survival-analysis framework, and focuses on the duration of trade relationships. Survival analysis allows to examine the relationship between the survival-times distribution and some covariates of interest. The survival function gives the probability that a trade relationship will survive past time t. Conversely, the hazard function, $h(t)$, assesses the instantaneous risk of demise at time t, conditional on survival till that time. Formally, let $T \geq 0$, denote the survival-time (length) of a trade relationship, with covariates X, then the hazard rate $h(t)$, is given by:

$$h(t|X) = \lim_{\Delta t \to 0} \frac{\Pr[(t \leq T < t + \Delta t)|T \geq t, X]}{\Delta t}$$

In discrete times,

$$h(t|X) = \Pr(T = t|T \geq t, X), t = 1, 2, ...$$

We estimate the hazard rate for our trade relationships data, using a Cox Proportional Hazard (PH) model (introduced in a seminal paper by *Cox, 1972*). The Cox PH model, is broadly applicable and the most widely used method for survival analysis. The hazard function for a given firm*destination*product triplet with covariates $X = \{x_1, x_2, ...x_j, ..x_n\}$:

$$h(t \mid X) = h_0(t) \exp(X.\beta)$$

is defined as the product of a baseline hazard function, $h_0(t)$, common to all observations and a parametrised function $\exp(X.\beta)$ with a vector of parameters β. The form of the baseline hazard function characterizes how the hazard changes as a function of time at risk t, only. The covariates X affect the hazard rate independently of time. The model offers some convenient features. It makes no assumptions about the form of the underlying baseline function. Additionally the relationship between the covariates and the hazard rate is log-linear, allowing for a straigthforward interpretation of the parameters. Increasing x_j by 1, all other covariates held constant, affect the hazard function by a factor of $exp(\beta_j)$ at all points in time -it shifts all points of the baseline hazard by the same factor. Parameters estimates in the Cox PH model are obtained by maximizing the partial likelihood as opposed to the likelihood for an entirely specified parametric hazard model (*Cox, 1972).* Resulting estimates are not as efficient as maximum-likelihood estimates, however no arbitrary, and possibly incorrect, assumptions about the form of the baseline hazard are made.

[14] The conditional probability that a spell dies in the time interval from $t_i - \Delta$ to t_i, given survival up to time $t_i - \Delta$, is estimated as $\frac{d_i}{n_i}$. The conditional probability that a spell survives beyond $t_i - \Delta$, given survival up to time $t_i - \Delta$, is estimated as $\frac{n_i - d_i}{n_i}$.In the limit as $\Delta \to 0, \frac{n_i - d_i}{n_i}$ becomes an estimate of the conditional probability of surviving beyond t_i given survival up to t_i.