Determinants of Export Survival in the Lao PDR

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Poverty Reduction and Economic Management Sector Department
January 2013

Abstract

This paper explores a rich dataset of monthly firm-level data on the population of exporters of Lao PDR from 2005 to 2010. The survival analysis uses a discrete-time logistic model based on firm-product-destination triplets while accounting for unobserved heterogeneity. It looks in detail at the role played by two important and related determinants of survival: experience and networks. These are particularly relevant for developing countries, where relevant export experience in firms is likely to be limited and networks leveraging it all the more important. The analysis reveals the positive impact

of having prior experience with the export product and destination, experience with importing, as well as using a developed neighboring country as launch platform. Networks are found to be most relevant when they are most specific—the largest impact comes from province level aggregations of firms selling the same product in the same market during a particular month. A competing risks model was also investigated to discern the impact of these determinants on the likelihood of experiencing an upgrade to a superior product versus termination when a trade contract ends.

This paper is a product of the Poverty Reduction and Economic Management Sector Department, East Asia and the Pacific Region. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at rrecord@worldbank.org.

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Keywords: Duration, firm dynamics, survival, trade networks

JEL classification: F14, L25, C41

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1 Introduction

What makes a survivor? For exporters, this question has become a focus of study since the seminal work of Besedes and Prusa (2006a) showed that the median duration of US-bound export spells was, strikingly, only two years. Subsequent work has identified the importance of the sustainability margin of exporting in addition to the classical margins: the intensive (growth in volume) and the extensive (diversification of products and markets). Low-income countries in particular face very high exit rates from exporting, despite having entry rates similar to developed economies (Brenton, Saborowski and Uexkull 2009). It is for this reason that in developing countries a key element in achieving higher aggregate export growth is to reach higher survival rates for existing trade flows (Besedes and Prusa 2006a).

The growing literature which looks at the determinants of export survival and the duration of trade has followed several strands. Theoretical developments (using both representative and heterogeneous firms) such as the search-cost theory (Rauch and Watson 2003) or the literature on sunk costs have some explanatory power, and the importance of sunk costs in firms' export decisions has been empirically verified (Roberts and Tybout 1997). With sunk costs one would expect long spells, but this tends to conflict with the low values found in the literature. It has therefore been argued that there is currently no given theoretical model that can fully explain the short trade durations that have been observed (Brenton, Saborowski and Uexkull 2009, Hess and Persson 2011b).

Empirical studies have focused on macro trade data at the country and industry level (usually from UN's Comtrade database), the dominant focus being on specific determinants of export survival. Research in this vein has analyzed, for example: the impact on duration spells of differentiated versus homogeneous products (Besedes and Prusa 2006b); the effect of the GDP in origin or destination country (Hess and Persson 2011b); the importance of initial export values and fixed costs to export (Fugazza and Molina 2009); and contract institutions (Araujo, Mion and Ornelas 2012).

Another type of empirical investigation into survival determinants uses firm-level data, including panels of firms and customs records, but these are generally much harder to obtain. They have tended to be country or sector specific, looking, among others, at the impact of diversification and receiving support from the export promotion agency in Peru (Volpe and Carballo 2008), sequencing of destinations for firms in Argentina (Albornoz, et al. 2011) and the importance of networks of exporting firms in regions of Colombia (Tovar and Martinez 2011). More recently, with increasing availability of customs data, cross-country comparisons of firm-level data have allowed a more refined understanding of local specificities (Cadot, et al. 2010). This culminated

with the recent aggregation by the World Bank of country level data from 45 countries (with different time coverage), which provides a real international comparison base for various elements of export dynamics (Cebeci, et al. 2012).

This paper complements the empirical literature by exploring a rich firm-level dataset of customs transactions from the Lao PDR to identify determinants of export survival. Such detailed analysis for a small, developing and landlocked economy, which, furthermore, relies heavily on exports of raw materials, can be of considerable help to policymakers and economists interested in export-led growth and diversification, and there are currently very few other examples available (Volpe and Carballo 2008). It continues work already carried out with this dataset (Stirbat, Record and Nghardsaysone 2011) which has provided novel descriptive statistics of the Lao exporter population, in particular the dominance of the intensive margin for export growth and the great deal of churning and experimentation happening in exports. That article, looking at the chances of an export unit (a firm exporting an HS 6-figure product to a particular destination) to survive past the first year (in a cross-section setup), has identified positive externalities from agglomeration and a positive impact of product- and destination-related experience.

In contrast to this previous work, the current analysis of the determinants of exporter survival is carried out in a dynamic context, using the full panel structure of the data. It has also been slightly extended to cover five full years. The aggregation of international trade data by years as well as a general shortage of detailed firm-level data means that yearly reporting is the general norm in the literature. In this case, however, the richness of the dataset allows for an analysis of month-level evolutions instead of just yearly ones. There are, however, several exceptions (Tovar and Martinez 2011), including one of the first instances of survival analysis of exporter data (Sabuhoro, Larue and Gervais 2006). This kind of analysis is expected to be more relevant in light of the short export spells and significant levels of experimentation encountered in developing countries.

The main analysis is carried out with a discrete-time survival model that takes into account unobserved heterogeneity among exporters. The choice of survival analysis method follows a recent push to break away from the basic (and extended) Cox survival analyses that have generally been used in the literature. Instead of relying on the rather simplistic assumptions of continuous-time, proportional hazards and no unobserved heterogeneity (all three of which can be shown to be fallacious) the case has been made for using binary outcome models with random effects (Hess and Persson 2011a).

Following Besedes and Prusa (2011), the thrust of the argument hinges on the belief that what matters for trade deepening and the export growth of developing economies is the survival of new exports and not just entry into foreign markets. The survival of specific trade links is a further refinement of exporter survival and allows for

a sharper analysis of how survival actually occurs. Therefore, the main unit of survival is a “contract” (i.e. a firm-product-destination triplet, or FPD) rather than the exporting firm, whose survival is implied naturally from the survival of the FPD. This “micro” perspective allows one to investigate a more complex and specific set of determinants than would otherwise be possible.

The focus is on two highly important and related families of determinants: experience (the firm) and network effects (its peers). Experience is meant to capture a path-dependency in the export behavior of firms based on past actions that can be inferred from the dataset, such as their prior involvement with a particular destination or product. The network effect means to capture influences of peers’ actions on the exporter, such as the number of other firms engaged in the same sector. The two determinants are particularly relevant in the case of small, developing economies such as Laos. The role of experience will help policy makers better target the very limited support resources available to them and to provide assistance with acquiring the most relevant types of know-how. Networks are bound to play an important role in such a small community of exporters and so their support at the appropriate level will leverage the existing experience and provide a better starting base for all new exports. However, this perspective may not always be shared by individual agents guarding their hard-acquired information from “competitors”. The FPD structure of the data makes possible such refinements of the concepts of “experience” and “network” in the analysis.

One important contribution of this paper is, therefore, its detailed investigation into the role of experience as a determinant of survival. This follows work which looks at the product and market experience of firms (Volpe and Carballo 2008, Eaton, et al. 2008) but also research dealing with sequences of destinations (to be successful, exports first go to neighboring and familiar markets) (Albornoz, et al. 2011, Carrere and Strauss-Kahn 2012). The analysis looks at the impact of various measures of experience (some of which are novel or little used in this kind of analysis) such as importing experience, prior experience with a product or destination, export market and product diversification (learning-by-doing) as well as the role of exporting to a certain destination first.

Another contribution of this paper is the detailed study of the role of peers in export survival. Previous research on exporter agglomeration and networks (Cadot, et al. 2010, Tovar and Martinez 2011, Stirbat, Record and Nghardsaysone 2011) has identified a positive correlation between trade networks and survival. The expectation is that agglomerations of competitors will reduce information costs and educate peers about trade opportunities, but questions remain as to whether this effect is truly about networks, if its influence is regional or national, and if it is product-, sector- or market-specific.

Finally, a novel contribution of the paper to the export survival sub-literature that focuses on contract rather than on firm survival² is the extension of the single-destination (death) model to a dual-destination one (death or upgrade). The panel structure of the data allows for a survival analysis of the same determinants mentioned above in a competing risks model. The assumption is that some of the “deaths” of the export unit (firm-product-destination) are actually upgrades to orders of more sophisticated products or of higher quality. It appears that this type of analysis has not yet been used in export survival research, which tends to consider terminations as final (and necessarily bad), and therefore this contribution has the potential to expand our understanding of trade dynamics at the firm-level. Examples in related fields of study are firm exits from the overall market through merger, acquisition, voluntary liquidation or bankruptcy (Esteve-Perez, Sanchis-Llopis and Sanchis-Llopis 2010) and export preparation and diversification strategies (Cirera, Marin and Markwald 2012).

The analysis also seeks to confirm the relevance of a set of influential determinants whose impact on export survival has already been documented in other geographic contexts: several destination-related variables such as distance, GDP, GDP growth and per capita levels (Hess and Persson 2011b), revealed comparative advantage, and the initial value of exports (Cadot, et al. 2010).

The paper is organized as follows. Section 2 introduces the economic context of the country of analysis and section 3 presents the data and related concerns. In section 4, some elements of basic survival analysis are outlined, followed by a detailed exposition of the research hypotheses together with the variables and frameworks used to test them and, lastly, the estimation strategy to be used. Section 5 presents the results of the survival analysis: first the main models; then, separately, a detailed investigation into the network hypothesis, the competing risks framework and some robustness checks. The conclusions are presented and discussed in section 6.

² The analysis does not work for firms because outcomes are binary: export or not.

2 Lao PDR Context

Lao PDR is a small, landlocked, least developed country in SE Asia, which has experienced a gradual opening to the international economy: merchandise trade as a share of GDP has risen from ~10% in the 1980s to ~50% at present but is still low by international standards. It is a member of ASEAN and plans to join the WTO. The country faces a rest-of-world average trade weighted tariff of just 1.4%. However the average rate applied to agricultural goods is rather higher at 6.3%. Foreign investment inflows have also increased rapidly, mostly from the region, in both resource (~80%) and non-resource sectors: hydropower, mining, agriculture, processing, and tourism (Record and Nghardsaysone 2009, World Bank 2009). Agricultural production (~50% of GDP) and most manufacturing production (18% of GDP) are now privately owned, while State Owned Enterprises cover only ~1% of employment. Overall, ~97% of manufacturing units are small (less than 10 employees), with 35% of the medium and large firms being privately owned by Lao citizens and 55% joint ventures with foreigners.

Historically, Lao trade has relied on its three big neighbors (Thailand, Vietnam and China). The sheer weight of Thailand in Lao exports is also reflected at the micro level: almost 70% of exporters are linked to Thailand, and close to 80% of Lao product types (at the HS-6 level) make their way there. As can be expected for a resource-rich developing country, its exports are dominated by large yet diversified firms: a large share of exporting is carried out by fairly sophisticated firms, serving six or more destination countries (73%) and selling 30 or more products (67%) (Stirbat, Record and Nghardsaysone 2011).

The garment sector has been a key driver of economic growth since the 1990s. Lately, though, trade in garments has decreased from almost 40% of exports in 2004 to 14% in 2010 due to the relatively slow growth in this sector and the very rapid growth in hydro and mining exports. Raw materials (and in particular copper) dominate by far, raising concerns about excessive concentration of exports which could act as a drag on economic growth and development. The Lao export basket is comparatively unsophisticated and dominated by products with low value addition and few linkages to products with higher value addition, and the country does not appear to be catching up with regional neighbors in terms of export sophistication (Record and Nghardsaysone 2009).

To showcase the skewed nature of Lao exports, they are grouped by destination regions in Table 1: Thailand is destination to 69% of the value over the period in the analysis sample, whereas Asia-Pacific (Vietnam, China, Australia etc.) only 11%. A more “natural” grouping of ASEAN destinations together changes little in the distribution, since Laos’ exports to ASEAN members other than Thailand (including Vietnam) are

relatively small. Aggregated at industry or sector level, the distribution reveals the importance of mineral exports in value, even if they represent only 4% of transactions compared with 52% for textiles.

Table 1 – Distribution of export value by destination region and by sector over the period (in millions USD)

Asia-Pacific		EU		R.O.W.	Thailand
\$201		\$267		\$87	\$1,230
11%		15%		5%	69%
Minerals	Textiles	Agriculture		Wood	Misc.
\$927	\$579	\$151		\$85	\$60
51%	32%	8%		5%	3%

Source: Own calculations based on Lao PDR customs data

In addition to this skewed landscape faced by potential exporting firms, it appears that the economic performance of Lao exporters does not compare well to non-exporters. Moreover, they face a heavier regulatory burden, even after controlling for firm characteristics such as size, ownership and sector. About 20% of manufacturing firms in Laos export some part of their output, but data from a 2009 World Bank enterprise survey indicate that annual value added per worker is much lower for exporters. Similarly, larger firms, which are more likely to have the scale necessary to serve export markets, generate less value addition than smaller firms. This suggests that the domestic market, buoyed by large FDI inflows and investment in construction, offers greater returns than the more competitive export markets, where high production and trade costs undermine Lao competitiveness (World Bank 2011).

To put the characteristics of Lao exports into perspective, the World Bank's Export Dynamics Database provides a useful framework for international comparison (Cebeci, et al. 2012). That analysis shows a high similarity between Laos and Malawi, another small, landlocked, developing economy, albeit without such large and developed neighbors. Overall, Laos is very close to trend on several measures given its GDP, including mean exports per exporter and exit rates. It has higher than average entry and survival rates, but its number of exporters (for its GDP) and of products and destinations per exporter is below average. In conclusion, it can be said that exporting is quite a difficult venture in Laos, in particular for small firms seeking to grow outside the dominant markets and products.

3 The Data

The dataset consists of transaction-level records obtained from the Lao PDR Customs Department reporting all³ legal export and import transactions covering the entire Lao exporter population. The following information is included: the checkpoint used; the form type (for special status, re-exports, tariff exemptions, etc.); the date (year, month, and day); HS 8-digit code of the product (a mix of revision 2002 and 2007 which has been harmonized for the analysis); the export license number and the firm name; the destination (using only a 2-letter code); the unit, amount and weight; and the value in US dollars (USD) and Lao kip (LAK). The analysis uses only the 6-digit HS code for international comparison purposes. Data coverage spans the period from October 2005 to September 2010 – the entire period of 60 months for which Customs have recorded data in this format. The 1138 firms, 668 HS-6 products and 88 destinations in the analysis sample combine to create 5053 FPDs after several manipulations for survival analysis.

Firm names have been discarded for anonymity purposes, and the firm identification is carried out based on export license numbers. This helps the analysis because firm names, recorded in Lao script, can have multiple transliterations and formatting (e.g. including or not the word “firm”, before or after the name) making individual identification by name unreliable. Very small firms or individuals are given a generic code. There are also shortcomings in using the export license number for the identification strategy. The crucial assumption is that licenses are owned by exporting producers and this can be invalidated when the license is in fact used by other entities which are irrelevant for export survival behavior (e.g. brokers, freight forwarders). Moreover, license numbers could be shared by multiple firms because of mergers, splits or for tax evasion purposes. Nevertheless, anecdotal evidence from personal interviews indicates that this is not at all prevalent (personal interview, Laos, 2012).

There are some further limitations related to this type of data. First, since the partner firm is not recorded (only the country is) the data cannot reveal if the contract changes to another firm or if there are multiple partners in the same country. Second is the heterogeneity of contractual arrangements: some firms receive punctual, one-time orders, while others have long-term contracts with a pre-arranged delivery schedule. The data cannot discriminate between these cases, which imply different survival behavior (i.e. in the former, another order is not guaranteed, whereas in the latter there is stronger hysteresis because the contract locks in the partners despite occasional dissatisfactions). Neither one is a serious concern: experience of the kind investigated here is likely to be country- or region- rather than firm-specific, while contractual

³ There are a few exceptions such as electric power, an optional Harmonized System (HS) heading and a significant Lao export, which is not always reported and is excluded.

arrangements are mostly industry-specific and less influenced by the experience and networks of exporters.

Another related limitation involves gaps in monthly export sequences (e.g. firms exporting once every 3 months, or only twice per year): depending on the product, the sector, or even the agreement between firms, there can be considerable heterogeneity in timing (e.g. the seasonality of produce in agriculture⁴). It therefore cannot be concluded that an export contract has been terminated simply because there is a gap. Taking this heterogeneity into account, the importance of the sunk costs related to exporting and the presumed depreciation of know-how and business connections in time, the article follows the literature (Sabuhoro, Larue and Gervais 2006) and assumes that an export spell ceases after a gap of more than 12 months (the robustness of this assumption is tested). Subsequent re-entries are treated as new spells⁵.

In general, export transactions tend to receive less attention than imports because they do not generate revenue. Comparisons with international trade statistics are therefore problematic, especially regarding trade with China and the number of trade partners. Lao PDR does not report directly to UN's Comtrade, and neither does Vietnam, so mirror data from destination countries can be very different. Moreover, improperly encoded re-exports via Thailand can lead to a considerable inflation of trade because so much of Lao's exports are routed through Bangkok. There may also be significant unreported border trade (e.g. smuggling, traditional trade, illegal logging). While product codes are recorded with accuracy by Customs, errors are sometimes evident in the data with regard to the destination country. Even with care, the two-letter code for destination on customs forms leaves room for confusions between China (CN), Switzerland (CH) and Swaziland (SZ) or between Germany (DE) and Georgia (GE).

In order to allay some of these concerns, the data cleaning process accounts for the following irregularities: product codes (missing or non-standard), destinations (excluding exports with non-standard codes or to Laos), firm licenses (missing or with generic codes), and USD transaction values (those with a zero, missing or showing abnormal currency exchange rates). Re-exports have also been excluded (those recorded as such in the data), as have transactions under \$500⁶, which the literature considers samples or gifts of no trade value.

⁴ In fact, the mean gap is highest in agriculture while the shortest is in minerals (3.6 months compared to 2.6 months, statistically different at the 99% level).

⁵ This affects only ~3.2% of transactions or ~8% of FPDs.

⁶ The USD value of all transactions has been deflated using the monthly United States Consumer Price Index (October 2005=100).

4 Empirical Analysis

4.1 Basic Survival Analysis

A first, approximate estimation of survival in Lao exporting can be made by looking at the average or median number of years or months that a firm, a product or a destination are present in the data. Similarly, one can trace yearly cohorts of firms or pairs of firms-products etc. from one year to the next to infer survival rates. These results can be found in Stirbat, Record and Nghardsaysone (2011).

A more thorough analysis must account for the inherent left- and right-censoring of the data: respectively, exports early in the period of observation may have started prior to its beginning, while exports late in the dataset may actually continue past its end. While right-censoring can easily be dealt with by the econometric techniques employed in this paper, left-censored observations cannot be incorporated into the analysis without strong assumptions and have therefore been excluded⁷, as elsewhere in the literature. Based on the definition of an export “death”, the first 12 months from the beginning of the dataset are discarded.

Figure 1 – Non-parametric survival function with 95% confidence intervals. Continuous-time (left) and discrete-time (right) give very similar results.

Source: Own calculations based on Lao PDR Customs data.

A simple analysis can be made using the non-parametric Kaplan-Meier estimator (KME) method used for survival functions with continuous-time data. This estimator incorporates information from all of the observations available, censored and uncensored, by considering survival at any point in time as a series of steps defined by the observed survival and censored times. The equivalent for discrete-time data is the lifetable method, which is more appropriate for this dataset since data are recorded discretely (in months). Defining f_k as the number of failures in interval t_k , N_k as the number of spells at risk of failure (termination) at the start of the interval and n_k as the

⁷ The data that were discarded (18.3% of transactions) were briefly analyzed to ensure that they have similar characteristics in terms of destinations, products, trade volumes etc.

adjusted number of spells at risk of failure at the midpoint of the interval, $n_k = N_k - f_k / 2$, the lifetable estimator of the survivor function is:

$$\hat{S}(t_k) = \prod_{k=1}^{k_{\max}} \left(1 - \frac{f_k}{n_k} \right) \quad (1)$$

Both methods show very similar shapes of the survival function (Figure 1); the slightly different values stem from the different assumptions that go into their calculations (mainly related to whether an exit is tabulated at the end of a time interval or in the middle). This justifies the use of discrete-time methods, which are more appropriate for this dataset, as will be discussed below. The median duration⁸ of export survival for FPDs is between 2 and 3; the equivalent value for firms is 6, a figure vastly inferior to the 20 months survival of Canadian exporters (Sabuhoro, Larue and Gervais 2006), as is expected for developing countries.

The Appendix presents survival functions for several classifications by industry, region of the world and region of Laos; these reveal significantly different survival rates (highest values are found in the textile sector, in trade from the North of Laos and for exports to the EU). This graphic representation of the heterogeneity of survival behavior provides further justification for the type of data structure that is used (the FPD) and the method chosen to identify the relevance level of the network effect (in Section 5.2).

Another interesting distinction that can be made in the data is for the case of re-entries (i.e. FPDs which have been broken up because they experienced gaps larger than 12 months). This is important to the main analysis because of the rather arbitrary definition of what constitutes a death and a re-birth (several definitions are tested for robustness), so it is important to see whether this distinction also makes sense from a survival point of view: are “reincarnations” behaviorally different from their previous lives?

KME survival functions for these re-entries are presented in the Appendix (Figure 5) as compared with the much larger pool of single-entry FPDs. One can observe a strikingly higher survival rate, with a median duration of 11. There can be two explanations for this phenomenon. One is that there is a much lower incidence of termination for mechanical reasons (re-entry happens automatically at a later stage in the observation period and therefore closer to the right-censorship boundary) and this distorts the estimator. Indeed, only ~30% of re-entry FPDs experience death compared to ~59% for single entries. Another explanation, which could be better supported if the

⁸ “Duration of x” is understood as “appearing in the dataset x number of times at intervals of maximum 12 months”. Aggregation and calendars also have an effect: a duration of 2 months can appear as 2 years in yearly aggregations, depending on how the observations are spaced (e.g. first in October and second in January of the following year).

observation period were significantly longer, is that those FPDs which make a comeback have used the time-out to retool the product to better adapt to specifications. This consequently helps them achieve longer-lasting trade relationships that explain their superior median durations.

4.2 Research Hypotheses

Identifying determinants of export survival and assessing their relative impact is important for understanding export dynamics in different economic contexts and can also be a useful tool for policymakers to properly target export promotion activities. In what follows, the various hypotheses about export survival determinants will be outlined along with the variables used to investigate them.

The experience of firms is expected to matter a great deal when it comes to surviving in export markets (Albornoz, et al. 2011, Cadot, et al. 2010, Carrere and Strauss-Kahn 2012). In order to identify precisely what types of experience are beneficial, several proxy variables are constructed from the dataset using counts and sequencing, as outlined below: experience with products and destinations, with importing, and with Thailand. These variables are either static (remaining constant for the duration of a spell) or time-varying (changing every month or every year) – this flexibility is one of the strong features of duration models.

Experience with products and *experience with destinations* are categorical variables that identify FPDs whereby the firm has already sold the very same product or exported to that very destination in another export spell, respectively. This would be expected to increase the odds of survival because the firm has already acquired experience with that product or market. This experience would be highly relevant for the new market it enters with an old product or for the new product it introduces to an old market (or, in a few cases, a reintroduction after more than 12 months, because of the adopted definition of death). In the dataset only ~34% of FPDs benefit from prior experience with the product (meaning, conversely, that two thirds involve products which are new for the firm, at least in the observation period) and ~51% from prior experience with the destination.

Complementing prior experience, which is a static concept, one can also quantify the *familiarity with the product* and *with the destination*. These are continuous variables that count cumulatively for a given month: the number of destinations a firm is selling a specific product to; and the number of products that a firm is selling in a market, respectively. Both are expected to have a positive impact on chances of survival because they are proxies for the level of success and expertise a firm has with exporting (Cadot, et al. 2010). In the dataset, only ~14% of firms sell the same product to more than one destination (up to a maximum of 11 destinations for the same product) and ~24% sell

more than one product to the same destination (up to a maximum of 17 products to the same market).

It is also important to study a variable that captures a firm's *experience with importing*. This variable is constructed from Customs import data, in which several of the firms have been matched (only a third of firms have no import experience, and there are three times as many importers as there are exporters). This categorical variable identifies transactions of the firm which have been preceded at any point in time by an import. It further defines if this prior import experience was with the same destination to which the FPD is exporting or with another. The expectation is that exporters that are also engaged in importing would have established trade connections outside the country, acquiring savoir-faire with international transactions and international quality standards, and possibly building a reputation for reliability. Additionally, it can be argued that imported inputs can be cheaper and more technologically advanced than domestic products (J. Wagner 2011). In the particular case of Laos, a small and non-sophisticated economy, domestically produced or traded inputs might simply not exist. Nevertheless, there is still ample scope for such an effect. Anecdotal evidence attests this: for example, a very successful exporter chose to import cardboard boxes for packaging directly instead of buying local to avoid certain taxes (personal interview by Stirbat, Vientiane, Laos, 2012).

The research hypothesis is therefore that having *import experience* is beneficial for the odds of survival. Furthermore, in cases where the imports come from the same country as the export destination of a firm's product, this experience should be more relevant for survival, at least to the extent that this would entail a better knowledge of that particular market.

Lastly, the firm's *prior experience with the product in Thailand* is a dummy variable which identifies FPDs for which the firm has sold the product in Thailand before anywhere else. Some theoretical models assume that firms learn fully about their profitability in export markets by entering a relatively easy one first. Thailand appears to be launch market for ~53% of the firm-product pairs compared with only 17% for the second largest launch market, the EU. Given the strong cultural ties between the two neighbors, the expectation is that many Lao exporters first test their products in Thailand. Moreover, Lao PDR is landlocked and depends on overland access through Thailand to most shipping routes. This would give them an easy stepping stone to other export markets and lead to more sustainable export relationships afterwards.

Trade networks are the other potentially important determinant of export survival which is analyzed in this article. They can take the form of regional agglomerations which help local firms start exporting to a given market (Koenig 2009) or centralized export promotion agencies (Volpe and Carballo 2008). Social and business networks in general can assist with matching international buyers and sellers (Rauch and Watson

2003, Cadot, et al. 2010). They often go beyond just signaling, which then attracts others to a profitable business. This is in itself a useful information spill-over – in these cases, pioneers are trailed by followers which can often prove more successful (Wagner and Zahler 2011). In this article, the focus is on their impact on assisting exporters to stay in a market rather than entering one. Networks are expected to facilitate the diffusion of information about technical requirements and standards, best practices in shipping or packaging, financial arrangements or product preferences at destination.

The guiding hypothesis here is that the more specific the inferred network the more likely it is to be an actual network, and the more relevant the information contained and shared by it will be. One important consideration is that it is not possible to distinguish between the negative effects of competition for export contracts and the positive effect of sharing information and one can only observe the net effect. The former, however, is likely to be minimal for Lao exporters, again because of the small size of its economy and the modest capacity of its industries making it hard for Laos to saturate foreign demand.

Peers is a continuous variable which counts the number of Lao firms that export the same product to the same destination. It is a flexible concept, which can be constructed at many different layers of geographic, product or time aggregation. This is, of course, only a proxy, since one infers network behavior from an observed agglomeration of firms. The assumption that they actually interact is supported, however, by the small size of the Lao population and economy, meaning that entrepreneurs are concentrated in a few areas and are likely to be socially engaged. Anecdotal evidence also confirms this: successful exporters tip others about interested importers in a particular country who still have unmet demand and would be willing to consider a Lao company as trade partner (personal interview by Stirbat, Vientiane, Laos, 2012). In around 80% of FPDs, though, there is only one firm per HS-6 product per month in the country.

One can further refine the concept of peers in the context of international markets, under the assumption that there are transferrable skills, in particular for trading blocs such as the EU. The same can be done to account for domestic regional aspects. This is done by inferring the home province of an exporter from the province in which export transactions were registered: 90% of firms export from only one province and only 9% through two or more. In the analysis subsample, there are 11 provinces that register exports, with Vientiane (the capital) accounting for ~68% of transactions and Savannakhet, in second place, with ~10%. Moreover, the specificity of the particular industry can be modulated to extend the concept of a network to the number of firms active in a certain HS-4 product category or even a more loosely defined sector. Several such refinements will be investigated to identify the most relevant level of definition, and these broader definitions of the variable *peers* are expected to be less influential than its most specific form because they would encapsulate less relevant information.

To exemplify the various possible specifications of *peers*, in January 2010 there were 63 firms exporting corn to Thailand, and in August and September 2009 there were 6 firms selling jerseys to the UK, while in February 2009, there were 10 firms in the province of Bolikhamxay (central Laos) which were exporting wood strips (anywhere), 30 which were exporting to Vietnam (anything) and only one firm that did both (i.e. export wood strips to Vietnam).

Besides exploring the main determinants of interest in this work (i.e. experience and networks), other variables are included which have been shown to impact survival in other research and could help control for spurious correlations. Here we seek to verify their applicability to the context of a small, landlocked economy. One such variable of interest that has been investigated in the literature is the *initial value* in the first month of activity of FPDs. This has been considered a proxy for the level of confidence that a firm has (Besedes and Prusa 2006b): if a firm knows its product well, or if the customer is confident the relation will be durable, this value will be high. Although in the dataset this is heavily skewed towards the lower threshold of \$500, there are a few instances of high initial values (up to \$17 million) which are mostly in textiles and mining.

The *revealed comparative advantage* (RCA)⁹ in making a particular product is a time invariant indicator variable which has value 1 where $RCA > 1$ and 0 otherwise. It should have positive impact on the odds of survival given that RCA is a proxy for tested national champions (Persson 2008). Laos had an RCA in 2007 (the latest data that was readily available) for 105 of the 668 products it exported during the observation period. The inclusion of this variable is particularly important for the network hypothesis, because agglomerations of exporters could also be due to the country having a comparative advantage in certain sectors. If the network effect holds even after controlling for RCA, its importance could be more clearly attributed to actual knowledge spillovers and information diffusion (Cadot, et al. 2010).

The analysis also includes the usual gravity-type determinants¹⁰. The *distance*, weighted by population densities, between Laos and its trading partners has been introduced in logarithm and comes from CEPII (Mayer and Zignago 2011). It ranges from ~630km (Thailand) to ~18200km (Chile). As in the general literature, remoteness is expected to increase the hazard rate because of various impediments associated with trading over large distances, such as trade costs and the cost of maintaining a partner.

⁹ RCA is $(x_i / \sum_i x_i) / (x_{iw} / \sum_i x_{iw})$, where x_i represents the country's export of good i and x_{iw} represents the world's export of good i . The ratio of a product's export shares in the country and in the world is taken as a proxy for the comparative advantage that the country has in the production of that good: the higher the value, the more the country is believed to have an advantage (Beltramello, De Backer and Moussié 2012).

¹⁰ Usual determinants such as common language or colonial links are not relevant here, whereas contiguity is not important in the case of two of the five neighbors of Laos for various reasons (there is almost no recorded trade with Cambodia and Myanmar).

Variables related to the *wealth of destinations* (GDP and GDP growth, both introduced as log, and GDP per capita) have been collected from the World Bank or from national statistical offices (e.g. Taiwan, China) and change every year (this allows us to control to some extent for agglomerations due to import booms at certain destinations generated by high GDP growth rates). The expectation is that large markets are likely to have a larger number of buyers and therefore increase the chance of finding a suitable match and a sustained relationship (Brenton, Saborowski and Uexkull 2009). Moreover, developed countries with affluent citizens can be expected to have stricter quality criteria (private and public standards) that will significantly increase the sunk cost required to enter them, thereby making exits less likely once these sunk costs have been paid. Lastly, growing markets will provide more opportunities to sustain trade for longer.

The competing risks analysis seeks to compare the impact of the variables outlined above on the hazard rates for exit from exporting to either an upgrade to a superior contract or a termination of the FPD without upgrade. Such a framework exploits the heterogeneity of contract terminations and is therefore a valuable extension of the single-destination model universally employed in the export survival literature. Ending a contract is not desirable, but there are, however, occasions when FPDs deaths are in fact transformations: a customer can start demanding a superior product and terminate orders for the current one.

The concept of upgrading is common in the firm portfolio and export diversification literature (Cirera, Marin and Markwald 2012). Competing risks analyses have also been made of firm exits from the market by liquidation or acquisition (Esteve-Perez, Sanchis-Llopis and Sanchis-Llopis 2010) and on the choice of export market between developing and developed destinations (Pisu 2008). While preserving the FPD for as long as possible is an obvious business strategy and policy goal, instances when the product exported to a particular destination is replaced by a superior one should be equally desirable, if not more.

A product upgrade can be requested by importers if their quality requirements have been met for simple products, or if they become satisfied with the reliability of the exporter for products which are less time-sensitive. The partners can choose to continue trading the inferior product as well (the two continue simultaneously), but in cases of actual upgrades, there may be little reason to continue wasting limited production resources on a basic or less profitable product, which may have been useful only as a signaling strategy. Example of such upgrades could be an export of raw wood replaced by exports of furniture, or plain shirts replaced by embroidered ones.

For the purpose of the current paper, upgrading is a re-coding of a subset of “deaths”. It identifies cases when another contract is started by the firm to the same destination after the end of the current one (but not later than 12 months in order to be

consistent with the definitions in use) for a product with a higher *PRODY*¹¹ as a continuous measure of product sophistication (Cirera, Marin and Markwald 2012). An alternative definition (to support the robustness of the concept) is for a contract with a higher *average selling price* (adjusted for weight) of the product in the subsequent FPD. These two definitions were chosen over others, such as the technological content sophistication index from the OECD, because they are continuous and therefore allow for a finer level of analysis.

The expectation is that some of the experience variables will support upgrading over simple terminations (while still helping to reduce the hazard rate of death). For example, having already had experience with a destination or being very familiar with it would help sustain an export overall, and in the event of termination, make an upgrade more likely. This could be because the trust levels between traders have already been raised by a repeated interaction and the reliability of the Lao exporter was rewarded with the subsequent contract. Moreover, having a large number of peers could act as a “trap”, whereby the network would help a firm’s contracts survive but prevent it from upgrading through peer pressure that drags it back into the norm. Still, other variables could prove irrelevant for the death vs. upgrade choice model, and in such cases the coefficients would be indistinguishable (i.e. the two effects would be symmetrical).

4.3 Estimation Strategy

The use of duration models is well suited for a multivariate analysis of survival and its determinants. As discussed above, the analysis is run on an arrangement of the data into export units, which consist of monthly aggregates of firm-product-destination triplets (i.e. FPDs). This arrangement has already been used in the literature (Cadot, et al. 2010, Tovar and Martinez 2011), and allows for a simpler and more detailed analysis of various firm-, product- and destination-specific characteristics than using the firm as the export unit (akin to a micro versus macro perspective). The policy focus of this kind of arrangement is on the survival of “contracts” rather than exporting firms.

It has been common to use continuous-time duration models, and in particular the Cox proportional hazards model, to evaluate determinants of export survival. As shown theoretically and empirically (Hess and Persson 2011a) this is not appropriate for three

¹¹ PRODY is the weighted per capita income of the countries that export a specific product (Hausmann, Hwang and Rodrik 2005). *Ceteris paribus*, “an economy is better off producing goods that richer countries export”. Since a core determinant of income levels across countries is the relative productivity of workers, rich countries should, on average, export products with higher value addition. Hence the measure of PRODY is a useful proxy, albeit with limitations, for the value gained from producing and exporting different goods. The values used are World Bank averages for 2000-2004. For example, raw cotton has a PRODY of 530 while electronic microcircuits have 11,907.

major reasons. First, with so many tied observations (i.e. spells of the same length), the Cox model can lead to biased coefficients and standard errors.

Second, it is difficult to control properly for unobserved heterogeneity (or frailty), even when using stratified Cox models (i.e. systematic differences may remain in the distribution of durations across units of observation even after conditioning on observed explanatory variables). Not accounting for it can lead to spurious duration dependence: the degree of negative (positive) duration dependence in the hazard is over-estimated (under-estimated) due to a selection effect. For example, with negative duration dependence, high frailty individuals finish the spell more rapidly. Then, as time goes by, a higher proportion of individuals with low frailty remain in the sample, which implies an artificially lower hazard. Moreover, positive (negative) regression coefficients are under-estimated (over-estimated).

Third, the Cox model makes a restrictive assumption about proportional hazards (PH), which is unlikely to hold empirically. Articles that do not use the Cox model tend to use a discrete-time complementary *log log* model (cloglog) instead, but this makes the same questionable assumption of PH (see Figure 5 in the Appendix for a visual proof that PH is violated in this dataset). Hess and Persson (2011a) therefore recommend using discrete-time durations models with proper controls for unobserved heterogeneity. The analysis focuses on a random effects discrete-time logit model with log of time¹², while also presenting Cox and logit model regression results for comparison.

In a discrete-time framework, the core of duration analysis is formed by the probability that a particular trade relation terminates in a given time interval $[t_k, t_{k+1})$, $k = 1, 2, \dots, k_{\max}$ and $t_1 = 0$, conditional on its survival up to the beginning of the interval and given the explanatory variables included in the regression model (described in Section 4.2). This conditional probability is termed the discrete-time hazard rate and formally defined as:

$$h_{ik} = P(T_i < t_{k+1} | T_i \geq t_k, x_{ik}) = F(x_{ik}'\beta + \gamma_k) \quad (2)$$

where x_{ik} is a vector of possibly time-varying covariates, γ_k is a function of (interval) time that allows the hazard rate to vary across periods, and $F(\cdot)$ is an appropriate distribution function ensuring that $0 \leq h_{ik} \leq 1$ for all i, k . In this article, the subscript i denotes separate export spells ($i = 1, \dots, n$) for a given FPD. With the software package Stata, this is implemented using the *logit* routine on a binary dependent variable taking 0 in censored cases and 1 in the last month of activity. The unobserved

¹² Results, not presented here, show almost no change in coefficients regardless of how the baseline hazard is specified in terms of time in the regressions: linearly; as logarithm; with second order terms; or in the most flexible fashion, by means of dummy variables, which enables the estimation of period-specific intercepts and unrestricted period-specific changes in the estimated hazard rates (Hess and Persson 2011b).

heterogeneity models, implemented with *xtlogit*, use a normally distributed random effect, whose variance is interpreted as the variance between individuals that is due to unobserved time-invariant characteristics, i.e. residual variance.

The analysis for the independent competing risks model is analogous to that for the single-risk or single-“destination” model (i.e. terminating the export contract): one needs to include a second “destination” (i.e. termination by upgrading the contract). In a discrete time framework, the two hazards are separable and the models for different “destinations” can be estimated independently. In the discrete time framework this is no longer the case, but with the simplifying assumption that transitions can only happen at interval boundaries (i.e. contracts only finish at the end of the month), an easy estimation can be made with a multinomial logit (Jenkins 2005). In Stata, this is implemented using *mlogit*; the dependent variable takes 0 in censored cases, 1 if the contract terminates but is not upgraded and 2 if there is a subsequent upgrade.

5 Results

This section presents the regression results of the duration models explained above. Results are reported throughout this section as odds ratios (exponentiated coefficients). In this format, a coefficient greater (smaller) than 1 identifies a positive (negative) effect of the covariate on the hazard rate (i.e. the risk of experiencing the event, in this case termination of an FPD). A value equal to one means there is no effect on the hazard rate. The interpretation in the case of multinomial logit regressions is similar. There, the ratio of the probability of exit to destination A (termination without upgrade) to the probability of no exit at all (censored data, or continuation), is $\exp(\beta_A)$, with an analogous interpretation for destination B (termination with upgrade).

5.1 Main Model

Table 2 presents the main results of the survival analysis in several steps. The first three models, the main focus of the analysis, are logistic regressions with random effects (RE) accounting for unobserved heterogeneity, or frailty. They are nested as follows. Model (1) looks at the impact of experience variables; then (2) adds the chosen variable for the network effect, *peers* (defined as the number of firms in a province selling the same HS-6 product to the same country in the same month); model (3) adds the set of additional variables whose impact we seek to confirm and control for. In a second stage, (4) and (5) show the results of a simple logistic regression without frailty and a Cox proportional hazards model to assess the extent to which the estimation strategy affects the results (i.e. how much of a problem frailty is and how important is the use of discrete-time specifications over a continuous-time PH model).

The experience variables are consistently increasing the odds of survival in all models (meaning they reduce the risk of experiencing death). This supports the main hypothesis that trade spells of experienced exporters have higher chances of survival. Some of the coefficients are not significant in (1), but they gain in significance in subsequent models. Between (1), (2) and (3), the coefficients tend to remain similar, but there are some differences: as one adds variables, the impact of prior experience with product and destination is strongly increasing (i.e. they get farther away from 1). Overall, the strongest effect is from prior experience with the product: having already sold the product in a previously started contract decreases the odds of termination by between ~32% and ~61%. Interpreted another way, this result shows that launch destinations or launch products for a firm are likely to end sooner than those already confirmed. Familiarity is a continuous variable, so its effect is still strong despite the smaller coefficient: for example, selling the product to an additional destination decreases the odds of death by 0.5-0.9%. Having sold the product first in Thailand before anywhere else also decreases the hazard, pointing towards the interpretation hypothesized here, that exporting to familiar destinations first is a helpful learning experience, a first step up the ladder of international trade.

When it comes to destination related experience, the effects are significant but of a smaller size. Having already sold in a certain market and selling the same product to many markets both decrease the hazard rate. The differences from the corresponding product experience and familiarity are large, and this suggests that products are more relevant to a contract's survival than the (number of) markets in which the firm sells them. Firms which export to more markets may have more information about a product and its demand, and are making better choices for additional destinations. Alternatively as has been suggested in the literature (Cadot, et al. 2010, Volpe and Carballo 2008) the number of markets served by a firm with a certain good captures that good's quality and therefore such contracts are more likely to endure. This is mixed news for Laos, which only serves ~90 markets: while it may be less important to know a market well, it is still less risky to sell your product in a new market than to introduce new products to old ones.

An interesting finding is the small impact of experience with imports from the same country compared to importing from other partners. The reverse effect was hypothesized, based on the intuition of a higher relevance of experience gained from trading with the same country. One potentially confounding influence that could account for this puzzling result is the prevalence of Thailand both as a destination for exports and as a source of imports (even more so), in which case the variable would be a "Thailand effect". This influence is confirmed in Table 6: when looking only at exports outside of Thailand, the relative size of the two coefficients is as expected.

The impact of *peers* is also significant and does not change much between models. Having another peer decreases by about 9-10% the odds of termination. Here we use the most specific formulation of the network variable (counting only peers from the same province, in the same month, exporting exactly the same HS-6 product to the same country). The relevance of this choice is further explored in the following section, but already the main hypothesis of a positive impact of networks on the odds of survival is confirmed.

The results in Table 2 also confirm expectations for the additional set of variables. Exporting to a destination with a higher GDP or GDP growth decrease the odds of termination, as does having a high GDP per capita (and the latter to a larger extent). Moreover, long-distance trade links are detrimental (the coefficient is higher than 1). Having a national RCA for a particular product is marginally helpful in sustaining contracts, but this coefficient is indistinguishable from 1. Nevertheless, its inclusion leaves the *peers* coefficient almost unchanged, suggesting that the network effect goes beyond comparative advantage differences and can therefore be more clearly interpreted in terms of knowledge flows.

Starting off with a high initial value is also very important, an effect which has been interpreted in the literature as a measure of the firm' confidence in the success of its strategy. Furthermore, in an analysis not presented here which follows Brenton, Saborowski and Uexkull (2009), it is also found that the initial-value effect disappears around the US\$ 50000 threshold (i.e. it is not significant for exports starting higher than this, perhaps because this is the level at which raw materials start to take up a larger share of transactions).

Table 2 – Exponentiated coefficients for the full model with three types of specification

	RE logit			logit	Cox
	(1)	(2)	(3)	(4)	(5)
Firm sold prod. in TH first	0.825***	0.809*	0.795**	0.857**	0.901**
No prior importing (ref)	1	1	1	1	1
Prior imports other dest.	0.922	0.827***	0.767**	0.806***	0.882**
Prior imports current dest.	0.959	0.916*	0.913*	0.840**	0.917
Prior experience w. prod.	0.677***	0.653***	0.382***	0.595***	0.703***
Prior experience w. dest.	0.820***	0.751***	0.586***	0.750***	0.823***
Familiarity with prod.	0.954***	0.945***	0.910***	0.946***	0.961***
Familiarity with dest.	0.997	0.994**	0.979***	0.990***	0.993***
Peers		0.911***	0.894***	0.905***	0.931***
RCA			0.935	0.988	0.990
Log of pop. weighted dist.			1.340***	1.179***	1.107***
Log of initial value			0.858***	0.922***	0.950***
Log of dest. GDP			0.931	0.957*	0.978

Log of dest. GDP/capita			0.743***	0.706***	0.801***
Dest GDP growth			0.812***	0.890***	0.927***
N	13986	13986	11706	11706	10706

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Source: Own calculations based on Lao PDR customs data. The time dependence of the hazard is introduced as $\log(\text{time})$ in all models.

Finally, comparisons between the RE logit models (1)-(3) and the logit and Cox in (4) and (5), respectively, reveal small but statistically significant differences which go in the expected direction. One can observe an important effect from unobserved heterogeneity when comparing models (3) and (4): the positive (negative) coefficients are indeed underestimated (overestimated), just as expected. Generally speaking, logit and Cox models should return very similar effects – this is observed in the analysis.

Moreover, to ascertain the importance of the unobserved heterogeneity, Stata calculates a likelihood-ratio test on the hypothesis that the proportion of the total variance contributed by the panel-level variance component is zero. In all the RE models this hypothesis is strongly rejected, confirming the importance of taking frailty into account. This finding agrees with other research which has revealed significant unobserved heterogeneity in similar data (Brenton, Saborowski and Uexkull 2009, Rondinelli and Nicoletti 2009, Hess and Persson 2011b) but conflicts with the minority view that it is not a concern (Esteve-Perez, Sanchis-Llopis and Sanchis-Llopis 2010).

5.2 Investigating Network Effects

Networks create positive externalities by allowing members to share in the experiences of others for their own benefit. If what is counted in this paper as *peers* (the number of other firms with similar characteristics) actually forms a true network, then the level of aggregation should matter for the specificity of the benefits drawn from it (information on certifications, on business practices, on quality checks, on shipping and packaging etc.). Consequently, as the network is measured more specifically, its influence should be larger¹³.

Table 3 - The four dimensions of aggregation along which network specificity is explored

Origin	Product	Destination	Time
province	HS-6	country	month
region	HS-4	region	year
Laos	sector	world	

In this section we investigate in further detail the impact of the variable by looking into the specific levels of aggregation that matter most. We construct these parallel

¹³ It should be reminded that the impact of *peers* is the net of the negative effect of simple competition among peers and the positive effect of having networks of peers.

definitions of the network in the following way. The core and reference is the most specific one, also used in the preceding section (i.e. peers in the same Lao province, exporting the same HS-6 product to the same country in a particular month). Each of the four dimensions involved has a corresponding layer of aggregation and specificity: geographical, sectorial, destination and temporal. We explore each with reference to the most specific level (see Table 3). To take an example: we compare the impact on survival of having peers in one's province (same HS-6 product to the same destination in the same month) to that of having peers in one's region but outside one's province and to that of having peers in the country but outside one's region. Similarly, for time, we compare the impact of having peers in a certain month (same province, same HS-6 product to the same destination) to that of having peers in the same year but in other months. A “placebo” is also constructed to count peers selling any product to the same destination. One expects this to be much less important for survival than product-peers, because information is assumed to travel via the product channel, not the country channel. Such an arrangement allows us to pinpoint the most relevant level at which networks function and to confirm some intuitive results.

Table 4 compares the coefficients of the various definitions of *peers* in the same full RE logit used in Table 2. For ease of use, it groups together the layers of aggregation mentioned above under the four dimensions in Table 3. Moreover, models (2) and (3) also introduce controls at the same layers of aggregation to estimate, in (2), a specification with fixed effects for Lao region, world region, sector and year fixed effects, and in (3) a specification with fixed effects for Lao province, country, HS-2 product and month.

Table 4 – Comparison of the coefficient on “peers” for different levels of aggregation

	RE logit		
	(1)	(2)	(3)
peers (same province, HS-6, dest. and month)	0.928***	0.915***	0.959**
peers <u>from</u> own Lao region (outside own province)	0.947	0.963	0.980
peers <u>from</u> all of Laos (outside own region)	1.002	1.012	1.015
peers <u>to</u> region of world (besides dest. country)	0.982*	0.981	0.964
peers <u>to</u> entire world (besides dest. region)	1.020	1.004	0.962
peers <u>in</u> HS-4 (outside own HS-6)	1.021	1.027*	1.045*
peers <u>in</u> sector (outside own HS-4)	0.995	1.003	1.001
peers <u>over</u> year (other than current month)	0.989	1.002	0.966
peers to same dest, any product (<u>placebo</u>)	1.001	0.999	0.998
<i>Controls sector, Lao region, dest. region and year</i>		<i>yes</i>	
<i>Controls HS-2, Lao province, dest. country and month</i>			<i>yes</i>
N	13986	9881	8454

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Source: Own calculations based on Lao PDR customs data. Model (2) includes controls for sector, Lao region, world region and year. Model (3) includes controls for HS-2

product, province, destination country and month. The time dependence of the hazard is introduced as $\log(\text{time})$ in all models.

First off, one can notice that although the various variables have somewhat similar coefficients, only the coefficient of the reference *peers* is statistically significant throughout all three models, the size changing only slightly. What also comes out is the irrelevance of the “placebo” (regional peers selling any product to the same destination). In Laos, as elsewhere, firms are formally associated in (sometimes compulsory) trade groups such as The Association of Lao Garment Industries or the Lao Coffee Association (Arnold and Ksoll 2012), but not in “export destination associations”.

Still, one has to keep in mind the scale of the Lao economy, meaning that certain “socializing” does occur even among seemingly unrelated businesses and outside formal institutions. Therefore, this channel’s influence will not be completely absent. In fact there is significant heterogeneity when looking at different sectors: the “placebo” impact exists in agriculture and the wood industry (though always very small), but is generally indistinguishable from 1. This result also reinforces the interpretation of *peers* as a network measure and not simply a proxy for prevalence (and therefore suitability) of Lao products in a particular country (similar to a national brand effect).

Furthermore, one can note a negative effect in several cases (i.e. an increase in the odds of death from a coefficient larger than 1), but these tend to be statistically insignificant. The exception is the impact of peers in the same HS-4 product group outside one’s own HS-6. This remains small and significant despite adding the controls, and could be interpreted as indicative of a mild competition effect from producers of substitutes or related but not entirely similar products. The HS-4 is also the product aggregation level at which formal trade associations (mentioned above) tend to be formed, and therefore this finding could have potential policy implications as to their usefulness.

Moreover, a gradient is noticeable within the geographic dimension: as the level of specificity decreases, so does the impact (i.e. peers from one’s region are slightly less relevant than peers in one’s province, while the national-level peers have no impact). This gradient is also found when analyzing individual sectors: for example, in agriculture, the difference in coefficients is smaller than in textiles, meaning that the inferred spill-overs travel further. Likewise, there is a slight decrease in the impact of “peers” when aggregating destinations into blocks of countries. Within the chosen grouping (see Table 1), the assumption is that information about one’s specific market, say the UK, would be more beneficial than general information about the EU. The effect is identified but is rather small (it is highest in the wood sector). Nevertheless, such gradients are not properly verifiable because of the overall lack of statistical significance of the coefficients.

Overall, one may conclude that networks, as constructed and interpreted in this paper, are all about specificity. The fact that the province is the most relevant layer favors an interpretation of spill-overs as being informal rather than institutional (the associations are national and there tend to be only few province-level activities). Moreover, the temporal specificity points to a potentially time-sensitive nature of the information embedded in such networks – it appears to be more relevant to an export’s survival whether the firm’s peers were active that same month than if they were at any other time in the same year. Lastly, the product specificity is indicative of the level of detailed knowledge which is required in order to be successful overseas.

5.3 Competing Risks Model

As outlined before, the end of an FPD is not a desirable outcome for the firm, and policy is interested in prolonging it for obvious reasons. There are, however, occasions when an FPD is not merely ending but rather transformed into something better: a customer can start asking for a more complex product and terminate orders of the current one. The introduction of the concept of evolution, rather than death, naturally lends itself to a competing risks analysis. Table 5 presents the results for a three-choice, multinomial model: continue exporting (censored observations), terminate, and terminate by replacement with an upgrade. Both models replicate specification (4) which was presented in Table 2¹⁴. Model (1) defines upgrades as subsequent FPDs by the same firm to the same destination with a higher PRODY, whereas model (2) provides an alternative definition: the subsequent FPD must involve a product with a higher average selling price (adjusted by weight).

The coefficients report a change in the odds of experiencing the particular event (death or upgrade) with respect to the reference category, which in both cases is “continuation”. One can see that the variables of interest affect the choice differently in the majority of cases. In the few instances where the difference in coefficients is not statistically significant (as indicated by the column *diff* in each of the two models) this is attributable either to the effect being the same (rendering the choice irrelevant) or to a low statistical significance in one or the other of the two outcomes. The two models for the two definitions of upgrades (PRODY and price) paint a similar picture despite these definitions being very different. This can be interpreted as a sort of robustness check for the choice model and its construction.

The sign of the impact tends to be the same for both outcomes (death and upgrade), an effect which is akin to a “trap” or a “gilded cage”, whereby survival is enhanced but upgrading is stifled. In particular, this is true for the coefficients of *peers*, where one interpretation can be that peer pressure acts as a deterrent to change. Also, familiarity

¹⁴ Taking unobserved heterogeneity into account is not possible with *mlogit* in Stata.

with the product, whereby the information that the firm sells the same product in many other markets would not be relevant to an importer interested in an upgrade as a way of establishing trustworthiness.

Table 5 – Competing risks model with upgrade defined by PRODY (1) and average price (2)

	(1)			(2)		
	upgrade by PRODY			upgrade by avg. price		
	death	upgrade	diff	death	upgrade	diff
Firm sold prod TH first	0.93	0.71***	-	0.918	0.79***	-
No prior importing (ref)	1	1		1	1	
Prior imports other dest.	0.77***	0.90	***	0.86	0.83**	-
Prior imports current dest.	0.74***	1.03	***	0.70***	0.92	***
Prior experience w. prod	0.65***	0.49***	***	0.59***	0.53***	***
Prior experience w. dest.	0.56***	1.47***	***	0.41***	1.42***	***
Familiarity with prod	0.95***	0.92***	**	0.95***	0.93***	**
Familiarity with dest.	0.98***	1.07	**	0.85***	1.08	***
Peers	0.92***	0.87***	**	0.91***	0.88***	**
RCA	1.06	0.87	-	0.75**	1.25*	***
Log of pop. weighted dist.	1.22***	1.02	***	1.28***	1.01	***
Log of initial value	0.92***	0.93***	***	0.98	0.88***	-
Log of dest. GDP	0.99	0.88***	-	0.99	0.91***	-
Log of dest. GDP/capita	0.69***	0.75***	***	0.67***	0.80***	***
Destination GDP growth	0.90***	0.88***	***	0.89***	0.89***	***
N	11706			11706		

*Exponentiated coefficients. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Source: Own calculations based on Lao PDR customs data. The time dependence of the hazard is introduced as $\log(\text{time})$ in all models*

One exception to the “trap” effect is the prior experience with destination: having already sold a product on a certain market in the past increases the odds of experiencing an upgrade by ~40%. Firms which know well a destination and whose reputation is established with a particular partner are more likely to be awarded an upgraded contract, as hypothesized (a “springboard” effect). The same effect is seen for RCA, but only in model (2) and with a lower level of significance.

Another such effect, although weaker, is the impact of familiarity with the destination in both models. In this case, selling another product on the same market not only increases the odds of survival (as was found in the previous section) but also slightly increases the odds of signing up to export a more sophisticated or a more expensive one (or at least it leaves the odds of an upgrade unchanged because the coefficient is not significant). This type of experience can be an accurate proxy for reliability from the point of view of the importer – if the two partners interact repeatedly in many goods they will be more likely to trust each other and extend this interaction to superior products.

However, one can see that having prior experience with a product is largely decreasing the odds of experiencing termination (versus continuation, as expected from Table 2), but it is decreasing the odds of upgrading even more (both are statistically significant). As explained above, this kind of effect may or may not be beneficial: firms which have exported the product in the past will continue exporting it but stand less of a chance of starting to export something superior.

Overall, this exploratory setup of a multiple-exit, competing risks model seems justified by the results. The impact of the variables of interest identified in the main analysis becomes more nuanced when looking at heterogeneity among outcomes (i.e. not all deaths are the same).

5.4 Robustness Checks

The results presented in section 5.1 have been tested for robustness by running the full model from Table 2 with slightly altered specifications. The results of these robustness checks are presented in Table 6 alongside the reference (i.e. specification (3) from the main analysis). The alterations pertain either to a specific assumption made in the analysis or to a particular sub-sample. The model used is the random effects logit since this was judged as the most appropriate one.

Table 6 – Robustness checks on the main specification with five different setups

	RE logit					
	Main	Value >\$1000	No Thailand	Textiles	Death 6 mths	Death 18 mths
Firm sold prod TH first	0.79**	0.86	0.66**	0.80*	1.01	0.77***
No prior importing (ref)	1	1	1	1	1	1
Prior imports other dest.	0.77**	0.75**	0.76**	0.66**	0.92	0.84**
Prior imports curr. dest.	0.91*	0.78*	0.49***	0.66**	0.92	0.85*
Prior experience w. prod	0.38***	0.39***	0.52***	0.36***	0.58***	0.54***
Prior experience w. dest.	0.59***	0.60***	0.64***	0.62***	0.86**	0.73***
Familiarity with prod	0.91***	0.91***	0.94***	0.90***	0.96***	0.94***
Familiarity with dest.	0.98***	0.98***	0.95***	0.97***	0.99***	0.99**
Peers	0.89***	0.83***	0.86***	0.92**	0.98***	0.91***
N	11706	10981	6262	7027	12462	10710

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Source: Own calculations based on Lao PDR customs data. Exponentiated coefficients. The time dependence of the hazard is introduced as $\log(\text{time})$ in all models. All models include the gravity variables, RCA and initial value, but are omitted for clarity.

The first alteration excludes from the sample all monthly transactions which are below USD1000, to ensure that they are indeed commercial transactions and not gifts, samples or personal items. Next is an exclusion of all exports to Thailand (a significant share in the dataset) to isolate the impact of this very large, developed and culturally similar trade partner, where different effects could be at play that are not captured in

this analysis. Textiles are also considered by themselves because, arguably, the textile industry is one of the most mature and sophisticated export sectors in Lao PDR and this is where the experience effects are expected to be strongest – this is indeed what is found (i.e. the diminution of the hazard rate from experience variables is the largest).

The last two specifications look at the impact of changes in the definition of death (i.e. the gap between two consecutive transactions is considered too long for it to be the same contract). The standard in the literature is 12 months (also to account for seasonal exports), but it is also customary to investigate whether the effect holds for 6 or 18 months. A death after only a 6 months break could be too radical because it would exclude, for example, exports of fruit that grow only once a year, or exports of warm clothes to Europe. In fact this alteration produces the most significant change, but even this is quite close to the Main specification.

Overall, the findings are confirmed and therefore strengthened by these checks. The coefficients do change, but not to a large extent, and the significance levels are sometimes diminished as compared to the specification of choice (Main). More importantly, though, the direction of the impact on the odds of termination is not changed in either of these alternate setups.

6 Discussion and Conclusions

This paper has analyzed the exporter population of Laos for the period 2005-2010 at the level of monthly activity of individual firms based on a recent dataset of Customs transactions. Its analysis has focused on the impact of firm experience and network effects on the odds that a trade contract (operationalized as a firm-product-destination triplet) survives in subsequent months. This “micro” approach to export survival (looking at contracts rather than firms) was justified by the higher level of refinement with which such variables could be constructed. The analysis has not looked at changes in investment climate or trade facilitation because the timeframe is small and the data insufficient. Furthermore, investment climate variables are more likely to impact export entry and discovery than survival, although improvements will make it easier for first-timers to acquire experience and enable them to be more reliable, thereby gaining the trust of their partners.

The main tool used for analysis is a discrete-time duration model which accounts for unobserved heterogeneity. This choice of the model and the importance of accounting for unobserved heterogeneity were validated by comparisons with the simpler ones generally used in the literature, and which have several shortcomings outlined in the methodological section. In line with results found elsewhere in the literature, it was also confirmed that the wealth of the trade partner (as measured by

GDP, GDP per capita) and its GDP growth are conducive to longer export spells, while the opposite is true for distance.

Most importantly, the analysis highlighted the positive impact that several forms of “experience” have on export survival, such as: product or destination prior experience or familiarity; experience with importing; and having Thailand as a launch customer for one’s product. Of a similar importance for this field of research is the detailed investigation that was carried out on the impact of trade networks, which this paper has operationalized as the number of peers a firm has according to several characteristics (product, destination, origin and time). Several definitions of networks and peers were contrasted and what was found is that the level of specificity is paramount – the more specifically a network is circumscribed, the higher its impact on survival. The most relevant definition, it was found, is the number of firms in a certain province that are selling the same product at HS-6 level to the same country in the same month. This seems to confirm the hypothesis of a “true network effect” instead of a spurious correlation between long export spells and simple crowds of firms.

In what is probably a first occurrence in the literature focusing on the determinants of export survival, this paper has also proposed a competing risks analysis, whereby the termination of an export “contract” was disaggregated into a death with and without an upgrade (understood as replacement shortly thereafter by a superior product, either with a higher PRODY or a higher average selling price). This type of analysis revealed a differential impact of the variables of interest. It indicated, for example, that experience and familiarity with a destination not only decrease the odds of dying, but also increases the likelihood of upgrades (i.e. a “springboard” effect). We observe the opposite in the case of experience and familiarity with products: while decrease the hazard rate, they also decrease the likelihood of upgrades (i.e. a “gilded cage” effect).

The dissimilarity between these two kinds of experience (product and destination) can be interpreted from the point of view of the partner as two different channels for gathering information about a Lao exporter. If the Lao firm has exported a particular product in the past or exports it to many other countries, the partner would learn that it is good at what it does and would maintain its contract but it would not have information about how this firm would perform if given a harder task (i.e. a superior product). At the same time, if a Lao firm has sold to its partner before or is selling to it a lot of products satisfactorily, it signals trustworthiness and flexibility, thereby increasing the odds of upgrade.

Conversely, a related difference in the impact of experience was found for the main survival analysis (focusing only on death). There, product related experience and familiarity seem to lead to larger decreases in the hazard rate than destination experience and familiarity. This effect has been identified in other developing countries. Volpe and Carballo (2008) report that product-differentiation (here termed destination

familiarity) is more important for export survival in Peru than market-differentiation (product familiarity). They conjecture that this is because a wide destination-base proxies for product quality and that there are rewards to product specialization. A similar effect is found in the case of Colombia (Tovar and Martinez 2011). Unlike these two countries, however, Laos is landlocked and, arguably, has a harder time expanding its range of destination countries – this may mean that the effect is smaller and taking advantage of it more difficult.

Overall, these findings point to several ways in which policy support aimed at exporters could be refined and targeted. Naturally, this strand of literature has argued that a policy focusing only on the support of new exports would miss out on a fundamental aspect of export dynamics, namely the survival of trade once it is set in motion. Nevertheless, a blank check of support should not be given to all exporters. Rather, it appears as if incumbents have a natural advantage based on their prior experience (learning-by-doing), and this must also be cultivated in newcomers.

Helping existing exporters to diversify and build up their credentials is one important follow-up but assisting all those that made the first step might be helping the losers. One easy way to assist with this conundrum seems to be to further facilitate and enhance peer groups like coffee growers' or furniture producers' associations, which educate and disseminate best practices. These best practices can be general, such as the importance of participation in tradeshow, or very specific (such as switching to another type of cloth for shirts). Such a strategy can be a cost-effective way of leveraging the experience of others so as to win the prize of export survival without paying the price of export discovery.

Appendix

Figure 2 - Survival function estimates using the lifetable method by origin

Source: Own calculations based on Lao PDR customs data.

Figure 3 - Survival function estimates using lifetable method by destination block

Source: Own calculations based on Lao PDR customs data.

Figure 4 - Survival function estimates using lifetable method by sector

Source: Own calculations based on Lao PDR customs data.

Figure 5 - The Proportional Hazards assumption, central to Cox models, fails in Lao data because the curves intersect (left). KME for single entry versus re-entry FPDs (right)

Source: Own calculations based on Lao PDR customs data.

References

- Albornoz, Facundo, Hector F Calvo Pardo, Gregory Corcos, and Emanuel Ornelas. "Sequential Exporting." *Centre for Economic Performance Discussion Paper 974, London School of Economics*, 2011.
- Araujo, Luis, Giordano Mion, and Emanuel Ornelas. "Institutions and Export Dynamics." *CEPR Discussion Paper No. DP8809*, 2012.
- Arnold, John, and Christian Ksoll. "Improving Trade Competitiveness in Lao PDR: An Analysis Using TTFA." *The World Bank, Lao PDR*, 2012.
- Beltramello, Andrea, Koen De Backer, and Laurent Moussiégt. "The Export Performance of Countries within Global Value Chains." *OECD Science, Technology and Industry Working Papers 2012/02*, 2012.
- Besedes, Tibor, and Thomas J. Prusa. "Ins, Outs and the Duration of Trade." *Canadian Journal of Economics*, 104, 2006a.
- Besedes, Tibor, and Thomas J. Prusa. "Product Differentiation and Duration of US Import Trade." *Journal of International Economics*, vol. 70(2), pp. 339–358, 2006b.
- Besedes, Tibor, and Thomas J. Prusa. "The Duration of Trade Relationships." In *Trade Adjustment Costs in Developing Countries: Impacts, Determinants and Policy Responses*, by Bernard Hoekman and Guido G. Porto (eds), pp. 265–282. Washington, DC: World Bank, 2010.
- Brenton, Paul, and Richard Newfarmer. "Watching more than the discovery channel: export cycles and diversification in development." *Policy Research Working Paper* (The World Bank), 2007.
- Brenton, Paul, Christian Saborowski, and Erik von Uexkull. "What Explains the Low Survival Rate of Developing Country Export Flows?" *Policy Research Working Paper, WPS 4951, The World Bank, Washington DC*, 2009.
- Cadot, Olivier, Leonardo Iacovone, Ferdinand Rauch, and Denisse Pierola. "Success and failure of African exporters." *World Bank Working Paper*, 2010.
- Carrere, Celine, and Vanessa Strauss-Kahn. "Exports Dynamics: Raising Developing Countries Exports Survival through Experience." *mimeo*, 2012.
- Cebeci, Tolga, Ana M. Fernandes, Caroline Freund, and Martha Denisse Pierola. "Exporter Dynamics Database." *World Bank, preliminary working document*, 2012.
- Cirera, Xavier, Anabel Marin, and Ricardo Markwald. "Firm Behaviour and the Introduction of New exports: Evidence from Brazil ." *IDS Working Paper 390*, 2012.
- Eaton, Jonathan, Marcela Eslava, Maurica Kugler, and James Tybout. "Export growth in Colombia: firm-level evidence." In *The Organization of Firms in a Global Economy*, by Elhan Helpman, Dalia Marin and Thierry Verdier. Cambridge: Harvard University Press, 2008.

- Esteve-Perez, Silviano, Amparo Sanchis-Llopis, and Juan A Sanchis-Llopis. "A competing risks analysis of firms' exit." *Empirical Economics, Volume 38*, 2010: 281-304.
- Esteve-Perez, Silviano, Juan A Manez Castillejo, Maria E Rochina Barrachina, and Juan A Sanchis-Llopis. "A survival analysis of manufacturing firms in export markets." *Communication in XXXI Jornadas de Economia*, 2005.
- Fugazza, Marco, and Ana Christina Molina. "On the determinants of exports survival." *HEI Working Papers 05, Economics Section, The Graduate Institute of International Studies*, 2009.
- Hausmann, Ricardo, Jason Hwang, and Dani Rodrik. "What you export matters." *CID Working Paper No.123*, 2005.
- Hess, Wolfgang, and Maria Persson. "Exploring the duration of EU imports." *Review of World Economics/Weltwirtschaftliches Archiv* doi: 10.1007/s10290-011-0106-x., 2011b.
- Hess, Wolfgang, and Maria Persson. "The duration of trade revisited. Continuous-time vs. discrete-time hazards." *Empirical Economics*, 2011a.
- Jenkins, Stephen A. *Survival Analysis*. Unpublished manuscript, Institute for Social and Economic Research, University of Essex, Colchester, UK. Downloadable from: <http://www.iser.essex.ac.uk/teaching/degree/stephenj/ec968/pdfs/ec968lnotesv6.pdf>, 2005.
- Koenig, Paul. "Agglomeration and the export decisions of French firms." *Journal of Urban Economics*, 66, 186-195, 2009.
- Mayer, and Zignago. "Notes on CEPII's distances measures (GeoDist)." *CEPII Working Paper 2011-25*, 2011.
- Persson, Maria. "Trade Facilitation and the Extensive Margin." *IFN Working Paper No. 828*, 2008.
- Pisu, Mauro. "Export destinations and learning-by-exporting: Evidence from Belgium." *Working Paper Research nr.140*, 2008.
- Rauch, J. E., and J Watson. "Starting Small in an Unfamiliar Environment." *International Journal of Industrial Organization*, vol. 21(7), pp. 1021-1042, 2003.
- Record, Richard, and Konesawang Nghardsaysone. "Export dynamics and diversification in the Lao PDR." *Lao PDR Development Report 2010, The World Bank*, 2009.
- Roberts, Mark J, and James R Tybout. "'The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs'." *American Economic Review, American Economic Association*, vol. 87(4), 1997.
- Rondinelli, Concetta, and Cheti Nicoletti. "'The (mis)specification of discrete duration models with unobserved heterogeneity: a Monte Carlo study'." *Economic*

- working papers 705, Bank of Italy, Economic Research and International Relations Area*, 2009.
- Sabuhoro, Jean Bosco, B. Larue, and Yvan Gervais. "Factors determining the success or failure of Canadian establishments on foreign markets: A survival analysis approach." *International Trade Journal*, Vol. XX, No. 1, pp. 33-73, 2006.
- Stirbat, Liviu, Richard Record, and Konesawang Nghardsaysone. "Exporting from a Small Landlocked Economy: An Assessment of Firm-Product-Destination Survival Rates in the Lao PDR." *Policy Research Working Paper 5695, World Bank*, 2011.
- Tovar, Jorge, and Luis Roberto Martinez. "Diversification, networks and the survival of exporting." *Serie Documentos CEDE, 2011-08, Universidad de Los Andes*, 2011.
- Volpe, Martincus Christian, and Jeronimo Carballo. "Is export promotion effective in developing countries? Firm-level evidence on the intensive and the extensive margins of exports." *Journal of International Economics*, 2008: 89-106.
- Wagner, Joachim. "Exports, Imports and Firm Survival: First Evidence for Manufacturing Enterprises in Germany." *IZA Discussion Paper No. 5924*, 2011.
- Wagner, Rodrigo, and Andres Zahler. "New Exports from Emerging Markets: Do Followers Benefit from Pioneers ?" *MPRA Paper 30312, University Library of Munich, Germany*, 2011.
- World Bank. "Lao PDR - Investment climate assessment : policies to promote growth in the non-resource sectors." Washington D.C., 2011.
- World Bank. "Lao PDR Economic Monitor #14." Washington D.C., 2009.