Staff Working Paper ERSD-2011-03 **Date: 10 March 2011**

World Trade Organization
Economic Research and Statistics Division

ARE YOU EXPERIENCED?
SURVIVAL AND RECOVERY OF TRADE RELATIONS AFTER BANKING CRISES

Cosimo Beverelli
WTO

Madina Kukenova
University of Lausanne

Nadia Rocha
WTO

Manuscript date: March 2011

ARE YOU EXPERIENCED?

SURVIVAL AND RECOVERY OF TRADE RELATIONS AFTER BANKING CRISES

Cosimo Beverelli[†], Madina Kukenova[‡] and Nadia Rocha[†]

Abstract

We examine the impact of banking crises on the duration of trade relations. We also investigate the effect of product-level characteristics, such as the size of exports and exporting experience, and of sector-level financial dependence variables, on the time to recover after a banking crisis. Using highly disaggregated US import data from 157 countries between 1996 and 2009, we first provide evidence that banking crises negatively affect the survival of trade relations. On average, the occurrence of a banking crisis decreases the rate of survival of trade relations by 13 percent. Moreover, we find that both the size of exports and exporting experience matter for recovery of trade relations after banking crises. Sectoral financial dependence has an experience-specific effect. Relations with more experience recover faster in financially dependent sectors. There is instead no clear evidence indicating effects of size heterogeneity, neither in financially dependent sectors nor in non-financially dependent ones. The results are robust and consistent across alternative econometric models.

Keywords: banking crises, financial dependence, export experience, duration models.

JEL classification: G01, C41 and F14.

[†] Economic Research Division, World Trade Organization. Rue de Lausanne 154, 1211 Geneva, Switzerland. E-mail: cosimo.beverelli@wto.org; nadia.rocha@wto.org.
[‡] Department of Economics, Université de Lausanne. E-mail: madina.kukenova@unil.ch.

We would like to thank seminar participants at the WTO Workshop and the European Trade Study Group (ETSG) 2010 conference. We are also grateful to Andrei Levchenko, Logan Lewis and Linda Tesar for providing us data on trade credit dependence measures.

I. Introduction

Survival matters in international trade. Besedes and Prusa (2006a) show that there is a remarkable amount of entry and exit in the US import market. More than half of export relationships last only one year, and 80 percent of them last less than five years. They argue that the inability to maintain export relationships is a reason behind the lack of export growth at country level. Similarly, Brenton, Pierola and von Uexkull (2009) show that poorly performing developing countries, despite having similar rates of introduction of new trade flows, experience much lower rates of survival of trade relations than stronger performing countries. These low survival rates undermine the expansion of export flows. Nitsch (2008) finds that the stability of aggregate trade patterns may mask considerable turnover at product level, with a large number of suppliers entering and exiting the market each year.

The literature on the duration of trade has considered the role of a wide range of product-, sector- and country-level variables in determining survival rates.[1] To the best of our knowledge, there has been no work that estimates how the occurrence of a banking crisis in an exporting country affects the survival of its export relations. The first contribution of this paper is to provide evidence of the quantitative impact of banking crises on trade survival. Using data on product-level exports to the US from 157 countries between 1996 and 2009, we first estimate a duration model *à la* Besedes and Prusa (2004) to study how trade relations are affected by a banking crisis (survival analysis).[2] Banking crises are found to have a negative and significant impact on the survival of export relations.

International trade has been rapidly recovering following a 12.2 percent fall in 2009, the biggest fall in 70 years. The WTO forecasts a 13.5 percent rise in 2010 compared to the previous year.[3] In addition, there is evidence that when recovery occurs it is fast. Descriptive statistics from the sample of product-level export data to the US between 1996 and 2009 indicate that most of the relations that recover after a banking crisis do so within two years (see Table 1).[4]

Since recovery is well under way, it is as important as timely to draw lessons from past crises on the factors that affect the probability of resuming trade relations that have been interrupted by the crisis. Based on the previous evidence, the objective of the second part of this paper is to investigate which

[1] See, among others, Besedes and Prusa (2006b), Besedes (2007), Brenton, Saborowski and von Uexkull (2009), Fugazza and Molina (2009), and Volpe-Martincus and Carballo (2009) for a study using firm-level export data.

[2] The reason to have the US as destination country is that the original trade data we use (from Global Trade Atlas) contains information at the 10 digit level of disaggregation only for trade flows in and out the US.

[3] The World Bank's forecast is 15.7 percent, the OECD's is 12.3 percent.

[4] We have extrapolated all relations that were interrupted at the occurrence of a banking crisis in the exporting country.

trade relations recover first and what distinguishes fast-recovering relations. In particular, we ask whether the product-level characteristics, as opposed to characteristics of the sector they belong to, matter more for recovery.

We use a duration model to examine how the size of export values and exporting experience have an effect on the time to recover after a banking crisis (recovery analysis). We also investigate if certain sector characteristics such as long- and short-term financial dependence have an impact on the time to recover. The empirical literature on growth and finance[5] shows that firms operating in external financially dependent industries rely heavily on bank loans, not only to support their capital investment, but also to promote their export expansion. Therefore, we expect that after a banking crisis the financial sector will decrease, if not stop, its credit operations. As a consequence, the recovery of export relations will be slower for products belonging to financially dependent industries.

Finally, we are interested in whether the impact of sectoral characteristics has a product-specific effect. Thus, we investigate if the interaction between sector level characteristics and either size or experience has an impact on the time to recover. Throughout the paper, we follow some empirical studies[6] in assuming that an individual trade flow represents a firm.

The novelty of our results is that while both size and experience matter for recovery of trade relations after banking crises, experience is more significant in financially dependent sectors. This outcome is consistent with some new empirical literature[7] showing that not all exporting firms are the same. Firms that export for longer periods exhibit certain characteristics that differentiate them from sporadic exporters. In this context, it is intuitive that, independently of size, products that have been exported for longer time will have fewer difficulties in recovering after a negative shock such as a banking crisis.

In addition, the fact that more experienced products enter first in financially dependent sectors is in line with empirical studies on banks' lending behavior such as Petersen and Rajan (1994). They show that firm's age, as well as the duration of its relationship with the financing bank, are an important determinant of the cost of financing. In light of this evidence, it is not surprising that after a banking crisis, when banks are faced with a lack of liquidity requiring them to restrict credit, only well established and better known firms are likely to get access to credit from the banks, being able to cover some of the cost of producing and exporting.

[5] See papers such as Petersen and Rajan (1994), Berger and Urdell (1993), and Nilsen (2002).
[6] See for instance Manova (2008).
[7] This literature includes papers such as Alvarez (2007), Alvarez at al. (2009), Borgersen (2006).

The paper proceeds as follows. The next section discusses some stylized facts around which the survival and the recovery analyses are organized. Section III discusses the data. Section IV presents the estimation strategy. Section V describes the main results on the effects of banking crises on survival. Section VI examines the recovery of trade relations and provides some robustness checks. Section VII concludes and offers some policy implications.

II. Some stylized facts

Survival matters in trade, especially after banking crises

We have collected annual product-level exports, disaggregated at the HS-10 level, from 157 countries to the US between 1996 and 2009. The dataset provides information on the duration of each export relation, making it amenable to survival analysis. In this dataset, on average, 23 percent of trade relations were interrupted by the occurrence of a banking crisis between 1996 and 2008 (see Table 2).[8] The stylized fact that banking crises negatively affect the survival of trade is confirmed by the Kaplan-Meier survival estimates, shown in Figure 1. Trade relations hit by a banking crisis (BC dummy equal to one) exhibit lower unconditional survival rates than trade relations not hit by a banking crisis (BC dummy equal to zero).

Experience matters for recovery

Experience, defined as the number of years a relation was active before a banking crisis, unambiguously helps firms to recover faster. As shown in Table 3, 58 percent of products with 18 years of experience re-entered the export markets after one year, while only 17 percent of products with 1 year of experience re-entered after one year. Size, measured as value of exports at the spell that ended with the crisis, does not matter as much as experience for recovery. A way to visualize this is with Kaplan-Meier survival estimates (see respectively, Figure 2 and Figure 3). In Figure 2, products have been ranked in three different groups (quantiles) according to their experience. It is evident that the relations belonging to the third quantile (more experienced ones) recover faster than those

[8] Table 2 lists all systemic banking crises that occurred between 1996 and 2008 in countries exporting to the United States. It uses the definition of banking crisis from Leuven and Valencia (2008), and it includes crisis episodes for 2008 for France, Germany, Luxemburg, Ireland, Belgium, Iceland, Netherlands and the UK. We consider as "destroyed" all relations that were active the year before the crisis, and turned inactive on the year of the crisis. Alternatively, in order to take into account the fact that the effects of banking crises can materialize with a lag, we have counted as "destroyed" all relations that turned inactive on the year of the crisis or the year after. The results are available upon request.

belonging to the second and first quantiles.[9] In Figure 3, products have been ranked in quantiles according to the size of the relation. This figure shows only limited evidence that bigger relations recover faster.[10]

Sectoral financial dependence has an experience-specific effect

Statistical analysis also shows that measures of sectoral financial dependence have an experience-specific effect. Consider the unconditional survival estimates graphed in Figure 4. The figure represents the pattern of each quantile of experience, interacted with financial dependence. Within the group of experienced relations (products belonging to the third quantile), the survival function is lower in trade credit dependent sectors (TCD equal to one) than in non-trade credit dependent sectors (TCD equal to zero). This implies that in the former type of sectors more experienced trade relations re-enter faster than in the latter type of sectors.

This pattern is reversed for less experienced relations (products belonging to the first and second quantiles). For these products, the survival function is higher in trade credit dependent sectors (TCD equal to one) than in non-trade credit dependent sectors (TCD equal to zero). Therefore, in the former type of sectors less experienced trade relations re-enter faster than in the latter type of sectors.

In contrast, as it can be observed in Figure 5, there is no clear descriptive evidence on the effect of size heterogeneity on survival, neither in financially dependent sectors nor in non-financially dependent ones.[11]

III. Data

The analysis is based on US manufacturing imports from 157 countries, at the HS 10 digit level of disaggregation.[12] Data from 1995 to 2009 are from the Global trade Atlas (GTA). To complement this dataset, we also use HS 10 import flows between 1991 and1995, collected by the Centre of International Data at UC Davis. As in Brenton, Saborowski and von Uexkull (2009), we use US

[9] In the graph, higher survival rates imply longer periods of inactivity, therefore a lower probability of re-entry.

[10] From the graph it might seem that the variable size is not constant across time. We control for this in the regressions by stratifying the sample (see below).

[11] From the graph it might seem that the variable size is not constant across time. We control for this in the regressions by stratifying the sample (see below).

[12] The reason to have the US as destination country is that the original trade data uses (from Global Trade Information Services) contains information at the 10 digit level of disaggregation only for trade flows in and out the US.

import data as a mirror from exports to the US, because they tend to be more reliable than export data, especially when the exporter is a developing country.

To calculate survival and recovery rates of trade relations, a key step involves converting the annual data into periods (or spells) of service of each trade relationship. We define a trade relation as the exports of a certain product *k* from country *i*. An export relation can have one or more non-overlapping spells, depending on the number of times (if any) it is interrupted during the whole period of analysis. If, for instance a country exports a product between 1997 and 2001, and again between 2005 and 2008, the export relation has two spells.

The survival analysis uses a database with a total of 921,960 spells. The database contains information on the dates of exit and re-entry of products into the US export market, and on various product-, sector- and country-specific characteristics for each spell.

The recovery analysis uses a database that contains information only on export relations that exit during a banking crisis. The sample consists of 13,055 spells.

Data on banking crises are from Leaven and Valencia (2008). Their database contains information on 124 systemic banking crises over the period 1970- 2007. According to the authors' definition, a systemic banking crisis is one in which *"a country's corporate and financial sectors experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time"*. We complement the dataset by adding information from the 2008 financial crisis. Specifically, based on the criteria of bank default and government intervention, a banking crisis is recorded in 2008 for the following countries: the UK, Germany, Belgium, Luxembourg, Iceland, the Netherlands, and Ireland.[13] Overall, there are 23 systemic banking crises during the time span of our sample.

Finally, we use variables for both short- and long-term financial dependence. For short-term financial dependence, we use trade credit dependence (TCD) from Levchenko (2009), computed at NAICS four digit level (the original measure is from Fisman and Love, 2003).The indicator of long-term financial dependence is the external financial dependence (EFD) variable from Rajan and Zingales (1998). It is computed at ISIC three-digit industry level. As shown in Table 4, the correlation between TCD and EFD is very high, and equal to 0.7.

[13] Each of these countries has experienced the failure of a significant Banking Institution. Northern Rock for the UK, Fortis Bank in the case of the Benelux countries. Icesafe in Iceland. Hypo in Germany and Bank of Ireland in Ireland.

IV. Empirical strategy

The empirical analysis is divided in two main parts. First, we estimate a duration model *à la* Besedes and Prusa (2004) to study how trade relations are affected in times of crisis. Second, always using a duration model but this time only for those products that exited with a banking crisis, we analyze how certain exporter and sectoral characteristics have an effect on the time to recover after banking crises. In this case, duration refers to the time during which a trade relation has been inactive, therefore the shorter the duration, the faster the recovery.

The regression we estimate is a stratified Cox proportional hazard model of the form

$$h_c(t, x, \beta) = h_{c0}(t)\exp(x'\beta)$$

where x denotes a series of explanatory variables and β is the vector of coefficients to be estimated. The baseline hazard $h_{c0}(t)$ represents how the hazard function changes with time and is different for each strata of the sample.

To allow for a different hazard function for each country and sector, the estimations are stratified by exporting country and three-digit ISIC industry.[14] In addition, we cluster standard errors by sector (ISIC three digit) and country, to allow for intra-industry and country correlation in the error terms.

The main explanatory variable for the survival analysis is a banking crisis dichotomous variable, taking value one in those years in which a country has experienced a banking crisis. In addition, we include various measures of size, recorded at the beginning of each spell.[15] All regressions also include a common set of control variables, measured at the beginning of each spell.[16]. First, the total number of countries exporting a certain product to the US and the total value of product exports respectively serve as control for the extensive and the intensive margin of competition. Second, to control for the fact that the banking crisis variable might be capturing a deterioration of demand in the destination country, we introduce a product-specific measure of the growth of US imports. Finally, we

[14] When sector-specific variables are included in the regression, we do not stratify the sample by sector.

[15] Details are provided in Section V below. The variable experience cannot be included in a Cox regression because it is highly correlated with the duration of a spell, which is the conditioning variable in duration models. Alternative estimation methods that can accommodate both size and experience are discussed in Section V.

[16] Measurement at the beginning of the spell is in line with the literature. See for instance Besedes and Prusa (2006b).

include fixed effects for the year in which a trade relation is started to control for the fact that certain years might be more favorable than others when it comes to export decisions.

With respect to recovery, we test whether size and experience of export relations at the time of exit have an impact on the number of years it takes to re-enter the export markets. In addition, to analyze whether products that exit the export market during a crisis recover at different speeds depending on the sector they belong to, we also include an interaction term between long- and short-term financial dependence indicators and product characteristics. In this case, too, the total number of countries exporting a certain product to the US and the total value of product exports are included as controls. As it is not possible to compute these control variables for the sub-sample of products where exports have never resumed, we calculate their averages between the first year after the banking crisis and either the year of re-entry or the last year of the sample, depending on whether exports have resumed or not.

There are some econometric issues related with the empirical methodology that are common to all duration models. First and most important, in the survival analysis we do not want to artificially record a banking crisis that occurred during a trade relation as happening at the beginning or at the end of its duration. We solve this problem by splitting each export relationship at the time of the banking crisis, and assuming that the crisis lasts for one year.

Second, for some export relations it might be impossible to accurately observe their beginning and/or their ending. We do not know if an export relation that is first observed at time t actually started at time $s<t$ (left censoring). Likewise, we do not know whether an export relation that is last observed at time T was interrupted at T or continued after it (right censoring). To control for left censoring we construct variables using trade data from 1991 until 2009. However, we exclude from estimations the spells that started in the initial five years of the dataset (1991-1995). The Cox model, which we use for estimations, controls for right censoring.

Third, there are products that exit more than once (multiple spells). The general approach of the literature to control for multiple spells in duration models is to include in the regressions a multiple spell dummy equal to one if the relation has at least one exit during the sample period. However, to control for the fact that multiple spells are time-varying within a relation, a different definition of multiple spell is considered, with the construction of a variable equal to the number of spells before time t. This approach, the authors believe, is theoretically more correct than the standard approach of

the literature because it does not consider a relation to be characterized by multiple spells until its first observed reentry, but only after it.[17]

Due to the high level of disaggregation of the dataset, throughout all the analysis we make the assumption that there is a representative firm for each trade relation. This allows referring to "experience" and "size" as two measures of heterogeneity among exporters. As seen in Table 4, the sample correlation between size of exports volumes and export experience is very low (0.07). This means that these two variables are not the same and hence they capture different characteristics of exporters.

V. Banking crises and the duration of trade relations

The Cox proportional hazard model results on the effect of a banking crisis on the survival of export relations are presented in Table 5. All estimates in the table are expressed in terms of hazard ratios. A hazard ratio greater than one indicates an increase in hazard and shorter duration, therefore meaning that an export relation survives less.

As it can be seen in the first column, and in line with the stylized fact presented above, a banking crisis raises the hazard ratio, thereby increasing the probability that a trade relation is interrupted by 11 percent. The total number of suppliers and the total exports of the products, in turn, have a positive impact on the probability of survival. This result is consistent with the literature of trade survival, in which both the extensive and the intensive margin of competition have a positive effect on survival. The coefficient on demand shock also has the expected sign, since positive demand shocks reduce the probability of exit. However, this coefficient is not significant in most of the regressions.

In column (2) we include a measure of the size of an export relation, recorded at the beginning of the spell. Size increases survival. However, its inclusion does not affect the coefficient on BC – on the contrary, it rises marginally.

An absolute measure of size might not be ideal if one deals with very heterogeneous products. As mentioned by Besedes (2007), *"for some products $15,000 may be big and for others $1 million could be small"*. In column (3) we include a relative measure of size, "market share", to deal with the issue of product heterogeneity. It is defined as the ratio of total product exports over its average world exports. The results indicate that the effect of this alternative measure of size on survival is still positive and significant.

[17] Alternatively, a multiple spell dummy equal to one if the relation that is interrupted at time t has at least one exit at time s<t has been included. Results are qualitatively the same.

Neither in the Leaven and Valencia (2008) dataset used for systemic banking crises, nor in other similar datasets, is there systematic information on the final date of banking crises. Therefore, in the previous regressions we have assumed a common duration of one year for all banking crises. In column (4) we replicate column (2) regression, considering that the effect of a banking crisis lasts two years instead of one. The banking crisis coefficient is still positive and significant, though it is reduced by more than half. One intuition for this result is that for a significant number of products, exports were resumed one year after a banking crisis (see Table 3). Hence assuming that banking crises last for two years would make us consider that those products never exited the export markets.

Finally, in the last column of Table 5 we exclude banking crises that occurred in 2008 from the sample. In this case, too, the coefficient on banking crisis remains positive and significant, but it becomes smaller. This could be due to the fact that the 2008 crisis hit disproportionately larger exporters from developed countries, which have a comparative advantage in financially dependent sectors. Therefore, the banking crisis coefficient could be picking up some of the effect of financial dependence.[18]

Table 6 presents the results of alternative estimation techniques, a linear probability model (LPM, columns (1) and (2)) and a Probit model (columns (3) and (4)), where the dependent variable is a dichotomous variable equal to one if an export relation is interrupted.[19] The main reason to adopt these techniques is that they can accommodate for the inclusion of product-level experience (the total number of years that a relation was active) in the set of explanatory variables. As it has been argued in footnote 18 above, this is not possible in the Cox model.

Consistently with the results obtained in the Cox regressions, the occurrence of a banking crisis increases the probability of exit Moreover, the size of export flows and exporting experience decrease the probability of exit of export relations. This last result is in line with studies such as Brenton, Saborowski and von Uexkull (2009), which show that product specific characteristics such as initial size of an export flow and experience positively affect survival.

VI. Are you experienced?

In this section we shift focus to the effect of the size of export values and export experience before a banking crisis on the time to recover after the crisis. We also study the impact of sectoral financial dependence variables, and whether it depends on product characteristics.

[18] This issue is addressed in the recovery regressions of Section VI.

[19] Notice that in the Probit regression we use robust standard errors, because clustering is not computationally feasible.

In Table 7, all estimates are expressed in terms of hazard ratios. In this case, however, a spell begins with the product exiting at the occurrence of a banking crisis, and it ends when exporting starts again. An hazard ratio greater than one, which indicates a shorter duration, means that the export relation recovers faster. The size of exports at exit and export experience at exit are included in the regressions of column (1) and (2), respectively. Both experience and size are found to increase the probability of recovery. Specifically, one extra year of export experience increases the probability of recovery by almost 6 percent. A one percent increase in exports size increases the probability of recovery by about 3 percent. Results are qualitatively and quantitatively similar even after using a relative measure of size such as product share of exports (column (3) of Table 7).

In column (4), both the size of exports and export experience, are contemporaneously included in the regression. Also in this case both variables decrease the time to recover. However, while the magnitude of the experience coefficient remains unchanged, the coefficient of size becomes slightly smaller.

In column (5), regressions are performed ranking products in 3 different quantiles of export size and experience. Statistical tests of equality of coefficients indicate that the effect on the time to recover does not vary across different export size groups. The effect of export experience, in turn, is statistically different across quantiles. Specifically, while for products with two to five years of export experience the probability of recovery is about 35 percent higher than for products with low export experience belonging to the reference quantile, for products with more than five years of experience the increase in the probability of recovery with respect to products in the reference quantile almost doubles. This last result implies that export experience might have a non-linear effect on recovery.

With respect to the control variables, both the number of suppliers and the total exports of a certain product have a positive effect on the probability of recovery.[20] These results indicate the presence of a pro-competitive effect both at the extensive and the intensive margin of competition. Finally, in all regressions, the higher the frequency a product has exited and entered the export market, the lower is the probability of recovery. A possible intuition for this result is as follows: relationships with multiple spells before the crisis might be low-productivity ones, with productivity levels close to the cut-off that makes exporting profitable. These trade flows will therefore tend to re-enter later after a banking crisis.

The regressions in Table 8 include a set of variables capturing sectoral financial dependence. Columns (1) and (2) include a dichotomous variable proxying long- term external finance dependence (EFD). Columns (3) and (4) include a dichotomous variable equal to one for trade credit dependent sectors

[20] Recall that these variables are computed as averages after banking crises.

(TCD). In neither of the regressions do the indicators of financial dependence have a significant effect. The coefficients of size and experience remain roughly the same, and heterogeneity across groups of the latter still persists.

To examine whether financial dependence variables have an experience-specific effect, we re-estimate the Cox proportional model separately for each of the three quantiles of export experience. Results are presented in Table 9.[21] Reading across columns, it is possible to observe that the coefficients of long-term financial dependence and trade credit dependence change across quantiles, implying that they have an experience-specific effect. While for products with least experience financial dependence has a negative impact on the time to recovery, products with more experience enter faster in financially dependent sectors. The sign and the magnitude of the other explanatory variables do not vary significantly across different groups of export experience.[22]

An alternative approach to investigate whether financial dependence has a product-specific effect is presented in Table 10. Always using a Cox proportional hazard model, we interact where long-term financial dependence and trade credit dependence with exporting experience and size of exports. The results confirm the fact that in both long- and short-term financially dependent sectors, products with more experience recover faster than products with less experience (see columns (1) and (2)). More specifically, in financial dependent sectors, more experienced products enter first. In contrast, there is no clear evidence indicating the effects of size heterogeneity on the time to recover, neither in financially dependent sectors nor in non-financially dependent ones (see columns (3) and (4)).

Due to the fact that the interpretation of interaction terms in not an easy task in Cox proportional models, similar regressions have been estimated using a linear regression model (LPM) and a Tobit model. Results are in Table 11). For both methodologies, the dependent variable is the number of years it takes an export relation to re-enter the foreign market after a banking crisis. In addition, the Tobit model takes into account that some export relations are right censored and hence have not been resumed yet.[23] As in the Cox proportional model, experience and size reduce the time to recover.. Moreover, as it can be seen in columns (1)-(4), more experienced exporters enter first in financially dependent sectors. Once again, the interaction between exports size and long- or short-term financial dependence is not significant (see columns (5)-(8)).

[21] In columns (1) and (4), the variable total number of previous spells is dropped from the regressions due to the very high collinearity with the experience variable.

[22] A similar Cox regression has been estimated for different groups of export size. Results, available under request, show that neither financial dependence variables nor other control variables have a size-specific effect.

[23] The maximum value of time to recover in the sample is 12 years. We have hence assumed that the products that have not re-entered the export market yet will enter after 15 years. We have also experimented with re-entry after 20 and 30 years, respectively. Results do not change.

From these results we can conclude that, independently of size, products with more years of experience might have an advantage in obtaining external finance, thereby recovering faster after a banking crisis.[24]

VII. Conclusion

Measuring the effects of a banking crisis and understanding the patterns of the recovery of trade relations is a very important question for policy makers when reacting to financial shocks. This study, based on a duration model using export data disaggregated at product level, has presented a set of results with relevant policy implications.

First, we have shown that a banking crisis negatively affects export trade relations. In addition, we have found that bigger and more experienced exporters are less adversely hit by a banking crisis than smaller and less experienced exporters, which may not be productive enough to overcome a sharp drop in foreign demand. This result is consistent with some empirical studies that have found a positive effect of initial size of an export flow, and of exporting experience, on trade survival.

Second, while on average size and experience have a significant impact on the recovery after banking crises, only the latter matters for the recovery of products belonging to industries that highly depend on external finance. Consistently with the idea that within-sector heterogeneity matters, we find that long- and short-term sectoral financial dependence has an experience-specific effect. In particular, more experienced exporters re-enter faster in financially dependent sectors. This result has very important policy implications. If the objective of a policy is to help trade recover faster after financial disruption, relatively un-experienced exporters should be targeted to restart foreign operations, independently of their size.

[24] In order to sharpen these conclusions, we are planning to perform the same analysis using firm-level data.

Bibliography

Alvarez, Roberto (2007), "Explaining Export Success: Firm Characteristics and Spillover Effects," *World Development* 35(3): 377-393.

Alvarez, R., Hasan Faruq and Ricardo Lopez (2009). "New Products in Export Markets: Learning from Experience and Learning from Others", *mimeo*.

Berger, Allen N. and Gregory F. Udell (1993), "Lines of credit, collateral, and relationship lending in small firm finance," Finance and Economics Discussion Series 93-9, Board of Governors of the Federal Reserve System (U.S.).

Bernard, Andrew B. and J. Bradford Jensen (1999), "Exporting and Productivity," NBER Working Paper 7135.

Besedes, Tibor (2007), "A Search Cost Perspective on Duration of Trade," Departmental Working Paper 2006-12, Department of Economics, Louisiana State University.

Besedes, Tibor and Thomas J. Prusa (2004), "Surviving the U.S. Import Market: The Role of Product Differentiation," NBER Working Paper 10319.

Besedes, Tibor and Thomas J. Prusa (2006a), "Ins, outs, and the duration of trade," *Canadian Journal of Economics* 39(1): 266-295.

Besedes, Tibor and Thomas J. Prusa (2006b), "Product differentiation and duration of US import trade," *Journal of International Economics* 70: 339-358.

Borgersen, T-A (2006). "When Experience Matter: The Export Performance of Developing Countries' SMEs", *Journal of Sustainable Development in Africa*, 8 (1): 106-118.

Brenton, Paul , Christian Saborowski and Erik von Uexkull (2009), "What explains the low survival rate of developing country export flows ?," Policy Research Working Paper Series 4951, The World Bank.

Brenton, P., Pierola, M. D. and von Uexküll, E. (2009), "The Life and death of trade flows: understanding the survival rates of developing-country exporters", in R. Newfarmer, W. Shaw and P. Walkenhorst (eds.), *Breaking Into New Markets: Emerging Lessons for Export Diversification*, Washington D.C.: The World Bank.

Fisman, Raymond and Inessa Love (2003), "Financial Dependence and Growth Revisited," NBER Working Paper 9582.

Fugazza, Marco and Ana Cristina Molina (2009), "The determinants of trade survival," Working Paper 05-2009, Graduate Institute, Geneva.

Laeven, Luc and Fabian Valencia (2008), "Systemic Banking Crises: A New Database," IMF Working Paper 08/224, International Monetary Fund.

Levchenko, Andrei A., Logan Lewis and Linda L. Tesar (2009), "The Collapse of International Trade During the 2008-2009 Crisis: In Search of the Smoking Gun," Working Paper 592, Research Seminar in International Economics, University of Michigan.

Manova, Kalina (2008), "Credit Constraints, Heterogeneous Firms and International Trade," NBER Working Paper14531.

Nilsen, Jeffrey H, (2002), "Trade Credit and the Bank Lending Channel," *Journal of Money, Credit and Banking* 34(1): 226-53.

Organization of Economic Cooperation and Development (2009), *OECD Economic Outlook* No. 85, June.

Petersen, Mitchell A. and Raghuram G. Rajan (1994), "The Benefits of Lending Relationships: Evidence from Small Business Data," *Journal of Finance* 49(1): 3-37.

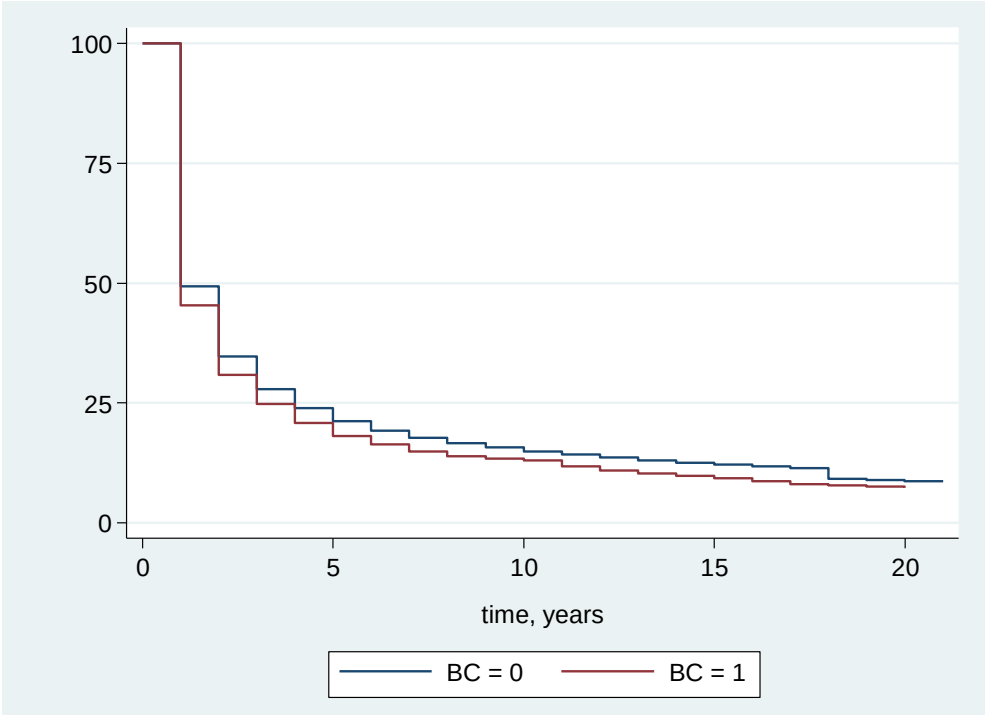
Rajan, Raghuram G. and Luigi Zingales (1998), "Financial Dependence and Growth," *American Economic Review* 88(3): 559-86.

Therneau, Terry M. and Patricia M. Grambsch (2000), "*Modeling Survival Data: Extending the Cox Model*," New York: Springer.

Volpe-Martincus, Christian and Jerónimo Carballo (2009), "Survival of New Exporters in Developing Countries: Does it Matter How They Diversify?," IDB Working Paper 140, Inter-American Development Bank.

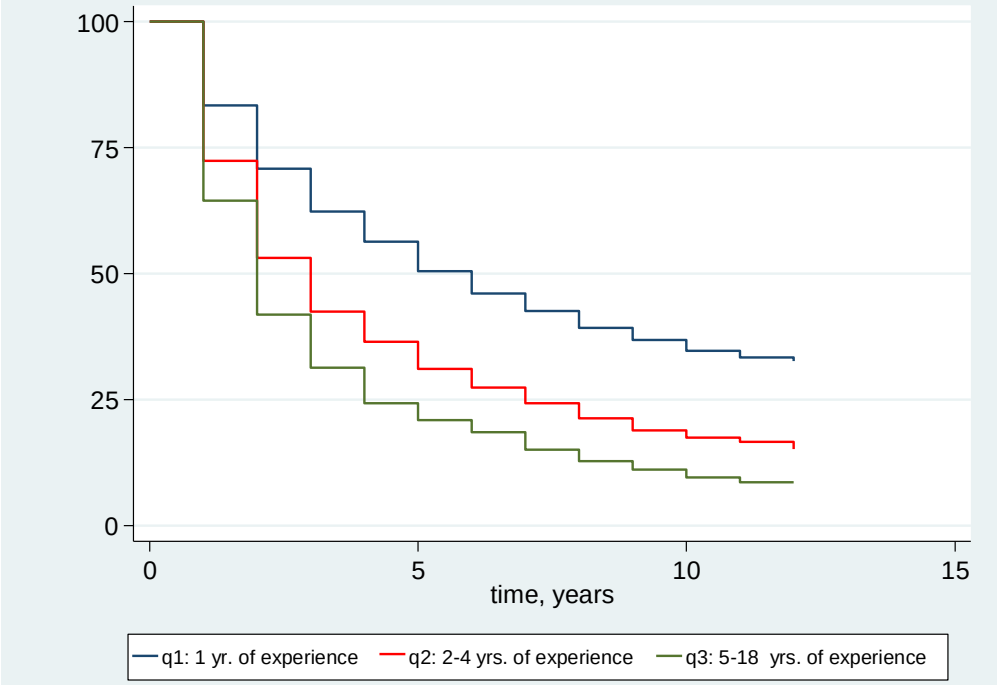
Figures and Tables

Figure 1: Banking Crisis and survival of trade relations



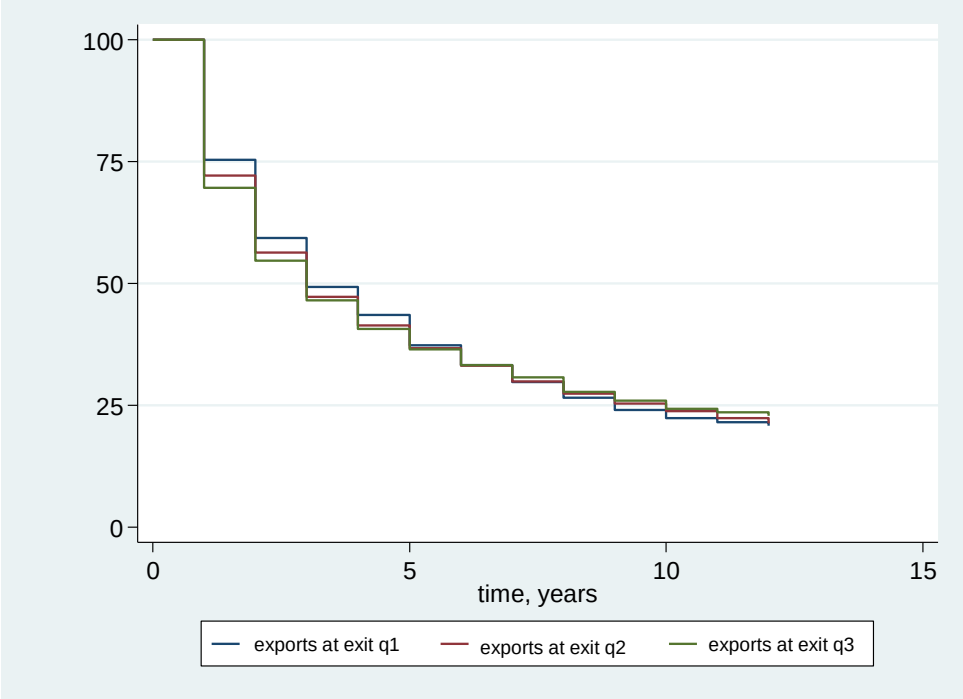
Note: BC = banking crisis

Figure 2: Experience and recovery of trade relations



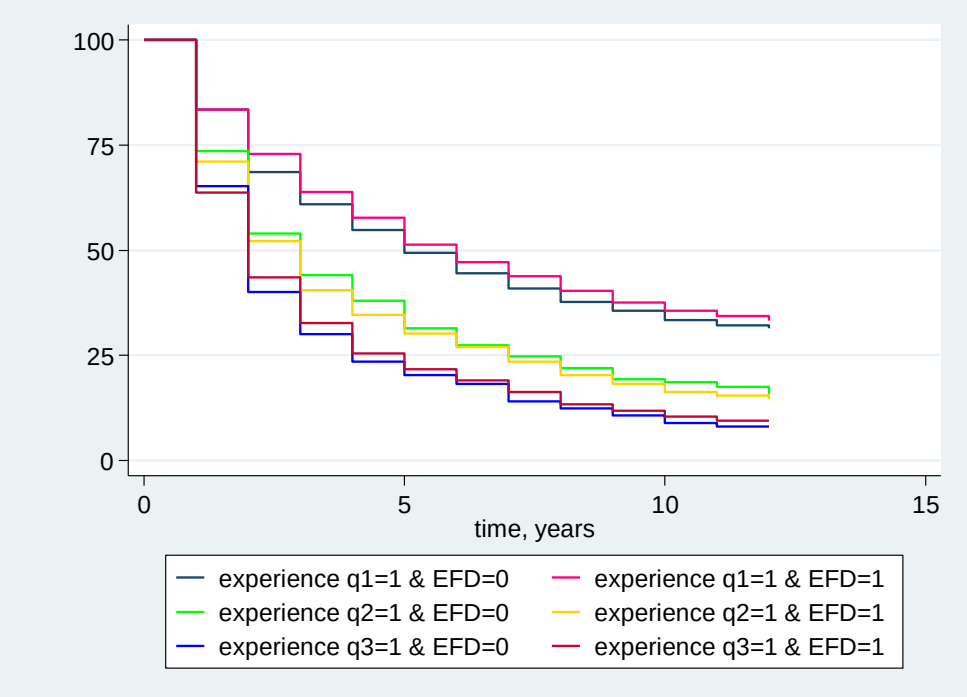
Note: q = quantile. In the graph, higher survival rates imply longer periods of inactivity, therefore a lower probability of reentry.

Figure 3: Size and recovery of trade relations



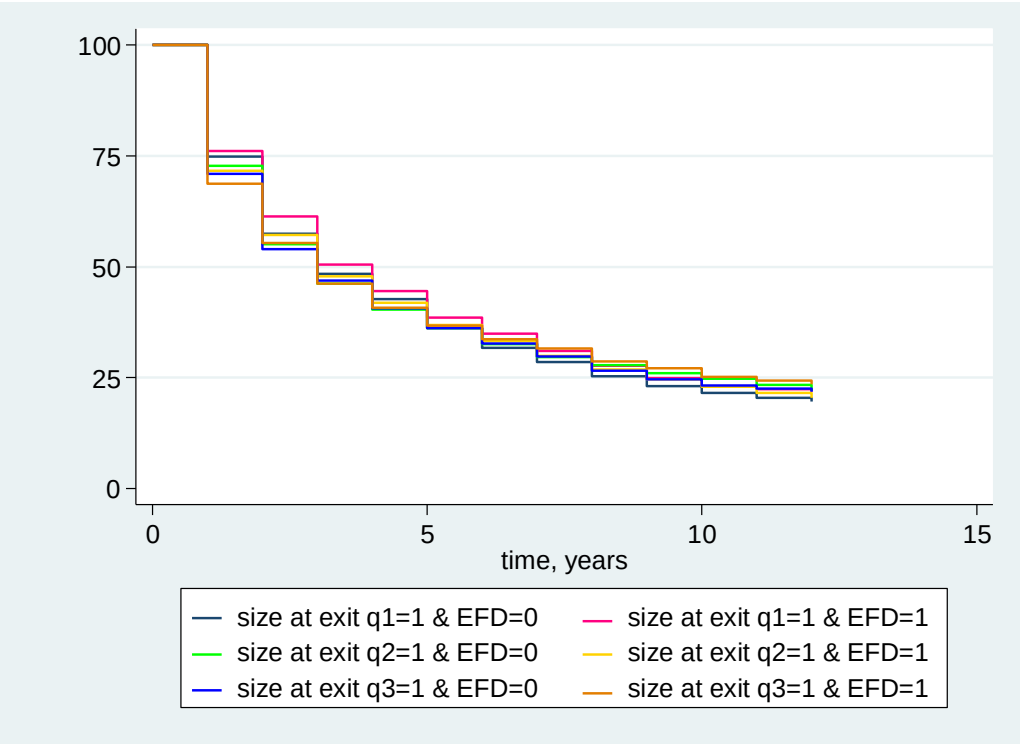
Note: From the graph, it might seem that the variable size is not constant across time. This is controlled for in the regressions by stratifying the sample (see below).

Figure 4: Experience, trade credit dependence and recovery of trade relations



Note: EFD external finance dependence. q = quantile.

Figure 5: Size, trade credit dependence and recovery of trade relations



Note: EFD external finance dependence. q = quantile.

Table 1: Recovery Time after Banking Crises, 1996–2009

Recovery time (yrs.)	No. of products	% of products
1	3,640	49.48
2	1,193	16.22
3	695	9.45
4	444	6.04
5	387	5.26
6	278	3.78
7	220	2.99
8	199	2.7
9	132	1.79
10	90	1.22
11	57	0.77
12	22	0.3
Total	7,357	100

Table 2: Survival of Trade Relations after Banking Crises, 1996–2008

Country	Year of crisis [a]	Tot relations (no.)	Relations destroyed (no.) [b]	Relations destroyed (%)
Argentina	2001	2534	636	25
Belgium	2008	6596	1450	22
Bulgaria	1996	726	246	34
China	1998	9382	949	10
Colombia	1998	2239	573	26
Czech Republic	1996	2382	610	26
Denmark	2008	11116	1128	10
Dominican Republic	2003	2210	494	22
Ecuador	1998	1059	321	30
Great Britain	2008	10585	1350	13
Honduras	1998	573	180	31
Indonesia	1997	3619	649	18
Ireland	2008	3280	833	25
Iceland	2008	610	235	39
Jamaica	1996	786	245	31
Japan	1997	10014	985	10
Republic of Korea	1997	7013	1118	16
Malaysia	1997	3420	721	21
Nicaragua	2000	386	96	25
The Netherlands	2008	6856	1295	19
Philippines	1997	3334	704	21
Russian Federation	1998	2415	667	28
Slovakia	1998	807	263	33
Thailand	1997	4632	870	19
Turkey	2000	3323	693	21
Ukraine	1998	752	235	31
Uruguay	2002	715	171	24
Viet Nam	1997	825	186	23
Yemen	1996	23	5	22

Table 3: Recovery time by Experience level

Experience (yrs.)	Total no. of products	Product reentry after 1yr. (no.)	Product reentry after 1 yr. (%)
1	3,939	654	17
2	1,978	512	26
3	1,371	377	27
4	986	307	31
5	795	237	30
6	707	245	35
7	554	165	30
8	385	119	31
9	364	104	29
10	368	125	34
11	351	139	40
12	350	126	36
13	263	100	38
14	221	96	43
15	196	94	48
16	172	77	45
17	159	75	47
18	151	88	58

Table 4: Correlation of Explanatory Variables

	Experience at exit	Exports at exit	N. of supplier reentry	Tot exports reentry	N. previous spells	Ext. Fin. Dep.	Trade Credit Dep.
Experience at exit	1						
Exports at exit	0.07	1					
N. of supplier reentry	-0.09	-0.09	1				
Tot exports reentry	-0.04	0.19	0.62	1			
N. previous spells	0.63	-0.03	-0.11	-0.09	1		
Ext. Fin. Dep.	-0.01	0.09	0.04	0.21	-0.01	1	
Trade Credit Dep.	0.01	0.12	0.06	0.25	-0.001	0.67	1

Table 5: The effect of banking crises on trade relations survival (Cox proportional hazard estimates)

	BC (1 yr length)	BC (1 yr length)	BC (1 yr length)	BC (2 yrs length)	BC excl. 2008 (1 yr length)
Variables	(1)	(2)	(3)	(4)	(5)
Banking crisis	1.112***	1.133***	1.135***	1.052***	1.031***
	[0.013]	[0.013]	[0.014]	[0.013]	[0.011]
Size at spellbegin		0.906***		0.906***	0.903***
		[0.001]		[0.001]	[0.001]
Market share at spellbegin			0.902***		
			[0.001]		
Number of suppliers at spellbegin	0.990***	0.988***	0.991***	0.988***	0.988***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Total product exports at spellbegin	0.966***	0.992***	0.903***	0.992***	0.992***
	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]
Demand shock	0.991**	0.993**	0.993**	0.994*	0.994*
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
N previous spells	0.951***	0.945***	0.946***	0.944***	0.945***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Observations	921960	921960	921960	889208	908854

Note: Standard errors (in brackets) clustered by country and by ISIC three digit industry. *** p<0.01, ** p<0.05, * p<0.1. Sample stratified by country and ISIC three digit industry. Other controls: year FE.

Table 6: The effect of banking crises on product exit

	LPM		PROBIT	
Dependent variable: Exit	(1)	(2)	(3)	(4)
Banking crisis	0.017***	0.034***	0.018***	0.037***
	[0.003]	[0.003]	[0.001]	[0.001]
Size $_{t-1}$		-0.342***		-0.364***
		[0.007]		[0.001]
Experience $_{t-1}$		-0.022***		-0.019***
		[0.000]		[0.000]
N suppliers $_{t-1}$	-0.003***	-0.003***	-0.004***	-0.004***
	[0.000]	[0.000]	[0.000]	[0.000]
Total product exports $_{t-1}$	-0.212***	-0.112***	-0.165***	-0.060***
	[0.007]	[0.010]	[0.002]	[0.002]
Demand shock	-0.005***	-0.003***	-0.009***	-0.009***
	[0.001]	[0.001]	[0.000]	[0.000]
Multiple spell dummy	0.146***	0.145***	0.159***	0.165***
	[0.001]	[0.002]	[0.000]	[0.000]
Observations	3,873,513	3,083,889	3,873,513	3,083,889
R-squared	0.114	0.299		

Note: In columns (1) and (2) standard errors (in brackets) clustered by country and by ISIC three digit industry. In columns (3) and (4) robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Other controls: ISIC three digit, country and year FE.

Table 7: Time to recover and exporter characteristics (Cox proportional hazard estimates)

Variables	(1)	(2)	(3)	(4)	(5)
Years of experience at exit	1.058***			1.057***	
	[0.005]			[0.005]	
Exports at exit		1.027***		1.020***	
		[0.008]		[0.007]	
Product Market share at exit			1.032***		
			[0.007]		
Years of experience at exit q_2					1.352***
					[0.049]
Years of experience at exit q_3					1.692***
					[0.084]
Exports at exit q_2					1.043
					[0.029]
Exports at exit q_3					1.082**
					[0.036]
N of suppliers at re-entry	1.032***	1.034***	1.034***	1.032***	1.032***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Total product exports at re-entry	1.020**	1.019**	1.046***	1.017**	1.019**
	[0.008]	[0.008]	[0.010]	[0.008]	[0.008]
N previous spells	1.032**	1.090***	1.088***	1.034**	0.982
	[0.013]	[0.015]	[0.015]	[0.013]	[0.015]
Observations	13055	13055	12974	13055	13055

Note: Standard errors (in brackets) clustered by country and by ISIC three digit industry. *** p<0.01, ** p<0.05, * p<0.1. Sample stratified by country and ISIC three digit industry.

Table 8: Time to recover and financial dependence
(Cox proportional hazard estimates)

Variables	(1)	(2)	(3)	(4)
Years of experience at exit	1.064***		1.069***	
	[0.004]		[0.005]	
Exports at exit	1.023***		1.020***	
	[0.007]		[0.007]	
Years of experience at exit q_2		1.416***		1.445***
		[0.050]		[0.053]
Years of experience at exit q_3		1.827***		1.893***
		[0.089]		[0.102]
Exports at exit q_2		1.046*		1.047*
		[0.028]		[0.029]
Exports at exit q_3		1.102***		1.098***
		[0.035]		[0.035]
EFD	0.986	0.997		
	[0.034]	[0.035]		
TCD			0.953	0.968
			[0.033]	[0.034]
Observations	12,928	12,928	11,628	11,628

Note: Standard errors (in brackets) clustered by country and by ISIC three digit industry. *** p<0.01, ** p<0.05, * p<0.1. Sample stratified by country. Other controls: total product exports at re-entry, total number of suppliers at re-entry, demand shock, number of previous spells.

Table 9: Time to recover and financial dependence
(Cox proportional hazard estimates with group varying characteristics)

	Experience q_1	Experience q_2	Experience q_3	Experience q_1	Experience q_2	Experience q_3
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Exports at exit	1.014	1.024**	1.022**	1.002	1.023**	1.024**
	[0.013]	[0.011]	[0.010]	[0.013]	[0.011]	[0.010]
EFD	0.893*	1.017	1.066*			
	[0.055]	[0.049]	[0.041]			
TCD				0.844***	0.987	1.053
				[0.053]	[0.050]	[0.043]
Observations	3,744	4,257	4,927	3,253	3,861	4,514

Note: EFD = external financial dependence. TCD = trade credit dependence. Standard errors (in brackets) clustered by country and by ISIC three digit industry. *** p<0.01, ** p<0.05, * p<0.1. Sample stratified by country. Other controls: total product exports at re-entry, total number of suppliers at re-entry, demand shock, number of previous spells.

Table 10: Financial dependence, exporter characteristics and recovery (Cox proportional hazard estimates)

Variables	FD=EFD (1)	FD=TCD (2)	FD=EFD (3)	FD=TCD (4)
Years of experience at exit q_2	1.322***	1.354***		
	[0.060]	[0.060]		
Years of experience at exit q_3	1.635***	1.693***		
	[0.085]	[0.093]		
FD	0.894**	0.857***	0.98	0.977
	[0.051]	[0.050]	[0.044]	[0.044]
Years of experience at exit q_2 x FD	1.129**	1.135**		
	[0.065]	[0.067]		
Years of experience at exit q_3 x FD	1.216***	1.256***		
	[0.082]	[0.091]		
Exports at exit q_2			1.017	1.036
			[0.041]	[0.040]
Exports at exit q_3			1.105**	1.130***
			[0.046]	[0.047]
Exports at exit q_2 x FD			1.034	0.994
			[0.054]	[0.054]
Exports at exit q_3 x FD			0.993	0.931
			[0.059]	[0.055]
Observations	12,928	11,628	12,928	11,628

Note: FD= Financial dependence. EFD = external financial dependence. TCD = trade credit dependence. Standard errors (in brackets) clustered by country and by ISIC three digit industry. *** p<0.01, ** p<0.05, * p<0.1. Sample stratified by country. Other controls: total product exports at re-entry, total number of suppliers at re-entry, demand shock, number of previous spells, exports at exit (in columns (1) and (2)) and years of experience at exit (in columns (3) and (4)).

Table 11: Financial dependence, exporter characteristics and recovery (OLS and Tobit estimates)

	OLS	Tobit	OLS	Tobit	OLS	Tobit	OLS	Tobit
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Years of experience at exit	-0.208***	-0.443***	-0.230***	-0.488***	-0.266***	-0.542***	-0.289***	-0.590***
	[0.024]	[0.044]	[0.025]	[0.046]	[0.020]	[0.036]	[0.021]	[0.039]
Exports at exit	-0.146***	-0.223***	-0.133***	-0.196***	-0.178***	-0.269***	-0.175***	-0.255***
	[0.031]	[0.056]	[0.032]	[0.057]	[0.046]	[0.081]	[0.043]	[0.076]
EFD	0.311	0.626			-0.736	-0.958		
	[0.442]	[0.732]			[0.748]	[1.284]		
TCD			0.765***	1.177**			-0.478	-0.681
			[0.281]	[0.481]			[0.622]	[1.088]
Years of experience at exit x EFD	-0.104***	-0.178***						
	[0.030]	[0.050]						
Years of experience at exit x TCD			-0.117***	-0.197***				
			[0.030]	[0.049]				
Exports at exit x EFD					0.053	0.072		
					[0.062]	[0.107]		
Exports at exit x TCD							0.073	0.099
							[0.062]	[0.109]
Observations	12,928	12,928	11,628	11,628	12,928	12,928	11,628	11,628
R-squared	0.283		0.284		0.282		0.282	

Note: OLS = ordinary least squares. EFD = external financial dependence. TCD = trade credit dependence. Standard errors (in brackets) clustered by country and by industry.*** p<0.01, ** p<0.05, * p<0.1. Other controls: Industry and country FE, total product exports at re-entry, total number of suppliers at re-entry, demand shock, number of previous spells