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Previous experience, experimentation and export survival: Evidence from firm-product-destination level data

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Abstract

This paper explores the role of a firm's product and/or market export experience and experimentation for survival of new product-destination export spells, using firm-level Spanish customs data over the period 1997–2015. Previous research has documented a positive impact of experience on export survival. This paper contributes to the extant literature by unravelling the distinct effect on export survival of ongoing accumulated experience (i.e., from the start of a product-destination export spell), previous product and/or destination-market experience and experimentation (repetition of product-destination relationships). We find that 60% of new product-country export spells end during their first year. Thereafter, the hazard rate remarkably falls with their elapsed duration (i.e., age). Exporting a new product endures a higher risk than entering a new market. Besides, experimentation (repeated product-destination combinations) and previous experience (especially at product rather than at destination level) significantly lower the exit hazard. The results are consistent with previous studies that suggest that sunk costs to enter markets are relatively high, while experimentation and learning are more relevant at product level.

KEYWORDS

experience, export survival, firm-product-destination export spells

1 | INTRODUCTION

Recent studies using micro-level trade data have pointed out that under the relatively stable and persistent aggregate trade flows, there is a rich dynamic at firm-, product- and destination-market/country level. Survival rates shortly after beginning to export, adding a new product or entering a new export market are very low. Then, the hazard rate sharply falls to later smooth out with elapsed duration (Albornoz et al., 2016; Araujo et al., 2016; Besedeš & Prusa, 2006a, 2006b; Iacovone & Javorcik, 2010). Hence, survival probability rises with accumulated ongoing experience (i.e., with the age of the exporting spell).

Furthermore, there exists high turnover (churning) along firm, product and destination-market dimensions in international markets. This suggests that while entry is relatively easy (and common), survival is harsh due to high rate of 'infant mortality' among new trade relationships. Bernard et al. (2010) and Bernard et al. (2018) report that large regular exporting firms that export a broad variety of products to different destinations conduct a remarkably large share of international trade. These firms vary their exported product mix within and across destinations by adding and dropping products and destination countries over time.[1] Besedeš and Prusa (2011) argue some of the short-lived export episodes that we observe might be trial and errors in which the exporter experiments with different prototypes of the good or in different markets before 'discovering' the new successful export activity. Therefore, international markets depict a high degree of experimentation.

A firm's export success is uncertain at the time of entry as it requires new knowledge and competences that are ex-ante unknown. The tacit nature of knowledge involves that uncertainty can only be resolved through export experience, that is, through the accumulation of time in export markets, and trial and errors (Albornoz et al., 2012, 2016; Araujo et al., 2016; Rauch & Watson, 2003). Thus, both market experimentation and experience are important dimensions of learning.

Several recent studies find that building up export experience through the accumulation of foreign sales and enlarging a firm's product-destination scope enhances survival when entering new markets (e.g., Albornoz et al., 2016; Araujo et al., 2016; Görg et al., 2012) and/or adding new products (e.g., Lawless & Studnicka, 2019b, 2019c).

This paper contributes to this literature by carrying out a comprehensive analysis of the differential effect of several sources of learning (i.e., through the accumulation of product and/or market export experience and experimentation by a firm) on survival of new firm-product-destination export spells. While previous studies have primarily focussed on the effect of either duration of an ongoing spell (i.e., how the survival probability changes with each additional year that a particular export spell is active) or the number of years of product/market prior experience, this paper aims at capturing additional sources of experience by accounting for the entire exporting history (available in the data set) of the firms. In particular, we distinguish among several sources of experience. First, the accumulated experience as a product-destination export spell goes on, that is, the increase in experience with time spent within a specific market selling a specific product. Second, experimentation and repetition are additional sources of experience and learning. Third, firms build up experience on products and/or markets over time, which may boost survival chances of new export spells. The latter two sources are related to prior accumulated experience, that is, to the experience built up by an exporter before the

[1]Product and destination switching by exporting firms has been confirmed by a number of recent studies on different countries (e.g., Amador and Opromolla, 2013 for Portugal; Békés and Muraközy, 2012, for Hungary; Damijan et al., 2014 for Slovenia; Iacovone and Javorcik 2010, for Mexico; Álvarez et al., 2013 and Blum et al., 2013, for Chile; Lawless et al., 2019a, for Ireland).

onset of the product-destination spell being analysed. Finally, static or current experience related to size and product and country portfolio characteristics of the exporter is also considered.

In order to disentangle the distinct role of product and destination-market experience and experimentation on export survival, this paper examines all new product-destination export spells ('fresh spells') of continuing Spanish exporters over the period 1998–2015. The data set comprises 1,935,355 product-destination spells corresponding to 8859 exporting firms. These data allow us to focus on entry (birth) and exit of product-destination export spells separately from firm entry to and exit from export markets (or even firm failure), which are different decisions that are not addressed in this paper.

To fully account for all sources of product and/or destination-market experience of an exporter, these firm-product-country 'fresh' spells (fpc, hereafter) are split into five exhaustive and mutually exclusive categories according to the firm's prior experience using its entire exporting history available in the data. These different 'entry mode' groups are the following: (a) a new product is sold to a previously served destination/country (NP, OC); (b) a product already exported is sold to a new destination market (OP, NC); (c) a new product is sold to a new destination (NP, NC); (d) a familiar product is sold to a familiar destination, though leading to a new product-country combination (OP, OC, NPC); and (e) a repeated product-destination spell (OPC). That is, the firm initiates an export spell that involves an old product-country combination. To the best of our knowledge, this thorough taxonomy of new export spells by sources of an exporter's previous experience (i.e., using its entire exporting history available in the data set) has not previously been made in this literature.

This paper is related to previous studies on trade duration at the product-country level (Besedeš & Prusa, 2006a, 2006b), firm level (Kostevc & Zajc Kejzar, 2020), firm-product level (Görg et al., 2012), firm-country level (Esteve-Pérez et al., 2013), firm-product-country level (Cadot et al., 2013) and to studies on the dynamics of firms' export portfolio (Amador & Opromolla, 2013; De Lucio et al., 2016; Freund & Pierola, 2010). Yet, the previous papers on portfolio dynamics have focussed on switching patterns of export products and destinations without explicitly examining trade duration.

Moreover, a number of papers have reported a positive relationship between accumulated experience and survival when entering an entirely new destination market. While Aeberhardt et al. (2014) measure experience as the interaction of past export status with firms' total export experience measured in years, Araujo et al. (2016) define experience as the number of similar destinations the firm already serves. Albornoz et al. (2016) proxy experience with firm export survival time, number of export markets, number of previous incursions and export exposure. Inui et al. (2017) define experience as number of years of firm export spells up to the current year.

The papers most closely related to ours are Lawless and Studnicka (2019b, 2019c). Using a rich data set on Irish firms, they empirically examine the effect of previous firm—as well as product—and market-level export experience (i.e., prior to initiating a new export flow) on survival of new product-destination export relationships of Irish firms. These authors find that previous product experience is more effective than the experience accumulated while serving a particular country. However, they do not investigate the effect on survival of (a) the accumulated experience from the onset of a spell (i.e., elapsed duration) as they assume a parametric functional form for the pattern of duration dependence; and (b) experimentation (i.e., trial and error) as they treat spells as continuous and ignore breaks between them, that is, they do not consider multiple spells of a given product-market export relationship.

Our main contribution is to perform a more comprehensive analysis of the different sources of learning that accrue to an exporter (i.e., through the accumulation of product and/or destination-market experience and experimentation) and to examine their effect on the likelihood of survival of new firm-product-destination export spells. This is important because exporting entails risk and uncertainty, which suggests that experimentation and accumulation of experience in products and markets could be essential for survival of export relationships.

Interestingly, our paper departs from Lawless and Studnicka (2019b, 2019c) in a number of aspects. First, we explicitly examine the role for survival of accumulated experience of an ongoing fpc spell by estimating a duration model with a rather flexible non-parametric specification of the baseline function (without assuming a functional form for duration dependence). In particular, we estimate the pattern of duration dependence, that is, we measure how the hazard of ending an export spell varies with its elapsed duration (i.e., age-of-spell effects). Second, the thorough taxonomy of new export spells according to the firm's previous export experience allows us to examine all possible sources of experience with a product and/or experience in a market. In particular, we account for repeated fpc export spells, that is, we explicitly consider that firms learn through product-market experimentation (i.e., trial and errors).[2] Third, the size of the gaps between repeated export relationships further allows us to account for the likely depreciation of a firm's acquired product-destination-specific knowledge gathered through experimentation. Fourth, while these authors measure previous export experience using information from 1996 to explain export survival over 2006–15, we make use of all available information over 1997–2015 to analyse the role of product and/or destination-market experience on survival of new fpc export spells initiated by continuing exporters. By doing so, we take full advantage on the information encoded in the data set, both in terms of spells and past history of exporters. Fifth, to further disentangle the effect of different sources of product and/or destination-market experience, we split spells into five 'entry modes' according to the prior product and/or market experience that the firm had accumulated before starting a new product-destination export spell. Notwithstanding, one drawback of our study compared to theirs is that we have no information at firm level other than customs data.

Our results confirm very high hazard rates in the first years of newly created product-destination export spells. Then, the risk falls with accumulated ongoing experience (i.e., elapsed duration). Adding a new product faces a higher exit hazard than starting to sell to a new destination market. Tryouts and experimentation (i.e., repetition) and previous experience (especially at product vs. destination level) significantly lower the exit hazard. These results could be initially difficult to reconcile with theoretical models that highlight the importance of producer heterogeneity, uncertainty and sunk export-entry costs (Melitz, 2003). They predict that a firm's trade status is rather persistent. Yet, as pointed out by Albornoz et al. (2016), they cannot explain why most export flows have a very short duration, which is more in line with recent empirical and theoretical works that highlight the important role of experimentation (i.e., trial and error) in international markets (Aeberhardt et al., 2014; Albornoz et al., 2012; Freund & Pierola, 2013; Iacovone & Javorcik, 2010, among others).

However, Arkolakis and Muendler (2013) argue that sunk-entry costs may differ across destination markets. They may be related to gathering information and fulfilling product standard requirements, technical regulations, red tape, setting a distribution network and marketing products. These high entry barriers would become exit barriers after entry, probably leading to expect little churning at destination-market level. This is in line with our result of longer expected duration at the destination than at the product level. Our result of higher risk when adding new products is compatible with uncertainty and experimentation. Araujo et al. (2016) argue that the lack of experience makes it more difficult to identify risky partners and to offer a product in line with consumers' tastes. When a firm decides whether or not and how to serve foreign markets, it faces considerable uncertainty. It is unaware of local regulations and legal requirements, about the size of foreign demand and the adequacy of its products to local tastes. Fanelli and Hallak (2018) develop a model in which exporters reduce uncertainty about demand features in foreign markets and distribution channels through

[2]Furthermore, unlike Lawless and Studnicka (2019b, 2019c), we further consider new fpc export spells: (a) that involve selling a new product to a new destination market and (b) that consists of previously sold products and previously served markets but leading to a new product-market mix.

experimentation. Our findings about higher exit hazard of adding new products, and the effectiveness of both repetition and previous product experience in boosting survival are consistent with these models. That is, firms would start with small commitments trying to gather information about their 'fitness-to-survive' in export markets.

The rest of the paper is organised as follows. Section 2 describes the data set and provides summary statistics. Section 3 outlines the empirical methodology and presents preliminary evidence. Section 4 presents and discusses the main results, and finally, Section 5 concludes.

2 | DATA AND SUMMARY STATISTICS

This paper employs annual firm-product-destination level export data from confidential transaction-level customs data collected by Spanish Customs (AEAT-ADUANAS). The data set covers the period 1997–2015.[3] The data have two characteristics that make them particularly suitable for the analysis of the link between experience and survival in export markets. First, it includes information on all firm-level export transactions above some size threshold[4]; therefore, it provides a comprehensive overview of export activity of the economy. Second, it covers a long time period.

Each record includes a unique ID code for the exporter, an 8-digit level combined nomenclature (CN) product code, destination country and shipment characteristics at annual frequency. The unit of observation is an export flow by a firm f of a product p to a destination country c in calendar year t.[5] Therefore, we aggregate transactions to annual (f, p, c, t) quartets, which is our unit of observation. Let $S_{fpc,t}$ be the value (in euros) of exports by a firm f of product p to destination c in year t.

From the annual data for the firm-product-country triplet (fpc, henceforth), we define an fpc export spell relying on the number of periods t (years) of consecutive exporting activity (transactions) at the firm-product-destination level (that is, $S_{fpc,t} > 0$) since it started/entered (i.e., it starts in year t when $S_{fpc,t-1} = 0$ and $S_{fpc,t} > 0$). Thus, the duration of an fpc exporting spell is the length of time (i.e., number of consecutive years of exporting a product to a destination market) until a firm f stops exporting a product p to a particular destination c, an event we will refer to as a 'failure'. An fpc exporting spell *fails* in year t when this is the last year of consecutive exports of that product to that country, so $S_{fpc,t} > 0$ and $S_{fpc,t+1} = 0$. Therefore, information in 2015 is only used to identify those fpc spells ending in 2014. Hence, the maximum length of a complete spell in our data set is 17 years.

The nature of the data set raises some important issues that merit further comments. First, we do not have information on trade relationships for the years before the beginning and after the end the of the sample period (1997–2015), leading to left- and right-censoring of individuals' transition times. The censoring issue is twofold. On one hand, there are a number of fpc spells for which we do not know their

[3]Appendix 1 provides detailed information on the construction of the dataset used in this paper.

[4]Two different thresholds apply to the declaration of export transactions for intra-EU (Intrastat) and extra-EU (Extrastat) trade. While Extrastat information is based on customs declarations and covers virtually all trade transactions, Intrastat covers all firms whose annual export flows exceed a certain annual threshold. Hence, this will likely lead to non-inclusion of a number of small exporters to the EU.

[5]The data are reported annually, which raises an issue regarding partial-year effects at entry: If a firm begins exporting late in the year, its initial annual exports will be underestimated and is subsequent growth after entry overestimated. Bernard et al. (2017), using transaction-level data for Peru, find that the bias in the year of export entry can be substantial. While partial-year effects are likely to be present in our data, their impact in our estimates on survival is less severe than that in growth estimates.

exact entry date (left-censored spells) since they were running at the start of the sample period (i.e., 1997).[6] That is, we do not know whether the first observed year of the spell (start of sample period) is in fact the first year of the relationship or the trade relationship had begun in some prior year. If we overlook that, duration estimates would be biased. In the survival analysis, in order to ensure consistency of our measures of spell age we drop those fpc spells ongoing in 1997 given that we do not know their starting period (i.e., we drop both spells that started in 1997 and left-censored spells).[7] Therefore, we focus on 'fresh spells' (i.e., those spells born from 1998 onwards). Yet, we will add a dummy variable to control for those trade relationships that existed in 1997. On the other hand, at the end of the sample period (i.e., 2015), there are a number of fpc spells still running. That is, we know the starting date of the spell and that it survived at least until year 2015, but we do not know how long the spell ultimately lasted. Survival methods appropriately account for the issue of right-censored observations.

Second, some firms export a product to a country for some periods (first fpc exporting spell), then stop for at least one year (fail), and then start exporting the same product to the same country again, that is, re-enter the market (second fpc spell), a pattern commonly known as repeated spells. In the survival analysis, we will include a dummy variable to control for repeated spells.[8] Taking into account these breaks in fpc relationships are important since it allows accounting for the fact that experimentation is a salient feature of product-market export dynamics.

Third, we use annual data to be consistent with previous studies that use annual export activity data (for instance, Besedeš & Prusa, 2006a, 2006b) and to avoid any impacts due to possible seasonality in export behaviour.

While our data source is comprehensive, it also has some drawbacks. First, as it is common with administrative data, it provides limited information about firms' characteristics, such as size, productivity, profitability and ownership structure. The latter may be important, and it precludes us from disentangling multinational activity that could affect the export vs FDI decisions.[9] Second, the data end in 2014 for all fpc export relationships, regardless of their starting time, which involves that the maximum potential age that individual spells can reach is different for each cohort. Although a spell from the 1998 cohort can reach a maximum of 17 years of life, those from 2012 cohort can reach, at most, three years.

2.1 | Summary statistics

This paper explores the relationship between previous experience, experimentation and learning and survival of newly born fpc export spells. That is, we are interested in estimating the probability that

[6]Notice that the data set with export relationships in 1997 is left-truncated because we only observe those fpc spells born before 1997 that have survived long enough to be ongoing in 1997, therefore excluding high-risk export spells initiated before 1997.

[7]See Appendix 1 for a more detailed discussion on left-censoring in this data set.

[8]We distinguish between first and second or higher order fpc spells. We also checked out the results differentiating between second, third, fourth and fifth or higher order but the results remain unaltered.

[9]Our data set does not allow us to properly take into account the case of multinational groups, an issue that often arises when dealing with national firm-level data. Multinational groups may introduce some distortions on the firm-product-country export relationships as firms may offshore production plants and/or breakdown production processes. Both activities may affect the link between experience/experimentation and export survival. For instance, some relationships might be finished due to replacement of exports with FDI activities or, alternatively, vertical FDI may promote strong trade relationships (see, for instance, Conconi et al., 2016).

TABLE 1 Summary statistics. 'Fresh' firm-product destination spells 1998–2015

Total number					
Exporters	8859				
CN8 products	7429				
Destination countries	198				
Firm-product-country exporting spells	1,935,355				
***N* (firm-product-country) exporting spells per firm**					
Mean	234				
Percentiles					
25th	53				
50th	114				
75th	242				
95th	771				
Max.	33,907				
Mean and percentiles of annual value per firm					
	Mean	**25th**	**50th**	**75th**	**95th**
Export value (thousands €)	4895	138	574	2132	14,007
CN8 products (no.)	2.6	1	1	2	7
Destination countries (no.)	3.1	1	1	3	12
Product-destination (no.)	30.2	5	12	29	99
N observations: 4,404,104					

a firm-product-destination export spell ends when it reaches a certain age. To this end, we restrict attention to continuing exporters, that is, firms that export each year over the period 1997–2015. This avoids mixing up the factors associated with entry into and exit from export activity (or, even firm failure) with those related to the survival of new fpc export spells. Therefore, we focus on survival of 'fresh' fpc export spells conditional on firm survival in export markets. As a result, the survival analysis is carried out for 1,935,355 fpc export spells (see top panel of Table 1), corresponding to 8859 firms, 7429 products and 198 destination markets, leading to 4,404,104 observations.

The bottom panel of Table 1 shows information at the firm level. In line with the results in previous studies, the distribution of Spanish product-destination trade flows is skewed along the different dimensions. On average, a Spanish regular exporting firm exports about 2–3 products to three destination market. Yet, most firms export one product to one destination market. The median product-destination portfolio of a continuing exporter is 12. Moreover, the annual export value of the median exporter is about 574,000€, with a small share of exporters accounting for most sales.

3 | MODELLING THE DURATION OF FIRM-PRODUCT-MARKET EXPORTING SPELLS

This section provides an outline of the empirical methods used in this paper, describes the vector of explanatory variables and presents preliminary evidence on their relationship with export survival.

3.1 | Piece-wise exponential model

This paper uses survival methods in order to assess the role of experience and experimentation for export survival.[10] Specifically, we aim at investigating the effect on export survival of accumulated ongoing experience (i.e., age-of-spell effects or duration dependence), previous 'dynamic' experience (i.e., over the entire exporting history of the firm, such as 'entry mode'), 'static' experience (related to firm export size and the extent of product and country diversification) and experimentation (i.e., repeated spells).

These methods examine time-to-an event (i.e., end of a new fpc export spell) since the onset of that fpc export spell. Survival methods depict some interesting features. First, they account for whether and when an event takes places, so it allows controlling for the evolution of hazard rate with an spell's age (i.e., duration dependence). Second, these methods appropriately deal with right-censored observations, which arise when fpc export spells are incomplete (i.e., spells that are ongoing at the end of the sample period).[11] Third, the long time span of our data set allows examining a large number of new spells over time with a long follow-up period, which permits to overcome some drawbacks of previous studies on trade and firm survival that examine few cohorts over short follow-up periods after entry.

We estimate several specifications of a piece-wise constant exponential hazard model that is a flexible semiparametric model characterised by its hazard rate, $h(t)$, which is the probability of leaving export markets at time t conditional upon survival up to that time t. The model takes the following form:

$$h\left(t, X_i(t)\right) = h_0(t) \exp\left(X_i(t)\,\beta\right) \tag{1}$$

where $h_0(t)$ is the *baseline function* or the hazard for a reference individual with covariate values (X) equal to 0 and captures the common risk faced by all spells of a given age t. It is parameterised using yearly dummy variables that summarise the age-of-spell specific effects (duration dependence) on the hazard. We include 17 dummy variables given that this is the maximum possible duration of an export spell in our data set. This baseline hazard specification does not impose a particular functional form, thus allowing for a flexible shape of duration dependence. Thus, we can retrieve from the estimation the age dummies that account for the evolution of risk as the fpc spell grows older. That is, it measures how the hazard of ending an fpc export spell changes with each additional year that it is active. Besides, this flexible specification is robust to misspecification errors and mitigates the potential problem brought about by unobserved heterogeneity when the baseline is mistakenly parameterised (Dolton & van der Klauw, 1995).

The second component in Equation (1), $\exp\left(X_i(t)\,\beta\right)$, is the relative risk associated with covariate values of X. The set of covariates is included to control for heterogeneity in the exit risk across export spells. In this specification, the effect of covariates is constrained to be a constant (over duration time) proportional shift of the baseline hazard function. The set of covariates comprises time-invariant and measured before of or at the onset of the export spells firm-, product-, destination- and regional-level characteristics in order to capture previous experience and experimentation. They are predetermined in the survival analysis, which helps mitigate the potential problem of simultaneity. To obtain efficient estimators and unbiased standard errors, we apply the robust (Huber-White sandwich) estimator.

As a robustness check, we further estimate several specifications of a frailty model that is aimed at controlling for unobserved heterogeneity that may remain after including the full set of

[10]See Jenkins (2005) for an excellent overview of these methods.

[11]This contrasts with traditional cross-section methods (e.g., logit, probit models) that focus on unconditional probability of occurrence of an event or on the average duration (OLS) over a period of time.

explanatory variables. The baseline hazard estimates of the different specifications of model (1) capture the pattern of duration dependence, which may arise from either true or spurious state dependence. The former may be related to the existence of high sunk-entry costs to exporting, 'success bread success' and/or learning-by-exporting effects (i.e., accumulated experience from the start of a product-destination export spell). Spurious state dependence results from the lack of control for both observed and unobserved heterogeneity. Overlooking unobserved heterogeneity has some implications. First, the non-frailty model will overestimate the degree of negative duration dependence in the (true) baseline hazard. This is a selection effect given that export spells with high frail fail faster, other things equal, so the survivors at any given survival time are increasingly composed of spells with relatively low frailty and thence lower hazard rates. Second, the presence of unobserved heterogeneity attenuates the proportionate response of the hazard to variation in each regressor at any survival time. That is, the estimate of a positive (negative) coefficient derived from the (wrong) no-frailty model will underestimate (overestimate) the 'true' estimate.

To tackle this issue, we estimate several specifications of a shared frailty model that is equivalent to a random-effect model for survival data. The shared frailty term, ν, captures unobserved effects related to unobservable firm characteristics given that the firm is the locus of decision-making of product-destination export spells.[12] Thus, the model takes the following form:

$$h\left(t, X_i(t) \mid \upsilon\right) = \nu \bullet h\left(t, X_i(t)\right) = \nu \bullet h_0(t) \exp\left(X_i(t)\,\beta\right) \tag{2}$$

where ν is a positive random variable that is distributed as gamma with mean one and finite variance that is assumed to be independent of t and X.[13] We must bear in mind an implication of the frailty model in terms of interpretation of exponentiated coefficients or hazard ratios. In model (1), a hazard ratio is interpreted as a proportional shift in the hazard function due to a unit change in the associated covariate. However, in model (2), hazard ratios carry the usual interpretation of model (1) only if comparing two hazards conditional on a given ν.

3.2 | Explanatory variables and preliminary evidence

This section presents the main explanatory variables (see Table A4 for a detailed description) and displays preliminary results on their relationship with export survival. To do so, we rely on non-parametric tests (log-rank tests) of equality of Kaplan–Meier survival functions across groups of spells classified according to the different values of each of these covariates. Under the null hypothesis, there is no difference in the survival rate across them. The results are presented in Table 2. The non-parametric Kaplan–Meier estimate of the survival function at t is obtained as follows:

$$S(t) = \prod_{j \mid t_j \leq t} \frac{n_j - d_j}{n_j}$$

[12]Hence, we partly correct for the lack of information on firm characteristics (such as productivity, employment, managerial capabilities…), which are likely to affect export survival.

[13]Tests on the significance of the frailty term are performed. In particular, we test whether the variance of the frailty term is statistically different from zero. If we reject the null, then the frailty model will be the preferred specification. Under the null hypothesis, the statistic is distributed as a chi-squared with one degree of freedom.

where n_j is the number of ongoing export spells of age t_j, so they are at risk of suffering the event (i.e., ending the fpc export spell) at the onset of that period; d_j is the number of spells that end after reaching that age (i.e., they are not active in next period). The product is work out for all ages smaller or equal to t.

We now outline experience, tryouts and experimentation, and other control variables that are used in the empirical model and provide preliminary evidence.

3.2.1 | Experience, experimentation (repeated spells) and entry mode

We define firm experience making use of the entire history about each firm's exporting profile available in the data set. Therefore, we account for different sources of experience. First, the accumulated experience as an fpc spell ages (i.e., the increase in experience with time spent within a specific market selling a specific product).

Second, the experience gathered by the firm at the product-destination level, as well as the experience amassed at the product and destination-market levels before the onset of the fpc export spell being analysed are also accounted for. We proxy these previous experience effects through different variables, such as binary indicators that capture their existence/non-existence, variables that count the number of years of product-country, product or country experience (before the onset of the fpc spell), as well as a binary indicator to account for existence of the relationship (at product-country, product, and country level) in 1997.[14] We also add two variables that count the number of years of the previous product-destination spell and the number of years between the previous and the current fpc export spell.

Third, we also control for experimentation using a variable that accounts for repeated (vs. first) product-destination spells. Some papers find a trial-and-error behaviour of firms; exporters start with small foreign deliveries to test whether exporting is profitable (Albornoz et al., 2012). Fanelli and Hallak (2018) develop a model with uncertainty and experimentation that points out that uncertainty and experimentation are central features that characterise exporter dynamics. In their model, export survival rates are strikingly low one year after entering a foreign market, while re-entrants are more likely to survive than first-time entrants. Thus, market experimentation could be seen as one dimension of learning.

Furthermore, to further examine the role for export survival of all sources of product and/or destination-market experience of an exporter, we split all new fpc export spells into five exhaustive and mutually exclusive categories according to the firm's overall prior experience. Hence, we consider the following 'entry modes': (a) a new product is sold to a previously served destination/country (NP, OC); (b) a product already exported by the firm is sold to a new destination market/country (OP, NC); (c) a new product is sold to a new destination (NP, NC); (d) a familiar product is sold to a familiar destination, but creating a new product-country combination (OP, OC, NPC); and (e) a new export spell involving an old product-country combination, that is, a repeated product-destination spell (OPC).

The first row of Table 2 ('benchmark') points out the existence of an extremely high infant mortality of new product-destination spells as only does 40% continue beyond their first year. Yet, the hazard sharply falls after the first year to later smooth out. In addition, the results of Table 2 strongly confirm a positive association between survival and previous experience along the different dimensions, with the only exception of previous experience at the destination-market level. We also find a high degree

[14]Unfortunately, we cannot distinguish whether ongoing export spells in 1997 were born in 1997 or before. The corresponding spells have been dropped from the analysis, but this dummy variable allows controlling for the previous existence of that relationship. Therefore, it is also capturing previous experience and experimentation.

of experimentation of Spanish exports, with repetition significantly raising survival probability. The variable that allows us to control for the 'entry mode' taking into account all the export history of a firm (from 1997) suggests the existence of a clear ranking in survival performance. New fpc spells involving selling a new product to either a new or a familiar market endure the highest risk as only 20 and 27 per cent of these spells survive beyond their first year of service, respectively. This survival rate rises to 40–43 per cent for old products, and to 49 per cent for repeated product-destination spells. Furthermore, previous experience in products seems to be more effective than previous experience in destination markets.

3.2.2 | Other control variables

The set of covariates further includes variables that are expected to have an effect on survival probability. Table 2 also presents preliminary evidence for those variables that are either binary or categorical. Continuous variables are considered in the regression analysis (i.e., counts of the number of years of experience, initial size of export spell, firm export size…).

We consider some variables that account for static experience. They are measured before the onset of the spell and capture whether the new spell includes the core product and/or destination market of the firm, as well as the extent of diversification of the firm along these two dimensions (i.e., products and markets). Starting a new fpc export spell selling the core product of the firm substantially improves survival. The impact of servicing an already known market has a positive impact, but smaller than that of the product.

Furthermore, we also include some firm-level variables, such as total export value of the firm (in the regression analysis of Section 4) and whether the firm is also an importer at the onset of the spell. Import activity seems to slightly improve survival prospects. Moreover, the existence information spillovers (proxied by the number of exporters of the same product to the same destination in a province) and holding comparative advantage in a product (measured by Balassa's relative specialisation index at country level) may improve survival prospects of new exporting spells. In addition, the degree of product differentiation (measured by the elasticity of substitution, following Minondo & Requena Silvente, 2011) may affect the survival probability of exporting spells.[15] Typically, exporting spells of differentiated products are expected to start smaller probably due to higher uncertainty about whether or not an appropriate matching between the supplier and the consumer is attained. Hence, the searching process for the 'right matching' might involve more tryouts and experimentation. Therefore, it is expected that they face a high hazard rate shortly after entry, but once they make their way in a market because consumers like them, they will probably survive longer than homogenous products, which always face stronger competition. The preliminary evidence suggests that new spells involving products for which Spain holds a comparative advantage reduce the risk, whereas highly differentiated products suffer a higher risk of failure.

Finally, we also consider some distinctive characteristics of the destination markets. In the regression analysis, we include a set of traditional gravity variables, such as real GDP, real per-head GDP, distance from Spain and other variables to capture 'proximity' (i.e., EMU membership, sharing a common language and a common border with Spain, being a land-locked destination market). Furthermore, destination markets (countries) differ in dimensions such as political stability, the functioning of

[15]Besedeš and Prusa (2006a) show that differentiated products survive longer than homogenous products because they focus on specific market niches that alleviate the toughness of price competition. Homogeneous products face stronger price competition that makes survival more difficult.

TABLE 2 Kaplan–Meier estimates of survival of 'fresh' product-destination export spells

	Kaplan–Meier survival rate Years of service				Log-rank tests (*p*-value)	Number of spells	Number of failures	Number observations
	1	3	6	9				
Benchmark	0.40	0.20	0.12	0.08		1,935,355	1,686,740	4,404,104
Previous experience (before onset of spell)								
(A) At product-destination level (fpc)								
Previous fpc experience, fpc existed in 1997								
No, No	0.37	0.18	0.11	0.07	18,837	1,358,856	1,216,023	3,011,686
Yes, No	0.48	0.24	0.14	0.09	(.000)	432,544	351,582	963,944
Yes, Yes	0.54	0.30	0.18	0.13		143,955	119,135	428,474
(B) At product-level (fp)								
Previous fp experience, fp existed in 1997								
No, No	0.26	0.11	0.06	0.04	49,399	405,821	382,357	737,370
Yes, No	0.39	0.19	0.10	0.07	(.000)	606,705	520,254	1,210,406
Yes, Yes	0.47	0.25	0.15	0.11		922,829	784,129	2,456,328
(C) At country level (fc)								
Previous fc experience, fc existed in 1997								
No, No	0.39	0.20	0.13	0.09	1086	304,184	270,449	765,070
Yes, No	0.39	0.19	0.11	0.08	(.000)	734,526	628,327	1,497,822
Yes, Yes	0.42	0.21	0.12	0.08		896,645	787,964	2,141,212
Experimentation								
Order of spell								
First	0.37	0.18	0.11	0.07	17,171	1,358,856	1,216,023	3,011,686
Repeated fpc spell	0.49	0.26	0.15	0.10	(.000)	576,499	470,717	1,392,418
Entry mode								
NP, OC	0.27	0.12	0.07	0.04	46,400	358,117	335,835	658,776
OP, NC	0.43	0.23	0.15	0.11	(.000)	256,480	223,927	686,476
NP, NC	0.20	0.07	0.04	0.03		47,704	46,522	78,594
OP, OC, NPC	0.40	0.20	0.12	0.08		696,555	609,739	1,587,840
OPC (repeated)	0.49	0.26	0.15	0.10		576,499	470,717	1,392,418
Static experience (before onset of fpc spell)								
(A) Core product								
No	0.32	0.14	0.08	0.05	44,100	901,914	823,526	1,762,661
Yes	0.47	0.25	0.15	0.11	(.000)	1,033,441	863,214	2,641,443
(B) Core country								
No	0.40	0.20	0.12	0.08	32	928,540	813,526	2,134,680
Yes	0.41	0.20	0.12	0.08	(.000)	1,006,815	873,214	2,269,424

(Continues)

TABLE 2 (Continued)

	Kaplan–Meier survival rate Years of service				Log-rank tests (*p*-value)	Number of spells	Number of failures	Number observations
	1	3	6	9				
(C) Core/non-core product/country								
Core product, core country								
No, No	0.28	0.12	0.06	0.04	49,113	319,280	298,374	578,059
Yes, No	0.46	0.24	0.15	0.11	(.000)	609,260	515,152	1,556,621
No, Yes	0.35	0.16	0.09	0.06		582,634	525,152	1,184,602
Yes, Yes	0.49	0.27	0.16	0.11		424,181	348,062	1,084,822
(D) Number products, number countries								
[1, 1]	0.41	0.23	0.15	0.11	5154	8244	7353	23,191
[1, 2–10]	0.44	0.24	0.15	0.11	(.000)	18,462	15,983	50,735
[1, >10]	0.49	0.27	0.18	0.13		8841	7226	24,287
[2–10, 1]	0.36	0.18	0.11	0.08		14,002	12,740	32,802
[2–10, 2–10]	0.36	0.17	0.10	0.06		241,312	220,078	531,297
[2–10, >10]	0.41	0.21	0.12	0.09		352,775	307,564	821,893
[>10, 1]	0.33	0.15	0.08	0.06		25,707	23,730	53,966
[>10, 2–10]	0.37	0.17	0.10	0.06		159,282	144,141	347,239
[>10, >10]	0.42	0.21	0.13	0.09		1,106,730	947,925	2,518,694
Firm-level variable (at onset of fpc spell)								
Non-importer	0.40	0.19	0.10	0.07	249.09	139,693	125,324	319,144
Importer	0.41	0.20	0.12	0.08	(.000)	1,795,662	1,561,416	4,084,960
Product-level variables (at onset of fpc spell)								
Revealed comparative advantage (Spain)								
No	0.39	0.20	0.12	0.08	280.26	1,101,510	958,973	2,464,125
Yes	0.42	0.21	0.12	0.08	(.000)	833,845	727,767	1,939,979
Extent of product differentiation								
Low-medium	0.43	0.23	0.14	0.10	5820.56	814,585	696,750	1,969,052
High	0.38	0.19	0.11	0.07	(.000)	1,120,770	989,990	2,435,052
Destination-level caracteristics (country risk)								
Low-risk	0.46	0.25	0.15	0.11	27,085	800,243	679,627	2,105,970
Medium-risk	0.38	0.18	0.10	0.07	(.000)	893,171	786,251	1,868,546
High-risk	0.32	0.13	0.06	0.04		230,103	210,268	407,718

Note: Log-rank test for the equality of the survival functions for each explanatory variable.

markets, red tape or trade policies. Reliability of the destination country may be a key determinant of the survival of trade relationships. As reported by the OECD (2008), a large percentage of credit losses in export markets accrue from the country (political) risk. Hence, we split countries relying on OECD Country Risk Classification Method, which measures the country credit risk, that is, the likelihood that a country will service its external debt. It was developed to ensure premium rates are charged to cover

TABLE 3 Age-of-spell effects

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Age of spell (dummy variables)				
1	0.596	0.610	0.784	0.589
	(0.000)***	(0.002)***	(0.007)***	(0.009)***
2	0.338	0.347	0.478	0.374
	(0.001)***	(0.001)***	(0.004)***	(0.006)***
3	0.244	0.250	0.354	0.284
	(0.001)***	(0.001)***	(0.003)***	(0.005)***
4	0.191	0.196	0.283	0.231
	(0.001)***	(0.001)***	(0.003)***	(0.004)***
5	0.159	0.163	0.239	0.197
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
6	0.138	0.142	0.211	0.175
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
7	0.123	0.126	0.189	0.158
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
8	0.112	0.116	0.174	0.147
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
9	0.102	0.104	0.158	0.134
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
10	0.093	0.095	0.145	0.124
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
11	0.088	0.090	0.138	0.118
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
12	0.082	0.086	0.131	0.114
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
13	0.076	0.079	0.121	0.106
	(0.001)***	(0.002)***	(0.003)***	(0.003)***
14	0.075	0.078	0.119	0.104
	(0.002)***	(0.002)***	(0.003)***	(0.003)***
15	0.071	0.073	0.113	0.100
	(0.002)***	(0.002)***	(0.003)***	(0.003)***
16	0.066	0.067	0.104	0.093
	(0.003)***	(0.003)***	(0.004)***	(0.004)***
17	0.076	0.075	0.115	0.103
	(0.004)***	(0.004)***	(0.006)***	(0.006)***
Initial size of spell (ln)			0.928	0.903
			(0.000)***	(0.001)***

(Continues)

TABLE 3 (Continued)

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Firm characteristics (at onset of fpc spell)				
Firm export value at onset of fpc spell (ln)			0.968	1.002
			(0.000)***	(0.001)**
Firm import dummy			0.985	0.996
			(0.002)***	(0.004)
Product characteristics (at start of fpc spell)				
Dummy revealed comparative advantage			0.985	0.979
			(0.001)***	(0.002)***
Dummy highly differentiated product			1.014	1.004
			(0.001)***	(0.002)*
Destination-market characteristics (at onset of fpc spell)				
Gravity variables				
ln real GDP			1.010	1.007
			(0.000)***	(0.001)***
ln real GDP per person			0.985	0.989
			(0.001)***	(0.001)***
ln distance			1.041	1.054
			(0.001)***	(0.001)***
Dummy share border with Spain			0.942	0.938
			(0.002)***	(0.003)***
Land-locked country dummy			1.002	1.008
			(0.002)	(0.003)***
Dummy euro member country			0.882	0.889
			(0.002)***	(0.003)***
Dummy common language			1.009	0.996
			(0.002)***	(0.003)
Destination-market country risk (omitted low risk)				
Medium-risk countries			1.035	1.045
			(0.002)***	(0.003)***
High-risk countries			1.112	1.113
			(0.003)***	(0.005)***
Spillover effects (at onset of fpc spell)				
Number of exporters at province/product/destination-market level (ln)			0.943	0.926
			(0.001)***	(0.001)***
Business cycle	NO	YES	YES	YES
Province dummies	NO	NO	YES	YES
log-pseudolikelihood	−2,448,512	−2,447,961	−2,379,314	−2,357,087

(Continues)

TABLE 3 (Continued)

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Number of observations	4,404,104		4,367,280	
Number of export spells	1,935,355			
Number of failures	1,686,740			

Notes: Piece-wise exponential model. Dependent variable: hazard rate. All the coefficients in the table are exponentiated and are interpreted as hazard ratios with respect to the baseline (omitted) category. Robust standard errors in brackets. Column (4) reports estimates of a PWE gamma frailty model shared by firm. Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively.

the risk of non-repayment of credits (i.e., credit risk) and are appropriate to cover long-term operating costs and losses associated with the provision of external credits. This particular approach makes OECD country risk classification rather appealing to examine the dynamics of export activity.[16]

In the multivariate analysis of next section, we will examine the role that each of these covariates play for export survival when simultaneously controlling for other factors.

4 | RESULTS

This section presents the results from the estimation of different specifications of Equation (1) in order to examine the role of experience and experimentation for export survival. The results are displayed in Tables 3–7. We include year and regional dummies to account for the business cycle and for regional disparities. The coefficients reported are exponentiated (hazard ratios, e^{β}) and, therefore, indicate the effect on the hazard for a shift from 0 to 1 for a dummy variable or a one unit increase in a continuous variable. Thus, a hazard ratio smaller (greater) than one indicates a reduction (increase) in the hazard and a longer (shorter) duration. The percentage change in the hazard produced by a change in a covariate by one unit (or from 0 to 1 for dummy variables) is obtained as $\left(e^{\beta}-1\right)\bullet 100$. A hazard ratio equal to one indicates no effect on the hazard by the covariate being considered.

As a robustness check, we further estimate several specifications of a frailty model (Equation 2) in order to control for unobserved heterogeneity that may remain after including the full set of explanatory variables. This is particularly relevant in this case given that we aim at unravelling the effect of firm experience and experimentation on the survival of new fpc export spells. The lack of control for unobserved heterogeneity might bias our estimates on duration dependence as well as on the effect of the explanatory variables. Therefore, the last column in each of the Tables 3–7 incorporates the estimates of frailty models. In all cases, we reject the null hypothesis of frailty variance equal to zero, so the frailty specification becomes our preferred specification. Therefore, we should interpret the reported coefficients as hazard ratios in the standard way but conditional on a given frailty v. In general, the results of the frailty models reinforce our main findings: (a) as expected, the size of the baseline

[16]The classification is made through the application of a model (the so-called Country Risk Assessment Model, CRAM), that is, a quantitative assessment complemented with a qualitative assessment of the results of the model. The OECD country risk classification ranks from zero (minimum risk) to 7 (maximum risk) and it is revised several times a year. We have split countries into three groups according to their average country risk rate over the sample period (https://www.oecd.org/trade/topics/export-credits/arrangement-and-sector-understandings/financing-terms-and-conditions/country-risk-classification/).

coefficients is slightly reduced, but negative duration dependence remains; and (b) the relationship between the main explanatory variables and export survival remains qualitatively unaltered.

The analysis proceeds in several steps. First, we start examining the relevance of experience accumulated through time spent in the spell being analysed (Table 3). Second, we have a first look at the effect of experimentation (Table 4). Then, we further investigate the impact of our measures of previous experience built up by an exporter (Table 5). Finally, to disentangle the role for export survival of all possible sources of product and/or destination-market experience of an exporter, we take into account the 'entry mode' of the new fpc export spells (Tables 6 and 7). We discuss the results in turn.

4.1 | Ongoing spell accumulated experience

Table 3 presents the results of several specifications to examine the link between age-of-spell and export survival, that is, we examine how the probability of ending a particular fpc export spell changes with each additional year that it is active. Columns (1)–(4) show that the hazard rate is very high, especially during the first year of service, then it drops off sharply to later smooth out. About 60% (Columns (1), (2) and (4)) of new fpc export spells end during their first year. Then, the hazard rate falls to 33%–37% during the second year and keeps falling thereafter. These findings are robust across the different specifications and are in line with the results in previous studies (Besedeš & Prusa, 2006a, 2006b; Esteve-Pérez et al., 2013; Görg et al., 2012).[17] Pair-wise test of equality of age estimates (not reported for brevity) suggest that the hazard significantly falls until the thirteenth year of a spell. Beyond that age, year-on-year differences in the hazard rates are no longer statistically different.

The last two columns include a group of control variables at firm-product-destination, firm, product and destination levels. We find that the initial size of the spell significantly reduces the exit hazard, which is consistent with previous findings by Besedeš and Prusa (2006a, 2006b), Cadot et al. (2013), Lawless and Studnicka (2019c) and Rauch and Watson (2003). The effect of destination-market characteristics is largely in line with the expected results in a gravity model with real GDP, sharing border, EMU membership reducing the hazard rate, while distance raising it. To some extent surprising, we find that the risk of ending an fpc export spell increases with the size of the destination market, proxied by GDP, and that it is higher for differentiated products.

Rather interestingly, we find that country risk is negatively associated with a spell survival chances in line with Aruajo et al. (2016), Besedeš and Prusa (2006a, 2006b) and Esteve-Pérez et al. (2013), whereas spillovers enhance survival as previously reported by Cadot et al. (2013). Besides, new product-destination spells involving products for which Spain holds comparative advantage further enjoy higher survival probability, which is consistent with Görg et al. (2012) and Cadot et al. (2013).

To sum up, these results may indicate that the accumulation of experience from the start of an export spell (i.e., with its elapsed duration or age) improves survival chances. Next sub-section explores additional dimensions of experimentation and learning.

4.2 | Experimentation and previous experience

Table 4 depicts the results when we further consider the impact of experimentation. We do so by adding a binary variable that controls for repeated product-destination spells.

[17]Besides, the results also hold when we control for year-of-birth of spells (i.e., cohort effects). No clear pattern of cohort effects arises. These results are not reported in Table 3 but are available upon request from the author.

The results confirm the decline in the hazard with the age of spells previously found as well as the positive association between export survival and initial size, holding a significant comparative advantage at the product level, and the number of exporters from the same region selling the same product to the same destination (i.e., spillovers). Likewise, some country characteristics (e.g., country risk, distance and GDP) maintain their negative effect on survival probability.

Interestingly, we find that repetition significantly reduces the hazard rate. Our estimates suggest that repeated product-destination export spells face a 11%–17% lower exit hazard than first fpc spells. This result is consistent with the findings in previous studies (Albornoz et al., 2012, 2016) that point out that experimentation can be seen as one dimension of learning. Fanelli and Hallak (2018) argue that exporters learn through experimentation (repeated spells). New fpc export relationships face an extremely high hazard rate at entry due to high uncertainty. Then, re-entrants (i.e., repeated spells) are more likely to succeed, survive and grow. Besides, we find that the existence of a product-destination export relationship in 1997 further improves survival chances.

Table 5 introduces additional variables in order to capture the effect of both experimentation and different sources of previous experience gathered by an exporter on survival of new fpc export spells. In particular, Columns (1)–(3) include a dummy variable for repeated spells, and two variables to control for duration (i.e., number of years) of the previous fpc spell and the gap between the current and the previous fpc spell, respectively. Then, Columns (4)–(6) incorporate one dummy variable that controls for having previously exported the product (i.e., firm-product, fp) to other destinations before the launch of the product-destination (fpc) export spell being examined. Likewise, we also add a dummy variable to control for having previously exported (other products) to a particular destination (firm-destination, fc) before the launch of the product-destination (fpc) spell being analysed. Besides, three additional dummy variables to control for existence of the firm-product, firm-country and firm-product-country export relationship in 1997, respectively, are also considered. Finally, Columns (7)–(10) depict the results when all sources of previous experience are included simultaneously. Besides, across the different columns of Table 5, we incorporate the full set of explanatory variables, including some variables to control for static experience and product and country diversification at the firm level in Columns (9) and (10). Finally, the last column reports the estimates of a frailty model of the most complete specification.

The results reported in Table 5 confirm our previous findings and add some interesting insights. The hazard rate falls with the age of the product-destination spell (though, the baseline coefficients are not reported for brevity) and with repetition. Moreover, the effectiveness of repetition of a product-destination export relationship in reducing the hazard increases with the duration of the previous spell and decreases with the length of the gap between the previous and current fpc spell. Therefore, these results may be compatible with the learning-through-experimentation in export markets hypothesis (Albornoz et al., 2012 and Fanelli & Hallak, 2018). Longer spells deliver more learning, which might be eroded by the duration of the gaps between identical and consecutive product-destination export spells.

The results in Columns (4)–(10) show that having prior product experience is more valuable for export survival than having previous experience in the destination market. The hazard rates for product experience are always smaller than one and statistically significant. The relatively small initial positive effect on survival of an fpc export spell of having prior experience in the destination market (Column (4)) becomes negative once we control for the full set of covariates (mainly, Columns (9) and (10)). Moreover, selling core products and/or selling to core market destinations seems to further improve survival chances. The impact of the former is stronger, which is consistent with previous studies (Iacovone & Javorcik, 2010; Lawless & Studnicka, 2019c) that highlight the survival-enhancing effect

of exporting core products. Thus, spells that combine core products and destinations endure a 14%–18% lower hazard than spells that comprise non-core products and non-core countries.

Besides, we find that new fpc export spells of firms with highly diversified product and destination portfolio endure shorter duration (i.e., hazard ratios larger than one and statistically significant). This finding is compatible with the high degree of churning by large continuing exporters pointed out by Bernard et al. (2010) and Bernard et al. (2018). Interestingly, the combination of one product sold to more than ten destination markets shares the best survival prospects with the omitted group (i.e., one product to one market). That might suggest the existence of some positive effects for export survival of experimentation with a product to different markets, despite the high sunk export-entry costs associated with delivering products to new destination markets.

Furthermore, both the initial size of the fpc spell, the firm's total trade value and participation in import activities reduce the exit hazard. Product characteristics lose their statistical significance when we account for unobserved heterogeneity. Destination characteristics depict the expected results according to the gravity model. That is, the risk of ending an fpc export spell falls with the economic size of the destination market (real GDP and real GDP per capita), neighbourhood, EMU membership and common language, while it rises with distance and it is higher when exporting to land-locked countries. Finally, as in previous sub-sections, selling to low-risk countries and the number of exporters at the province-product-country level significantly raise survival chances.

4.3 | Entry mode

This section digs deeper into the effect of all possible sources of product and/or destination-market prior experience on survival of new fpc export spells. The variable *Entry Mode* breaks all new fpc spells down into the following five exhaustive and mutually exclusive categories according to the firm's prior experience using its entire exporting history (available in the data). First, a new export product is sold to a previously served destination market (NP, OC). Second, a previously exported product is sold to a new destination market (OP, NC). Third, a new product is sold to a new destination market (NP, NC). Fourth, a familiar product is sold to a familiar destination, but leading to a completely new product-market combination (OP, OC, NPC). Finally, a repeated product-country pair (OPC). The latter is the omitted category in the regression analysis.

The results of Table 6 confirm the pattern of negative duration dependence (though baseline coefficients are not reported for brevity) and the positive effect of repetition (i.e., the omitted category OPC) on the subsequent survival of new fpc spells. Interestingly, there exist remarkable and statistically significant differences in post-entry performance across the different entry routes. Survival is particularly difficult for new fpc trade relationships involving selling new products to either new or familiar destination markets as they endure about a 35%–52% and a 32%–36% higher exit hazard than repeated spells (reference category), respectively. Survival conditions are relatively more pleasant for new fpc trade flows when a market (either familiar or unfamiliar to the firm) is served with familiar products, with a hazard rate closer to one. This survival ranking is robust across the different specifications of Table 6, including the frailty model (Column (4)). These results are consistent with Bernard et al. (2011) and Iacovone and Javorcick (2010) and Manova and Zhang (2009) that point out that entry costs are lower for new products at a familiar market than for new markets. Hence, we would expect more tryouts and experimentation at product level leading to more churning at new product than at new destination level.

The impact of the other covariates on export survival is, in general, consistent with our previous results. The size of the spell, holding a comparative advantage at the product level, several

TABLE 4 Age-of-spell effects and experimentation

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Age of spell (dummy variables)				
1	0.661	0.661	0.760	0.582
	(0.002)***	(0.002)***	(0.007)***	(0.009)***
2	0.384	0.384	0.465	0.372
	(0.001)***	(0.001)***	(0.004)***	(0.006)***
3	0.279	0.279	0.345	0.282
	(0.001)***	(0.001)***	(0.003)***	(0.005)***
4	0.220	0.221	0.275	0.229
	(0.001)***	(0.001)***	(0.003)***	(0.004)***
5	0.183	0.184	0.232	0.195
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
6	0.159	0.160	0.204	0.173
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
7	0.141	0.142	0.182	0.155
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
8	0.129	0.131	0.168	0.144
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
9	0.117	0.118	0.152	0.131
	(0.001)***	(0.001)***	(0.002)***	(0.003)***
10	0.106	0.108	0.139	0.120
	(0.001)***	(0.001)***	(0.002)***	(0.002)***
11	0.100	0.102	0.132	0.115
	(0.001)***	(0.001)***	(0.002)***	(0.002)***
12	0.095	0.096	0.125	0.110
	(0.002)***	(0.002)***	(0.002)***	(0.003)***
13	0.087	0.088	0.115	0.102
	(0.002)***	(0.002)***	(0.002)***	(0.003)***
14	0.084	0.086	0.113	0.100
	(0.002)***	(0.002)***	(0.003)***	(0.003)***
15	0.080	0.081	0.107	0.095
	(0.002)***	(0.002)***	(0.003)***	(0.003)***
16	0.072	0.073	0.097	0.087
	(0.003)***	(0.003)***	(0.004)***	(0.004)***
17	0.079	0.079	0.106	0.095
	(0.004)***	(0.004)***	(0.006)***	(0.005)***

(Continues)

TABLE 4 (Continued)

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Experimentation/previous experience				
Product-destination experience (dummy v.)—repeated spell	0.834	0.864	0.890	0.886
	(0.001)***	(0.001)***	(0.001)***	(0.002)***
fpc export relationship on or before 1997 (dummy v.)		0.881	0.917	0.906
		(0.002)***	(0.002)***	(0.003)***
Initial size of spell (ln)			0.930	0.906
			(0.000)***	(0.001)***
Firm characteristics (at onset of fpc spell)				
Firm export value at onset of fpc spell (ln)			0.969	1.000
			(0.000)***	(0.001)
Firm import dummy			0.982	0.996
			(0.002)***	(0.004)
Product characteristics (at start of fpc spell)				
Dummy revealed comparative advantage			0.990	0.984
			(0.001)***	(0.002)***
Dummy highly differentiated product			1.014	1.003
			(0.001)***	(0.002)
Destination-market characteristics (at onset of fpc spell)				
Gravity variables				
ln real GDP			1.010	1.007
			(0.000)***	(0.001)***
ln real GDP per person			0.987	0.991
			(0.001)***	(0.001)***
ln distance			1.042	1.053
			(0.001)***	(0.001)***
Dummy share border with Spain			0.942	0.939
			(0.003)***	(0.003)***
Land-locked country dummy			0.997	1.002
			(0.002)	(0.003)
Dummy euro member country			0.881	0.890
			(0.002)***	(0.003)***
Dummy common language			1.017	1.004
			(0.002)***	(0.003)
Destination-market country risk (omitted low-risk)				
Medium-risk countries			1.029	1.039
			(0.002)***	(0.003)***

(Continues)

TABLE 4 (Continued)

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
High-risk countries			1.107	1.106
			(0.003)***	(0.005)***
Spillover effects (at onset of fpc spell)				
Number of exporters at province/product/destination-market level (ln)			0.950	0.934
			(0.001)***	(0.001)***
log-pseudolikelihood	−2,448,512	−2,447,961	−2,375,934	−2,353,469
Number of observations	4,404,104		4,367,280	
Number of export spells	1,935,355			
Number of failures	1,686,740			

Notes: Piece-wise exponential model. Dependent variable: hazard rate. All the coefficients in the table are exponentiated and are interpreted as hazard ratios with respect to the baseline (omitted) category. All regressions include year dummies and province-of-origin dummies. Robust standard errors in brackets in Columns (1)–(3). Column (4) reports estimates of a PWE shared (by firm) gamma frailty model. Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively.

destination-market characteristics such as GDP per capita, sharing border and language with Spain, EMU membership and the number of exporters at province-product-country level are positively associated with export survival. Besides, country risk and distance reduce survival probability.

This section has uncovered remarkable differences in survival performance across export spells according to their entry mode. Therefore, the source of an exporter's prior experience affects the survival chances of new fpc export spells. Next section carries out a more in-depth analysis of the distinct role that each type of experience plays for export survival. To do so, we explore the hazard rate by entry modes separately.

4.4 | Separate regression by entry mode: different sources of experience

This section extends the analysis on the role of experimentation and previous product and/or country experience for export survival of Section 4.2 when we breakdown new fpc export spells by their entry mode as in Section 4.3. This allows us to overcome a limitation of the analysis in Section 4.2 in which the different entry routes were pooled together. For instance, when assessing previous product experience, we jointly considered new product-destination markets arising from (OP, NC) and (OP, OC, NPC) entry modes. Likewise, when examining the role of previous country experience, we did not distinguish between new spells arising from (NP, OC) and (OP, OC, NPC) entry modes.

Table 7 displays the results by entry mode separately. In addition, we replace the dummy variables that accounted for existence/lack of previous experience with a product and/or experience in a destination market used in Table 5 with alternative measures of experience. That is, the number of years of experience at the product-destination, product, and destination levels.

Remarkably, Table 7 shows that a number of factors have a similar effect on the exit hazard independently of the entry route, which is consistent with our previous findings. Thus, the initial size of the product-destination spell and the number of firms in the same region selling the same product to the same destination significantly reduce the hazard rate. Trade with high-risk countries entails worse

TABLE 5 Previous experience

	Frailty									
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
'Dynamic' previous experience (before onset of spell)										
Product-destination experience (dummy v.) (repeated fpc spell)	0.906	0.915	0.915				0.959	0.951	0.960	0.945
	(0.002)***	(0.002)***	(0.002)***				(0.002)***	(0.002)***	(0.002)***	(0.003)***
fpc export relationship on or before 1997		0.924	0.949				0.996	0.982	0.979	0.975
		(0.002)***	(0.002)***				(0.003)	(0.003)***	(0.003)***	(0.004)***
Duration previous fpc spell (*n* years)	0.950	0.954	0.964				0.957	0.967	0.968	0.971
	(0.001)***	(0.001)***	(0.001)***				(0.001)***	(0.001)***	(0.001)***	(0.001)***
Gap with previous fpc spell (*n* years)	1.007	1.008	1.010				1.010	1.012	1.010	1.010
	(0.000)***	(0.000)***	(0.000)***				(0.000)***	(0.000)***	(0.000)***	(0.001)***
Product experience (dummy v.)				0.787	0.860	0.868	0.876	0.882	0.943	0.951
				(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.002)***
fp export relationship on or before 1997					0.860	0.860	0.886	0.880	0.910	0.883
					(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.002)***
Destination-market experience (dummy v.)				0.976	1.015	1.032	1.041	1.054	1.053	1.042
				(0.001)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.003)***
fc export relationship on or before 1997					0.914	0.998	0.931	1.013	1.013	0.990
					(0.001)***	(0.001)	(0.001)***	(0.001)***	(0.001)***	(0.002)***
'Static' previous experience (before onset of spell)										
Core product, core country (omitted: no core product, no core country)										
Core product, no core country									0.833	0.857
									(0.001)***	(0.002)***
No core product, core country									0.952	0.969
									(0.002)***	(0.003)***

(Continues)

TABLE 5 (Continued)

	Frailty									
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Core product, core country									0.816	0.858
									(0.002)***	(0.002)***
Firm export portfolio: *N* products; *N* countries (omitted: [1]; [1])										
[1]; [2–10]									1.044	1.037
									(0.011)***	(0.015)**
[1]; [>10]									0.986	1.026
									(0.012)	(0.019)
[2–10]; [1]									1.054	1.039
									(0.011)***	(0.016)**
[2–10]; [2–10]									1.162	1.097
									(0.010)***	(0.014)***
[2–10]; [>10]									1.119	1.088
									(0.010)***	(0.014)***
[>10]; [1]									1.032	1.053
									(0.010)***	(0.017)***
[>10]; [2–10]									1.169	1.123
									(0.010)***	(0.015)***
[>10]; [>10]									1.149	1.132
									(0.010)***	(0.015)***
Initial size of spell (ln)			0.931			0.932		0.934	0.932	0.911
			(0.000)***			(0.000)***		(0.000)***	(0.000)***	(0.001)***

(Continues)

TABLE 5 (Continued)

	Frailty									
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Firm characteristics (at onset of fpc spell)										
Firm export value at onset of fpc spell (ln)			0.969			0.974		0.973	0.974	0.998
			(0.000)***			(0.000)***		(0.000)***	(0.000)***	(0.001)*
Firm import			0.981			0.989		0.987	0.980	0.990
			(0.002)***			(0.002)***		(0.002)***	(0.002)***	(0.004)**
Product characteristics (at start of fpc spell)										
High revealed comparative advantage			0.991			1.002		1.004	1.009	1.001
			(0.001)***			(0.001)		(0.001)***	(0.001)***	(0.002)
Highly differentiated product			1.014			1.013		1.012	1.011	1.002
			(0.001)***			(0.001)***		(0.001)***	(0.001)***	(0.002)
Destination-market characteristics (at onset of fpc spell)										
Gravity variables										
ln real GDP			1.009			0.999		0.999	0.997	0.996
			(0.000)***			(0.000)**		(0.000)***	(0.000)***	(0.001)***
ln real GDP per person			0.987			0.986		0.986	0.987	0.991
			(0.001)***			(0.001)***		(0.001)***	(0.001)***	(0.001)***
ln distance			1.041			1.060		1.060	1.061	1.066
			(0.001)***			(0.001)***		(0.001)***	(0.001)***	(0.001)***
Dummy share border with Spain			0.942			0.889		0.890	0.887	0.893
			(0.003)***			(0.002)***		(0.002)***	(0.002)***	(0.003)***
Land-locked country dummy			0.997			1.015		1.014	1.014	1.013
			(0.002)			(0.002)***		(0.002)***	(0.002)***	(0.003)***
Dummy euro member country			0.882			0.892		0.892	0.897	0.907
			(0.002)***			(0.002)***		(0.002)***	(0.002)***	(0.003)***

(Continues)

TABLE 5 (Continued)

	Frailty									
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Dummy common language			1.017			0.973		0.976	0.973	0.974
			(0.002)***			(0.002)***		(0.002)***	(0.002)***	(0.003)***
Destination-market country risk (omitted low-risk)										
Medium-risk countries			1.026			1.032		1.028	1.029	1.036
			(0.002)***			(0.002)***		(0.002)***	(0.002)***	(0.003)***
High-risk countries			1.103			1.088		1.084	1.088	1.098
			(0.003)***			(0.003)***		(0.003)***	(0.003)***	(0.005)***
Spillover effects (at onset of fpc spell)										
Number of exporters at province/product/destination-market level (ln)			0.951			0.960		0.962	0.959	0.947
			(0.001)***			(0.001)***		(0.001)***	(0.001)***	(0.001)***
log-pseudolikelihood	−2,427,030	−2,426,767	−2,374,499	−2,427,447	−2,422,846	−2,369,214	−2,419,569	−2,367,081	−2,362,613	−2,343,127
Number of observations	4,404,104		4,367,280	4,404,104		4,367,280	4,404,104	4,367,280		
Number of export spells	1,935,355									
Number of failures	1,686,740									

Notes: Piece-wise exponential model. Dependent variable: hazard rate. All the coefficients in the table are exponentiated and are interpreted as hazard ratios with respect to the baseline (omitted) category. All regressions include age-of-spell dummies, year dummies and province-of-origin dummies. The coefficients are not reported for brevity but are available from the author upon request. Robust standard errors in brackets in Columns (1)–(9). Column (10) reports estimates of a PWE shared (by firm) gamma frailty model. Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively.

TABLE 6 Entry mode

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Entry mode (OPC omitted)				
NP, OC	1.361	1.325	1.330	1.322
	(0.002)***	(0.002)***	(0.002)***	(0.003)***
OP, NC	1.093	1.087	1.009	1.033
	(0.002)***	(0.002)***	(0.002)***	(0.003)***
NP, NC	1.523	1.495	1.355	1.353
	(0.005)***	(0.004)***	(0.004)***	(0.007)***
OP, OC, NPC	1.154	1.131	1.118	1.132
	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Initial size of spell (ln)		0.929	0.932	0.908
		(0.000)***	(0.000)***	(0.001)***
Firm characteristics (at onset of fpc spell)				
Firm export value at onset of fpc spell (ln)			0.971	1.002
			(0.000)***	(0.001)*
Firm import			0.987	0.995
			(0.002)***	(0.004)
Product characteristics (at start of fpc spell)				
High revealed comparative advantage			0.997	0.990
			(0.001)**	(0.002)***
Highly differentiated product			1.012	1.003
			(0.001)***	(0.002)
Destination-market characteristics (at onset of fpc spell)				
Gravity variables				
ln real GDP			1.002	1.000
			(0.000)***	(0.001)
ln real GDP per person			0.987	0.991
			(0.001)***	(0.001)***
ln distance			1.055	1.062
			(0.001)***	(0.001)***
Dummy share border with Spain			0.901	0.907
			(0.002)***	(0.003)***
Land-locked country dummy			1.010	1.012
			(0.002)***	(0.003)***
Dummy euro member country			0.892	0.899
			(0.002)***	(0.003)***
Dummy common language			0.987	0.982
			(0.002)***	(0.003)***

(Continues)

TABLE 6 (Continued)

	Frailty			
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Destination-market country risk (omitted low-risk)				
Medium-risk countries			1.031	1.040
			(0.002)***	(0.003)***
High-risk countries			1.094	1.105
			(0.003)***	(0.005)***
Spillover effects (at onset of fpc spell)				
Number of exporters at province/product/ destination-market level (ln)			0.957	0.942
			(0.001)***	(0.001)***
log-pseudolikelihood	−2,424,598	−2,414,230	−2,370,715	−2,349,714
Number of observations	4,404,104		4,367,280	
Number of export spells	1,935,355			
Number of failures	1,686,740			

Notes: Piece-wise exponential model. Dependent variable: hazard rate. All the coefficients in the table are exponentiated and are interpreted as hazard ratios with respect to the baseline (omitted) category. All regressions include age-of-spell dummies, year dummies and province-of-origin dummies. The coefficients are not reported for brevity but are available from the author upon request. Robust standard errors in brackets in Columns (1)–(3). Column (4) reports estimates of a PWE shared (by firm) gamma frailty model. Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively.

survival conditions. Some gravity variables have the expected results. Export spells to countries that have Spanish as their official language are EMU members, share border with and/or are geographically close to Spain enjoy longer expected duration. Specifically, sharing border with Spain turns out to be particularly effective for the survival of (NP, NC) export spells.

Turning to the role of an exporter's prior experience, Table 7 reveals some interesting differences across entry modes. First, when the new product-destination spell involves selling a new product to a familiar destination (NP, OC), the length of previous experience selling other products to that market slightly enhances survival. The hazard ratio in Columns (1)–(3) is very close to one, involving that one more year of destination-market experience reduces the hazard rate by about 0.1%. Yet, we obtain that adding a new product to a core destination of an exporter endures a higher hazard. This is consistent with Lawless et al. (2019a) argument that an exporter may enlarge her export portfolio by adding products that are likely to be less closely aligned to that firm's core competencies to their known markets, which may lead to lower survival rates. Moreover, the firm's total sales to that destination at the onset of the product-destination being analysed significantly reduces the hazard rate. Second, Columns (4)–(6) show that current firm's total sales of the product and selling a core product significantly reduce the hazard rate of new product-market combinations made up of familiar products and new destinations (OP, NC).

Third, new spells comprising both new product and new destination (NP, NC) have no prior experience with that product or in that market. In this case, Columns (7) and (8) indicate that current the firm's total sales in foreign markets enhances survival. Fourth, for new spells involving a familiar product and a familiar destination, though a new product-destination pair (OP, OC, NPC), both the firm's current total exports of the product and its total sales to the country significantly reduce the exit hazard (Columns (9)–(11)). The impact of the previous experience measured by the number of years at product or destination have either a tiny or insignificant effect, especially in the frailty model.

In this case, only does selling a core product to a core country simultaneously seem to significantly reduce the hazard rate (about 2.5% in Column (11)) with respect the omitted group (no core product and no core destination). Fifth, in the case of repeated fpc spells (OPC), Columns (12)–(14) reveal that previous product-destination experience undoubtedly raises survival probability (number of years of experience, duration of previous fpc spell, existence of the spell in 1997), while the length of the gap between the previous and the current spell increases the risk of ending the spell. Selling the core product (and both core product and core country) of the firm further boosts survival.

Importantly, there arises heterogeneity in the role played by other control variables for export survival. Thus, while holding a comparative advantage in the product significantly reduces the hazard rate when selling completely new products either to a familiar or to a new destination (NP, OC and NP, NC), it turns out to be non-significant or even increases the risk for spells involving already exported products by the firm (OP, NC; OP, OC, NPC; and OPC). Besides, if the firm is simultaneously an importer does not seem to be relevant for survival when exporting a new product (NP, OC and NP, NC), but it reduces the hazard rate when exporting familiar products (OP, NC; OP, OC, NPC; and OPC). Diversification of the firm's product-destination portfolio is generally associated with more churning at the product-destination level and therefore increases the exit hazard, except for the case of new spells involving a completely new product-destination pair made up of sales of a familiar product to a familiar destination (OP, OC, NPC). In this case, we find either a non-significantly different effect or even a lower exit hazard when the firm was selling only one product to two or more destinations before the onset of the product-destination spell being analysed.

Once we control for other factors, the economic size and the GDP per capita of destination markets enhances survival (i.e., hazard below one) when selling a familiar product to a completely new destination market for the firm (OP, NC). They also reduce the exit hazard in the case of familiar products and destinations (OP, OC, NPC and OPC), but have no significant effect when selling new products (NP, OC and NP, NC). Selling a highly differentiated product does not arise as a relevant factor in shaping survival (see frailty model estimates for each entry route—Columns (3), (6), (8) and (11)), except for the case of repeated spells in which it improves survival chances (Column (14)). Finally, the total trade value of the firm seems to raise the exit hazard (except for the case of NP, NC spells).

5 | DISCUSSION AND CONCLUSION

This paper explores the role of experience and experimentation for survival of all new product-destination spells by continuing exporting firms over the period 1998–2015 using Spanish customs data. Our main contribution is to unravel the distinct effect on export survival of the different sources of experience accumulated by an exporter. Specifically, we examine the role of ongoing accumulated experience (i.e., the build-up of experience with the age of a specific fpc export spell), prior product and/or destination-market experience and experimentation (repetition of product-destination relationships).

The results indicate that while entry is relatively easy, survival is not. The hazard rate is very high at birth and then it drops off sharply to later smooth out (e.g., Table 3). Besides, experimentation (i.e. repetition of product-destination export relationships) is fairly common and significantly reduces the exit hazard (e.g., Tables 2, 4 and 5). In addition, we find that previous experience effectively enhances survival chances (Tables 2 and 5).

The low survival rate upon entry to export and the extent and effectiveness of repetition could be initially difficult to reconcile with models of entry with sunk costs (e.g., Melitz, 2003), which predict longer survival after entry leading to low churning. However, these findings may be in line with recent

TABLE 7 Entry mode and previous experience

	Frailty			Frailty		
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**New Product, Old Country (NP, OC)**			**Old Product, New Country (OP, NC)**		
'Dynamic' previous experience (before onset of spell)						
Product-destination experience (*n* years)						
fpc export relationship on or before 1997						
Duration previous fpc spell (*n* years)						
Gap with previous fpc spell (*n* years)						
Product experience (*n* years)				0.977	0.998	1.002
				(0.001)***	(0.001)***	(0.001)*
fp export relationship on or before 1997				0.931	0.983	0.970
				(0.004)***	(0.004)***	(0.007)***
Destination-market experience (*n* years)	0.986	0.997	0.998			
	(0.000)***	(0.000)***	(0.001)***			
fc export relationship on or before 1997	0.925	1.014	1.004			
	(0.003)***	(0.003)***	(0.006)			
'Static' previous experience (before onset of spell)						
Core product, core country (before onset, $t-1$) (omitted: no core product, no core country)						
Core product, no core country				0.939	0.966	
				(0.004)***	(0.006)***	
No core product, core country		1.047	1.033			
		(0.003)***	(0.005)***			
Core product, core country						
Firm export portfolio: *N* products; *N* countries (omitted: [1]; [1])						
[1]; [2–10]		1.029	1.027	1.025	1.018	
		(0.021)	(0.031)	(0.022)	(0.030)	
[1]; [>10]		1.109	1.097	1.010	0.997	
		(0.025)***	(0.047)**	(0.025)	(0.034)	
[2–10]; [1]		1.053	1.047	1.089	1.069	
		(0.019)***	(0.029)*	(0.029)***	(0.039)*	
[2–10]; [2–10]		1.101	1.101	1.146	1.086	
		(0.018)***	(0.027)***	(0.022)***	(0.029)***	

Frailty		Frailty			Frailty		
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
New Product, New Country (NP, NC)		Old Product, Old Country, New Product-Country (OP, OC, NPC)			Old Product-Country (repeated) (OPC)		
					0.989	0.991	0.986
					(0.001)***	(0.001)***	(0.001)***
					0.953	0.973	0.978
					(0.004)***	(0.004)***	(0.005)***
					0.969	0.974	0.980
					(0.001)***	(0.001)***	(0.001)***
					1.008	1.006	1.006
					(0.001)***	(0.000)***	(0.001)***
		0.982	0.999	1.000	0.984	1.000	1.002
		(0.000)***	(0.000)***	(0.001)	(0.000)***	(0.001)	(0.001)**
		0.979	0.990	0.969	0.974	0.992	0.978
		(0.002)***	(0.002)***	(0.004)***	(0.003)***	(0.003)**	(0.005)***
		0.988	0.998	0.999	0.997	1.001	1.001
		(0.000)***	(0.000)***	(0.001)***	(0.000)***	(0.001)**	(0.001)
		0.974	1.016	0.998	1.004	1.031	1.010
		(0.002)***	(0.002)***	(0.004)	(0.003)	(0.003)***	(0.005)**
			0.982	1.000		0.968	0.981
			(0.003)***	(0.005)		(0.004)***	(0.006)***
			0.996	1.008		1.002	1.008
			(0.003)	(0.005)*		(0.004)	(0.007)
			0.943	0.975		0.946	0.969
			(0.003)***	(0.005)***		(0.004)***	(0.006)***
1.035	1.033		0.915	0.911		1.102	1.094
(0.020)*	(0.036)		(0.033)**	(0.049)*		(0.026)***	(0.034)***
1.097	1.088		0.896	0.882		0.993	1.008
(0.047)**	(0.090)		(0.035)***	(0.056)**		(0.025)	(0.034)
1.045	1.043		0.957	0.975		1.115	1.089
(0.023)**	(0.039)		(0.037)	(0.057)		(0.027)***	(0.036)***
1.067	1.072		1.021	0.981		1.185	1.134
(0.017)***	(0.029)***		(0.029)	(0.043)		(0.024)***	(0.030)***

(Continues)

TABLE 7 (Continued)

	Frailty			Frailty		
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**New Product, Old Country (NP, OC)**			**Old Product, New Country (OP, NC)**		
[2–10]; [>10]	1.094	1.093		1.088	1.038	
	(0.018)***	(0.027)***		(0.021)***	(0.028)	
[>10]; [1]	1.066	1.060		0.909	0.929	
	(0.018)***	(0.028)**		(0.035)**	(0.049)	
[>10]; [2–10]	1.091	1.096		1.182	1.119	
	(0.018)***	(0.027)***		(0.024)***	(0.032)***	
[>10]; [>10]	1.066	1.094		1.119	1.064	
	(0.017)***	(0.027)***		(0.022)***	(0.029)**	
Initial size of spell (ln)	0.945	0.935		0.959	0.936	
	(0.001)***	(0.001)***		(0.001)***	(0.002)***	
Firm characteristics at onset of fpc spell						
Firm export value at onset of fpc spell (ln)	1.007	1.014		1.005	1.037	
	(0.001)***	(0.002)***		(0.001)***	(0.002)***	
Firm import	0.996	1.003		0.984	0.980	
	(0.004)	(0.008)		(0.005)***	(0.009)**	
Firm-product total exports (ln)				0.935	0.931	
				(0.001)***	(0.001)***	
Firm-country total exports (ln)	0.974	0.978				
	(0.001)***	(0.001)***				
Product characteristics (at start of fpc spell)						
High revealed comparative advantage	0.985	0.988		1.018	1.002	
	(0.002)***	(0.004)***		(0.003)***	(0.006)	
Highly differentiated product	1.008	0.998		1.013	0.993	
	(0.002)***	(0.004)		(0.003)***	(0.006)	
Destination-market characteristics (at onset of fpc spell)						
Gravity variables						
ln real GDP	1.011	1.009		0.980	0.980	
	(0.001)***	(0.002)***		(0.001)***	(0.002)***	
ln real GDP per person	0.995	0.999		0.983	0.986	
	(0.001)***	(0.003)		(0.002)***	(0.003)***	
ln distance	1.036	1.038		1.092	1.096	
	(0.002)***	(0.004)***		(0.003)***	(0.004)***	
Dummy share border with Spain	0.893	0.890		0.829	0.871	
	(0.005)***	(0.007)***		(0.012)***	(0.015)***	

Frailty		Frailty			Frailty		
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
New Product, New Country (NP, NC)		Old Product, Old Country, New Product-Country (OP, OC, NPC)			Old Product-Country (repeated) (OPC)		
1.132	1.122		0.966	0.927		1.107	1.067
(0.019)***	(0.033)***		(0.027)	(0.041)*		(0.022)***	(0.029)**
0.682	0.805		1.033	1.001		1.130	1.088
(0.034)***	(0.055)***		(0.051)	(0.082)		(0.024)***	(0.034)***
1.139	1.127		1.006	0.957		1.149	1.100
(0.019)***	(0.034)***		(0.029)	(0.042)		(0.023)***	(0.030)***
1.125	1.117		0.966	0.944		1.108	1.096
(0.019)***	(0.033)***		(0.027)	(0.042)		(0.022)***	(0.030)***
0.957	0.955		1.007	0.982		0.994	0.970
(0.002)***	(0.003)***		(0.001)***	(0.001)***		(0.001)***	(0.001)***
0.976	0.982		1.049	1.068		1.051	1.063
(0.002)***	(0.003)***		(0.001)***	(0.002)***		(0.001)***	(0.002)***
1.013	1.021		0.957	0.967		0.972	0.980
(0.009)	(0.017)		(0.004)***	(0.007)***		(0.004)***	(0.007)***
			0.907	0.911		0.918	0.918
			(0.001)***	(0.001)***		(0.001)***	(0.001)***
			0.943	0.949		0.937	0.943
			(0.001)***	(0.001)***		(0.001)***	(0.001)***
0.961	0.969		1.030	1.020		1.016	1.014
(0.005)***	(0.010)***		(0.002)***	(0.003)***		(0.002)***	(0.004)***
1.008	1.003		1.004	1.000		0.986	0.974
(0.005)	(0.010)		(0.002)**	(0.003)		(0.002)***	(0.004)***
1.000	0.998		0.995	0.994		0.994	0.993
(0.002)	(0.004)		(0.001)***	(0.001)***		(0.001)***	(0.001)***
1.000	0.998		0.996	0.998		0.987	0.988
(0.003)	(0.006)		(0.001)***	(0.002)		(0.002)***	(0.002)***
1.037	1.042		1.059	1.060		1.041	1.047
(0.004)***	(0.008)***		(0.002)***	(0.002)***		(0.002)***	(0.003)***
0.707	0.719		0.894	0.891		0.911	0.917
(0.016)***	(0.021)***		(0.004)***	(0.006)***		(0.005)***	(0.006)***

(Continues)

TABLE 7 (Continued)

	Frailty			Frailty		
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**New Product, Old Country (NP, OC)**			**Old Product, New Country (OP, NC)**		
Land-locked country dummy		1.046	1.042		1.016	1.018
		(0.004)***	(0.008)***		(0.004)***	(0.006)***
Dummy euro member country		0.834	0.867		0.928	0.928
		(0.004)***	(0.007)***		(0.006)***	(0.008)***
Dummy common language		0.991	0.979		0.932	0.941
		(0.003)***	(0.006)***		(0.004)***	(0.007)***
Destination-market country risk (omitted low-risk)						
Medium-risk countries		1.092	1.094		1.020	1.026
		(0.004)***	(0.009)***		(0.006)***	(0.009)***
High-risk countries		1.147	1.131		1.105	1.115
		(0.007)***	(0.014)***		(0.009)***	(0.014)***
Spillover effects (at onset of fpc spell)						
Number of exporters at province/product/destination-market level (ln)		0.966	0.961		0.953	0.945
		(0.001)***	(0.002)***		(0.002)***	(0.002)***
log-pseudolikelihood	−430,093	−421,245	−419,013	−328,593	−314,671	−311,549
Number of observations	658,776	657,227		686,476	673,794	
Number of export spells	358,117			256,480		
Number of failures	335,835			223,927		

Notes: Separate regressions. Piece-wise exponential model. Dependent variable: hazard rate. All the coefficients in the table are exponentiated and are interpreted as hazard ratios with respect to the baseline (omitted) category. All regressions include age-of-spell dummies, year dummies and province-of-origin dummies. The coefficients are not reported for brevity but are available from the author upon request. Robust standard errors in brackets. Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively. Columns (3), (6), (8), (11) and (14) report estimates of PWE shared (by firm) gamma frailty models.

models of experimentation and learning (e.g., Albornoz et al., 2016; Eslava et al., 2015; Fanelli & Hallak, 2018), which show that exporters learn through experimentation (tryouts, that is, repeated spells) and the accumulation of prior experience in order to resolve the high degree of uncertainty in international markets. Therefore, they argue that the extremely high hazard rate at entry is due to high uncertainty. Then, re-entrants (i.e., repeated product-destination export spells) are more likely to succeed, survive and grow.

Furthermore, this paper further disentangles the distinct effect of product and/or destination-market experience on new product-market export spells survival by splitting them into five exhaustive and mutually exclusive categories according to the entire export history of firms. We find substantial heterogeneity in survival probability among the different entry routes. In particular, our results indicate that there exists more experimentation and churning at the product than at the destination-market level (i.e., adding new products to either new or familiar destination markets endures higher exit hazard than starting to sell—either familiar or unfamiliar products- to a new destination).

Frailty		Frailty			Frailty		
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
New Product, New Country (NP, NC)		Old Product, Old Country, New Product-Country (OP, OC, NPC)			Old Product-Country (repeated) (OPC)		
1.029	1.025		1.007	1.005		0.990	0.991
(0.007)***	(0.016)		(0.003)**	(0.005)		(0.004)**	(0.006)
0.850	0.853		0.921	0.926		0.960	0.961
(0.011)***	(0.018)***		(0.003)***	(0.004)***		(0.004)***	(0.005)***
0.963	0.959		0.985	0.987		0.982	0.986
(0.006)***	(0.014)***		(0.003)***	(0.004)***		(0.004)***	(0.005)***
1.062	1.057		1.033	1.041		1.005	1.008
(0.009)***	(0.019)***		(0.003)***	(0.005)***		(0.004)	(0.006)
1.095	1.087		1.096	1.100		1.070	1.075
(0.013)***	(0.029)***		(0.005)***	(0.009)***		(0.007)***	(0.010)***
0.969	0.968		0.972	0.961		0.962	0.949
(0.003)***	(0.006)***		(0.001)***	(0.001)***		(0.001)***	(0.001)***
−53,837	−53,779	−873,621	−847,008	−841,905	−723,953	−706,694	−702,713
77,821		1,587,840	1,576,095		1,392,418	1,382,343	
47,704		696,555			576,499		
46,522		609,739			470,717		

These findings are consistent with previous studies that suggest that exporting a new product to a familiar destination does entail lower initial sunk costs than starting to sell to a new destination market. The higher sunk costs at the market level raise entry barriers that become exit barriers when re-entry is a possibility, which is the case in our context given that we account for repeated spells. Therefore, our findings that the hazard of ending an fpc export spell involving a new product should be higher than that for export spells involving selling to a new market (Table 6) are consistent with this argument. Therefore, we should expect more churning (i.e., entry and exit) at the product than at the country level. Finally, as for the effect of the built-up experience of a firm in exporting, our results in Tables 2 and 5 point out that previous product experience is more effective than previous experience in a market in raising survival chances. This result may indicate that experimentation and accumulation of time in export markets may be more relevant for products than for markets.

Moreover, our results are broadly consistent with those in Lawless and Studnicka (2019b, 2019c) with regard to the survival-enhancing properties of proximity to an exporter's core competencies.

In particular, we find that selling a core product (i.e., closest to the 'best' product of the exporter) has a larger positive effect on survival than selling to a core destination. Furthermore, the somewhat initial unexpected negative relationship between the degree of product differentiation and export survival in Tables 2 and 3 vanishes (or even becomes positive in the last column of Table 7) when we control for the full set of covariates, specifically the size of the initial spell, previous experience and experimentation, and unobserved heterogeneity. This finding is broadly consistent with the view that trade relationships involving differentiated products tend to be of smaller size and are subject to more experimentation due the high uncertainty about achieving a correct matching between suppliers and consumers as discussed in Besedes and Prusa (2006a).

Therefore, once we take into account the different nature of new product-destination export spells (according to the firm's entire export history), and consider the different sources of experience (product, country and product-country levels), our findings are broadly consistent with the literature that points out the existence of two key drivers of survival of trade relations. While experimentation and accumulation of experience is crucial for adding new products, sunk-entry costs seem to be relatively more relevant when entering new markets.

The results of this paper have implications for the design of export-promotion policies. Heterogeneity at firm, product and destination-market level is high and substantially affects the expected duration of new trade relationships. Therefore, one challenge for policymakers is to find out how short- and long-lasting trade relationships can be distinguished, not only *ex post*, but also *ex-ante*. This could be used to design more sound export-promotion strategies prompting entry with desirable product characteristic that are appropriate to the particular target market taking into account survival probabilities.

This study has some limitations that open avenues for future research. In particular, this study focuses on transaction-level data, that is, includes information on all trade transactions but lacks important information at firm level. Specifically, we have no information about ownership, so we cannot distinguish between purely domestic-based firms, domestic-based multinationals and foreign multinationals with affiliates in Spain.

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APPENDIX 1

DESCRIPTION OF DATA SET AND EXPLANATORY VARIABLES

This appendix describes the procedure followed to build up the data set used in this paper and provides some summary statistics. The source of information is confidential data on all export transactions from Spanish Customs over 1997–2015. It comprises annual information on exports of Spanish firms by product (CN 8-digit level) and destination market. Hence, we use data at firm-product-country (fpc) level. In order to examine the role of experience and experimentation on new product-destination export relationships, we exclude the following categories (see Table A1).

First, we drop outliers and product categories that do not provide a meaningful and consistent unit of count across years. Second, we use the algorithm in Pierce and Schott (2012) and Van Beveren et al. (2012) to account for changes in product categories at the 8-digit level. This algorithm allows us to obtain categories that are consistent across the sample period (1997–2015). Out of 15,215 CN8 codes over the sample period, there are 7671 combined-CN8 codes. Third, we drop some products and destinations because of their peculiarities. That is, CN groups CN98 'complete industrial plants' and CN99 'Special CN code', as well as Andorra, Gibraltar, new/disappeared countries (e.g., Yugoslavia, South Sudan), destinations with reserved codes (i.e., 'provisioning to third parties'). Thus, Spanish firms export 7650 products to 199 countries over the sample period (Column (1) of Table A1).

Fourth, we drop 'sporadic fpc relationships', that is, firm-product-country export relationship with a value of sales abroad below 1000€ in a particular year. Fifth, we correct for 'accidental or false exits' that arise as a result of the previous threshold, which could lead to 'false repeated spells'. Therefore,

TABLE A1 Data set description

	Customs data (raw)	Sample (1)	Sample (2)
N firms	749,722	386,679	8859
N products	7650	7610	7429
N countries	199	198	198
% of total exports	100	95.4	55.4
N observations	20,422,962	12,995,853	4,404,104

Notes: Sample (1)—After dropping 'accidental exporters' (i.e., Annual exports <1000€) from customs data; and with 'correction for accidental exiters' (an ongoing fpc spell with sales below our 'trade value threshold' 1 year). Sample (2)—Yearly customs data in regression analysis. From Sample (1), we only keep regular exporters (i.e., Firms with positive exports every year over 1997–2015).

if exports of an fpc relationship in one year lies below 1000€ but both in $t-1$ and $t+1$ its value exceeds that level, then it is not considered as two different spells, one ending in $t-1$ and a second one starting at $t+1$, but as one ongoing spell from $t-1$ to $t+1$. That is, one-year gaps due to our export threshold are not considered as exits and re-entry.

These changes leave us with exports of 7610 CN 8-digit level product categories to 198 destination countries by 386,679 unique Spanish exporters over the period 1997–2015 (see Column (2) of Table A1).

Table A2 reports the number of fpc exporting relationships over 1997–2015. Each column follows an fpc exporting cohort—that is a group of firm-product-country exporting relationships that began in a particular year—from the year of its birth through time. This table allows us to further assess the impact of left-censoring. We must bear in mind that, since we do not know the history before 1997, the 1997 'cohort' consists of all fpc that were active in that year, thus including ongoing as well as new-born relationships.[18] This implies that this cohort will be in general overestimated in terms of their initial number of spells. In addition, the survival probability of this cohort is much higher than that of the others. In particular, the fpc exporting relationship of the 1997 cohort amount to 2.9% of ongoing spells in 2015 and account for 20% of total export value in that year, while a similar share in number of continuing spells in 2015 is only attained by the 2009 cohort but only accounting for 4.8% of total exports in 2015. In addition, the new fpc relationships born in 1998–2000 merely amount to about 0.6% of spells in 2015 representing about 1.8% of total value of exports in 2015. The previous two comments provide a rough proxy of the impact of left-censoring in the data set. Hence, the '1997 cohort' includes a large share of long-lasting relationships with relatively higher survival probabilities.

Table A3 displays the number of all firm-product-country spells created from 1998 onwards ('fresh spells') and their survival rates by entry cohort followed over time. The first column shows the remarkable increase in the number of spells over time, which reveals the intense process of internationalisation of the Spanish economy during this period. Both the number of fpc export relationships and their total trade value have remarkably risen over the period (except for the Trade Collapse in 2008–9). On average, only does 35% of new fpc relationships survive beyond their initial year, and only 22% survive at least 2 years. Thereafter, failure rates slow down as spells grow older. Therefore, while export entry seems to be relatively easy, survival is harsh. This table (and our results in the paper) confirms a remarkable turnover among product-destination trade flows. In a typical year, about 44.7% of all fpc exporting relationships are new and small (accounting for about 13% total export value),

[18]Unfortunately, we cannot distinguish between them.

TABLE A2 Number of FPC exporting relationships, by entry cohort

	Year of birth of fpc exporting relationship									
Year	1997 or before	1998	1999	2000	2001	2002	2003	2004	2005	2006
1997	456,432									
1998	248,595	240,820								
1999	181,650	80,634	241,259							
2000	147,246	49,678	86,383	269,491						
2001	124,272	35,558	53,191	93,280	276,631					
2002	106,332	27,417	38,122	56,237	95,862	291,096				
2003	92,607	22,225	29,601	40,295	58,624	104,936	272,006			
2004	82,367	18,536	23,989	31,104	41,889	65,230	93,816	274,955		
2005	73,640	15,700	19,627	24,722	31,829	46,781	57,020	99,057	273,399	
2006	66,042	13,512	16,620	20,611	25,568	36,655	41,142	62,671	99,383	288,985
2007	58,840	11,628	13,878	17,152	20,837	29,486	31,269	44,660	61,333	101,189
2008	53,122	10,169	12,053	14,590	17,487	24,252	24,895	34,907	44,295	63,400
2009	47,638	8891	10,516	12,343	14,842	20,356	20,209	27,641	33,292	44,245
2010	42,981	7894	9242	10,743	12,821	17,434	17,022	22,979	26,886	34,201
2011	39,040	7073	8204	9487	11,310	15,354	14,587	19,490	22,611	27,495
2012	35,496	6277	7358	8445	9989	13,630	12,705	16,800	19,282	22,975
2013	32,816	5759	6783	7694	9023	12,303	11,171	14,858	17,002	19,889
2014	30,347	5323	6246	7094	8188	11,092	9994	13,173	15,148	17,546
2015	28,039	4853	5723	6401	7400	9986	8975	11,705	13,471	15,386

and 78% of these new fpc exporting relationships will be gone two years hence. These results might suggest high trial and experimentation at product and destination market.

Finally, in the empirical analysis of the paper, we restrict attention to new firm-product-destination (fpc) export spells (i.e., 'fresh' spells) of continuing exporters over the period 1998–2015 (Column (3) of Table A1). By doing so, we focus on survival of new product-destination export spells without considering firm-level entry to and exit from export market decisions (or even firm failure).

Finally, Table A4 provides a description of the explanatory variables and data sources.

2007	2008	2009	2010	2011	2012	2013	2014	2015	Total (number fpc relationships)
									456,432
									489,415
									503,543
									552,798
									582,932
									615,066
									620,294
									631,886
									641,775
									671,189
298,242									688,514
107,864	296,859								703,893
64,832	97,553	288,808							691,166
46,433	60,866	101,195	325,940						736,637
36,290	44,403	63,445	117,788	342,912					779,489
29,463	35,187	46,334	75,177	122,729	378,456				840,303
24,856	29,043	36,776	55,558	77,602	135,237	395,837			892,207
21,578	24,871	30,814	44,275	57,309	86,942	140,263	402,930		933,133
18,684	21,422	25,695	35,974	44,441	62,911	88,039	139,866	416,210	965,181

TABLE A3 Survival rates by entry cohort (new-born fpc relationships)

Cohort	FPC spells	Survival rates after *n* years (%)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1998	240820	33.5	20.6	14.8	11.4	9.2	7.7	6.5	5.6	4.8	4.2	3.7	3.3	2.9	2.6	2.4	2.2	2.0
1999	241259	35.8	22.0	15.8	12.3	9.9	8.1	6.9	5.8	5.0	4.4	3.8	3.4	3.0	2.8	2.6	2.4	
2000	269491	34.6	20.9	15.0	11.5	9.2	7.6	6.4	5.4	4.6	4.0	3.5	3.1	2.9	2.6	2.4		
2001	276631	34.7	21.2	15.1	11.5	9.2	7.5	6.3	5.4	4.6	4.1	3.6	3.3	3.0	2.7			
2002	291096	36.0	22.4	16.1	12.6	10.1	8.3	7.0	6.0	5.3	4.7	4.2	3.8	3.4				
2003	272006	34.5	21.0	15.1	11.5	9.2	7.4	6.3	5.4	4.7	4.1	3.7	3.3					
2004	274955	36.0	22.8	16.2	12.7	10.1	8.4	7.1	6.1	5.4	4.8	4.3						
2005	273399	36.4	22.4	16.2	12.2	9.8	8.3	7.1	6.2	5.5	4.9							
2006	288985	35.0	21.9	15.3	11.8	9.5	8.0	6.9	6.1	5.3								
2007	298242	36.2	21.7	15.6	12.2	9.9	8.3	7.2	6.3									
2008	296859	32.9	20.5	15.0	11.9	9.8	8.4	7.2										
2009	288808	35.0	22.0	16.0	12.7	10.7	8.9											
2010	325940	36.1	23.1	17.0	13.6	11.0												
2011	342912	35.8	22.6	16.7	13.0													
2012	378456	35.7	23.0	16.6														
2013	395837	35.4	22.2															
2014	402930	34.7																
Average		35.2	21.9	15.8	12.2	9.8	8.1	6.8	5.8	5.0	4.4	3.8	3.4	3.0	2.7	2.5	2.3	2.0

Notes:: Within each row, each column of the table calculates the percentage of exporting spells that survived beyond *n* years who were born in the row year. The table follows all cohorts of new fpc exporting spells over 1998–2014.

TABLE A4 Description of variables and data sources

Variable	Description	Source
Entry mode (before onset of fpc spell)	Variable that splits all 'fresh' product-destination spells born from 1998 to 2014 into 5 exhaustive and mutually exclusive categories accounting for all past history (back to 1997). In regression analysis, we use 5 dummies (OPC, omitted category)	AEAT-Aduanas (Spanish Customs)
New Product, Old Country (NP,OC)	Product not previously exported to a country previously served by the firm	
Old Product, New Country (OP, NC)	Product previously exported to a new destination market	
New Product, New Country (NP, NC)	New export product to a new destination market	
Old Product, Old Country, New Product-Country (OP, OC, NPC)	Product previously sold and country previously served, but new product-market combination	
Old Product-Country (OPC, repeated fpc spell)	Repeated Product-market combination	
'Dynamic' previous experience (before onset of spell)		
(A) At product-destination level (fpc)		AEAT-Aduanas (Spanish Customs)
Product-destination experience (dummy v.)	Dummy variable equal to 1 if prior product-country experience, before the onset of a new product-destination spell (i.e., repeated spell)	
Product-country experience (*n* years)	Number of years of prior experience (0, 1, 2…), before start of a new product-destination spell	
fpc export relationship on or before 1997	Dummy variable equal to one if product-destination relationship existed in 1997 (i.e. born on or before 1997)	
Duration previous fpc spell (*n* years)	Duration in number of years (0, 1, 2…) of previous fpc spell	
Gap with previous fpc spell (*n* years)	Number of years between current and previous fpc spell	
(B) At product level (fp)		
Product experience (dummy v.)	Dummy variable equal to 1 if prior product experience, before the onset of a new product-destination spell	
Product experience (*n* years)	Number of years of prior experience (0, 1, 2…), before start of a new product-destination spell	
fp export relationship on or before 1997	Dummy variable equal to one if firm-product relationship existed in 1997 (i.e., born on or before 1997)	

(Continues)

TABLE A4 (Continued)

Variable	Description	Source
(C) At destination market/country level (fc)		
Destination-market (country) experience (dummy v.)	Dummy variable equal to 1 if prior country experience, before the onset of a new product-destination spell	
Destination-market experience (*n* years)	Number of years of prior experience (0, 1, 2…), before start of a new product-destination spell	
fc export relationship on or before 1997	Dummy variable equal to one if firm-country relationship existed in 1997 (i.e., born on or before 1997)	
'Static' previous experience (before onset of spell)	Following Gullstrand and Persson (2015)	AEAT-Aduanas (Spanish Customs)
Core product	Dummy variable equal to 1 if export volume of the 8-digit CN product above the mean within each 4-digit CN industry, before the start of spell	
Core country	Dummy variable equal to 1 if export volume to that destination is receiving above the mean to all destinations within each 4-digit CN industry, before the start of the spell	
Core product, core country	Four categories combining 'core product' and 'core' country. In the regression analysis we include 4 dummy variables to account for the 4 possible categories ('no core product, no core country' omitted)	
Number of products, number of destinations	Number of products exported by the firm, before onset of spell	
	Number of destinations served by the firm, before onset of spell	
	Nine categories: [1, 1]; [1, 2–10]; [1, >10]; [2–10, 1]; [2–10, 2–10]; [2–10, >10]; [>10, 1]; [>10, 2–10]; [>10; >10]. In the regression analysis, we include 9 dummy variables to account for these categories ([1, 1] omitted)	
Initial size of spell (ln)	Initial value exports by product-destination (ln)	AEAT-Aduanas (Spanish Customs)
Firm characteristics (at onset of fpc spell)		
Firm export value (ln)	Firm total export value (ln), at onset of spell	AEAT-Aduanas (Spanish Customs)
Firm import dummy	Dummy variable equal to 1 for importers, at onset of spell	
Firm-product total exports	ln of firm total export value of the product (CN8), at onset of spell	
Firm-country total exports	ln of firm total export value to that destination, at onset of spell	

(Continues)

TABLE A4 (Continued)

Variable	Description	Source
Product characteristics (at start of fpc spell)		
Dummy revealed comparative advantage	Takes value 1 for products for which Spain holds high revealed comparative advantage, using Balassa's revealed comparative (RCA) index upon exports value at country-CN8 product level	COMTRADE http://atlas.cid.harvard.edu/
Dummy highly differentiated product	Takes value 1 if the product is highly differentiated, following the methodology in Minondo and Requena (2011)	AEAT-Aduanas
Destination-market characteristics (at onset of fpc spell)		
ln real GDP	GDP in 2010 EUR (ln)	World Development Indicators
ln real GDP per person	GDP per capita in 2010 EUR (ln)	World Development Indicators
ln Distance	Distance in km between Spain an destination market (ln)	CEPII
Dummy share border with Spain	Takes value 1 if destination market shares border with Spain	CEPII
Land-locked country dummy	Takes value 1 if destination market is a land-locked country	CEPII
Dummy euro member country	Dummy variable equal to one if the destination country's currency is the euro at onset of spell	CEPII
Dummy common language	Dummy variable that takes value one if the if the official language of the destination country is Spanish	CEPII
Destination-market country risk	Country risk on export credit operations elaborated by OECD and varies between 0 (no risk) and 7 (maximum). We create 3 categories of countries: (a) low-risk for value 0; (b) medium-risk for values [1, 4]; and (c) high-risk for values [5, 7]. In the regression analysis, we use 3 dummy variables to proxy each category (low-risk, omitted)	OECD Country risk indicator
Spillover effects (at onset of fpc spell)		
Number of exporters at province/product/destination-market level (ln)	ln of the number of firms in the triad province-of-origin, product and destination market	AEAT-Aduanas