De Economist (2015) 163:155–176
DOI 10.1007/s10645-014-9242-8

The Duration of Dutch Export Relations: Decomposing Firm, Country and Product Characteristics

Arjan Lejour

Published online: 13 September 2014

Abstract Using Dutch transaction-level data on international trade we find that the intensive margin drives trade growth year by year. After 6 years, new trade relations cover about 50 % of Dutch exports. Only 25 % of the new relations specified by firm, product and destination survives after 2 years. The estimates conclude that new trade relations with new exporting firms or with new destinations have lower hazard rates than those with new products. If the destination is an EU country the hazard is much lower as is also case for higher initial sales.

Keywords International trade · Export duration · Hazard models · Export margins · Firm heterogeneity

JEL Classification F10 · D22

1 Introduction

In their seminal works on export survival, Besedeš and Prusa (2006a, 2006b) show that the median duration of export spells is only 2 years. These authors and others

I am very grateful to Roger Smeets for fruitful discussions and his work in the initial stage of this project. Moreover, I want to thank two anonymous referees, Jan Möhlmann, Bas ter Weel and the participants of the Micro data conference Productivity and Internationalization in The Hague (2010), the Trade workshop in Groningen (2011), the ETSG conference in Leuven (2012) and Global Economics and Management seminar in Groningen (2014) for useful comments. The efforts and help of Statistics Netherlands for providing the confidential international transaction data are much appreciated. The Stata programs are available upon request.

A. Lejour (✉)
CPB Netherlands Bureau for Economic Policy Analysis, PO Box 80513, 2508 GM The Hague, The Netherlands
e-mail: a.m.lejour@cpb.nl; arjan.lejour@cpb.nl

have also shown that the hazard rate sharply declines with the duration of export relationships, suggesting that longer-lasting relationships have a higher future survival rate. One important question is how short- and long-lasting trade relationships can be distinguished, not only ex post, but also ex ante. This is important for exporting firms, because of the sunk costs involved in foreign market entry (as suggested by Das et al. 2007). Targeting of export markets and products may be particularly important for avoiding market entry costs which cannot be recovered if a trade relation fails.

This paper aims to present a systematic analysis of various *ex ante* characteristics of the trade relations of Dutch firms. It analyses export behaviour of firms by product and destination and gives thereby a complete overview of all new trade relations. A shortcoming of the export survival literature so far is that it has been conducted mainly at the product-country level. This paper contributes by considering the product-country relationships at the firm level. Eventually firms decide to sell products to foreign markets.

Except for a few papers, the analysis of firm-country-product (FCP) relations is still underdeveloped, in particular for exports from developed countries. We fill this gap by identifying firm, product and country characteristics which indicate successful/long-lasting export relations. After presenting the descriptive statistics we conduct an econometric analysis to identify the determinants of the survival rate. A further contribution of this paper that we replace the standard continuous proportional Cox hazard models by discrete non proportional hazard models (see Hess and Persson 2012).

The econometric results show that a higher initial trade value, larger market size, and a shorter distance to the destination increase the survival probability. These results are quite standard in the literature. A novel result is that EU membership reduces the hazard rate of Dutch export relations by 40 %. Other new results are that trade relations characterized by new firms or new destinations have hazard rates which are about 15 % lower. Trade relations with new products, independent of the experience of the destination, reduce the survival probability by 20–30 % compared to new trade relations with familiar products and destinations. These effects are substantial. We are the first which identify these different characteristics of export relations. The results suggest that new export relations with new exporting firms or to new destinations survive significantly longer than those with new export products.

If trade relations exist for 5 years the survival probability is four times as high as for new trade relations. Recurrent new trade relations have a substantial higher probability of surviving than brand new relations. The results are quite robust for various specifications of the discrete hazard models with random effects. The Cox hazard model delivers qualitatively similar results, although the assumption of a proportional hazard rate is strongly rejected.

In short, the survival chances of new exporting firms with large initial sales of homogeneous goods to other EU countries and of incumbent exporting with large initial sales of homogenous goods to new EU destinations are much higher than of incumbent exporting firms with small initial sales of familiar differentiated products to familiar destinations outside Europe. Export experimentation seems to occur more often by incumbent exporters with familiar products and destinations for which market entry costs are lower.

The remaining of this paper is structured as follows. The relevant literature is reviewed in Sect. 2. Section 3 presents the data sources and Sect. 4 the basic decomposition. It also shows the development of the intensive and extensive export margins between 2002 and 2008. Section 5 analyses the development of trade relations by birth year and the decomposition in new firm, new product, new destination relations and various combinations. Section 6 presents the econometric analysis and Sect. 7 concludes.

2 Literature

This paper builds upon two empirical strands in the international trade literature. The first analyses the duration of bilateral trade relations at the product (category) level and the second analyses the trade behaviour of firms, in particular switching of export products and destinations.

Besedeš and Prusa (2006b) use US import data at the 7-digit (US tariff schedule) level from nearly all countries between 1972 and 1988 to estimate Kaplan-Meier survival functions. The survival rate is estimated at 76 % in the first year, but decreases thereafter. In their (2006a) paper they distinguish homogeneous and differentiated goods using the Rauch (1999) classification with the same import data as in the former paper. Homogeneous goods have higher hazard rates than differentiated goods and higher initial trade values increase survival. The hazard rates in the latter paper are estimated with Cox proportional hazard models. Nitsch (2009) applies also Cox proportional hazard models on the duration of German import relations between 1995 and 2005. The mean duration is also only 2 years although the data are analysed at a more detailed level (8-digit) than the US data by Besedeš and Prusa. Nitsch (2009) also concludes that GDP in the exporting country and a similar language lowers the hazard rate. This is also the case for the initial trade value and market share in the importing country. Brenton et al. (2009) analyse the duration of export flows at the 5-digit SITC level of about 80 exporting countries and 50 importing countries between 1985 and 2005. They apply a discrete cloglog model for estimating the effects on the hazard rate and also conclude that the initial trade value is important for survival. Hess and Persson (2011) focus on the imports of 15 EU-countries from 140 different exporting countries between 1962 and 2006 at the 4-digit SITC level. They conclude that the mean duration of import flows is only 1 year. Less than 10 % survives 10 years. These findings are rather persistent over this long time period. Hess and Persson (2011) apply discrete-time duration models such as the cloglog, logit and probit models with random effects.

All these papers focus on country-product relations. Another strand of the literature considers the international transaction data at the firm level which permit the analysis of FCP relations. Some papers conclude trial and error behaviour of firms; exporters start with small foreign deliveries to test whether exporting is profitable. If exporting is profitable they increase their exports by the intensive and extensive margins (Albornoz et al. 2012). Freund and Pierola (2010) distinguish familiar and new export destinations and products (at least for other firms). For familiar destinations and products foreign market entry costs are relatively lower. The entry and exit

rates are correspondingly high. For new export products and destinations this is different. Market entry costs are much higher and this suggests that entry and exit rates are much smaller. Our empirical analysis will confirm this pattern for the Netherlands.

Cadot et al. (2013) investigate survival of FCP- relations from six African countries. The more experienced a firm in exporting a product (the number of destinations) or in exporting to a destination (the number of products) the larger is the export survival probability. However, they do not present systematic analysis of the various FCP relations as this paper does. Arkolakis and Muendler (2010) analyse the export relations of Brazilian firms and conclude that market-entry costs drop fast if the number of products at a particular export destination increases. Fixed entry costs can be spread over a larger number of products and product-specific fixed costs are relatively small (and possibly decreasing with scope), but these authors do not address duration.[1] Manova and Zhang (2009) analyse the trade flows of firms located in China between 2003 and 2005 at the 8-digit level (harmonized system). Because of the short period it is not possible to examine reallocation across firms, products and trading partners very well. However, their findings also suggest that product churning is easier than changing export destinations because of the higher sunk costs of entering new markets.

Traditionally, the literature uses Cox proportional hazard models to estimate survival rates.[2] Hess and Persson (2011, 2012) have convincingly argued that the assumption of proportional hazard is violated. Moreover, they argue that the estimated coefficients are also biased due to the many tied duration times (using year data) and that it is nearly impossible to control for unobserved heterogeneity. These arguments hold in particular for large datasets like trade spells. Brenton et al. (2009) have used the discrete-time version of the Cox model, the so called cloglog model, to deal with unobserved heterogeneity. Moreover, a discrete model fits better to the trade duration data which are yearly data than a continuous-time estimation model. However, Brenton et al. (2009) does not address the non-proportionality of the hazard rate, which can be easily tested (Hess and Persson 2012).

The confidential international transaction data of Statistics Netherlands are also used in some other papers. Some earlier work on the Dutch firm-level export data has concentrated on the export-productivity premium (Kox and Rojas-Romagosa 2010), market entry costs (Creusen and Smeets 2011) and economic diplomacy (Creusen and Lejour 2013). These papers did not exploit the product dimension of the data. An exception is Creusen et al. (2011) who discuss briefly product churning of core and fringe products, but do not analyse the survival of FCP export relations. More recently, Kox (2012) and Van den Berg and van Marrewijk (2013) have used the international transaction data to study import behaviour of firms.

[1] Miranda et al. (2012) and Amador and Opromolla (2013) are examples of papers investigating various dynamic aspects of FCP relations with European data (Estonia and Portugal, respectively), but do no present hazard rate analyses.

[2] Examples are Besedeš and Prusa (2006a) and Nitsch (2009).

3 Data Sources

The most important source for our analysis is the International Trade (IH) data set of Statistics Netherlands. This is a set of customs data extended with a survey across Dutch firms on international transactions of imported and exported goods between 2002 and 2008.[3] For each transaction the IH dataset contains information on the country of destination (or origin), the type of product, the value and the volume in physical units, and the share of the export value that is related to re-exports. Each record is identified by the VAT-number and an IH relation number of a Dutch firm.[4] The IH dataset does not include intra-EU transactions of firms with total exports (or imports) below a threshold value which increases over time.[5] Firms with lower export or import values are expelled from the survey to ease their administrative burden. The IH dataset does include additional data from the Dutch Tax Authorities on the sum of all exports by firm from the VAT registration, but these totals cannot be specified towards EU countries and products. This study uses export data excluding re-exports, deflated to export price levels in 2002. Note that the analysis might be vulnerable to potential selection bias, particularly due to the threshold value in registering international trade data. In order to correct for the change in selection bias over time, we impose a threshold value of 900 thousand euro to all countries, which are member of the EU in 2007 for all years in the analysis. We analyse the data at the 5 digit product level, and ignore product switching at a more disaggregated level. Product classifications change over time considerably and we use conversion tables for a consistent classification between 2002 and 2008.[6] Still, one could question the differences between products at the 5-digit level. This could imply a bias towards lower survival rates. Therefore we apply robustness checks at the 4, 3 and 2-digit level.

Moreover, we skip all trade transactions with a value of $<$1,000 euro. This hardly affects the total value of trade in the data sample, but reduces the number of observations by about 30 %.[7] This is a debatable threshold. In thinking about market entry, we often assume implicitly that firms are deliberately seeking market access. Most of the small observations are probably accidental exports or service deliveries and are not the outcome of a market access strategy. In the robustness analyses we experiment

[3] We had only access to the data from 2002 to 2008. The end year of the sample was not chosen because of the beginning of the great recession and the collapse of world trade.

[4] Statistics Netherlands has created an IH-relation number as identifier. This number identifies exporters (at the firm level) with one or more VAT-numbers, but refrains from the legal and organizational status of exporters. This study uses the IH-relation number for identifying exporting firms. In most cases these are firms, but in case various firms or plants within an enterprise holding have the same VAT number, the IH identification number refers to an enterprise.

[5] The threshold for the export value is 225 thousand euro until 2005, 400 thousand euro in 2006 and 2007 and 900 thousand euro in 2008.

[6] Pierce and Schott (2012) find that for about half of the US trade value the product codes have changed between 1989 and 2004. The conversion tables can be found at http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC. It is hardly duable to provide accurate conversions over 6 years at a more disaggregated product level.

[7] The number of observations is reduced from 1.81 to 1.27 million.

with a threshold for 100 euro which adds 0.33 million observations to the sample, but this hardly affects the results.

We use the Rauch (1999) classification for distinguishing homogeneous and heterogeneous goods using his conservative classification. Reference-price goods and goods traded at an organised exchange are classified as homogeneous goods.[8] Rauch made this distinction at the SITC4 classification. Using concordance tables we have linked these data with those of Statistics Netherlands based on the harmonized system at the five digit level. Due to product classification changes over time we could not classify about 10 % of the goods.

The firm level data are complemented with country data. For market size, we use (the log of) total GDP from the World Bank Development Indicators. Variable trade costs are approximated by geographical data from CEPII.

4 The Intensive and Extensive Margin Over Time

We decompose the value of trade and the number of trade relations of Dutch exporters with respect to the destination countries and export products (at the 5 digit level). As discussed extensively by Bernard et al. (2009), the variation in the number of FCP relations has various sources. First of all, new firms can decide starting to export and exporting firms can decide to continue or to quit. Second, firms can decide to export to new destinations, to continue a destination or to quit. Third, firms may add new products to a destination, export the same products or drop products. These new products could be new export products or existing export products of the firm but sold at new destinations. Similarly, a dropped product at a specific destination could still be a part of the export portfolio of a firm.[9]

Let's call Y_t the national trade value of FCP export relations at time t.

$$Y_t = \sum_{f \in IF} Y_{ft} + \sum_{f \in NF} Y_{ft} \tag{1}$$

The trade value in period t, equals the trade value of incumbent exporters (already exporting last year), denoted by IF, and the new exporters at time t. The set of new exporters is NF and varies by year. The incumbent firms can export to familiar (FD) and new destinations (ND). The sets of familiar and new destinations are firm specific and time-varying.

$$\sum_{f \in IF} Y_{ft} = \sum_{f \in IF} \left(\sum_{c \in FD} Y_{fct} + \sum_{c \in ND} Y_{fct} \right) \tag{2}$$

[8] We have put the reference-price goods in the group of heterogeneous products for robustness analysis and have also used the liberal classification of Rauch. Although the precise numbers in all these specification differ, the pattern remains the same. Therefore we do not present these results, but these are available upon request.

[9] A similar reasoning holds for export destinations. It could be a new destination for the firm, but also a familiar destination which is only new with respect to a particular export product.

The incumbent firms can sell their familiar export products and new products at familiar and new destinations. *NP* (*FP*) represents the set of new (familiar) products, which are firm and time specific.

$$\sum_{c \in CD} Y_{fct} = \sum_{c \in CD} \left(\sum_{p \in FP} Y_{fcpt} + \sum_{p \in NP} Y_{fcpt} \right) \qquad CD \in \{FD,\ ND\} \tag{3}$$

Finally, familiar products exported to a familiar destination can be a familiar product for firm f at that destination c (FCP) or a familiar product at other familiar destinations (NCP).

$$\sum_{p \in FP} Y_{fcpt} = \sum_{p \in FCP} Y_{fcpt} + \sum_{p \in NCP} Y_{fcpt} \tag{4}$$

Substituting Eqs. (2–4) in Eq. (1) gives the total export value decomposed into

$$Y_t = \sum_{f \in IF} \left(\sum_{c \in FD} \left(\sum_{p \in FCP} Y_{fcpt} + \sum_{p \in NCP} Y_{fcpt} + \sum_{p \in NP} Y_{fcpt} \right) + \sum_{c \in ND} \left(\sum_{p \in FP} Y_{fcpt} + \sum_{p \in NP} Y_{fcpt} \right) \right) + \sum_{f \in NF} Y_{ft} \tag{5}$$

The first term represents the intensive margin: the trade value of incumbent export firms of familiar products to familiar destinations. All other terms represent various characteristics of the extensive margin. The second and third term represent the sales of new products at familiar destinations distinguished by a familiar export product at other familiar destinations for the incumbent firm (second term) and by a new export product (third term). The fourth and fifth term represent sales of incumbent exporting firms to new destinations with familiar export products (fourth) and new export products (fifth). The final term represents the export value of new exporting firms which are by definition also new destinations and new export products for the firm. To economize text phrases and notation we use the term *new products* for new products at a familiar destination (third term) and *new destination* for familiar products at a new destination (fourth term).

We estimate these margins year by year and for the full period of 6 years. In the latter case the value of the intensive margin in 2008 is based on all FCP relations in 2002 (that still exist in 2008). Table 1 presents a summary of the development of the extensive and intensive margins. The total export value is 65.8 billion euro in 2003 of which 58.8 billion comes from firm-destination-product relations that exist in 2002 and 7 billion euro comes from new trade relations. At an annual base nearly 90 % of the exports are generated by existing trade relations and only 10–12 % by new relations. For the whole period 2002–2008 the extensive margin is much more important: nearly 50 %. In the US, existing FCP relations are responsible for more than 80 % of the export growth although this varies between 46 and 294 % (Bernard et al. 2009). Over

Table 1 Development of the intensive and extensive margins in billion euro between 2002 and 2008

Type FCP	Code	2002–2003	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008	2002–2008
New FCPs		7.0	7.1	8.9	9.0	10.8	12.3	47.5
New firms	NF	1.7	1.7	1.8	2.5	1.8	1.7	18.9
New destinations	IF, ND, FP	2.0	1.9	2.3	2.0	1.9	3.1	8.2
New products	IF, FD, NP	1.5	1.5	2.7	2.2	3.5	4.7	10.1
New des and prod	IF, ND, NP	0.9	1.0	1.1	1.2	1.7	1.3	7.1
Fam des and prod	IF, FD, NCP	0.9	1.0	1.1	1.1	1.9	1.6	3.2
Intensive margin	IF, FD, FCP	58.8	62.1	66.5	76.2	85.9	89.7	54.5
Total		65.8	69.2	75.4	85.2	96.6	102.0	102.0

Rows new FCPs and intensive margin add up to total. The other five rows add up to new FCPs. The codes in the second column refer to the subsets defined in Sect. 4. *Source*: International Trade Data of Statistics Netherlands, 2002–2008

a 10 year period existing FCP relations only contribute a third to US export growth.[10] Our year-by-year results vary less than those for the US. The main reason is that we decompose the value of exports, while Bernard et al. (2009) decompose the value of export growth. This and the shorter time interval explain that the intensive margin is more important than in Bernard et al. (2009). These authors explain the importance of the intensive margin by the fact that the value of new trade relations is much smaller than that of existing relations.

The decomposition in Table 1 shows that new products contribute most to new FCPs followed by new destinations and by new firms, although there is considerable variation over the years. The combinations of new products and destinations and new combinations of familiar export products and destinations add less to the extensive margin. Over the whole period from 2002 to 2008 the contribution of new firms is most important followed by new products of incumbent firms and new destinations. New combinations of familiar export products and destinations do not add much to the trade value.

The differences between year by year changes and 6-year period changes suggest that new export firms grow faster or survive more frequently than trade relations with new products or destinations. The opposite is the case for combinations of familiar products and destinations. These conjectures will be analysed in more depth in the remaining of this paper.

Apart from the trade value we also decompose the number of trade relations in incumbent trade relations and new trade relations decomposed by the same five char-

[10] Manova and Zhang (2009) report that the intensive margin is responsible for 42 % of the 80 % increase in export value between 2003 and 2005. 30 % is generated by new exporting firms and the rest by new export products and/or markets of incumbent exporters.

acteristics as in Eq. (5). The number of trade relations, A_t, is equal to:

$$A_t = \sum_{f \in IF} \left(\sum_{c \in FD} \left(\sum_{p \in FCP} A_{fcpt} + \sum_{p \in NCP} A_{fcpt} + \sum_{p \in NP} A_{fcpt} \right) + \sum_{c \in ND} \left(\sum_{p \in FP} A_{fcpt} + \sum_{p \in NP} A_{fcpt} \right) \right) + \sum_{f \in NF} A_{ft} \quad (6)$$

A_{fcpt} is a dummy which is one if the FCP relation exists in period t and zero otherwise. f indicates an exporting firm, c the export destination and p the export product. The symbols for the sets of firms, countries and destinations are the same as in Eqs. (1–5).

5 Basic Results by Birth year

A more detailed way to examine the dynamics of trade relations is a decomposition by birth year. Figure 1 presents the number of FCP relations from 2002 to 2008. The number of FCP relations increases with 43 % between 2002 and 2008 (from 156,994 to 224,762 relations) which indicates the internationalization of business. The value of trade increases from 66 to 102 billion euro in that period (see Fig. 2), a real increase of 55 %. The total number of FCP relations is distinguished by the birth year in the columns. For the starting year of the sample, 2002, we do not know whether the trade relations are new. The upper part in the columns reflects the number of new FCP relations. This is about 40 % of the relations in a year. New is defined as a FCP relation that did not exist the year before. This could be a brand new relation but also a recurrent relation which existed 2 or 3 years ago. In the regression analysis we distinguish recurrent relations from new ones.

Figure 1 clearly depicts the dynamics of new trade relations. If all of these new relations survive for some years, the increase in FCP relations would be much higher

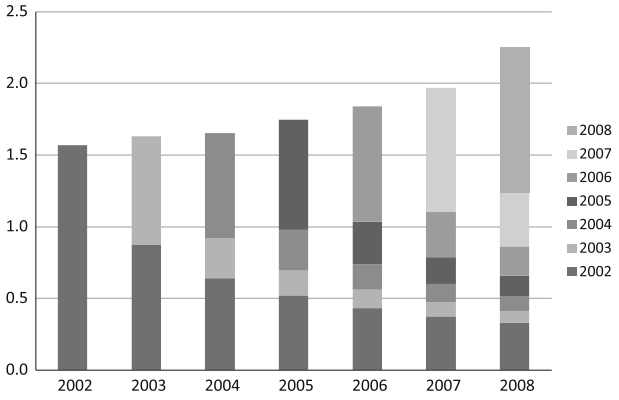

Fig. 1 Number of FCP relations (per 100,000) between 2002 and 2008 and their birth year. *Source*: International Trade Data of Statistics Netherlands, 2002–2008

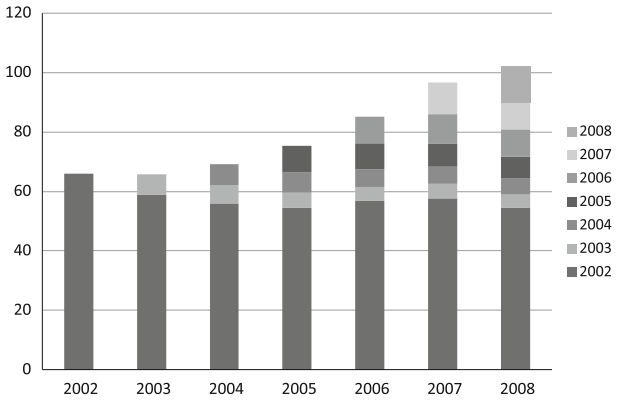

Fig. 2 Development of trade value between 2002 and 2008 by birth year of trade relations in billion euro. *Source*: International Trade Data of Statistics Netherlands, 2002–2008

Table 2 Share (%) of finishing FCP relations of new cohorts by survival year

Birth year/survival	2002	2003	2004	2005	2006	2007	2008
2002	44.1	–	–	–	–	–	–
2003	15.1	63	–	–	–	–	–
2004	7.8	14	61.4	–	–	–	–
2005	5.4	6.3	14.4	61.1	–	–	–
2006	3.9	3.7	6.5	14.7	61	–	–
2007	2.8	2.2	3.4	5.9	13.3	57.1	–
2008	21	10.9	14.4	18.3	25.7	42.9	100

Cells in columns add up to 100 %. *Source*: International Trade Data of Statistics Netherlands, 2002–2008

than 43 %. This is not the case at all. Although many FCP relations are new, most of them do not survive for a few years. In 2008 only 21 % of the 2002 relations has survived and the majority of these surviving trade relations are probably incumbent relations in 2002. For new FCP relations the survival rate is even lower. In 4 years' time, only 13.1 % (in 2003) to 14.4 % (in 2004) of the new FCP relations still exists according to Table 2. This table presents the shares of the relations borne in a year (reflected in the columns) by the year of survival. The table concludes that 57.1 % (in 2007) to 63 % (in 2003) of the new relations disappears within 1 year and another 13.3 % (in 2006) to 14.4 % (in 2005) within 2 years.

Although only 21 % of the FCP relations originating from 2002 or earlier still exists in 2008 (see Fig. 1), the impact on the trade value is large. In spite of the fact that 79 % of the FCP relations is lost, the trade value is still 55 billion euro in 2008 (the intensive margin, see Sect. 3), suggesting a massive rise in the average export value of a FCP relation from 2002 or earlier. These relations are responsible for half of the trade value in 2008 as can be seen in Fig. 2.

The average export value of a FCP relation is about 400 thousand euro. Due to new FCPs the average over all trade relations increases only by 10 %. The average export value of new relations is about 100 thousand euro and increases fivefold in

Table 3 Average trade value (in hundred thousand euro) of new cohorts by survival year

Birth year/survival	2002	2003	2004	2005	2006	2007	2008
2002	1.2	–	–	–	–	–	–
2003	2.5	0.5	–	–	–	–	–
2004	3.9	1.1	0.6		–	–	–
2005	4.2	1.2	1.0	0.6	–	–	–
2006	3.7	1.4	1.4	1.4	0.5		–
2007	6.0	1.3	1.0	1.5	1.0	0.6	–
2008	11.7	2.5	2.4	2.8	2.6	2.0	1.2

Source: International Trade Data of Statistics Netherlands, 2002–2008

about 4 years' time. The export value of the 2002 relations increases four times to 1.6 million euro. The main reason is that many exporters from 2002 with relatively low export values retreat from international markets in later years. The average trade value of FCPs existing for 1 year is 50–60 thousand euro (see Table 3), only for 2008 it is substantially higher, but this also includes FCPs which will exist for several years. For FCPs which are active for 3 years the average initial trade value is 120–150 thousand euro. For FCPs with a longer survival span the initial trade value is substantially higher on average, about 250 thousand euro for the new trade relations in 2003. Thus, initial sales seem to be a good indicator for the survival as is also concluded in studies with country-product data (Brenton et al. 2009; Besedeš and Prusa 2006a).

New trade relations can be characterized by new firms, new products, new destinations, new products and new destinations, or new combinations of familiar products and destinations. We estimate this decomposition for the birth year and subsequent years. Table 4 presents the results averaged by age of the new FCPs; standard deviations are presented in parentheses. The overwhelming share of new trade relations comes from incumbent exporting firms (see the row on birth); the share of new exporting firms is on average 8.9 % of all new FCPs in the birth year. It increases until 14.7 % after 4 years, which is still a modest share and illustrates the important role of incumbents in trade. However, the increase over time still implies that relatively more new firm relations survive than export relations of incumbent exporting firms.

22.6 % of the new FCP relations are new destinations on average. After 4 years this share increases to 32.1 %. This is different for firms selling new export products to new destinations. In the birth year this share is on average 14 % and decreases by nearly 5 % points after 4 years. The survival rate of these FCP relations is relatively low. Also for new products to familiar destinations the survival rate is low, at least lower than for the average new FCP relation. The share of new products in new FCPs decreases from 30.9 to 19.5 % on average after 4 years.

From comparing Tables 4 and 5 we find that new firms are much more important for the value of trade than for the number of trade relations. Moreover, the share increases until 34 % of the export value of new FCPs after 4 years. The average export value of new exporters per product and destination is much higher than of new FCP relations from incumbent exporters in the birth year. However, the growth rate of average export value is lower for surviving export firms (see Fig. 3). The export value

Table 4 Average share of decomposed FCP relations by birth year and over time (standard deviation between brackets)

Survival year	New firms	New products	New destinations	New des-prod	Fam des-prod	Obs.
Birth	8.9	30.9	22.6	14.0	23.7	6
	(0.35)	(1.72)	(1.13)	(1.10)	(0.61)	
One	11.0	26.4	25.8	10.1	26.7	5
	(0.59)	(3.18)	(2.61)	(1.23)	(0.81)	
Two	12.7	23.1	27.9	9.9	26.4	4
	(1.21)	(1.52)	(2.01)	(1.47)	(1.18)	
Three	13.7	21.3	29.7	9.3	26.0	3
	(0.83)	(2.05)	(2.27)	(1.77)	(1.21)	
Four	14.7	19.5	32.1	9.2	24.5	2
	(0.76)	(1.53)	(0.58)	(2.51)	(0.80)	
Five	14.5	18.2	32.8	11.4	23.0	1

Cells in columns 2–6 in a row add up to 100 %. *Source*: International Trade Data of Statistics Netherlands, 2002–2008

of new combinations of familiar products and destinations is only responsible for about 14 % of the export value of new FCP relations (Table 5), much smaller than their 25 % share in number of relations. This reflects a low average export value, suggesting that these sales are try outs without much investment effort beforehand because the export products and destinations are familiar (Freund and Pierola 2010). Over time the export values increase fivefold, but remain much lower than for other types of FCP relations as can be seen in Fig. 3. The new product and destination relations add only 13 % of the trade value in the birth year and this share decreases by about 5 % points over time. The development of trade values of the FCPs with new products or new destinations is more dynamic and varies by year. The average export value of FCPs with new products is much higher and increases relatively faster over time, although 2005 is an exception. However, the low survival rates imply that the contribution to total trade declines from 29.2 % in the birth year to 12.2 % after 4 years.

Although a relatively large share of the new FCPs involves new products, this alters rather quickly after a few years due to the high hazard rate of new products. This suggests that it is easier for firms to change the export product composition than it is to change the export destination composition. Manova and Zhang (2009) derive a similar result and suggest that market entry costs are lower for new products at a familiar market than for new markets or for new exporters. Bernard et al. (2011) and Iacovone and Javorcik (2010) also suggest that it is quite easy to add and drop products because market entry costs are lower for products at familiar destinations. However, these two papers do not compare product switching with destination switching.

6 Estimation Results

The preceding sections discussed various factors affecting the duration of new trade relations such as the status of the firm, product and destination and the initial trade

Table 5 Average share of decomposed trade value by birth year and over time (standard deviation between brackets)

Survival year	New firms	New products	New destinations	New des-prod	Fam des-prod	Obs.
Birth	20.2	23.9	29.2	13.0	13.8	6
	(5.03)	(4.15)	(6.71)	(1.87)	(2.22)	
One	26.5	23.1	24.0	11.3	15.1	5
	(4.32)	(6.06)	(7.04)	(1.86)	(3.65)	
Two	31.4	25.4	21.1	9.1	13.0	4
	(4.29)	(6.65)	(8.33)	(1.04)	(2.26)	
Three	30.4	25.8	22.7	8.1	13.0	3
	(4.49)	(8.49)	(14.28)	(2.08)	(3.18)	
Four	34.3	30.9	12.2	8.2	14.3	2
	(2.55)	(4.23)	(0.76)	(2.31)	(0.13)	
Five	32.9	35.4	12.7	6.2	12.8	1

Cells in columns 2–6 in a row add up to 100 %. *Source*: International Trade Data of Statistics Netherlands, 2002–2008

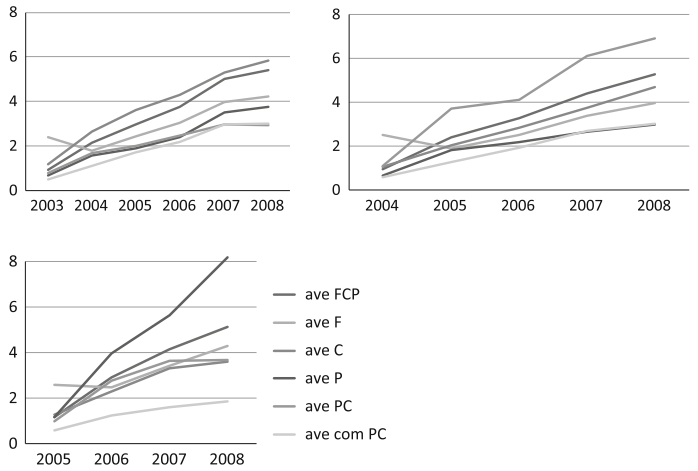

Fig. 3 Development of average sales of 2003, 2004 and 2005 cohorts (in hundred thousand euros). *Source*: International Trade Data of Statistics Netherlands, 2002–2008

value. This section aims to estimate the impact of these factors using a hazard rate model. Hazard rate models tend to estimate the failure of a (trade) spell i. h is the probability that the export relation terminates in period k (recorded by the last positive trade value the year before).

$$h_{ik} = P(T_i < t_{k+1} | T_i \geq t_k, x_{ik}) = F(x'_{ik}\beta + \gamma_k) \tag{7}$$

T is time and x_{ik} are the spell and period-varying covariates. γ is a dummy to allow for a period varying hazard rate. F represents the functional form which is a Cox proportional hazard, probit or logit model in this paper. The log likelihood is as follows

$$\text{In } L = \sum_{t=1}^{n} \sum_{k=1}^{k_i} [y_{ik} \text{In}(h_{ik}) + (1 - y_{ik}) \text{In}(1 - h_{ik})] \tag{8}$$

y_{ik} is a dummy which is 1 if the trade spell is terminated and 0 if the spell continues.

Following most other papers, we estimate a Cox proportional hazard model, but we also test whether the hazard rates are proportional. Then, we estimate the logit and probit model with random effects. First, we compare the outcomes of the various methods. Subsequently, we interpret the outcomes of our preferred specification and present various robustness checks.

We explain the duration of a trade relation by various factors. The first is the initial trade value in the starting year of the spell, which is important for survival according to Table 3. Second, we include the number of product-destination spells of a firm (indicating the size of the firm). Various characteristics of the destination country are included: EU-membership,[11] EMU-membership, WTO-membership, distance, common language and market size (measured by GDP). 60 to 65 % of the FCP observations have an EU destination. This is not surprising; more than 70 % of the Dutch exports value remains within Europe.

We include a dummy indicating the homogeneity of the good (a 0 implies heterogeneity) using the classification of Rauch (1999). One could imagine that differentiated products are more customized and are produced in smaller quantities because of that reason. As a consequence, these products are more vulnerable for market entry costs. Besedeš and Prusa (2006a) conclude that the initial export sales of differentiated products are smaller than for homogeneous products, but that their survival rates are higher. So we expect a negative coefficient. Moreover, the average trade value of a FCP relation with heterogeneous products is about twice as low as the one with homogenous products. This confirms our conjecture that heterogeneous products are sold at smaller quantities. We have twice as much FCP relations with heterogeneous products than with homogeneous products.

Succeeding, we use dummies characterizing the new FCP relation by a new exporting firm, by a new destination, by a new export product or by a new export product and destination for the firm. If these four dummies are zero the trade relation is a new combination of a familiar product and destination. Based on the stylized facts in Sect. 5 we expect that the coefficients of the dummies for new firms and new destinations are negative and those for new products and new products and new destinations are positive.

Column (1) of Table 6 presents the estimated coefficients of the traditional continuous-time hazard model. A negative coefficient reduces the hazard or, to formulate it differently, increases the probability of survival. A higher initial trade value, more product-destination spells, EU membership, the euro, larger market size, and a shorter distance increase the survival probability. This is also the case for trade relations characterized by new firms or new destinations. Trade relations with new products reduce the survival probability. Year dummies are significant. Relations with

[11] We also include the EFTA countries Switzerland, Norway, Iceland and Liechtenstein in the EU sample, because these countries are more or less included in the internal market.

homogeneous goods also increase survival which contrasts the findings of Besedeš and Prusa (2006a). However, they investigate US country-product import relations for 12 years, while we analyse Dutch FCP export relations for 6 years, which makes it hard to compare both outcomes. It could be that the survival rates for differentiated goods improve relatively over a longer time period. Moreover, our survival rates could also be lower because these are firm specific.

We test the proportional hazard assumption using the test on Schoenfeld residuals (Schoenfeld 1983). It tests whether there is a nonzero slope in a generalized regression of the scaled Schoenfeld residuals on functions of time. Table 7 shows that the global test rejects the assumption of proportionality.

Columns (2) and (3) in Table 6 present the regression results for the logit and probit regressors with random effects. The number of observations is higher than in the first regression because it ignored the panel dimension of trade spells. Each observation was a different trade spell. The regressions have been extended with dummies for spell duration at time t and for the number of times a spell recurs. A new trade relation is defined as a relation that did not exist before in the sample period 2002–2008.[12] In 2008 the recurrent relations form about a third of the new relations. Because firms already paid the market entry costs and experienced the market or product, we expect higher survival rates for recurrent relations. Because the dummies for the first and second spell are defined in deviation from a third spell we expect positive coefficients.

Most of the coefficients in columns (2) and (3) are significant and have the same sign as in column (1). A common language and WTO membership have a significant positive impact on survival now. Trade relations with new products and destinations have a negative impact on survival which is an opposite result from the first regression. The coefficients of the dummies on duration and on recurrent spells are all positive and significant.

The outcomes of the regressions are robust for the estimation method. It does not matter much whether a logit or probit model is used [compare columns (2) and (3)]. We prefer the logit model; the log likelihood performs slightly better than the one of probit model. The coefficients are larger than in the probit model, but this is a standard result because the variance of the logistic distribution is larger than the variance of the probit distribution (Verbeek 2004).

For comparing the different estimations methods it is useful to present the estimated coefficients, but most papers only present odds ratios where coefficients smaller than one suggest a positive impact on survival compared to the baseline and coefficients larger than one a negative impact. We do so in column (4) of Table 6. The odds ratios are only another presentation of the results in column (2). The odds ratio of about 0.8 on the initial export value is somewhat lower than in Brenton et al. (2009), and Besedeš and Prusa (2006a). The odds ratios on GDP and distance are comparable to Besedeš and Prusa (2006a), but closer to one than in Brenton et al. (2009). The odds ratio on homogenous goods suggests that these trade relations have a nearly 10 % higher survival probability than trade relations with heterogeneous goods, while the

[12] This definition has two consequences. First, only from 2004 we have recurrent trade relations. Second, a trade relation characterized as new could have been there before 2002. It is less likely that new trade relations are recurrent relations from the year 2001 or earlier if the end of the sample period is reached.

Table 6 Regression results of continuous and discrete hazard models

Column Method	(1) Cox	(2) Logit	(3) Probit	(4) Logit	(5) Logit	(6) Logit	(7) Logit
Log initial export	−0.0692***	−0.197***	−0.115***	0.821***	0.824***	0.717***	0.751***
	(0.00215)	(0.00179)	(0.00104)	(0.00147)	(0.00161)	(0.00220)	(0.00677)
No prod-destinations	−8.6e−05***	−0.00021***	−0.00012***	1.000***	1.000***	1.000***	1.000***
	(7.93e−06)	(3.80e−06)	(2.19e−06)	(3.80e−06)	(4.21e−06)	(6.26e−06)	(1.02e−05)
Dum EU member	−0.194***	−0.529***	−0.320***	0.589***	0.583***	0.446***	0.495***
	(0.0123)	(0.0127)	(0.00754)	(0.00746)	(0.00802)	(0.00938)	(0.0131)
Dum hom good	−0.0384***	−0.0866***	−0.0479***	0.917***	0.905***	0.898***	0.913***
	(0.00969)	(0.00669)	(0.00395)	(0.00613)	(0.00661)	(0.0100)	(0.00923)
Import doc	−0.00196	−0.0075***	−0.0046***	0.992***	0.994***	0.981***	0.984***
	(0.00132)	(0.00234)	(0.00140)	(0.00233)	(0.00254)	(0.00382)	(0.00333)
Log gdp	−0.00267*	−0.0138***	−0.0082***	0.986***	0.987	0.989***	0.991***
	(0.00146)	(0.00196)	(0.00117)	(0.00194)	(0.00211)	(0.00321)	(0.00278)
Dum new firm	−0.263***	−0.165***	−0.0985***	0.848***	0.848***	0.878***	0.894***
	(0.0246)	(0.0119)	(0.00701)	(0.0101)	(0.0106)	(0.0173)	(0.0153)
Dum new product	0.0490***	0.280***	0.163***	1.323***	1.375***	1.529***	1.443***
	(0.00863)	(0.00830)	(0.00494)	(0.0110)	(0.0127)	(0.0210)	(0.0231)
Dum new destination	−0.124***	−0.185***	−0.111***	0.831***	0.827***	0.811***	0.838***
	(0.00888)	(0.00898)	(0.00531)	(0.00746)	(0.00828)	(0.0122)	(0.0116)
Dum new prod prod-dest	−0.0372***	0.197***	0.116***	1.217***	1.255***	1.463***	1.396***
	(0.0127)	(0.0106)	(0.00631)	(0.0128)	(0.0142)	(0.0254)	(0.0247)
Log dist	0.0119***	0.0486***	0.0288***	1.050***	1.053***	1.088***	1.074***
	(0.00368)	(0.00480)	(0.00285)	(0.00504)	(0.00551)	(0.00867)	(0.00773)
Dum WTO	0.00283	−0.0239*	−0.0158**	0.976*	0.991	0.793***	0.824***
	(0.00909)	(0.0130)	(0.00779)	(0.0127)	(0.0140)	(0.0170)	(0.0161)
Dum com. Language	−0.0209	−0.0598***	−0.0374***	0.942***	0.938**	0.943**	0.949**
	(0.0155)	(0.0152)	(0.00891)	(0.0143)	(0.0156)	(0.0238)	(0.0207)
Dum euro	−0.0788***	−0.205***	−0.119***	0.814***	0.796***	0.683***	0.723***
	(0.00929)	(0.00840)	(0.00496)	(0.00684)	(0.00730)	(0.00957)	(0.0114)
Dum dur 1 years		1.462***	0.777***	4.315***	4.003***		3.407***
		(0.0288)	(0.0139)	(0.124)	(0.116)		(0.329)
Dum dur 2 years		0.793***	0.382***	2.209***	1.969***		2.903***
		(0.0294)	(0.0143)	(0.0649)	(0.0586)		(0.155)
Dum dur 3 years		0.437***	0.187***	1.548***	1.369***		2.524***
		(0.0306)	(0.0150)	(0.0474)	(0.0425)		(0.0969)
Dum dur 4 years		0.287***	0.118***	1.333***	1.234***		2.146***
		(0.0332)	(0.0164)	(0.0443)	(0.0419)		(0.0760)
Dum first spell		0.541***	0.318***	1.717***			
		(0.0380)	(0.0214)	(0.0652)			
Dum second spell		0.227***	0.139***	1.254***			
		(0.0385)	(0.0217)	(0.0483)			

Table 6 continued

Column Method	(1) Cox	(2) Logit	(3) Probit	(4) Logit	(5) Logit	(6) Logit	(7) Logit
Constant		−0.690***	−0.324***	0.502***	4.88e−06***	32.54***	5.737***
		(0.0882)	(0.0511)	(0.0443)	(1.44e−05)	(4.024)	(1.217)
Year dum.	Yes	Yes	Yes	Yes	Yes	No	No
Observations	381,296	622,390	622,390	622,390	515,247	622,390	622,390
Trade spells		381,352	381,352	381,352	316,097	381,352	381,352
Log likeli.	−3,305,871	−337,120	−337,696	−337,120	−282,828	−366,443	−366,013
χ^2	9,757	105,512	120,328	105,512	88,942	26,686	35,315
P		0.0724	0.0316	0.0724	0.0187	0.538	0.409
$\chi^2(\rho = 0)$		7.16e−06	4.56e−06	7.16e−06	2.47e−06	33029	421.7

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, Robust standard errors in parentheses. The coefficients in (4)–(7) are odds ratios

Source: International Trade Data of Statistics Netherlands, 2002–2008

Table 7 Test on the proportionality of the hazard function: the test on the Schoenfeld residuals

	ρ	χ^2	FD	Prob > χ^2
Detailed test				
Log initial exports	0.02398	578.77	1	0
No prod-countries	−0.00304	29.26	1	0
Dum EU member	−0.02195	479.1	1	0
Dum hom goods	0.01137	175.97	1	0
Import documents	0.00916	23.34	1	0
Log gdp	−0.00709	25.81	1	0
Dum new firm	−0.04023	4401.4	1	0
Dum new prod	−0.01276	151.11	1	0
Dum new des	−0.02159	348.8	1	0
Dum new prod-des	−0.01358	202.01	1	0
Log distance	−0.00093	0.45	1	0.5017
Dum WTO	0.00649	27.3	1	0
Dum com. language	−0.00134	1.43	1	0.2324
Dum euro	−0.00386	18.19	1	0
Year dummies			4	
Global test		6757.43	18	0

Source: International Trade Data of Statistics Netherlands, 2002–2008

literature finds a higher hazard rate. However, most of the literature uses international trade databases with product and country characteristics and do not distinguishes firms. Trade with EU countries has a large impact on the survival of Dutch trade relations.

Hazard rates are much lower if trade relations are established for the second or third time. A brand new FCP relation has a 72 % higher hazard rate compared to recurrent

relations (denoted by the coefficient of the dummy first spell). Brenton et al. (2009) find that recurrent relations have a nearly 60 % lower hazard rate than new relations. We also discriminate between a first and second revival of trade relations (dummy second spell). The former has a 25 % higher hazard rate. Over time the hazard rate declines. This is a well established fact in all papers. We use duration dummies and find that a new relation has a four times higher hazard rate than trade relations which continue for at least 5 years. In the second year the hazard rate is already twice as low as in the first year.

About 100 thousand observations are trade spells occurring for a second or third time. We dismiss these from the regression in column (5), but their impact is minimal. All coefficients are of similar size. Only the coefficient of the WTO dummy is not significant any longer.

According to Hess and Persson (2012) ρ can be interpreted as the degree of individual variation in the hazard rate due to unobserved factors. If we include year and duration dummies ρ is fairly small and insignificant according to the χ^2 test. Column (6) in Table 6 presents the regressions results ignoring the dummies for year, duration and the frequency of spells. All coefficients are substantially larger in absolute size than in our preferred specification. ρ, indicating the degree of heterogeneity affecting the hazard rate, is about 50 %. This is large and significantly different from zero according to the χ^2 test. This suggests that heterogeneity matters. Including duration dummies reduces the size of most regression coefficients from comparing columns (6) and (7) in Table 6.

The descriptive statistics and estimation results are based on product relations at the 5 digit level. This level of detail could affect the outcomes. The first three columns in Table 8 present the estimation results for products at the 4, 3 and 2 digit level. Although the number of product categories is lower, in particular at the 3 and 2 digit level most observations remain; these are not affected by aggregation. This suggests that many firms only export one product at a particular market. At the 2 digit product level, the coefficients of the dummies on homogeneous goods and new firms are not significant.

The large impact of EU membership, even if market size, distance and a dummy for the Eurozone are included, could be due to the threshold effects for reporting intra-EU trade as discussed in Sect. 3. The export relations of firms sometimes above and below the threshold could be wrongly interpreted as failures and therefore recurrent traders. Because we do not have the export data below the threshold we can not check this, but we can apply the same threshold for all extra-EU trade relations such that the threshold holds for all trade relations. The results are shown in the last column of Table 8. The odds ratio of the EU dummy deviates slightly less from one than the standard specification in column (4) in Table 6. The difference in thresholds does not seem to be a disturbing factor for the magnitude of the estimated odds ratio. Another reason for the low odds ratio could be the EU enlargements with 12 countries from Middle and Eastern Europe in 2004 and 2007. Column (4) presents the results for an EU dummy of the before 2004 member of the EU and a dummy for trade among the new members and between the old and new members. The odds ratio of the last dummy is somewhat smaller, but also the dummy of the old EU member states has a

Table 8 Robustness checks on dummies and observations (odds ratio)

Column Variant	(1) Prod 4dgt	(2) Prod 3dgt	(3) Prod 2dgt	(4) Split EU	(5) Threshold
Log initial export	0.887***	0.878***	0.870***	0.822***	0.829***
	(0.000972)	(0.00122)	(0.00133)	(0.00147)	(0.00157)
No prod-destinations	1.000***	1.000***	1.000***	1.000***	1.000***
	(2.52e−06)	(3.37e−06)	(4.29e−06)	(3.80e−06)	(3.80e−06)
Dum EU member	0.723***	0.712***	0.704***		0.623***
	(0.00574)	(0.00631)	(0.00688)		(0.00854)
Dum hom good	0.950***	0.975***	0.996	0.918***	0.953***
	(0.00394)	(0.00460)	(0.00541)	(0.00614)	(0.00667)
Import doc	0.995***	0.995***	0.998***	0.998	0.996
	(0.00147)	(0.00161)	(0.00176)	(0.00235)	(0.00257)
Log gdp	0.993***	0.992***	0.990***	0.977***	0.986***
	(0.00123)	(0.00134)	(0.00147)	(0.00196)	(0.00215)
Log dist	1.031***	1.030***	1.027***	1.068***	1.052***
	(0.00311)	(0.00345)	(0.00383)	(0.00519)	(0.00538)
Dum WTO	0.983**	0.973***	0.956***	0.982	0.981
	(0.00806)	(0.00878)	(0.00950)	(0.0128)	(0.0143)
Dum common language	0.968***	0.972**	0.961***	0.956***	0.956***
	(0.00926)	(0.0107)	(0.0121)	(0.0146)	(0.0148)
Dum euro	0.887***	0.885***	0.884***	0.744***	0.890***
	(0.00466)	(0.00521)	(0.00583)	(0.00688)	(0.00775)
Dum new firm	0.916***	0.945***	0.986	0.839***	0.637***
	(0.00675)	(0.00770)	(0.00893)	(0.00988)	(0.00894)
Dum new product	1.207***	1.249***	1.289***	1.314***	1.266***
	(0.00640)	(0.00774)	(0.00924)	(0.00109)	(0.0110)
Dum new destination	0.901***	0.919***	0.940***	0.837***	0.819***
	(0.00501)	(0.00563)	(0.00642)	(0.00752)	(0.00765)
Dum new prod-destination	1.139***	1.178***	1.221***	1.210***	1.100***
	(0.00759)	(0.00871)	(0.0101)	(0.128)	(0.0127)
Dum dur 1 year	2.041***	2.016***	1.908***	4.369***	4.339***
	(0.0215)	(0.0212)	(0.0196)	(0.0125)	(0.129)
Dum dur 2 year	1.381***	1.381***	1.330***	2.219***	2.281***
	(0.0153)	(0.0144)	(0.0142)	(0.0652)	(0.0692)
Dum dur 3 year	1.117***	1.122***	1.087***	1.554***	1.588***
	(0.0137)	(0.0138)	(0.0144)	(0.0476)	(0.0502)
Dum dur 4 year	1.051***	1.059***	1.030*	1.333***	1.352***
	(0.0151)	(0.0165)	(0.0178)	(0.0443)	(0.0464)
Dum first spell	1.350***	1.333***	1.310***	1.738***	1.717***
	(0.0197)	(0.0167)	(0.0158)	(0.0660)	(0.0685)
Dum second spell	1.146***	1.131***	1.117***	1.262***	1.254***
	(0.0175)	(0.0153)	(0.0150)	(0.00486)	(0.0507)

Table 8 continued

Column Variant	(1) Prod 4dgt	(2) Prod 3dgt	(3) Prod 2dgt	(4) Split EU	(5) Threshold
Dum new EU members				0.522***	
				(0.00718)	
Dum old EU members				0.686***	
				(0.00979)	
Constant	0.796***	0.916	1.139**	0.517***	0.409***
	(0.0,395)	(0.0,490)	(0.0,662)	(0.0,457)	(0.0,393)
Observations	560,607	473,320	402,420	622,390	549,609
Trade spells	351,565	305,785	265,609	381,352	322,683
Log likeli.	−301,325	−250,369	−210,219	−338,653	−293,878
χ^2	111,600	95,327	79,734	105,742	84,128
P	1.10e−05	0.0,116	0.0,350	7.16e−06	5.70e−06
$\chi^2(\rho = 0)$	0.0330	3.978	31.62	0.0725	0.0502

$***p < 0.01, **p < 0.05, *p < 0.1$, Robust standard errors in parentheses.
The coefficients are odds ratios
Source: International Trade Data of Statistics Netherlands, 2002.2008

low odds ratio. It thus seems that the internal market has a large impact on the survival of export relations irrespective of the new member states or the threshold values.

7 Conclusions

This paper utilizes new Dutch transaction-level data on international trade to investigate the duration of FCP export relations between 2002 and 2008. First, we establish that the intensive margin drives trade growth year by year. However after 6 years, new trade relations are responsible for about half of the Dutch export value. Each year 40 % of the FCP relations is new, but only 25 % survives 3 years.

We have identified various ex ante characteristics that tend to increase the survival of new export relations. Higher initial sales, EU membership, new exporting firms, new destinations, and EMU membership have a positive impact on survival. Also homogeneous goods, a common language and market size contribute to survival of the export relation. A larger distance, and new products have a negative effect. Relations with an average initial export value of 50 thousand euro have nearly no chance to survive, while those with an initial value of 200 thousand euro will exist after a few years. New firms have higher initial sales (factor 2) and their survival rate is about 15 % higher. That is also the case for trade relations to new destinations. New products have a 30 % lower survival rate. All these results follow from descriptive and econometric analyses with discrete hazard rate models.

Survival rates seem to be higher if market entry costs are higher. This could be due to a selection effect. As with starting to export, the more productive and larger firms are more inclined in exporting. This could also be the case for higher market entry

costs. Another reason could be that market entry costs are too high to experiment with exporting because the financial burden of export failure is a bottleneck. This suggests a causal relation between market entry costs and survival rates. Something similar could be the case with initial sales. Higher initial sales indicate better survival chances, but it is not clear whether this is a causal relationship or a selection effect.

Notice that the hazard or failure of new export relations is not always a problem. Occasional exports do also occur frequently. This happens quite often for investment goods which are not bought at an annual base. Extensions to the export duration of different types of goods could be quite interesting. Moreover, a failure of an export relation does not always imply the end of that relation due to the threshold value for EU exports. It could only signal a lower trade value.

It could be interesting to examine whether trade shocks would affect the duration of Dutch FCP relations. The trade collapse late 2008 and in the beginning of 2009 is an interesting natural experiment. Bricongne et al. (2012) have investigated the world trade collapse for French exports. In France 70 % of the drop in the trade value was due to the reduction in the intensive margin. This suggests that the impact on the number of trade relations is less important. It is however not clear whether the reduced export values affect the duration of export relationships in the longer term. Moreover, the effects probably differ by sector as Levchenko et al. (2010) conclude that the collapse was worse in sectors used as intermediate inputs, using international transaction data of the US.

Although Levchenko et al. (2010) did not find an effect of trade credit on exports, various papers have focused on the role of credit constraints for exports. Manova (2013) finds that credit constraints harm exports in various ways. These constraints reduce output and therefore also exports, hinder firms starting to export and reduce the value of exports directly. This suggests the debt-equity ratio and access to credit could be major determinants for the export strategy of firms and possibly also the duration of export relationships. Antras and Foley (2011) study the trade finance of an US exporter of frozen and refrigerated food products in more detail. They find that exports have collapsed to a larger extent with customers using cash in advance or letter of credits during the crisis compared to other payment methods. Although selection plays a role, the findings of Antras and Foley pinpoint to an effect of the type of credit on the duration of export relationships.

In this paper we have presented a description of long and short-lasting trade relationships. We have a better understanding which relations have better survival chances. However, we did not determine the underlying motivations and characteristics of firms when they decide to enter a new export destination or to export a new product. Further analyses would require a link between the firm-level trade data and other firm characteristics related to productivity, the balance sheet and access to credit.

References

Albornoz, F., Calvo Pardo, H.F., Corcos, G., & Ornelas, E. (2012). Sequential exporting. *Journal of International Economics*, *88*(1), 17–31.

Amador, J., & Opromolla, L. D. (2013). Product and destination mix in export markets. *Review of World Economics*, *149*(1), 23–53.

Antras, P., & Foley, C. F. (2011). *Poultry in motion: A study of international trade finance practices*. NBER Working Paper 17091.
Arkolakis, C., & Muendler M. (2010). *The extensive margin of exporting products: A firm-level analysis*. NBER Working Papers 16641.
Bernard, A. B., Jensen, J. B., Redding S. J., & Schott, P. K. (2009). *The margins of US Trade (long version)*. NBER Working Paper 14662.
Bernard, A., Redding, S. J., & Schott, P. K. (2011). Multiple-product firms and trade liberalization. *The Quarterly Journal of Economics*, *126*(3), 1271–1318.
Besedeš, T., & Prusa, T. (2006a). Product differentiations and duration of US import trade. *Journal of International Economics*, *70*, 339–358.
Besedeš, T., & Prusa, T. (2006b). Ins, outs and the duration of trade. *Canadian Journal of Economics*, *39*(1), 266–295.
Brenton, P., Saborowski, C., & von Uexhull, E. (2009). What explains the low survival rates of developing county export flows? *World Bank Economic Review*, *24*(3), 474–499.
Bricongne, J.-C., Fontagné, L., Gaulier, G., Taglioni, D., & Vicard, V. (2012). Firms and the global crisis: French exports in the turmoil. *Journal of International Economics.*, *87*(1), 134–146.
Cadot, O., Iacovone, L., Rauch, F., & Pierola, D. (2013). Success and failure of African exporters. *Journal of Development Economics*, *101*(C), 284–296.
Creusen, H., Kox, H., Lejour, A., & Smeets, R. (2011). Exploring the margins of Dutch exports: A firm-level analysis. *De Economist*, *159*(4), 413–434.
Creusen, H., & Lejour, A. (2013). Market entry and economic diplomacy. *Applied Economic Letters*, *20*(5), 504–507.
Creusen, H., & Smeets, R. (2011). *Fixed export costs and multi-product firms*. CPB discussion Paper 188.
Das, S., Roberts, M. J., & Tybout, J. R. (2007). Market entry costs, producer heterogeneity, and export dynamics. *Econometrica*, *75*(3), 837–873.
Freund, C., & Pierola, M. D. (2010). *Export entrepreneurs: Evidence from Peru*. World Bank Policy Research Working Paper Series 5407.
Hess, W., & Persson, M. (2012). The duration of trade revisited: Continuous-time versus discrete-time hazards. *Empirical Economics*, *43*, 1083–1107.
Hess, W., & Persson, M. (2011). Exploring the duration of EU imports. *Review of World Economics*, *147*(4), 665–692.
Iacovone, L., & Javorcik, B. S. (2010). Multi-product exporters: Product churning, uncertainty and export discoveries. *Economic Journal*, *120*(2), 481–499.
Kox, H. (2012). *Import decisions and firm performance: An empirical analysis for the Netherlands*. Mimeo.
Kox, H., & Rojas-Romagosa, H. (2010). Exports and productivity selection effects for Dutch firms. *De Economist*, *158*(3), 295–322.
Levchenko, A. A., Lewis, L. T., & Tesar, L. L. (2010). The collapse of international trade during the 2008–2009 crisis: In search of the smoking gun. *IMF Economic Review*, *58*(2), 214–253.
Manova, V. (2013). Credit constraints, heterogeneous firms and international trade. *Review of Economic Studies*, *80*, 711–744.
Manova, K., & Zhang, Z. (2009). *China's exporters and importers: Firms, products and trade partners*. NBER Working Paper 15249.
Miranda, V., Badia, M., & Van Beveren, I. (2012). Globalization drives strategic product switching. *Review of World Economics*, *148*(1), 45–72.
Nitsch, V. (2009). Die another day: Duration of German import trade. *Review of World Economics*, *145*, 133–154.
Pierce, J. R., & Schott, K. P. (2012). *Concording US harmonized system codes over time*. Mimeo.
Rauch, J. E. (1999). Networks versus markets in international trade. *Journal of International Economics*, *48*(1), 7–35.
Schoenfeld, A. D. (1983). Sample-size formula for the proportional-hazards regression model. *Biometrics*, *39*(2), 499–503.
Van den Berg, M., & van Marrewijk, C. (2013). *Import and productivity: The impact of geography and factor intensity*. Tjalling C. Koopmans Research Institute Discussion Paper 13–12.
Verbeek, M. (2004). *A guide to modern econometrics*. London: Wiley.