What makes a successful export?
Evidence from firm-product level data

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Abstract

We analyse a very rich and unique panel database which provides information on exports at the firm-product level. A stylised fact in the data is that many firms add as well as drop products from their export mix in any given year. Motivated by the recent theory of multi-product firms, we investigate what determines the survival of products in the export mix. Estimating hazard models we find evidence that is consistent with the view that in export dynamics characteristics of the product as well as that of the firm matter. In particular firm productivity as well as product scale and tenure are associated with a higher export survival rate. This suggests, in line with theory, that there are firm- as well as firm-product specific competencies that are important for shaping firms' export mix.

JEL codes: F12, F14

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1 Introduction

Studies on firm level heterogeneity and its implications for globalization have dominated the research agenda of international economists over the last few years.[1] Perhaps one of the most recent and promising extensions to this literature takes into account not only heterogeneity at the level of the firm, but also at the level of the product.

In this regard, the stylised facts set out by Bernard et al. (2007, 2010) are striking. US firms producing multiple products account for 90 percent of total output in manufacturing and among those firms, adding and dropping products is rife. Over 90 percent of US manufacturing firms add and/or drop a product over a given five-year interval. Of particular interest to international economists, Bernard et al. (2007) document that exporters that export more than one product represent 58 percent of the total number of exporters, but these account for 96 percent of total export value in US manufacturing.

This prevalence of multi-product firms and, more importantly, multi-product exporters raises a number of new and exciting questions.[2] Some of the aspects related to multi-product firms have been asked by Bernard et al. (2010): what are the implications of the prevalence of multi-product firms for the theory on the boundary of the firm? Why are some firms multi-product and others single-product? What are the implications for firm growth? Related questions arise when considering exporters: Why do some firms export one and others multiple products? What types of products are added and dropped? Why are some products more successful than others, say in terms of the length of time they are exported? How are these processes related to characteristics of the exporting firm?

[1] Early theoretical work includes Montagna (2001) and Bernard et al. (2003), although the specific modelling approach of Melitz (2003) has received the greatest attention. On the empirical side, the literature has extensively documented different aspects of firm level heterogeneity and how it shapes firms' decisions to export. For example, Bernard et al. (2007) show that there is substantial heterogeneity among firms that export and do not export in the US. Bernard and Jensen (2004) look more formally at what shapes export decisions at the firm level and Görg et al. (2008) examine how heterogeneity matters for the relationship between receipt of subsidies and exporting at the plant level.

[2] Recent examples of multi-product firms in the trade literature are, for example, Eckel and Neary (2006), Nocke and Yeaple (2006), Bernard et al. (2006, 2010).

These gaps in our understanding of the export process form the starting point for this paper. We focus on the last set of questions and ask, specifically, what determines the success of export products, where success is defined as the duration over which the firm manages to find international buyers for its product. We model empirically the factors that determine the duration for which a product remains in the export mix. To do so, we develop an empirical model of the hazard of dropping a product, as a function of product, firm, and industry characteristics. The empirical analysis is motivated by recent theoretical and empirical work on multi-product firms, in particular the paper by Bernard et al. (2010). For the empirical analysis we exploit a very detailed and firm-product level dataset for Hungary, which is ideally suited for our purposes.

In studying this set of questions we build on a number of related papers that have previously analysed the survival of firm, destination or product within international markets. For example, Eaton et al. (2007) use transactions level data to study firm-specific export patterns over time. In particular, they are able to examine firms' entry and exit into specific destination markets. One interesting finding is that exporters tend to start in one market and, if successful, successively expand into further markets. Hidalgo et al. (2007) model the development of export products as a network of related products. Our analysis is different in focus, as we look at survival of products, rather than exit from particular destination markets.[3]

There is also a related literature that looks at the duration of imports and exports, using product level data in a particular country or set of countries. Examples for imports are Besedes and Prusa (2006a,b) and Nitsch (2009) for the US and Germany respectively, while Besedes (2008), Jaud et al. (2009) Fugazza and Moliva (2009) and Benton et al. (2010) perform a similar exercise for the exports of developing countries. They model the survival

[3] A separate branch of the literature has also considered exit from export markets as a zero-one decision at the level of the firm, with past export experience and other firm characteristics playing a prominent role (see, e.g., Roberts and Tybout, 1997, Bernard and Jensen, 2004). As is made clear from our analysis a number of interesting aspects of the internationalisation decision of firms are lost by this aggregation of products.

of international trade at the product level as functions of product characteristics, such as product differentiation, trade value, and country characteristics of the trade partner (e.g., country size and distance from destination market). Compared to this literature, the use of firm-product level data enables us to show that firm and firm-product characteristics matter for product survival of exports.[4] Finally, recent papers by Goldberg et al. (2010) and Iacovone and Javorcik (2010) look also at product turnover in exporting firms, but do not specifically focus on the duration of product exports and its relation to firm-product specific characteristics. As far as we are aware only Volpe and Carballo (2009) have previously used firm-product data to study questions of the duration of trade, in their case in the context of Chile.

There are a number of reasons for why Hungary provides an interesting case study for this type of analysis. Between 1992 and 2003, the economy experienced a rapid transition from a planned to a market economy accompanied by rapid trade liberalization, exposing Hungarian firms to competition on international markets on a new scale. The pace of trade liberalization was similarly quick over the 1990s and early 2000s, until Hungary joined the EU in 2004. After 1994 average tariffs decreased continuously. Import tariffs for products coming from the EU decreased from about 15 percent below 3 percent on average. In the case of non-EU countries, a similar decrease in tariffs took place: from more than 20 percent to about 10 percent. EU accession led to further decreases in tariff rates from 2003 onwards. Trade liberalization and intensive restructuring led to a surge in foreign trade. The ratio of exports to GDP grew from around 30 percent in 1992 to more than 80 percent in 2003. This growth slowed down only after the turn of the century. In this context it is illuminating to study how firms adjusted their exporting behaviour to this rapid liberalization and to examine what internationalisation strategies succeeded and which did not.

[4] Also related is work by Greenaway et al. (2007) who consider industry switching as a strategy to survive the globalisation process. A strand of literature in industrial organization examines product survival in general, see, e.g., Greenstein and Wade (1998) and Stavins (1995).

In this paper we define a product at the HS6 level. Initial observation of the product data shows rapid turnover of products at the level of the firm. First, most of the firms in our sample export a large and increasing number of products: the average was about 15 in 1993 and 25 in 2003. Only a few of these products contribute significantly to the total export sales of the firm however. The number of products that contribute at least 1 percent of the firm's total export revenue is on average just 5. Second, firms alter their mix of exported products in each year, with product additions as common as product drops. As our data show, in 2000 87 percent of exporters added at least one product to their export mix, while 92 percent of firms dropped at least one product. The data also suggest that this is not just the firm simply dropping products with low levels of export sales. The percentage of exporters dropping a product that accounted for more than 1 percent of total export sales is 43 percent. Hence, firms actively rearranged their product portfolio over the sample period.

The structure of this paper is the following. Section 2 describes the relevant theoretical literature and its implications for our empirical model. Section 3 describes the database and summarizes descriptive statistics which illustrate the importance of analysing multi-product firms and product switching. Section 4 presents the empirical methodology, while results are discussed in Section 5. Section 6 concludes.

2 Theoretical motivation

In order to provide a theoretical motivation for our empirical analysis this section briefly reviews some of the main aspects of the model on multi-product firms by Bernard et al. (2010), referred to as BRS hereafter. The key feature of the model is the endogenous choice of product range made by each firm, where that product range depends on a set of evolving firm and firm-product characteristics.

After incurring a sunk cost, each firm observes an initial productivity level and a firm-product specific consumer taste parameter for each product in their industry.[5] Optimization yields a zero-profit consumer taste cutoff for each firm-product that depends on both these productivity and consumer taste parameters. Firms choose to produce a product only if its consumer taste parameter, given its productivity, is greater or equal to this cutoff, whereas parameter combinations below this cutoff will lead the firm to make negative profits and therefore choose to drop that particular product. The cutoff varies across firms, and is negatively related to firm productivity. That is firms that are more productive do not require such a favorable draw from the consumer taste distribution compared to low productivity firms in order for them to make profits from selling that product. As a result, more productive firms produce more products in equilibrium. There is also a productivity cutoff below which firms exit the market.

Across time both firm productivity and firm-product consumer tastes are subject to random shocks, the process that encourages some firms to drop products and others to close down altogether. These shocks affect the profitability of producing particular products either positively or negatively and firms cease to produce those products that fall below the zero-profit cutoff and begin to produce others that now rise above this threshold. It follows that the firm-products that are most vulnerable to these shocks are those with low productivity, and those with low consumer taste draws, although both productive and unproductive firms will therefore add and drop products over time.[6]

The BRS model provides a number of important predictions for our exercise. Since we are interested in modeling empirically the duration of products in the export mix we reformulate the intuition for some of the model predictions in a hazard framework.

[5] These variables are independent from each other in the model. Productivity and consumer tastes evolve according to a Poisson process, generating serial correlation in these variables.

[6] After formulating the model, BRS show that within-firm product switching is important empirically, and it is correlated with both firm and firm-product level attributes. They also show that product switching plays an important role in the reallocation of resources towards their most efficient use.

First, as a result of the serial correlation in firm-level productivity and firm-product level taste parameters, the model exhibits scale and age dependence in the production of each product. Firms with a high existing value of the consumer-taste variable leads both to larger shipments of the product, and a low probability of drawing a sufficiently bad product-taste parameter that they would choose to drop the product (scale dependence). Also, due to the serial correlation in productivity and taste parameters, the longer the duration of production, the higher a firm's expected productivity and the firm-product level taste parameter. As a result, the model predicts that the probability of dropping the product is also negatively related to firm-product tenure (tenure dependence). Hence, the duration of a product in the set of products the firm exports would be expected to be longer the greater the scale (the volume of sales) and the longer the tenure of the product. Second, firm-level productivity plays a key role in the BRS model. The more productive is a firm, the lower its threshold taste parameter and the more products it produces. The model in its fully general form does not have clear predictions on the relationship between product switching and productivity. However, if one is prepared to make some mild assumptions on taste parameter dynamics the model predicts that more productive firms drop a *smaller share* of their products each year. Thus, the probability that a particular firm-product combination is dropped is decreasing in productivity.[7]

Third, the consumer taste parameter in the BRS model can arguably be interpreted as being positively correlated to product quality: thus the model predicts that quality is positively related to product survival. In the version with CES preferences, quality is not reflected in price. In non-CES models however, higher quality goods usually have a higher price. Also,

[7] The assumption needed is that the probability of any given decrease in the taste parameter does not increase (too much) as the existing value of taste parameter decreases. This is a natural assumption, as there is no reason to expect that products with high taste parameters (or quality) are more likely to deteriorate than lower quality products. Formally, one possible restriction is that for every, λ' and $\lambda_1>\lambda_2$ that $Z_{ci}(\lambda'| \lambda_2)\leq Z_{ci}(\lambda'+ \lambda_1-\lambda_2| \lambda_1)$. The statement can easily proved as the probability of dropping a product is the ratio of Λ^d (in equation (14) of the Online Appendix of BRS) and Λ (in equation (33) in the Online Appendix of BRS). Λ, the number of products exported by the firm is increasing in the productivity level in the BRS model, as discussed in the main text. Under our assumption the denominator does not increase faster than the nominator.

some recent heterogeneous firm models (with single-product firms) suggest that product quality, especially in the case of exporting, may be correlated with firm level productivity (e.g., Johnson, 2008, Hallak and Sivadasan, 2008). Assuming, as in Hallak and Sivadasan (2008) that there are certain quality standards that exist in export markets, then firms that export low quality products (at a low price) are less likely to be successful and hence more likely to drop these products. As a consequence we anticipate a negative correlation between product quality (measured in terms of product price) and the probability of dropping a product from the set of exported products.

Finally, BRS show that add and drop rates of products are positively correlated. They explain this by arguing that there are cross-industry differences in the size of shocks, which leads to more frequent product additions and drops in those industries with the largest shocks. This suggests that industry characteristics may also play an important role in the duration of production or export.

3 Description of the data

We now turn to investigating these predictions empirically. The data used for our analysis are from the Hungarian Customs Statistics merged with the firms' balance sheet and earning statements using a common firm identifier.[8] The dataset consists of an unbalanced panel of 1587 large Hungarian exporting firms from 1992 to 2003. Large exporting firms are defined as those that exported above 100 million HUF (approximately 400,000 EUR in 2003) in any of the years; all such firms operating in manufacturing are included in the dataset. The firms in the sample account for 89 percent of all manufacturing exports, while their turnover sums to 75 percent of total manufacturing turnover in Hungary.[9]

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[8] A detailed description of this dataset can be found in Halpern et al. (2005).

[9] The appendix contains some further discussion on how representative our sample is of the population of manufacturing firms. By excluding small firms we potentially lose information on a considerable amount of the dynamics present in total exports. We also lose potential variation in both the dependent variable and firm level variables, like size and productivity compared to the full population of Hungarian exporters. This may mean that we underestimate their importance when using data for only large firms compared to the full population. The

While the use of financial and accounting data is widespread in the literature, the use of customs data with both firm and product dimension has appeared only in recent years. The Hungarian Customs Statistics has both these dimensions. The dataset contains the annual export and import traffic of these firms, both in value and weight. The dataset includes all transactions for firms with an export value above 100 million HUF, i.e. there is no value threshold at the product level if the firm has sales large enough to be included in the data. The product dimension of the dataset is available at the 6-digit Harmonized System (HS) level. We define a product as a 6-digit category.[10] "Motor vehicles for transport of goods" is an example for a 4-digit category, while "Motor vehicles for the transport of goods GVW not exceeding 5 metric tons" is an example for 6-digit category. All in all, there are about 7000 6-digit codes in the Harmonized System Nomenclature, of which 4762 were active sometime during the period under study. In total we have 137,736 firm-product-time observations.

A potential complication for our empirical analysis is the considerable amount of product reclassification that occurred in the period under study at this level of aggregation. Using concordance tables from Eurostat we were able to identify 3007 changes in classification. As most changes occurred because of the splitting or unifying of product categories it is not possible to create a one-to-one correspondence between the old and the systems. As we have no reason to believe that reclassified products behave differently from other products, we restrict our analysis to those HS6 product categories that were not redefined during the sample window. We therefore concentrate on a constant set of products in the main empirical analysis.[11] As new product categories typically emerge from 'residual'

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direction of bias would therefore appear to be against the results that we find for firm characteristics. As already noted there is no equivalent restriction on the transactions made for firms with export volumes above the 100 million HUF threshold. The industry and product variables are therefore less likely to be affected by this data restriction.

[10] We are cautious to point out, however, that using more aggregated (4-digit) categories does not change our results.

[11] This filtering reduces the sample size by some 12000 observations (8% of observations). Including these spells modifies the duration dependence of export survival somewhat, but the coefficients of main determinants do not change qualitatively.

product categories, we have also chosen to exclude these for the same reason. We define these categories as products with HS6 codes specified “other” or “not elsewhere classified”.[12]

In our sample multi-product firms dominate, indeed they have become increasingly important over time. Table 1 shows the number of firms in the sample and the number of firms that export more than one product. This table shows that even in 1992 88 percent of exporters exported more than a single product. By 2003 this figure was as high as 96 percent.

We also report in the table the number of firms that transit in and out of export markets. In the period between 1992 and 1998 a large number of (mostly foreign-owned) firms entered into the Hungarian economy and started to export. A small, but significant fraction of these firms then stopped exporting; across the sample between 3 and 8 percent of firms exit from export markets each year. An even smaller number of firms restarted exporting in some later year. As we show in the rest of this section this rate of entry and exit from export markets by firms is several orders of magnitude lower than the exit and entry rate from export markets of products. While the entry and exiting of firms into/from exporting is relatively uncommon in our data, we restrict our analysis to firms that exported each year to reduce any possible selection effects. In so doing we focus our attention on the within-firm extensive margin. In the Appendix we report results including all firms in the sample. In general, the qualitative results are robust to this change although there is some sensitivity to the magnitudes of the estimated coefficients in in some cases.

[Table 1 around here]

Alongside the rise in the number of firms exporting multiple products shown in Table 1, we also find in the data evidence of a rise in the average number of products exported by each firm. The green line in Figure 1 shows the evolution of the average number of products exported by cohorts of firms. In 2003 the average number of products exported was close to

[12] This is because these groups may contain residual categories of products that may be subject to frequent re-classification. We also estimate all regressions without these exclusions as a robustness checks. Our results did are unaffected by their inclusion.

25, well above the 1993 figure of just over 15. A similar pattern emerges at other points in the firm-productivity distribution. The number of exported products by firms at the 90th percentile increased from close to 20 in 1992 to 60 in 2003. This suggests that firms exporting a large number of products have become more important in total Hungarian exports in this period.

Despite the often large numbers of products that are exported by firms, total export revenues are typically heavily dependent on just a few of these products. The majority of exported products constitute only a tiny share of export revenue for a firm. In Figure 1 we show this point by excluding products that represented less than 1 percent of total export revenues for the firm. Now the average number of products exported by a firm is just below 5. It is also notable that the trend in the average for these important products is less steep compared to that for all products. It would appear that the transition period in Hungary has been associated with large increases in the number of exported products, but has had little impact on the overall diversification of firm-exports. These remained concentrated around a relatively small number of products.

[Figure 1 around here]

In this paper our interest lies in the time span a firm exports a product. As a consequence, one logical observation in this analysis is an export spell: a period when a firm continuously exports a particular product. An open question is what period of time should be used to classify an export spell. Table 2 shows the distribution of spells using two different definitions. The '1-year' definition treats multiple spells as separate spells if the firm does not export the product for at least one year. Under this definition about 15 percent of spells would be classified as repeated spells.

Short periods between spells, such as one year, may reflect the building of inventories of the product by trade partners, or simply the timing of export sales in particular points in the year. As an alternative we therefore also consider a '3-year' definition of an export spell, in which a repeated spell is only considered as new if the firm did not export the product for 3 years before starting again. According to this definition, the firm introduces a new export product when export values are positive in period t and zero in period t-1. It is considered to have dropped the product from its export portfolio in the period when it exports are recorded as zero and there is no positive value in three years after it last recorded positive export sales. Spells with pauses in export sales shorter than this are treated as continuous.

[Table 2 around here]

Table 3 illustrates our approach with some examples. In example 1, export sales are first recorded in 1993, they cease in 1997 and then the firm did not export in the 3 following years. In example 2, the spell does is not considered to have ended in 1997 or 1999, as these are only 1 year pauses. It instead ends in 2000, as the firm does not export the product for 3 years after that. In example 3, for this firm the first export spell of this product ends in 1995, and a new one starts in 2000 after a 3-year pause. As we cannot determine whether the spell then ended permanently in 2002 or just paused for one year, we classify that spell as 'ongoing'.

In the empirical analysis we use the 3-year definition of an export-spell as it is 'stricter' in terms of identifying an actual product drop.[13] We also choose to drop products which represented less than 1 percent of export revenue at introduction.[14] Given the potentially important nature of this assumption we report results with different thresholds to demonstrate robustness to this point.

As shown in the example, the data spells can be completed (if the firm has stopped exporting for 1 or 3 years) or ongoing (there is a positive value in 2003 for the 1-year

[13] Using the 1-year definition or changing the time period allowed for the 'off' periods to 2 or 4 years does not change our results in Section 5 importantly.

[14] Restricting the sample to important exports reduces the number of observations quickly: about 75 % of all spells do not pass the filter that they count for 1 per cent of firm export revenues. We get a very similar proportion if we restrict the sample to those spells, in which the product reaches the 1% threshold anytime during the spell. The fact that firms appear very willing to sell many products at relatively small volumes in overseas markets arguably sits uncomfortably with the notion of high sunk costs for entering export markets. We leave this as a potential avenue for future research however.

definition, or there is a positive value after 2000 in the case of the 3-year definition). Table 2 shows that the majority of export spells are only a few years long. Using a single year to define a completed spell the top part of Table 2 shows that 39.5 percent of products are exported for just one year. For the alternative 3-year definition of a new spell the figure is almost identical at 39.6 percent. By restricting the sample to more important exports, the share of one-year long spells reduces by about one quarter. Under all methods of counting products and defining their export spells, the median export spell is quite short. Rapid product switching is an inherent characteristic of our firm-product level export data.

[Table 3 around here]

In Table 4 we present descriptive statistics on the length of exporting spells by industry (determined by the main product group of the firm) applying the 3-year definition. In general there appear to be few differences across industries. Foodstuffs are exported for the shortest time period on average, while footwear and textiles are exported for the longest periods.

[Table 4 around here]

Table 5 re-focuses the analysis back to firms; it shows the fraction of always exporting firms adding or dropping at least one product using the 3-year definition.[15] The table suggests that the turnover of products is a strategy common among almost all large exporting firms. In 2000 17.6 percent of firms dropped at least one product from their export sales. Product additions, are in contrast somewhat less frequent. This suggests that firms not only introduce new products to expand into export markets, but they constantly modify their product mix to remain competitive. Extensive adjustments of the export mix constitute a significant fraction of total firm level adjustment in our data. These findings are in line with the results in Bernard et al. (2006, 2010).

[15] Appendix Table 5 shows that product adding and dropping is even more important when the full sample is considered.

[Table 5 around here]

To provide descriptive statistics about the relationship between important variables and product switching, Table 6 shows a 'transition matrix' from the raw data, i.e. the probability that a product is not exported in year *t+1* conditional on exporting in year *t*.[16] The tables report the probabilities for all exports, only exports representing more than 1 percent of firm export revenue and transactions above USD 2000. With the 1 percent threshold there is a 14 percent probability that the product is dropped. The numbers clearly show that there is a negative correlation between the importance of the product in the firm's total export revenue and the probability of dropping the product.

Next, we study whether firm size is related to survival. For this, we classify the firms into four quartiles in Table 6 according to the number of their employees. Here, there are interesting differences across the samples. While there is a clear negative relationship between firm size and the probability of dropping the product when the threshold is relative (i.e. 1 percent of firm export), the difference disappears when we use an absolute threshold. This suggests that large firms export small shipments for short periods, but they are less likely than smaller firms to drop products which are important relative to their size. Finally, the exports of foreign firms (defined by a 10 percent property threshold) have a longer duration than the exports of domestic firms – however, the nature of the threshold also matters here.

[Table 6 around here]

4 Econometric Methodology

Survival analysis is a natural framework to investigate the duration of export products. In our case time is intrinsically continuous, but the econometrician can only observe product survival on a yearly basis. This makes the use of discrete-time survival models necessary. A

[16] While Table 6 shows it for always exporting firms, Appendix Table 6 shows these numbers for all firms in the sample.

widely used model for such a set-up is the complementary log-log model, which is the discrete time version of the proportional hazard models.[17]

In proportional hazard models, the hazard rate, $\theta(t, X)$, satisfies an important separability assumption:

$$\theta(t, X) = \theta_0(t)\exp(\beta' X),$$

thus it is the product of a baseline hazard $\theta_0(t)$, which depends only on time at risk, and of $\exp(\beta' X)$ which is independent of t and depends on the attributes of the export product (X). The appropriate discrete-time hazard function, $h(j, X)$ shows the interval hazard for the j^{th} time interval, i.e. the period between the beginning and the end of the j^{th} year after the introduction of the product. This hazard rate takes the following form:

$$h(j, X) = 1 - \exp[-\exp(\beta' X + \gamma_j)]$$

Our main interest lies in the identification of the β parameters, which show the effect of the explanatory variables on the hazard rate. In the tables we report the exponentiated coefficients, which represent the hazard ratio, i.e. how the hazard changes if the explanatory variable increases with one unit. Thus, if the exponentiated coefficient is less than 1, then larger values of the variable are associated with a lower hazard of dropping a product and, hence, longer survival.

The γ_j set of dummies capture duration dependence; it represents the differences in values of the integrated hazard function for different durations, or product tenures, from the beginning of the spell, thus, for example γ_1=1 if the product was introduced by the firm one year ago, and γ_1=0 otherwise. While it is possible to impose some restrictions on these parameters, we see no reason for this. Thus we estimate a full set of γ_js, transforming the

[17] See Jenkins (2005) for an excellent overview of complementary log-log and proportional hazard models. We implement the survival analysis using Stata 10.

model to a type of semi-parametric model in terms of duration dependence. These will be used to investigate the importance of product tenure for the hazard of dropping a product.

The complementary log-log model in its simple form does not allow for unobserved firm heterogeneity. In order to do so we also estimate all specifications using a random-effects version of the complementary log-log model as a robustness check. In these specifications firms are taken as the cross-sectional units. Also, to check whether the results are robust to the inclusion of firm fixed effects, we estimate a fixed effects logit model.

The survival of products is measured according to the 3-year definition: the firm introduces the product when it exports a positive quantity after exporting zero (t=1), and the firm drops the product from its export mix in the period when it exports zero, if there is no positive value in three years after exporting a positive amount for the last time. Spells with a shorter difference are treated as continuous.

In the estimation of the hazard model we consider a number of explanatory variables for the vector X, which capture characteristics of the firm / industry and the product. In this respect we are particularly interested in variables which are predicted to affect export survival according to the theoretical framework presented in section 2. In particular, we investigate the relationship between product survival and *firm* level productivity, scale and tenure of the *product* and its quality.

Firm level productivity is measured as total factor productivity (TFP) using the residual from a production function estimation. This is implemented with the approach developed by Levinsohn and Petrin (2003).[18] As discussed in section 2, the BRS model predicts under mild assumptions, that productivity is negatively correlated with the probability of product dropping in their model. Consequently our expectation is that measured firm level TFP is negatively related to the hazard of a product exit in our data.

[18] The production functions are estimated separately for two digit industries to take industry heterogeneity into account. As robustness checks we also use the residual from a fixed effects estimation, as well as a simple measure of labour productivity as output per worker.

As for the scale and tenure of the product, the theoretical model predicts that the probability of a product being dropped declines with firm-product sales, i.e., there is a scale effect at the level of the product. Also, the model predicts that products with longer tenure are less likely to be dropped subsequently.

In order to measure the scale effect, and motivated by the summary statistics discussed in section 3, we calculate the revenue share for a product in the total revenue of the export mix. However, this variable may become endogenous as firms may decrease their sales of the product before finally abandoning it. To handle this, we calculate the initial share (its share in the first year of the spell) of the product in total export revenue during the spell as our measure of scale.[19] As for the tenure of the product, we can estimate duration dependence as discussed in the previous section with a full set of "tenure" dummies. We expect both scale and tenure to have a positive effect on the probability the product continues to be exported.

In the theoretical models of Arkolakis and Muendler (2010) and Eckel et al. (2011), there is a sharper distinction between core and other products than implicitly assumed by our continuous scale variable. Whereas in the BRS model there is no correlation between the sales of products across markets, the modelling framework of Arkolakis and Muendler (2010) and Eckel et al. (2011) allow this feature. The products that are successful in one market are also successful in other markets. Motivated by this idea, and following Eckel et al. (2011), we perform a robustness check where we construct binary variables to proxy whether the product is core to the firm. The first set of these variables indicates whether the product was the most important product, within the top 3 products or within the top 10 percent of products. To mitigate endogeneity problems, we measure these variables when the product was introduced. A further variable measures whether the product was introduced early by the firm, meaning

[19] To see the robustness of the results for this definition, we estimated the models with the current and lagged share of the product in firm-level export revenue. We also calculated a variable measuring the maximum of the share of the product in export revenue during the spell. Replacing the variable with any of these variations did not lead to important differences in estimated coefficients.

that it was introduced in the first year we observe. The prediction from these models is that core products are exported longer than other products.

The BRS model suggests that product quality should be related to product survival. While it is difficult to measure quality, as is common in the literature, we use the product price as a proxy. Specifically, we calculate a proxy for product prices as the *relative unit value* of the product:

$$RUV_{ij} = \frac{\sum_{i=1}^{T} UV_{ijt} / UVEU_{jt}}{T}$$

where UV_{ijt} is the unit value of product j exported by firm i at year t, and $UVEU_{jt}$ is the average unit value of the product in EU 15 external imports in USD (based on Eurostat data). This variable measures the relative price the firm was able to sell the product at compared to some EU-wide price. We average this price over periods to eliminate short-term fluctuations. As Hungarian firms are usually small in comparison to total values sold in international markets, it is a reasonable assumption that they are price takers. Thus relative prices may be a valid proxy for export quality. We expect that products with larger relative unit values will be exported for a longer period as they are of higher quality.[20]

While firm level productivity and product scale, tenure and quality are the main variables of interest in our analysis it is important to control for other variables to allow for observed heterogeneity. To do so, we include the following control covariates:

Product Variables

As a proxy for demand shocks that may affect export performance we include the *EU average price change since introduction of the product*. This variable proxies the change in

[20] Empirically, relatively high unit prices may also reflect relatively high costs, in which case the probability of dropping the product may be higher, the higher the price (for a given quality). We can use our empirical result to discriminate between these two competing hypotheses.

world (EU-wide) price of the product since the firm has started to export it. For firm i and product j it is calculated as:

$$UV\_change_{ijt} = \frac{UVEU_{jt}}{UVEU_{jt_0}}$$

where t_0 is the date when the firm started to export the product. Our expectation is that negative price shocks tend to decrease the survival probability.[21]

Firm and Industry Variables

We control for the size of the firm, measured in terms of the natural logarithm employment (in 1000 employees). The theoretical sign of this variable is ambiguous. In the theoretical model there exists a one-to-one relationship between size and productivity. Beyond this, size may show some efficiency advantage of the firm, unmeasured in productivity (for example heterogeneous technology) or it may simply reflect some kind of rigidity in firm size.

We also control for the degree of internationalisation of the firm, which we measure by the share of export revenue in total revenues. Furthermore, we include a dummy variable to indicate whether the firm is foreign-owned. It takes the value 1 if foreign share in the firm is more than 10 percent, in line with international definitions of multinationals.[22] Multinational firms may have stronger links with firms abroad; also they may have better information on export markets.

The final firm/industry variable is the concentration in the industry, measured by the Hirschman-Herfindahl-index. While these firms compete on foreign markets to a large extent, domestic concentration may still matter in terms of sources necessary to pay the fixed costs of exporting.

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[21] Further product characteristics are added in robustness checks and are discussed below.
[22] Changing this threshold does not change the result in any significant way.

Finally, our 3-year definition raises an additional problem: some variables (relative unit value and average price change since introduction) are unobserved in the years when the firm pauses exporting.[23] In these years, we substituted these variables with their last observed value. We also checked the robustness of this approach to a linear interpolation and to dropping these years from the sample. The results did not change significantly.

Summary statistics for the main variables included in the empirical analysis are reported in the appendix.

5 Results

5.1 Baseline Regressions

This subsection summarizes our main findings based on the complementary log-log estimations. The main regression results are reported in Table 7 based on the three-year definition and for firms which are present in the sample in all years.[24] In order to concentrate on non-trivial products, we restrict the sample to products with an initial share of at least 1 percent from the firm's export revenue. To conserve space we do not report the coefficients of the dummy variables representing duration dependence, calendar years and two-digit industries.

Rather than looking at the coefficients on the duration dummies we begin by investigating the importance of product tenure for the hazard of dropping a product by plotting the hazard rate for different levels of product tenure (Figure 2). To be more precise, the figure plots the predicted hazard rate for a 'typical firm - product' combination (i.e., conditional on values for the covariates chosen to reflect average characteristics).[25] What the

[23] Note, that we observe the firm in the year when it pauses the export the product, so firm-level variables are not missing in these years.

[24] The Appendix reports the same specifications with the one year definition, for all firms in the sample and for the whole sample without dropping products where there is a possibility of code change or which name includes 'other' 'not elsewhere classified' or 'excluding'.

[25] Such a figure could also be produced using other values for the covariates. It is important to note that the shape of the function would not change, only the levels.

graph clearly shows is that the hazard of dropping strongly decreases with duration, i.e. product-tenure, quickly at first and then more slowly. This is in line with the expected tenure dependence sketched in the theoretical section.

[Figure 2 around here]

Our baseline specification is reported in column (1) of Table 7. In line with the theoretical expectation we find that products sold at a larger scale (i.e., accounting for a larger share of a firm's export revenue) are less likely to be dropped. Also, firm productivity has a significant negative coefficient in the hazard model. This implies that the hazard of dropping the product from the export mix of the firm is decreasing as the productivity of the firm increases. In line with the theoretical arguments, more productive firms export products that on average are more likely to survive in export markets.[26]

Unexpectedly, we find that the relative unit value of a product is also statistically significant and has a positive effect on the hazard rate. If this variable reflected product quality, then we would expect the opposite sign. Hence, it seems more likely that high unit value products are, at least in the Hungarian context, also high cost products, and that high cost products (for a given quality level) are more likely to be dropped.

In terms of the control variables, we find that larger firms are less likely to drop products. This suggests that our measure of productivity may not capture all aspects of firm organisational advantage. It might be, for example, that larger firms have broader networks of clients. Conditional on other observables we also find that foreign firms have a more stable product mix; the survival probability of a product is about 18 percent higher for foreign than for domestic firms. This may be explained by the fact that these firms have established links with foreign partners, but also a greater level of export experience. Their more intimate relationship with foreign customers may help them in choosing products that are more likely

[26] This is also in line with the literature on firm export behaviour more generally, as surveyed by Greenaway and Kneller (2007), where more productive firms are both more likely to export and are more export intensive.

to be successful in export markets. As far as we are aware this aspect of the advantage of MNEs has not been previously documented. Also, firms which export a larger share of their turnover export products for a longer period. Finally, industry concentration in the home market and unit price demand conditions (proxied by the change of EU-level price) do not seem to be significant determinants of product survival.

[Table 7 around here]

In the next columns we also consider other aspects of the product that may be related with the firm or product characteristics that we try to identify. Hence, not controlling for these variables may bias our coefficients. In column (2) we add a variable that measures when the product was first exported compared to other products of the firm. Bernard et al. (2006) show theoretically, that after trade liberalization, multi-product exporters are more likely to drop products from their export mix in which they have a low product level expertise. One potential way of measuring such expertise is to examine the *order* in which the firm started to export the products, assuming that firms start to export the product for which they have the highest expertise, and then add others subsequently. For this, we count how many products had been exported by the firm before introducing product j. To make the variable more meaningful, we normalise it with the total number of products exported by the firm between 1992 and 2003, and construct quartiles from this ratio.[27] Our assumption is that firms have less expertise in export products with higher order; the expected sign of the variable is positive on the hazard of exit. Our results show that the variable has a positive relationship with product survival, implying that the later the firm started to export the product the higher the hazard of the product being dropped. The results for the variables of interest do not change when this additional covariate is added to the regression.

[27] If the firm introduces a product in 1998, exported 10 product before that year, and exported 15 product altogether between 1992 and 2003, the product is the 11th export product from 15, thus it is in the 3rd quartile, which is the value of the order variable. If a firm starts exporting more than one product in a year, the variable takes the same value for all of them.

We expand on the idea of the importance of expertise in column (3). We employ a pair of dummy variables which measure whether the firm or industry have exported a similar product before. *Firm exported hs4* measures whether the firm has exported a product which is at the same 4 digit HS category. Similarly *industry exported h6* measures whether any firm in the NACE 2-digit industry the firm operated in has exported the same product. Our expectation is that previous exporting experience either in the firm or industry-level helps firms to learn which products to export and how. This experience may lead to longer export success and duration. Significance of the firm-level variable may mean that learning-by-doing is present at the firm level across products within the same industry. If the industry-level variable is significant, then spillovers may be present among firms within an industry. On the other hand, it is possible to interpret these variables as indicating more generally supply or demand complementarities. In our specification both variables are highly significant, suggesting that previous experience may have a strong effect on success in export markets. The main variables of interest are again left unchanged however.

Another determinant of the duration of exporting may be the knowledge-intensity of the product. Knowledge intensity may characterize the life-cycle of products. More knowledge-intensive products may have shorter life cycles. Also, firms in a transition economy may try to upgrade their export mix to more knowledge-intensive products. It is possible that Hungarian firms find it harder to remain competitive in the international markets with these products. Consequently one may expect a negative relationship between knowledge intensity and the persistence of exports. To proxy this dimension of the product, we use the OECD (2001) approach to categorize all 6-digit products into one of four broad categories: low tech (1); medium low-tech (2); medium high-tech (3) and high-tech (4). We control for this variable in column (4). This product level variable is not statistically significant, and including it does not change the estimates of other variables.

Before moving on to further robustness checks, we examine the economic significance of the main variables of interest, namely product scale and firm productivity. As shown in the regression table, these variables are negatively related with the hazard of product exit. In order to judge their economic importance, we generate predicted hazard rates of dropping a product for different types of firms. These are reported in Table 8. We consider six types of firms, namely small, medium and large (measured by employment) with either domestic or foreign ownership in the six columns in the table. We then allow product scale and firm productivity to take on different values in the rows of the table. All other variables are set at the same level for all types of firms.

In order to illustrate the importance of the scale variable, consider firstly small domestic firms in column (1). At the median level of firm productivity, these types of firms show a predicted hazard of dropping the product of 33.1 percent when the product only accounts for a small share of revenue (25^{th} percentile). This hazard rate drops substantially to 18.0 percent for products that account for a large share (75^{th} percentile) of revenue. The table also shows that the predicted hazard rates generally decrease with firm size, and for firms that are foreign owned.

The table also shows the importance of productivity, although this variable is less economically significant than product scale. At the median level of scale, small domestic firms with a productivity level at the 25^{th} percentile of the distribution have a 31.3 percent hazard rate of dropping a product. This is reduced to 28.8 percent for firms with high levels (75^{th} percentile) of productivity.

[Table 8 around here]

5.2 Further Robustness checks

This section presents a number of extensions to our baseline model and other robustness checks. We begin by noting that the results on our main variables of interest remain, by and large, stable throughout this section.

Table 9 provides further analysis on the effects of product level characteristics on export duration. The regression in column (1) is related to the work of Ahn, Khandelwal and Wei (2010), who find evidence that firms select into product markets after using intermediaries. One possible prediction from this hypothesis is that firms will be more successful in exporting products which had been previously exported in large quantities by retailers and wholesalers. To examine this point, we calculate a variable showing the share of wholesalers and retailers in the export of each 6-digit product during the 1990s.[28] This variable is statistically significant, but shows that - in contrast with the theoretical prediction - the higher share of intermediaries is associated with a higher hazard of dropping the product. One possible explanation is that this reflects that in the case of these products firms can relatively easily switch between direct and indirect exporting.

Second, the relationship between unit values and product survival may differ across products with different degrees of differentiation. To check this hypothesis, we calculated the price dispersion across firms in 2000 for each 6-digit product. Those with a level of price dispersion above the median were classified as high price dispersion products.[29] Column (2) reports estimates with this dummy and its interaction with the relative unit value. We find that more differentiated products face a higher hazard than less differentiated products. Higher relative unit values are associated with improved survival for more differentiated products,

[28] As this share varies considerably from year to year, we used this averaging across years. Small modifications in the calculation of the variable did not change the fact that we have found a positive association between this variable and hazard.

[29] We have choosen one year as we did not want the classification to change with time. We have run robustness checks for different years and calculated the variable for each year, and the results remained unchanged. Also, we experimented with the Rauch (1999) classification, but it provided little variation, as the overwhelming majority of the products in our sample are differentiated.

reflecting their higher quality. This contrasts with the lower probability of survival of more expensive - less differentiated products.

Third, we were interested in the question of whether the potential use of the goods is associated with export success. For this, we classified goods into 'consumer', 'capital' and intermediate' good categories based on their Broad Economic Category. These results are reported in columns (3) and (4). We find, that consumer goods (the base category) have the longest probability of survival, while intermediate goods are the most likely to be dropped by the firms. The last column also shows that higher relative unit value has a stronger effect on survival when consumer goods are considered, compared to those found when the sample is restricted to capital goods and intermediate inputs, although we make this point noting that the coefficient of consumer goods is noisily estimated.

[Table 9 around here]

In Table 10, we replace our continuous scale variable with dummy variables that proxy whether the product is core to the firm. The table shows that independently of the proxy used, core products are exported longer than other products. The measured effect is very large: the hazard is approximately 40 percent smaller for the top 3 products of the firm. In regressions where the scale variable is also included,[30] both variables are significant, showing that scale matters even when controlling for core product attributes. It would appear that both the BRS as well as the Arkolakis and Muendler (2010) and Eckel et al. (2011) models capture different features of the data with respect to their predictions about product tenure and core products.

[Table 10 around here]

Table 11 presents further robustness checks with respect to the productivity variable and sample selection. We use two alternative productivity measures. In column (1) we

[30] Results are available from the authors upon request.

include a measure estimated with firm fixed effects. The estimated coefficient of this variables is not different significantly from the coefficient of the Levinsohn-Petrin TFP. In column (2), we estimate the model with labour productivity (output per worker). This variable also yields similar estimates to our baseline measure of TFP.

In columns (3) and (4), we estimate the regression for the whole sample rather than only for exports representing at least 1 percent of firm export revenue at the initial period, and for export shipments exceeding USD 2000 in year 1 of the spell. There are some interesting changes in the results. First, the coefficient on TFP becomes insignificant, suggesting that more productive firms also export a number of small shipments for short periods. Second, firm size remains significant, but its coefficient becomes smaller in absolute value. This is also explained by the fact that large firms export a number of small shipments, which was also reflected in Table 6. Third, the size of the export volume becomes even more important for these larger samples.

[Table 11 around here]

Table 12 presents some further robustness checks with respect to the method of estimation. First, we replace the explanatory variables with their lagged values to control for potential simultaneity and reverse causality. Second, we run a complementary log-log model with firm random effects. Third, we estimate a logit model, to see whether the results are robust to change in the functional form.[31] The results do not change in any important way with these changes. Finally, we run a firm fixed effects logit model to see the role of firm heterogeneity in export duration. As expected, the variables which change only slightly within a firm become less significant. The foreign ownership variable turns insignificant (there are only 216 firm privatised in our sample, mainly at the beginning of the period), but it remains negative. Productivity also loses its significance, but has the expected sign. Interestingly the

[31] The results are also robust to estimation using a Cox proportional hazard model.

effect of firm size increases considerably. As these results can be interpreted as within firm changes, this suggests that growing firms are less likely to drop export products.

[Table 12 around here]

6 Conclusions

In this paper we use a unique and very detailed database which provides information at the firm-product level. We use this data to study an aspect of export behaviour that has not received much attention in the literature, namely, what determines the survival of a given product in a firm's export mix.

Our empirical analysis shows that firm aspects are important determinants of the survival of products in the export mix. All other things equal, firms that are more productive export products that survive longer in international markets. We also find that firm-product characteristics matter. In particular, the larger the scale of exports of a given product, and the longer product tenure, the less likely it is to be dropped by the firm. These findings are broadly in line with recent theoretical ideas that firm- as well as firm-product characteristics are important determinants of product adding and dropping among multi-product firms (Bernard et al., 2006, 2009).

Overall, our empirical analysis highlights the importance of considering multi-plant firms when studying export behaviour, as many firms export more than one product in a given year. Furthermore, many firms drop as well as add products to their product mix, and this process seems to be governed by firm as well as product characteristics.

References

Ahn, J., A. Khandelwal and S.-J. Wei (2010). The role of intermediaries in facilitating trade, *Journal of International Economics*, Vo. 84, Issue 1, pp. 73-85.

Arkolakis, C. and Muendler, M-A. (2011). The Extensive Margin of Exporting Products: A firm-level Analysis. NBER Working Paper 16641.

Baldwin, R., and Harrigan, J., (2007). Zeros, quality and space: Trade theory and trade evidence. NBER Working Paper No. 13214.

Bernard, A.B., Eaton, J., Jensen, J.B., and Kortum, S., (2003). Plants and productivity in international trade. *American Economic Review*, 93, pp. 1268-1290.

Bernard, A.B., Jensen, J.B., Redding S.J., and Schott, P.K., (2007). Firms in international trade, *Journal of Economic Perspectives*, 21(3), 105–130.

Bernard, A.B., Redding S.J., and Schott, P.K., (2006). Multi-product firms and trade liberalization. NBER Working Paper 12782.

Bernard, A.B., Redding S.J., and Schott, P.K., (2010). Multi-product firms and product switching. *American Economic Review*, Vol. 100, 70-97.

Besedes, T. (2008). "A Search Cost Perspective on Formation and Duration of Trade," *Review of International Economics*, Vol. 16, pp.835–849.

Besedes, T., and Prusa, T. J., (2006a). Ins, outs, and the duration of trade, *Canadian Journal of Economics*, 39, 266–295.

Besedes, T., and Prusa, T. J., (2006b). Product differentiation and duration of US import trade, *Journal of International Economics*, 70, 339–358

Brenton, P., C. Saborowski, and E. von Uexkull (2010). "What Explains the Low Survival Rate of Developing Country Export Flows?" *World Bank Economic Review (2010), Vol. 24, No. 3, pp. 474-499.*

Deardorff, A. V., (1980). The General Validity of the Law of Comparative Advantage. *Journal of Political Economy* vol. 88, pp. 941–957

Eaton, J., Eslava, M., Kugler, M., Tybout, J., (2007). Export dynamics in Colombia: Firm-level evidence, NBER Working Paper 13531.

Eckel, C., Iacovone, L. Javorcik, B. and Neary, J. P., (2011). Multi-product Firms at Home and Away: Cost- Versus Quality-Based Competence, CEPR Discussion Paper 8186.

Eckel, C., and Neary, J. P., (2006). Multi-product firms and flexible manufacturing in the global economy, CEPR Discussion Paper 5941.

Fugazza, M. and A.C. Molina (2009). "On the Determinants of Exports Survival," HEI Working Papers 05-2009, Economics Section, The Graduate Institute of International Studies.

Görg, H., M. Henry and E. Strobl (2008). Grant support and exporting activity, *Review of Economics and Statistics*, 90(1), pp. 168-174

Greenaway, D. Gullstrand, J. and Kneller, R. (2007). "'Surviving globalisation", *Journal of International Economics*,

Greenaway, D., and Kneller, R., (2007). Firm Heterogeneity. Exporting and Foreign Direct Investment. *Economic Journal*, Vol. 117, no.517, pp.F134–F161.

Greenstein, S. M. and Wade, J. B., (1998). The Product Life Cycle in the Commercial Mainframe Computer Market, *Rand Journal of Economics*, 29(4) pp. 772–789.

Hallak, J.C., Sivadasan, J., (2008). Product, quality and exporting behaviour under minimum quality requirements, mimeo, University of Michigan.

Halpern, L. Koren M. and Szeidl Á. (2005). Imports and productivity. CEPR Discussion Paper 5139.

Hidalgo, C.A., Klinger, B. , Barabási, A.-L., Hausmann, R., (2007). The Product Space Conditions the Development of Nations, *Science*, Vol. 317. No. 5837, pp. 482 - 487

Jaud,M., M. Kukenova, and M. Strieborny (2009). "Financial Dependence and Intensive Margin of Trade," Paris School of Economics Working Paper 2009-35.

Jenkins, S. P. (2005). Survival Analysis, mimeo, University of Essex.

Johnson, R.C. (2008). Trade and prices with heterogeneous firms, mimeo, Princeton University.

Levinsohn, J. and Petrin, A., (2003). Estimating Production Functions Using Inputs to Control for Unobservables. *Review of Economic Studies*, vol. 70, pp. 317–341.

Melitz, M. (2003), The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, *Econometrica*, 71(6), 1695-1725.

Montagna, C. (2001). Efficiency Gaps, Love of Variety and International Trade, *Economica*, 68, pp. 27 – 44.

Nitsch, V. (2009). Die another day: Duration in German import trade, *Review of World Economics*, 145, 133-154.

Nocke, V. and Yeaple, S., (2006). Globalization and endogenous firm scope, NBER Working Paper 12322.

OECD (2001). OECD Science and Industry Scoreboard 2001.

Rauch, J.E. (1999), Networks versus markets in international trade. *Journal of International Economics* 48, 7-35.

Stavins, J., (1995). Model entry and exit in a differentiated industry: The personal computer market, *Review of Economics and Statistics*, 74, 571–584.

Volpe, C., and J. Carballo (2009). "Survival of New Exporters in Developing Countries: Does It Matter How They Diversify?" INT Working Paper 04, Inter-American Development Bank.

Figure 1: Evolution of the average number of exported products per firm

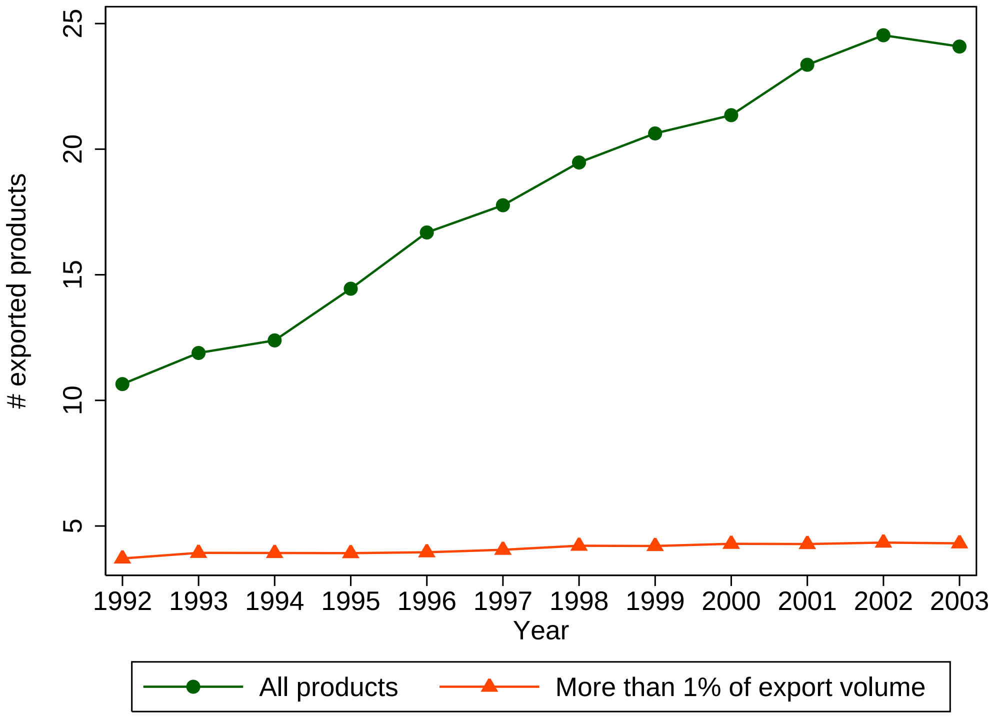
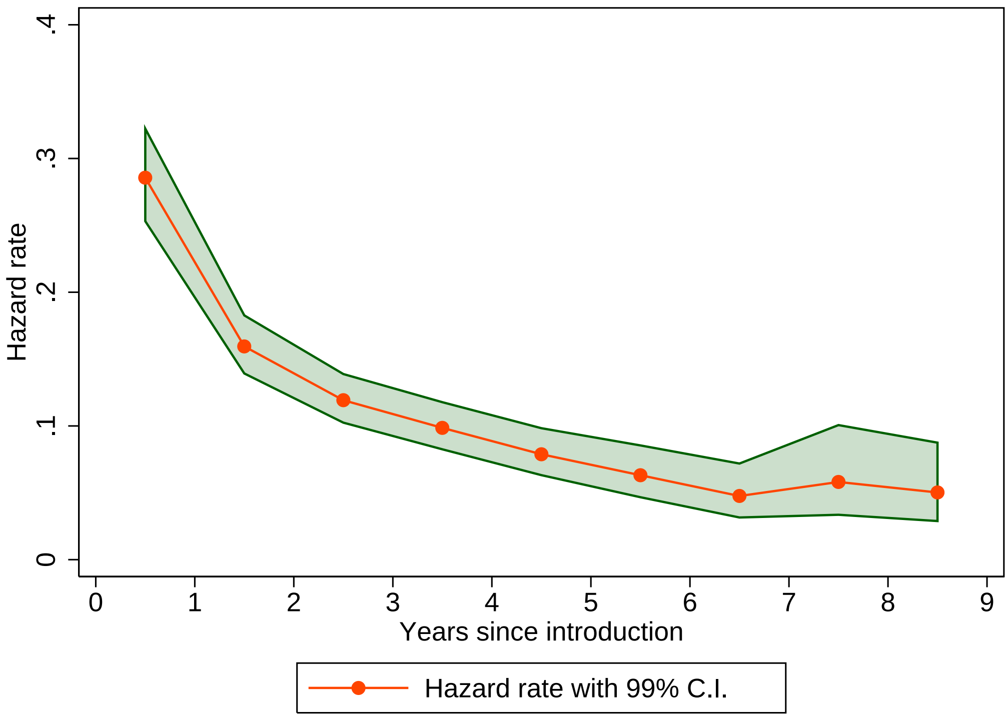


Figure 2 Predicted hazard rate for an important product of a typical domestic firm



Note: Estimated hazard rates in the baseline regression in 2000 for a domestic firm operating in the machinery and equipment sector with 100 employees, 50% export share, 0.15 Hirchmann-Herfindahl index, for a product representing 10 percent of the export revenue at introduction, with an export price equal to the EU-wide average, which did not change since introduction.

Table 1: Number of firms in the sample

Year	Firms	New exporters	Exit from exporting	Re-entry to exporting	More than one export product
1992	589	0	64	0	87.9%
1993	739	248	25	0	89.0%
1994	889	195	23	26	90.1%
1995	963	104	24	40	92.2%
1996	1047	101	32	50	92.7%
1997	1100	103	21	35	93.4%
1998	1211	93	50	61	95.0%
1999	1168	36	50	19	95.2%
2000	1230	71	41	53	96.6%
2001	1213	31	95	13	96.0%
2002	1135	12	104	20	96.1%
2003	1058	4	0	23	96.4%

Table 2: Number of spells

Duration	Only products representing more 1% from export volume at introduction			
	1-year definition		3-year definition	
	Completed spells	Ongoing spells	Completed spells	Ongoing spells
1	39.48%	11.73%	39.63%	14.76%
2	12.50%	6.45%	11.34%	8.49%
3	5.21%	4.89%	6.90%	9.41%
4	3.52%	3.85%	5.04%	9.87%
5	2.10%	3.52%	2.65%	6.76%
6	1.67%	3.65%	1.48%	7.93%
7	1.17%	3.85%	0.76%	7.71%
8	0.55%	7.69%	0.19%	7.51%
9	0.55%	3.19%	.	4.97%
10	0.25%	3.91%	.	6.01%
11	0.19%	5.41%	.	4.92%
was active in 1992	32.79%	41.33%	31.97%	11.66%
Total	100%	100%	100%	100%

Duration	Only products representing more 5% from export volume at introduction		Only products representing more 10% from export volume at introduction	
	3 year-definition		3-year definition	
	Completed spells	Ongoing spells	Completed spells	Ongoing spells
1	29.74%	9.5%	25.85%	5.0%
2	12.87%	6.9%	12.63%	5.2%
3	5.53%	7.0%	5.94%	3.7%
4	4.10%	9.3%	3.71%	4.4%
5	2.67%	6.4%	2.67%	2.8%
6	1.53%	8.3%	1.78%	4.5%
7	0.67%	7.8%	0.89%	3.6%
8	0.29%	8.9%	0.30%	8.6%
9	.	5.7%	.	4.4%
10	.	7.4%	.	4.8%
11	.	6.80%	.	5.68%
was active in 1992	42.52%	16.07%	46.06%	47.33%
Total	100%	100%	100%	100%

Table 3: Examples for the 3-year definition

	Example 1		Example 2		Example 3	
1992	0		0		0	
1993	1	Beginning	1	Beginning	1	Beginning
1994	1		1		1	
1995	1		1		1	End
1996	1		1		0	
1997	1	End	0		0	
1998	0		1		0	
1999	0		0		0	
2000	0		1	End	1	Beginning
2001	0		0		1	
2002	0		0		1	
2003	0		0		0	

Table 4: Average and median duration in different products, with different thresholds

Category	Average length of finished spells for exports…			
	no threshold	representing at least 1% at introduction	representing at least 5% at introduction	representing at least 10% at introduction
Foodstuffs	1.62	2.26	3.11	4.00
Mineral Products	2.05	2.65	3.07	3.07
Chemicals & Allied Industries	2.25	3.86	4.74	5.10
Plastics / Rubbers	2.43	3.71	4.33	4.59
Raw Hides, Skins, Leather, & Furs	2.02	3.82	4.23	4.58
Wood & Wood Products	2.39	3.85	4.34	4.62
Textiles	2.65	4.28	5.25	5.49
Footwear / Headgear	2.68	4.45	4.91	5.51
Stone / Glass	2.08	3.94	5.13	5.38
Metals	2.16	3.28	3.85	4.10
Machinery / Electrical	2.15	3.19	3.77	4.04
Transportation	2.50	3.62	3.98	4.24
Miscellaneous	2.10	3.58	4.21	4.50

Category	Median length of finished spells for exports…			
	no threshold	representing at least 1% at introduction	representing at least 5% at introduction	representing at least 10% at introduction
Foodstuffs	1.00	1.00	2.00	3.00
Mineral Products	1.00	1.00	2.00	2.00
Chemicals & Allied Industries	1.00	3.00	4.00	4.00
Plastics / Rubbers	1.00	3.00	4.00	4.00
Raw Hides, Skins, Leather, & Furs	1.00	3.00	3.00	3.50
Wood & Wood Products	1.00	2.00	3.00	3.00
Textiles	1.00	3.00	5.00	5.00
Footwear / Headgear	1.00	3.00	4.50	5.00
Stone / Glass	1.00	3.00	4.00	4.50
Metals	1.00	2.00	3.00	3.00
Machinery / Electrical	1.00	2.00	3.00	3.00
Transportation	1.00	3.00	3.00	3.00
Miscellaneous	1.00	2.00	3.00	4.00

Table 5:Product switching of always exporting firms

	Share of always exporting firms adding or dropping at least one product representing at least 1% of export volume at introduction	
	adding	**dropping**
1992	.	11.37%
1993	.	18.04%
1994	.	17.65%
1995	13.33%	21.18%
1996	24.31%	19.61%
1997	6.67%	17.25%
1998	6.27%	14.51%
1999	6.67%	20.78%
2000	7.45%	17.65%
2001	5.49%	.
2002	10.20%	.
2003	6.27%	.

Table 6: Probability that a firm drops a product in each year

	All observations	1% threshold	2000 USD threshold
Full sample	37.29%	13.90%	24.56%
Share of product from export<1%	44.09%		32.48%
Share of product from export 1-5%	21.55%	21.55%	20.52%
Share of product from export 5-10%	13.22%	13.22%	12.63%
Share of product from export 10-50%	8.86%	8.86%	8.44%
Share of product from export 50-100%	3.38%	3.38%	3.01%
Firm size: 1st quartile	38.98%	20.16%	25.67%
Firm size: 2nd quartile	37.58%	14.85%	24.10%
Firm size: 3rd quartile	37.10%	12.52%	24.06%
Firm size: 4th quartile	35.51%	8.12%	24.41%
Domestic firm	37.59%	16.47%	25.48%
Foreign firm	37.17%	12.39%	24.15%

Table 7: Baseline results

	(1)	(2)	(3)	(4)
Scale (weight of the product from export mix at introduction)	0.093***	0.112***	0.088***	0.093***
	(0.016)	(0.019)	(0.015)	(0.016)
Relative unit value	2.554***	2.372***	2.539***	2.554***
	(0.328)	(0.317)	(0.329)	(0.328)
TFP	0.880***	0.887**	0.882***	0.880***
	(0.041)	(0.043)	(0.042)	(0.042)
Control Variables				
Ln employment in 1000	0.853***	0.859***	0.850***	0.853***
	(0.019)	(0.019)	(0.019)	(0.019)
Foreign owned	0.813***	0.857***	0.813***	0.813***
	(0.044)	(0.046)	(0.044)	(0.044)
Hirschmann-Herfindahl index	0.772	0.753	0.733	0.771
	(0.151)	(0.148)	(0.143)	(0.151)
Export/sales	0.466***	0.437***	0.445***	0.467***
	(0.042)	(0.040)	(0.040)	(0.042)
EU average price change since introduction	0.690***	0.728***	0.682***	0.690***
	(0.061)	(0.066)	(0.060)	(0.061)
Time of introduction (quartile)		1.483***		
		(0.048)		
Firm had produced hs-4 before			0.863**	
			(0.058)	
Industry had produced hs-6 before			0.777***	
			(0.052)	
High tech (OECD process approach)				1.009
				(0.087)
Nace2 effects	yes	yes	yes	yes
HS2 effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Duration fixed effects	yes	yes	yes	yes
Log likelihood	-4466	-4386	-4448	-4464
Observations	15,388	15,388	15,388	15,388

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample consists of observations which represent at least 1 % of the firm export revenue at introduction. The sample is restricted to firms and products which are present in each year in the sample.

4. Estimation method: complementary log-log.

Table 8: Predicted hazard rates for different firms

	Ownership:	Domestic			Foreign		
	Employment:	10	50	250	10	50	250
Share of product	**TFP**						
25. percentile	median	0.331	0.267	0.214	0.279	0.223	0.178
median	median	0.301	0.242	0.193	0.253	0.202	0.160
75. percentile	median	0.180	0.142	0.112	0.149	0.118	0.092
median	25. percentile	0.313	0.252	0.201	0.263	0.210	0.167
median	median	0.301	0.242	0.193	0.253	0.202	0.160
median	75. percentile	0.288	0.231	0.184	0.242	0.193	0.153

Other parameters: year=2000, first year of exporting, product priece is equaval to EU-average, it did not change since introduction, nace=28, hs2=85, share of exports form sales=0.5, hhi=0.2

Table 9: Product-level characteristics

	(1)	(2)	(3)	(4)
Scale (weight of the product from export mix at introduction)	0.093***	0.096***	0.089***	0.089***
	(0.016)	(0.016)	(0.017)	(0.017)
Relative unit value	2.545***	4.026***	2.606***	11.580***
	(0.328)	(0.828)	(0.268)	(3.986)
TFP	0.880***	0.890**	0.865***	0.872**
	(0.041)	(0.042)	(0.046)	(0.047)
Control Variables				
Ln employment in 1000	0.817***	0.805***	0.825***	0.828***
	(0.044)	(0.044)	(0.049)	(0.049)
Foreign owned	0.470***	0.462***	0.466***	0.468***
	(0.042)	(0.042)	(0.046)	(0.046)
Hirschmann-Herfindahl index	0.769	0.762	0.741	0.764
	(0.151)	(0.148)	(0.154)	(0.159)
Export/sales	0.689***	0.682***	0.698***	0.668***
	(0.061)	(0.060)	(0.068)	(0.067)
Share of intermediaries in the 1990's	2.421***			
	(0.680)			
High price dispersion across firms		1.264***		
		(0.081)		
High dispersion x relative unit value		0.492***		
		(0.119)		
intermediate good			1.170	1.272**
			(0.131)	(0.145)
capital good			2.069***	2.263***
			(0.257)	(0.286)
intermediate good x relative unit value				0.212***
				(0.076)
capital good x relative unit value				0.185***
				(0.083)
Nace2 effects	fixed	fixed	fixed	fixed
HS2 effects	fixed	fixed	fixed	fixed
Year effects	fixed	fixed	fixed	fixed
Duration effects	fixed	fixed	fixed	fixed
Log likelihood	-4396	-4390	-3643	-3635
Observations	15,353	15,388	15,383	13,081

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample consists of observations which represent at least 1 % of the firm export revenue at introduction. The sample is restricted to firms and products which are present in each year in the sample.

4. Estimation method: complementary log-log.

Table 10: The role of core products

	(1)	(2)	(3)	(4)
Most important product when introduced	0.530***			
	(0.084)			
Top 3 products when introduced		0.600***		
		(0.051)		
Top 10 percent when introduced			0.314***	
			(0.025)	
Introduced in first year of firm export				0.442***
				(0.025)
Relative unit value	2.865***	2.733***	2.745***	2.684***
	(0.377)	(0.368)	(0.371)	(0.355)
TFP	0.883***	0.893**	0.876***	0.872***
	(0.041)	(0.042)	(0.042)	(0.042)
Control Variables				
Ln employment in 1000	0.887***	0.879***	0.901***	0.889***
	(0.019)	(0.019)	(0.020)	(0.019)
Foreign owned	0.826***	0.824***	0.834***	0.879**
	(0.044)	(0.044)	(0.045)	(0.047)
Hirschmann-Herfindahl index	0.789	0.812	0.890	0.777
	(0.155)	(0.161)	(0.174)	(0.152)
Export/sales	0.459***	0.469***	0.557***	0.436***
	(0.041)	(0.042)	(0.050)	(0.038)
EU average price change since introduction	0.662***	0.679***	0.724***	0.693***
	(0.056)	(0.058)	(0.063)	(0.061)
Nace2 effects	yes	yes	yes	yes
HS2 effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Duration fixed effects	yes	yes	yes	yes
Log likelihood	-4570	-4562	-4462	-4482
Observations	15,388	15,388	15,388	15,388

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

Robust standard errors in parentheses

Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample consists of observations which represent at least 1 % of the firm export revenue at introduction. The sample is restricted to firms and products which are present in each year in the sample.

Estimation method: complementary log-log.

Table 11: Robustness checks 1: Productivity and sample

	(1)	(2)	(3)	(4)
	Exports with at least 1% of export revenue at introduction	Exports with at least 1% of export revenue at introduction	Whole sample	Shipments with volume>2000 USD
Scale (weight of the product from export mix at introduction)	0.093***	0.092***	0.013***	0.036***
	(0.016)	(0.016)	(0.003)	(0.007)
Relative unit value	2.556***	2.570***	1.453***	1.564***
	(0.328)	(0.330)	(0.057)	(0.084)
TFP (Levinsonhn-Petrin)			0.977	0.976
			(0.015)	(0.024)
Control Variables				
Ln employment in 1000	0.827***	0.798***	0.954***	0.947***
	(0.018)	(0.019)	(0.007)	(0.011)
Foreign owned	0.819***	0.877**	0.893***	0.880***
	(0.045)	(0.049)	(0.017)	(0.027)
Hirschmann-Herfindahl index	0.464***	0.403***	0.872***	0.821***
	(0.042)	(0.038)	(0.025)	(0.041)
Export/sales	0.768	0.837	0.726***	0.609***
	(0.150)	(0.163)	(0.037)	(0.056)
EU average price change since introduction	0.688***	0.682***	0.700***	0.697***
	(0.061)	(0.060)	(0.028)	(0.038)
TFP (Fixed effects)	0.885**			
	(0.045)			
Labour productivity (output/worker, million HUF)		0.811***		
		(0.028)		
Nace2 fixed effects	yes	yes	yes	yes
HS2 fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Duration fixed effects	yes	yes	yes	yes
Log-likelihood	-4401	-4384	-32194	-13903
Observations	15,388	15,388	64,995	36,211

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample is restricted to firms and products which are present in each year in the sample. In the first two columns, the sample consists of observations which represent at least 1 % of the firm export revenue at introduction.

4. Estimation method: complementary log-log.

Table 12: Robustness cheks 2: Estimation methods

	(1)	(2)	(3)	(4)
Estimation method	cloglog, lagged explanatory variables	RE cloglog	logit	FE logit
Scale (weight of the product from export mix at introduction)	0.092***	0.071***	0.081***	0.047***
	(0.016)	(0.011)	(0.015)	(0.008)
Relative unit value	1.751***	2.823***	3.169***	3.876***
	(0.253)	(0.334)	(0.509)	(0.664)
TFP (Levinsonhn-Petrin)	0.965	0.911*	0.856***	1.006
	(0.043)	(0.051)	(0.046)	(0.081)
Control Variables				
Ln employment in 1000	0.873***	0.820***	0.830***	0.786***
	(0.020)	(0.027)	(0.021)	(0.063)
Foreign owned	0.778***	0.801***	0.789***	0.760*
	(0.043)	(0.061)	(0.048)	(0.112)
Hirschmann-Herfindahl index	0.569***	0.425***	0.431***	0.375***
	(0.051)	(0.050)	(0.043)	(0.083)
Export/sales	0.773	0.597**	0.737	0.463
	(0.152)	(0.155)	(0.160)	(0.231)
EU average price change since introduction	0.669***	0.684***	0.652***	0.640***
	(0.062)	(0.067)	(0.064)	(0.075)
Nace2 effects	fixed	fixed	fixed	.
HS2 effects	fixed	fixed	fixed	fixed
Year effects	fixed	fixed	fixed	fixed
Duration effects	fixed	fixed	fixed	fixed
Firm effects	no	random	no	fixed
Observations	15,353	15,388	15,383	13,081

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample is restricted to firms and products which are present in each year in the sample. In the first two columns, the sample consists of observations which represent at least 1 % of the firm export revenue at introduction.

Appendix

Appendix Table 1:
Distribution of firms across industries in the sample and in the population of all firms

NACE code	Sample	All firms
15	15,82%	14,05%
16	0,36%	0,03%
17	4,43%	3,47%
18	5,37%	5,18%
19	2,32%	1,58%
20	2,76%	5,71%
21	1,81%	1,29%
22	1,96%	12,89%
23	0,22%	0,05%
24	4,79%	2,41%
25	8,06%	4,68%
26	3,63%	7,72%
27	2,54%	1,15%
28	10,16%	13,56%
29	11,68%	9,12%
30	0,94%	0,87%
31	6,39%	2,91%
32	3,70%	2,49%
33	3,19%	3,69%
34	5,08%	0,96%
35	1,16%	0,56%
36	3,41%	5,08%
37	0,22%	0,56%

Appendix Table 2: Summary statistics

Firm level variables			
All firms	Observations	Mean	St. Dev
Employment (in 1000s)	12342	0.327	0.691
Foreign owned	12342	0.575	0.494
Export share from turnover	12342	0.559	0.336
Hirschman-Herfindahl index	12342	0.160	0.178
TFP (fixed effects)	12342	0.084	0.656
TFP (Levinsohn-Petrin)	12342	0.371	0.438
Only always exporting firms			
Employment (in 1000s)	3638	0.380	0.889
Foreign owned	3638	0.660	0.474
Export share from turnover	3638	0.573	0.309
Hirschman-Herfindahl index	3638	0.175	0.189
TFP (fixed effects)	3638	0.158	0.533
TFP (Levinsohn-Petrin)	3638	0.388	0.434

Firm-product level variables			
All products	Observations	Mean	St. Dev
Relative unit value	137736	0.040	0.148
Weight from export mix (at introduction)	137736	0.041	0.150
Order	137736	2.131	0.973
OECD	137736	2.178	0.963
Firm had produced hs-4 before	137736	0.400	0.490
Industry had produced hs-6 before	137736	0.587	0.492
EU average price change since introduction	137736	1.029	0.251
Only products representing more 1% from export volume at introduction			
Relative unit value	22005	0.022	0.099
Weight from export mix	22005	0.196	0.282
Order	22005	1.794	0.936
OECD	22005	2.134	0.966
Firm had produced hs-4 before	22005	0.338	0.473
Industry had produced hs-6 before	22005	0.635	0.481
EU average price change since introduction	22005	1.032	0.197

Appendix Table 3: Number of spells, all firms

	Only products representing more 1% from export volume at introduction			
	1-year definition		3-year definition	
Duration	Completed spells	Ongoing spells	Completed spells	Ongoing spells
1	38.86%	12.50%	40.35%	14.76%
2	15.78%	6.85%	13.22%	8.49%
3	7.63%	6.62%	8.70%	9.41%
4	5.65%	8.52%	6.25%	9.87%
5	3.16%	5.91%	3.49%	6.76%
6	2.32%	7.76%	2.10%	7.93%
7	1.77%	7.53%	1.11%	7.71%
8	1.08%	7.89%	0.44%	7.51%
9	0.87%	5.00%	.	4.97%
10	0.56%	7.55%	.	6.01%
11	0.13%	6.77%	.	4.92%
was active in 1992	22.19%	16.88%	24.31%	11.66%
Total	100%	100%	100%	100%

	Only products representing more 5% from export volume at introduction		Only products representing more 10% from export volume at introduction	
	3 year-definition		3-year definition	
Duration	Completed spells	Ongoing spells	Completed spells	Ongoing spells
1	33.13%	9.5%	31.79%	42.5%
2	13.76%	6.9%	13.42%	11.8%
3	9.09%	7.0%	9.05%	12.1%
4	6.16%	9.3%	6.30%	10.0%
5	4.04%	6.4%	4.20%	5.8%
6	2.66%	8.3%	2.80%	5.1%
7	1.14%	7.8%	1.27%	3.6%
8	0.72%	8.9%	0.74%	3.1%
9	.	5.7%	.	1.7%
10	.	7.4%	.	1.4%
11	.	6.80%	.	0.98%
was active in 1992	29.28%	16.07%	30.39%	2.07%
Total	100%	100%	100%	100%

Appendix Table 4: Average duration in different products, with different thresholds, all firms

Category	Average length of finished spells for exports…			
	no threshold	representing at least 1% at introduction	representing at least 5% at introduction	representing at least 10% at introduction
Foodstuffs	1.68	2.54	6.50	6.50
Mineral Products	2.41	4.00	4.00	4.00
Chemicals & Allied Industries	2.21	3.88	4.51	4.88
Plastics / Rubbers	2.41	3.58	4.39	4.89
Raw Hides, Skins, Leather, & Furs	1.90	3.55	4.25	9.00
Wood & Wood Products	2.39	3.35	3.65	4.04
Textiles	2.72	4.20	5.22	5.48
Footwear / Headgear	2.53	4.28	5.06	5.50
Stone / Glass	2.02	3.70	5.10	5.80
Metals	2.15	3.25	3.89	4.35
Machinery / Electrical	2.08	3.00	3.59	3.96
Transportation	2.43	3.30	3.60	3.91
Miscellaneous	2.06	3.42	4.14	4.82

Appendix Table 5: Product switching, all firms

	Fraction of firms **adding** a product		
Threshold:	1%	5%	10%
1995	47.40%	27.23%	20.37%
1996	53.88%	35.22%	29.00%
1997	39.62%	22.04%	17.30%
1998	38.10%	20.91%	16.53%
1999	29.59%	15.35%	11.58%
2000	32.47%	17.49%	13.51%
2001	27.97%	12.54%	8.25%
2002	29.12%	12.48%	8.41%
2003	24.00%	9.96%	5.98%

	Fraction of firms **dropping** a product		
Threshold:	1%	5%	10%
1992	36.50%	23.60%	20.03%
1993	32.02%	19.48%	13.76%
1994	36.41%	21.08%	16.23%
1995	43.76%	27.03%	21.52%
1996	38.56%	22.97%	18.28%
1997	35.52%	20.86%	16.12%
1998	39.17%	23.80%	18.26%
1999	40.14%	23.76%	18.01%
2000	42.64%	23.84%	17.25%

Appendix Table 6: Probability that a firm drops a product in each year, all firms

	All observations	1% threshold	2000 USD threshold
Full sample	36.20%	14.95%	24.12%
Share of product from export<1%	42.44%		31.08%
Share of product from export 1-5%	22.84%	22.84%	22.02%
Share of product from export 5-10%	13.94%	13.94%	13.39%
Share of product from export 10-50%	9.53%	9.53%	9.12%
Share of product from export 50-100%	4.69%	4.69%	4.24%
Firm size: 1st quartile	38.74%	21.88%	26.35%
Firm size: 2nd quartile	36.99%	15.77%	24.06%
Firm size: 3rd quartile	35.80%	12.85%	23.40%
Firm size: 4th quartile	33.30%	9.40%	22.69%
Domestic firm	36.35%	16.75%	25.12%
Foreign firm	36.13%	13.40%	23.54%

Appendix table 7: Baseline results: 1 year definition

	(1)	(2)	(3)	(4)
Scale (weight of the product from export mix at introduction)	0.105***	0.123***	0.106***	0.105***
	(0.012)	(0.014)	(0.012)	(0.012)
Relative unit value	2.526***	2.616***	2.546***	2.526***
	(0.244)	(0.266)	(0.247)	(0.245)
TFP (Levinsonhn-Petrin)	0.878***	0.860***	0.876***	0.876***
	(0.029)	(0.029)	(0.029)	(0.029)
Control Variables				
Ln employment in 1000	0.844***	0.857***	0.845***	0.844***
	(0.014)	(0.014)	(0.014)	(0.014)
Foreign owned	0.792***	0.825***	0.793***	0.791***
	(0.030)	(0.032)	(0.030)	(0.030)
Hirschmann-Herfindahl index	0.453***	0.428***	0.454***	0.455***
	(0.029)	(0.027)	(0.029)	(0.029)
Export/sales	0.860	0.895	0.880	0.851
	(0.116)	(0.121)	(0.119)	(0.115)
EU average price change since introduction	0.985	0.986	0.980	0.986
	(0.110)	(0.111)	(0.110)	(0.110)
Time of introduction (quartile)		1.289***		
		(0.027)		
Firm had produced hs-4 before			0.956	
			(0.045)	
Industry had produced hs-6 before			1.101**	
			(0.051)	
High tech (OECD process approach)				1.105
				(0.067)
Nace2 fixed effects	yes	yes	yes	yes
HS2 fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Duration fixed effects	yes	yes	yes	yes
Log likelihood	-7485	-7397	-7483	-7475
Observations	18,713	18,713	18,713	18,713

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample consists of observations which represent at least 1 % of the firm export revenue at introduction. The sample is restricted to firms and products which are present in each year in the sample.

4. Estimation method: complementary log-log.

Appendix table 8: Baseline results: Only permnent products, all firms

	(1)	(2)	(3)	(4)
Scale (weight of the product from export mix at introduction)	0.127***	0.143***	0.128***	0.127***
	(0.013)	(0.014)	(0.013)	(0.013)
Relative unit value	2.374***	2.265***	2.297***	2.374***
	(0.193)	(0.188)	(0.189)	(0.193)
TFP (Levinsonhn-Petrin)	0.872***	0.893***	0.861***	0.872***
	(0.021)	(0.021)	(0.021)	(0.021)
Control Variables				
Ln employment in 1000	0.855***	0.834***	0.859***	0.855***
	(0.011)	(0.011)	(0.011)	(0.011)
Foreign owned	0.814***	0.875***	0.809***	0.814***
	(0.027)	(0.030)	(0.027)	(0.027)
Hirschmann-Herfindahl index	0.446***	0.436***	0.438***	0.446***
	(0.025)	(0.024)	(0.024)	(0.025)
Export/sales	0.841	0.877	0.755**	0.840
	(0.097)	(0.101)	(0.088)	(0.097)
EU average price change since introduction	0.791***	0.808***	0.791***	0.791***
	(0.047)	(0.049)	(0.047)	(0.047)
Time of introduction (quartile)		1.257***		
		(0.019)		
Firm had produced hs-4 before			1.051	
			(0.041)	
Industry had produced hs-6 before			0.666***	
			(0.024)	
High tech (OECD process approach)				1.018
				(0.059)
Nace2 fixed effects	yes	yes	yes	yes
HS2 fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Duration fixed effects	yes	yes	yes	yes
Log likelihood	-82459	-81528	-81119	-82443
Observations	158,742	158,742	158,742	158,742

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients. The sample consists of observations which represent at least 1 % of the firm export revenue at introduction. The sample is restricted to products which are present in each year in the sample.

4. Estimation method: complementary log-log.

Appendix table 9: Baseline results: Full sample

	(1)	(2)	(3)	(4)
Scale (weight of the product from export mix at introduction)	0.042***	0.052***	0.042***	0.042***
	(0.005)	(0.005)	(0.005)	(0.005)
Relative unit value	1.638***	1.599***	1.592***	1.645***
	(0.045)	(0.044)	(0.044)	(0.045)
TFP (Levinsonhn-Petrin)	0.929***	0.946***	0.923***	0.929***
	(0.007)	(0.007)	(0.007)	(0.007)
Control Variables				
Ln employment in 1000	0.977***	0.957***	0.984***	0.977***
	(0.004)	(0.004)	(0.004)	(0.004)
Foreign owned	0.933***	0.993	0.919***	0.932***
	(0.010)	(0.011)	(0.010)	(0.010)
Hirschmann-Herfindahl index	0.746***	0.764***	0.739***	0.747***
	(0.013)	(0.013)	(0.013)	(0.013)
Export/sales	0.864***	0.855***	0.765***	0.862***
	(0.027)	(0.027)	(0.024)	(0.027)
EU average price change since introduction	0.915***	0.941**	0.915***	0.912***
	(0.024)	(0.025)	(0.024)	(0.024)
Time of introduction (quartile)		1.239***		
		(0.006)		
Firm had produced hs-4 before			0.841***	
			(0.009)	
Industry had produced hs-6 before			0.614***	
			(0.007)	
High tech (OECD process approach)				1.097***
				(0.019)
Nace2 fixed effects	yes	yes	yes	yes
HS2 fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Duration fixed effects	yes	yes	yes	yes
Log likelihood	-82459	-81528	-81119	-82443
Observations	158,742	158,742	158,742	158,742

1. *** p<0.01, ** p<0.05, * p<0.1

2. Robust standard errors in parentheses

3. Dependent variable is a dummy showing whether the spell ends. The table shows exponentiated coefficients.

4. Estimation method: complementary log-log.