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Export Market Survival of Pioneers and Followers

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Abstract: *This study investigates empirically whether export pioneers and followers are different in terms of export market survival, utilising a rich plant-product-level dataset on Korean manufacturing industries for 1991–1997. We find that export pioneers that bring new products to the export market are less likely to survive than export followers of the existing export products. We also find that there is some heterogeneity in the export survival probability after new export entry, even amongst export pioneers and followers. Amongst export followers, the followers of the existing products show higher survival rates than those of the export-pioneered products. Amongst export pioneers, those that introduce a new product to both domestic and export markets simultaneously for the first time in the economy exhibit higher survival than export pioneers that take an existing domestic product to the export market.*

***Keywords*:** Plant-product-level data; export pioneers; export followers; survival

***JEL Classification*:** F15; F23

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1. Introduction

This study aims to investigate empirically whether export pioneers and followers are different in terms of export market survival. By utilising a rich plant-product-level dataset on Korean manufacturing industries for the period 1991–1997, when Korean firms were expanding rapidly via exporting in the global market, we focus on exporters' new entry in the international market. We also examine plant-product characteristics that determine export survival: Do export pioneers, firms that export a product for the first time in a country, survive longer than export followers, or the other way around? Why? Getting answers to these questions seems to be important to understand better the prevalence of short-lived trade relationships and the role of export pioneers in the appearance of new export industries.

We find that export pioneers are less likely to survive than export followers of the existing export products. This result lends support to the view that export followers can learn from the experimentation of export pioneers (whether pioneering products are successfully established) and reduce uncertainty in the profitability of the new export product after entry. In addition, we find a couple of results indicating that there is some heterogeneity in the export survival probability, even amongst export pioneers or followers.

First, amongst export followers, followers of the *existing* export products show higher survival rates than those of the *pioneered* products in the export market. This is consistent with our main findings of higher survival rates for export followers than export pioneers, as the existing and established products help plants survive longer. Moreover, interestingly, we have nuanced findings amongst export pioneers. Those that introduce a new product to both the domestic and export markets simultaneously exhibit a higher survival rate than those that take an existing domestic product to the export market. This

implies that the scale and scope of pioneering may matter. The first mover in the market can benefit more from its active and comprehensive pioneering activity, mainly targeting domestic and export markets together, than the passive pioneering activity of introducing domestic products to the export market.

The remainder of this paper is organised as follows: Section 2 reviews the related literature and discusses the contribution of the study. Section 3 presents the data and empirical specifications. Section 4 reports the empirical results, and our concluding remarks follow in Section 5.

2. Relation to the Literature

Standard theory on heterogeneous firms, such as Melitz (2003), and its numerous extensions, predicts implicitly that export pioneers are more likely to be high-productivity firms than followers and, hence, more likely to survive in the export market, other things being equal. By contrast, Albornoz et al. (2012) developed a theoretical model based on experimentation and learning to explain the low survival rates of new exporters, one empirical regularity documented in many previous studies (e.g., Besedes and Prusa [2006] and Eaton et al. [2008]). They showed that when firms are uncertain about their export profitability and if the export profitability is correlated across time and destination markets, they use their initial export experience to infer information on their future success in other markets, which justifies the initial entry costs despite high failure rates. This view would imply that export pioneers are more likely to exit than export followers to the extent that export followers can learn from the experimentation of export pioneers. Thus, it is an empirical issue whether export pioneers survive longer or shorter than export followers in the export market, which is the current study's focus.

First, this study tries to build on micro-empirical studies on the duration of trade relationships by considering export pioneers' and followers' status as the firm-level determinants. Eaton et al. (2008) and Besedes and Prusa (2006) were amongst the first to document the prevalence of short-lived trade relationships in trade data. Using transaction-level data for Colombia, Eaton et al. (2008) showed that nearly one-half of exporting firms are new exporters and that most of these new exporters are small and stop exporting within 1 year, although some of the surviving new exporters grow very rapidly in later years.[1] Since these studies, there has been a growing number of empirical and theoretical studies exploring the determinants of firm or firm-product survival in export markets.

For example, as explained above, Albornoz et al. (2012) built a model of sequential exporting whereby firms use new export experience in a market to learn about the export profitability in other markets, and find evidence from Argentine firms consistent with their model. Bekes and Murakozy (2012) and Albornoz, Fanelli, and Hallak (2016) focused on the role of sunk costs vis-à-vis variable or fixed costs in determining firm survival in export markets. Bekes and Murakozy (2012) built a model of firms choosing between two trade technologies – pay a large fee up-front in return for lower costs later (sunk cost technology), or pay less now but more in each future period (variable cost technology) – and show that this technology choice can yield, for some firms and destinations, an equilibrium outcome of temporary trade, finding evidence consistent with their theory. Gorg, Kneller, and Murakozy (2020) found empirically that firm-specific as well as firm-product-specific competencies, such as firm productivity and product scale and tenure, are associated with a higher export survival rate. To the best of

[1] Besedes and Prusa (2006) finds similar results using a disaggregated U.S. product level import data.

our knowledge, our study is one of the few studies to focus on being an export pioneer/follower as a firm-level characteristic to understand better the nature of the short-lived trade relationship.

Second, this study is also related to a small but growing literature on the role of export pioneers in early export dynamics and the appearance of new export industries. Hausmann and Rodrik (2003) showed theoretically that the activity of finding out what one is good at producing and exporting (self-discovery) is key to economic growth. They show that there is too little self-discovery and too much imitation, as self-discovery is easily imitated. With regard to empirical studies, Iacovone and Javorcik (2010) found evidence from Mexico that once a firm introduces an export product previously not exported by any other firm, other firms quickly follow. Freund and Pierola (2010) and Artopoulos, Friel, and Hallak (2013) documented the important role of export pioneers in the emergence of a new export industry in Peru and Argentina, respectively. However, these empirical studies rely on descriptive analysis or a case-study approach biased towards successful cases or industries that grew ex-post.

By contrast, Wagner and Zahler (2015), by utilising comprehensive transaction-level data on Chilean exports, found evidence that there are spillovers from export pioneers to followers. They find that export followers are 40% more likely to enter a product market if an export pioneer survives more than 1 year of exporting. They also find that export pioneers export less than followers for the same new product, which is interpreted as evidence strengthening the existence of market failures associated with the export pioneering activity. As far as we are aware, Wagner and Zahler (2015) are the only existing study empirically examining the export market survival of pioneers and followers as we do in this study, which is not, however, the main focus of their study. They did not find any systematic difference between export pioneers and followers in the hazard rate

of firm-product export duration.

In our view, whether there are any systematic differences between export pioneers and followers in export survival is not understood well enough and deserves further scrutiny. Specifically, we examine empirically whether the estimated higher survival rates of export followers than pioneers and what products and types of pioneers and following activities affect plants' survival.

3. Data and Methodology

3.1. Data

This study utilises two datasets. The first dataset consists of the unpublished plant-level census data underlying the *Mining and Manufacturing Census,* which Statistics Korea publishes for the period 1991–1997. We chose this time span, 1991–1997, for two important reasons. First, the data since 2002 are not fully accessible because Statistics Korea does not release all the information from the mining and manufacturing survey.[2] Second, as the Asian financial crisis (AFC, 1997–1999) influenced plant exit exogenously, we cannot help but exclude the period of the AFC. Thus, we limit our data up to 1997. It is an unbalanced panel dataset that covers all plants with five or more employees in the mining and manufacturing sector. The dataset contains information about various plant characteristics, such as production, shipments, production, non-production workers, tangible fixed assets, and R&D expenditures.

The second dataset is an unpublished plant-product-level dataset for the same period, which can be matched to the plant-level dataset through plant identification numbers. A product is identified by an eight-digit product code, which is devised by

[2] The precise export value is not fully revealed but reported as the discrete value in specific ranges. R&D information is not reported either.

combining the five-digit Korea Standard Industrial Classification (KSIC) code to which the product belongs and the three-digit code based on Statistics Korea's internal product-classification scheme. The product code is consistent over time during the period of the analysis. For each plant-product observation, the values of total shipments (domestic plus export shipments) and export shipments are available. The plant-product dataset covers roughly 70%–80% of plants in the plant-level dataset. The coverage ratio is much higher for total and export shipments. Yearly total shipments and exports from the plant-product dataset account for more than 84.1% of shipments and virtually all (99.9%) of the exports in the plant-level dataset. Using the information on the plant-product-level total and export shipments, we can identify which plant made a discovery of a new export product for the first time in the economy and which plant began exporting the same product later on.

Table 1 reports the summary statistics of our count data for the survival analysis. We count the plant-product first entry from 1992 and check the duration of product survivals up to 1997. Table 1 shows that a total of 19,930 plants reported their product entry and exit in the export market. Most of these are single-product plants. When checking the number of records, multiproduct plants show a maximum of three new product entries into the export market. Time at risk indicates the sum of each plant's time at risk or the sum of the time that each plant remained under observation. Failures denote the number of product exits. 88% of plant-product observations show an exit during the sample period.

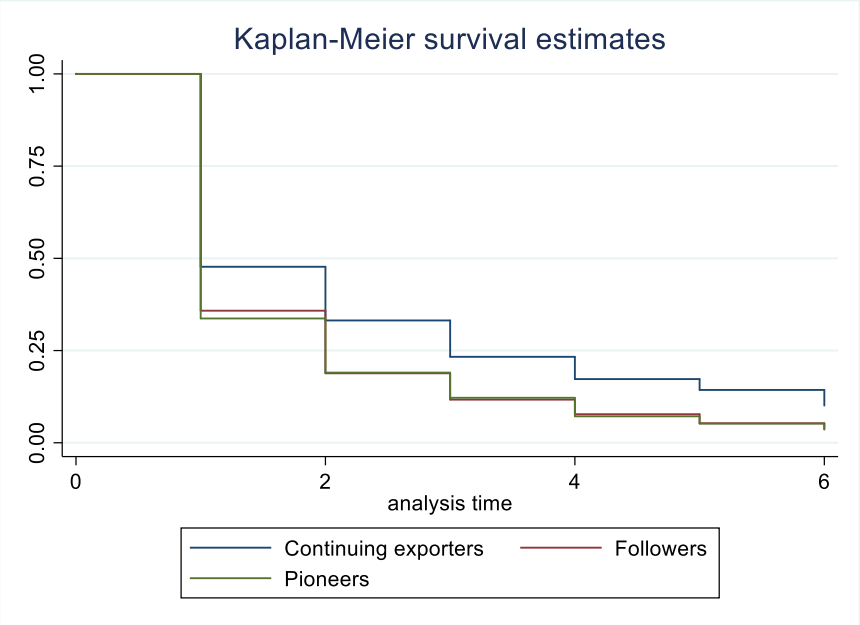
Table 1. Summary Statistics

	Total	Mean	Min.	Median	Max.
No. of plants	21,386				
No. of records	21,645	1.012	1	1	3
(First) entry time		0.002	0	0	5
(Final) exit time		1.671	1	1	6
Time at risk	35,693	1.669	1	1	6
Failures	18,971	0.887	0	1	1

Source: Authors' calculations.

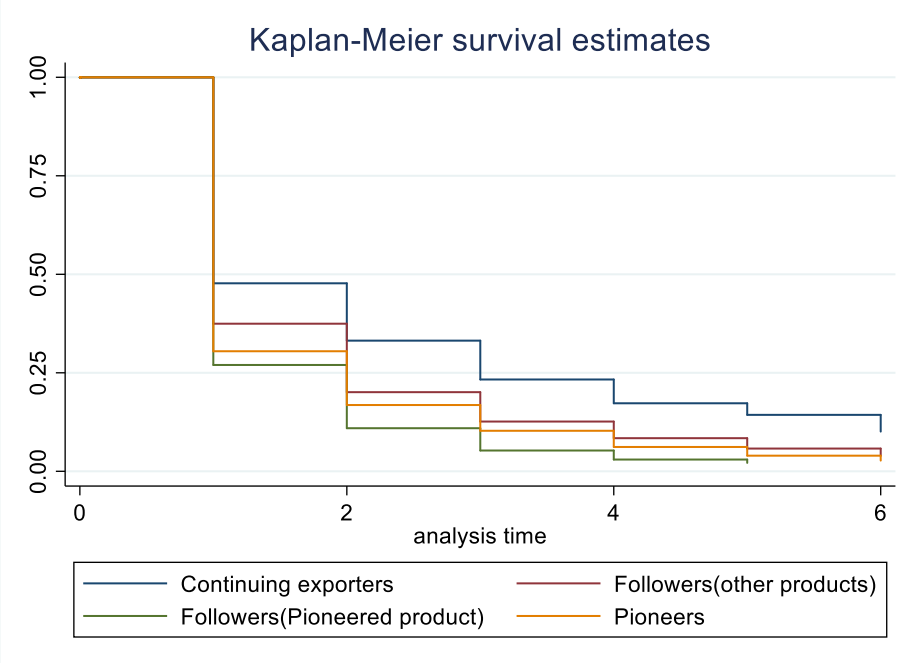
Figure 1 shows the proportion of existing exporters and new exporters, such as export pioneers and followers, by the Kaplan-Meier method. Exporters either exit early after the entry or stay in the export market. A blue line indicates the export pioneers' survival, whilst a red line shows the followers' survival. Overall, pioneers exit earlier than followers. In particular, for the first year after the entry, the proportion of pioneers' exit is greater than that for followers.

Figure 1. Exporters' Survival Probability



Source: Authors' calculations.

Figure 2. Exporters' Survival Probability (2)



Source: Authors' calculations.

Table 2. Incidence Rates between Export Pioneers and Followers

Category	No. of plants	Time at risk (incidence rate)		No. of plants	Time at risk	Incidence rate	25%	50%	75%
Continuing exporters				2,491	5,872	0.379	1	1	3
Followers	17,512	28,722 (0.560)	Followers (existing products)	15,370	24,928	0.543	1	1	2
			Followers (new to domestic and export)	1,164	1,460	0.703	1	1	2
			Followers (new to export)	1,013	1,296	0.685	1	1	2
Pioneers	1,467	2,137 (0.607)	Pioneers (new to domestic and export)	731	1,099	0.571	1	1	2
			Pioneers (new to export)	740	1,038	0.645	1	1	2
Total	21,386	35,693		21,386	35,693	0.532	1	1	2

Source: Authors' calculations.

To understand the results shown in Figure 1, we examine the detailed characteristics of continuing exporters and new exporters (pioneers and followers). Table 2 shows the time at risk and incidence rates for pioneers and followers. First, to understand what determines the success of new export entry between export pioneering and following, we use the product characteristics of whether products are new to the export market only or both domestic and export markets. Thus, we classify pioneers into 1) pioneers that are the very first to bring an existing domestic product to the export market (new to export), and 2) pioneers that introduce a new product to both the domestic and export markets simultaneously (new to domestic & export). We also divide three sub-group followers: 3) export followers that follow the pioneers (new to export), 4) followers

of the pioneers to both markets (new to domestic & export), and 5) followers of the existing products (existing products). For instance, whilst pioneer 1) may spend time selecting a domestic product as a new exporting item, pioneer 2) may introduce an entirely new item in both the domestic and exporting markets via innovation or invention procedures. Thus, pioneer 1) and pioneer 2) can be distinguished in terms of their pioneering activities.

When comparing the five groups of pioneers and followers, we find very interesting heterogeneity in the export survival probability. Pioneers that bring a new product to both the domestic and export markets simultaneously have the lowest incidence rates (exit rates). In contrast, pioneers that introduce an existing domestic product for the first time to the export market show a relatively high incidence rate. Amongst the followers, followers that introduce existing products in all markets show the lowest incidence rates, but other followers that keep track of the export pioneers have high incidence rates.

Table 3. Export Pioneers versus Followers

	Continuing exporters	Followers (existing products)	Followers (new to domestic & export)	Followers (new to export)	Pioneers (new to domestic & export)	Pioneers (new to export)
(log) Size	4.279	3.766	3.932	3.894	4.384	4.106
	(1.565)	(1.395)	(1.467)	(1.493)	(1.692)	(1.623)
(log) Skill intensity	3.186	3.259	3.251	3.353	3.270	3.349
	(0.653)	(0.660)	(0.628)	(0.608)	(0.617)	(0.589)
Multiproduct	0.466	0.444	0.489	0.561	0.534	0.628
	(0.499)	(0.497)	(0.500)	(0.496)	(0.499)	(0.484)
Innovator	0.234	0.215	0.278	0.264	0.332	0.298
	(0.423)	(0.411)	(0.448)	(0.441)	(0.471)	(0.458)
(log) TFP	2.655	2.766	2.488	2.634	2.461	2.631
	(1.123)	(1.014)	(1.061)	(1.097)	(1.025)	(1.121)
Observations	5,009	30,952	2,745	2,383	2,388	2,062

Note: The mean of each variable is reported, and the standard deviation is in parentheses.

Source: Authors' calculations.

Table 3 also reports the characteristics of the export pioneers and followers. Here, we find interesting points about the new export entry (export pioneers and followers). First, we find that export pioneers tend to be larger and have multiple products than the followers. The mean of the R&D dummy is the highest for pioneers that introduce a new product to both markets (= 0.332). It is arguable that active pioneers pursuing both domestic and international markets pour their resources into R&D activity intensively. The followers that bring existing products to the export market show the highest productivity, followed next by continuing exporters. This implies that plant productivity is positively correlated to product tenures in the market.

3.2.Empirical methodology

To deepen our understanding of the data, we introduce a discrete-time duration model, the Cox proportional hazard model. We implement survival analysis using a hazard model if the hazard rates of the export pioneers are larger or smaller than the export followers. We include additional plant-level and plant-product-level characteristics considered in the existing literature, such as plant productivity and a multiproduct firm dummy, etc. To see if the high hazard rates of export pioneers are likely to reflect the export followers' learning from the pioneers' experimentation, we control for various plant product characteristics that may affect the export pioneers' and followers' behaviour/performance before and after the export entry.

Before moving to our main survival analysis, we examine the distribution of the export pioneers' and followers' exit. The Kaplan-Meier product-limit (PL) method estimates the probability of surviving longer than a given time t, the survival distribution, S(t).[3] The estimate is the product of a series of estimated conditional probabilities. For example, the probability of surviving longer than N years is estimated as,

$$\hat{P}(T > N) = \hat{S}(N) = p_1 \cdot p_2 \cdot p_3 \cdots p_N$$

where p_1 denotes the proportion of firms surviving at least 1 year, p_2 does denote the proportion of firms surviving the second year after they have survived the first year, and p_N does the proportion of firms surviving the Nth year after they have survived $N-1$ years. The Kaplan-Meier method assumes that the probability of a censored observation is independent of the actual survival time (the cause of exit).

[3] However, the PL estimates are limited to the time interval in which the observations fall. If the largest observation is uncensored, the PL estimate at that time is always zero. If the largest observation is censored, the PL estimate can never equal zero and is undefined beyond the largest observation, unless an additional assumption is imposed. In addition, if less than 50% of the observations are uncensored and the largest observation is censored, the median survival time cannot be estimated. Thus, the method is not perfect and there are reasons to search for a parametric model.

Our hazard model for the export duration is the Cox proportional hazards model (Cox, 1972). This method is more flexible than any parametric accelerated failure time (AFT) model as it contains a nonparametric baseline hazard function, h0(t), along with a parametric part. In this model, the hazard function is given by

$$\mathrm{h}(t|X) = \mathrm{h}_0(t)\exp(X\beta) \tag{1}$$

and the survival function is

$$\mathrm{S}(t|X) = \exp\left(-\exp(X\beta)H_0(t)\right) \tag{2}$$

Where $H_0(t) = \int_0^t h_0(u)du$

with $H_0(t)$ the cumulative baseline hazard function. We use Breslow's method to estimate the cumulative baseline hazard rate, given by

$$\widehat{H_0}(t) = \sum_{t_i \le t} \frac{1}{\sum_{k \in K(t_i)} \exp(X\beta)} \tag{3}$$

where $K(t_i)$ denotes the group of exporters (K=Pioneer, Follower) at risk at time t_i (which are the ones that have not yet exited by time t_i).

We also consider a number of explanatory variables for the vector X, which capture the characteristics of the plant/product and the industry to which each plant belongs. Plant-level productivity is measured as total factor productivity (TFP) estimated by the approach of Levinsohn and Petrin (2003). It is expected that productivity is negatively correlated with the probability of a product dropping, so the measured TFP reduces the hazard of a product exit. We also include plant size (employment), a multiproduct firm dummy, an innovator dummy (R&D dummy), and skill intensity. The innovator dummy is whether plant *i* is engaged in R&D investment at time *t*. Skill intensity is the ratio of the number of skilled workers (white-collar workers) to total workers. Whilst multiproduct plants are more vulnerable to product exit than single-product plants, being an innovator and having high skill intensity would reduce the probability of product exit.

4. Empirical Results

Our main interest is to identify the coefficient β, which shows the effect of the explanatory variables on the hazard rate. Table 4 reports the hazard ratio, indicating how the hazard changes when our explanatory variable increases by one unit. Thus, if the hazard ratio is less than 1, then an increase in the explanatory variable is associated with a lower hazard of dropping a product, implying longer survival.

Table 4. Main Results

	(1)	(2)	(3)	(4)	(5)	(6)
Survival distribution		**Cox**		**Exponential**	**Weilbull**	**Gompertz**
			Hazard ratio			
Size	0.908***	0.908***	0.908***	0.888***	0.832***	0.861***
	(0.00503)	(0.00502)	(0.00502)	(0.00599)	(0.00869)	(0.00729)
Skill intensity	1.000	0.998	0.998	1.001	1.012	1.005
	(0.00760)	(0.00759)	(0.00759)	(0.00945)	(0.0152)	(0.0120)
Multiproduct	1.234***	1.224***	1.223***	1.276***	1.424***	1.337***
	(0.0155)	(0.0154)	(0.0154)	(0.0201)	(0.0378)	(0.0274)
Innovator	1.014	1.011	1.011	1.019	1.046	1.028
	(0.0159)	(0.0158)	(0.0158)	(0.0195)	(0.0314)	(0.0247)
TFP	0.951***	0.955***	0.955***	0.945***	0.921***	0.934***
	(0.00517)	(0.00519)	(0.00519)	(0.00624)	(0.00933)	(0.00773)
Baseline	Continuing exporters					
Followers	1.246***					
	(0.0234)					
Followers (existing products)		1.224***	1.224***	1.349***	1.765***	1.578***
		(0.0232)	(0.0232)	(0.0306)	(0.0586)	(0.0461)
Followers (pioneered products)		1.416***				
		(0.0315)				
Followers (domestic & export)			1.430***	1.687***	2.738***	2.155***
			(0.0360)	(0.0504)	(0.127)	(0.0803)
Followers			1.400***	1.640***	2.605***	2.082***

(export)			(0.0367)	(0.0510)	(0.124)	(0.0803)
Pioneers	1.267***	1.306***				
	(0.0415)	(0.0335)				
Pioneers			1.273***	1.421***	1.883***	1.660***
(domestic & export)			(0.0419)	(0.0585)	(0.132)	(0.0919)
Pioneers (export)			1.339***	1.514***	2.129***	1.829***
			(0.0401)	(0.0561)	(0.129)	(0.0872)
Observations	19,035	19,035	19,035	19,035	19,035	19,035

TFP = total factor productivity.

Note: Robust standard errors clustered by plant ID are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation.

Throughout all columns in Table 4, we find the effects of common plant characteristics on product exit (relapse) based on the output using hazard ratios. As plant size (log employment) increases by one unit and all other variables are held constant, the rate of relapse decreases by 9.2% (100% – 90.8%) in column (1). If plants are multiproduct plants, whilst holding all other variables constant, the rate of relapse increases by 23.4%. As the log TFP increases by one unit, and all other variables are held constant, the rate of relapse decreases by 4.9% (100% – 95.1%). Our results suggest that higher TFP and larger size plants tend to show more prolonged product survival, consistent with previous studies.

More interestingly, we compare the hazard ratios between continuing exporters and new exporters, such as pioneers and followers. Column (1) shows that the hazard ratios between pioneers and followers show a slight difference, but their product exit probability increases compared to the continuing exporters. Column (2) divides the followers into the followers of existing products and those of pioneered products. Here, we find that the followers of existing products survive longer than the pioneers. The

relapse rate of pioneers' products in the export market is higher by 8% than that of followers' existing products in the export market. This implies that export followers with well-established products in the domestic and foreign markets have accumulated knowhow of maintaining their market shares and less need for experimentation than the export pioneers.

However, the followers of the pioneered products show the shortest survival amongst all groups. Their rate of relapse increases by 41.6% compared to the continuing exporters. Given that the hazard of the pioneers' products is greater than that of the followers' existing products, the followers of the pioneered products are likely to take various risks because there is a lot of uncertainty about the success of the pioneered products.

In columns (3)–(7), we dissect the characteristics of the pioneers' and followers' products more thoroughly and compare their product exits. Consistent with column (3), the followers of the pioneered products show a higher rate of relapse than those of the existing products. However, when examining the pioneers' detailed product characteristics, we find that pioneers that introduce a new product to both the domestic and export markets simultaneously can survive in the markets similar to the followers of the existing products. However, pioneers that first bring their domestic products newly to the export market show higher relapse rates of their products than the followers of the existing products. This suggests that export pioneers (that can appeal to domestic and foreign markets with product competencies) are more likely to be better-performing firms than followers and, hence, more likely to survive in the export market, other things being equal.

Table 5 introduces the industry sub-sample analysis based on the industry means of export shares, capital intensity (= capital-to-labour ratio), and the Herfindahl-Hirschman

Index (HHI). First, we compute the means of three measures and divide our full sample into two sub-groups based on each industry's mean. Thus, we examine whether there is any heterogeneity in the survival rates between export pioneers and followers across industry characteristics. Interestingly, in the industries with low export shares and HHI (less competition) but high capital intensity (high technology), we find that the export pioneers are likely to survive longer than the followers, unlike our main findings in columns (1) and (2) of Table 4.

Table 5. Sub-sample Analysis: Industry Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)
Sub-sample by industry	**Export share**		**Capital intensity**		**Herfindahl-Hirschman Index**	
	High	**Low**	**High**	**Low**	**High**	**Low**
	Hazard ratio					
Baseline	**Continuing exporters**					
Followers	1.192***	1.282***	1.217***	1.245***	1.285***	1.233***
	(0.0301)	(0.0359)	(0.0452)	(0.0270)	(0.0487)	(0.0266)
Pioneers	1.296***	1.182***	1.106	1.321***	1.363***	1.195***
	(0.0525)	(0.0563)	(0.0715)	(0.0457)	(0.0702)	(0.0540)
Size	0.950***	0.882***	0.897***	0.929***	0.914***	0.903***
	(0.00833)	(0.00634)	(0.00912)	(0.00623)	(0.00967)	(0.00596)
Skill intensity	1.018*	1.007	1.000	1.012	1.053***	0.985*
	(0.0109)	(0.0114)	(0.0164)	(0.00874)	(0.0181)	(0.00847)
Multiproduct	1.286***	1.223***	1.243***	1.246***	1.210***	1.248***
	(0.0283)	(0.0187)	(0.0286)	(0.0186)	(0.0285)	(0.0186)
Innovator	0.980	1.021	1.023	0.998	1.023	1.009
	(0.0261)	(0.0195)	(0.0292)	(0.0187)	(0.0273)	(0.0196)
TFP	0.844***	1.011	1.002	0.866***	0.937***	0.960***
	(0.00741)	(0.00744)	(0.0126)	(0.00646)	(0.00976)	(0.00686)
Observations	8,738	10,297	5,025	14,010	4,604	14,431

TFP = total factor productivity.
Note: Robust standard errors clustered by plant ID are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimation.

5. Conclusion

This study investigates the survival probability of new exporters, such as export pioneers and followers, using a rich plant-product-level dataset on Korean manufacturing industries for 1991–1997. We find that export pioneers that bring new products to the export market are less likely to survive than export followers of existing export products. This result lends support to the view that export followers can learn from the experimentation of the first mover (whether pioneering products are successfully established) and reduce uncertainty in export profitability after new export entry. We also find that there is some heterogeneity in the export survival probability after new export entry, even amongst export pioneers and followers. Amongst export followers, the followers of existing export products show higher survival than those of the export-pioneered products. Amongst export pioneers, those that introduce a new product to both the domestic and export markets simultaneously for the first time in the economy exhibit higher survival rates than the export pioneers that take an existing domestic product to the export market.

There are a couple of empirical results in this paper which may be particularly relevant for policy. First, we find that new exporters, those that export a product new to the plant, are less likely to survive in the export market than old exporters, as in Albornoz et al. (2012). We can further divide the new exporters into export pioneers and export followers. Export pioneers are those that export a product for the first time in the economy, and export followers are those that export a product after some other plants have already export-pioneered the product. Then, we find the following second result: export pioneers are less likely to survive in the export market than export followers, particularly when the export followers emerge long after the emergence of the export pioneers.

Although this paper alone is only a very small step towards understanding the causes

of the prevalence of the short-lived trade relationship in the trade data, this paper, combined with the small but growing existing studies on this issue, has some implications on policy. First, to the extent that the prevalence of short-lived trade relationships reflects mainly the experimentation and learning motives of new exporters, as in Albornoz et al. (2012), and also to the extent to which the social marginal benefit from this experimentation outweighs the social marginal cost in the sense that there are positive informational spillovers from the activity of exporting new products, there is a need for policy that promotes new exports. Second, if export followers learn from the successes and failures of export pioneers' experimentation and, for that reason, have a higher chance of survival in the export market, there is more need for an emphasis on policies to promote export pioneers rather than export followers.

This study is expected to provide some important evidence that can help understand the early export dynamics and the mechanism of the appearance of new export industries. Specifically, this study is probably one of the early studies exploring the survival, as well as the various performances, of export pioneers vis-à-vis export followers. Since one of our main interests lies in whether there is evidence that export followers can learn from export pioneers' experimentation, this study will shed light on policies to address the potential market failures associated with pioneer-to-follower spillovers.

References

Albornoz, F., H. Calvo-Pardo, G. Corcos, and E. Ornelas (2012), 'Sequential Exporting', *Journal of International Economics,* 88(1), pp.17–31.

Albornoz, F., S. Fanelli, and J.C. Hallak (2016), 'Survival in Export Markets', *Journal of International Economics,* 102, pp.262–81.

Artopoulos, A., D. Friel, and J.C. Hallak (2013), 'Export Emergence of Differentiated Goods from Developing Countries: Export Pioneers and Business Practices in Argentina', *Journal of Development Economics,* 105, pp.19–35.

Bekes, G. and B. Murakozy (2012), 'Temporary Trade and Heterogeneous Firms', *Journal of International Economics,* 87, pp.232–46.

Besedes, T. and T.J. Prusa (2006), 'In, Outs, and the Duration of Trade', *Canadian Journal of Economics*, 39(1), pp.266–95.

Cox D.R. (1972), 'Regression Models and Life-tables', *Journal of the Royal Statistical Society. Series B (Methodological)*, 34(2), pp.187–220.

Eaton, J., M. Eslava, M. Kugler, and J. Tybout (2008), 'The Margins of Entry into Export Markets: Evidence from Colombia', in E. Helpman, D. Marin, and T. Verdier (eds.), *The Organization of Firms in a Global Economy*. Cambridge, MA: Harvard University Press.

Freund, C. and M.D. Pierola (2010), 'Export Entrepreneurs: Evidence from Peru', *World Bank Policy Research Working Paper* 5407. Washington, DC: World Bank.

Gorg, H., R. Kneller, and B. Murakozy (2020), 'What Makes a Successful Export? Evidence from Firm-product-level Data', *Canadian Journal of Economics*, 45(4), pp.1332–68.

Hausmann, R. and D. Rodrik (2003), 'Economic Development as Self-discovery', *Journal of Development Economics*, 72, pp.603–33.

Iacovone, L. and B.S. Javorcik (2010), 'Multi-product Exporters: Product Churning, Uncertainty and Export Discoveries', *Economic Journal,* 120, pp.481–99.

Levinsohn, J. and A. Petrin (2003), 'Estimating Production Functions Using Inputs to Control for Unobservables', *The Review of Economic Studies*, *70*(2), pp.317–41.

Melitz, M. (2003), 'The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity', *Econometrica*, 71, pp.1695–725.

Wagner, R. and A. Zahler (2015), 'New Exports from Emerging Markets: Do Followers Benefit from Pioneers?', *Journal of Development Economics,* 114, pp.203–23.

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