What's next? Returning to exports after a failure

(Preliminary)

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August 3, 2017

Abstract

We study in depth the phenomenon of re-established exports using transaction level export data for Irish firms. We find that the fraction of returning products is sizable and that firms re-launch products multiple times. The export value at the first launch is linked to the eventual path of product survival: it is lowest for products exported only once, highest for products exported continuously, with returning products in between the other two categories. Returning products exhibit an increase in unit-value after each break from exporting; furthermore, the unit value growth for returning products is found to be systematically larger than the unit-value growth of products exported continuously over a certain time span.

JEL Classification: F10
Keywords: returning to exports, unit value

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‡We would like to thank Ronald B. Davies and Martina Lawless for helpful comments. We gratefully acknowledge the logistic support of the Central Statistics Office and Damian Malone in particular for the provision of the data. Contact: mattia.diubaldo@gmail.com or zuzanna.studnicka@gmail.com

1 Introduction

Recent empirical evidence shows that the majority of products launched by exporters are discontinued very shortly after entry (Eaton et al., 2008; Albornoz et al., 2012). A large fraction of these short-lived export flows consists of isolated one-off transactions (Geishecker et al., 2016), with the remaining fraction returning to exporting after a break. These unstable trade flows are at odds with the traditional trade theories predicting persistence in exporting due to high sunk costs necessary to enter the foreign market (Melitz, 2003; Das et al., 2007; Eaton et al., 2011) and the empirical studies reporting sizable investments performed by firms to launch new products and enter new markets (Iacovone and Javorcik, 2009; Freund & Pierola, 2010). Attempts to reconcile the transitory nature of exports with the persistence of trade suggested by the theory include models where firms choose between variable and sunk trade cost technologies[1] (Békes & Muraközy, 2012), or learning mechanisms whereby firms "test the water" by selling small quantities at entry and adjust their involvement in exporting in subsequent years (Freund & Pierola, 2010; Albornoz et al., 2012; Aeberhardt et al., 2014).

Intermittent exporting, or exit and re-entry, has also been studied, with analyses performed at the firm level (Welch & Welch, 2009; Blum et al., 2013, Bernini et al., 2016) and the firm-destination level (Lawless, 2009; Békes & Muraközy, 2012) and has found an explanation in the interplay between heterogeneous efficiency, demand shocks and learning activities.

In this paper we study in depth the phenomenon of re-established exports flows at the product level, using transaction level trade data for Ireland between 1996 and 2015. We concentrate on intermittent exports of products at the HS-6 level, putting the breaks in between export spells in the limelight, as our aim is to provide an empirical exploration of what happens to discontinued products at their re-launch. The main contribution consists therefore in singling out products exported in a discontinuous way (henceforth returning products) and in comparing their characteristics with products exported only once (one-off products) and, more importantly, with products exported over multiple years without breaks (continuous products). We explicitly restrict the sample under analysis to returning products shipped by exporters that appear continuously in our data, without any interruption in exporting activity from one year to the other, in order to exclude firm specific determinants of exit and re-entry.[2]

The idea behind our study is the following: given the sizeable costs to launch new products, it is sensible to expect firms to make some effort to re-launch them should the export experience not be immediately successful. Are returning products a sizeable fraction of the short-lived export transactions? Do returning products come back with different features such as higher (lower) prices/quality? Addressing these questions contributes to the understanding of the volatility of export margins (both extensive and intensive) and indirectly helps reconciling the conflicting findings on the persistence of

[1] The variable cost technology is more likely to give rise to temporary trade, vice-versa for the sunk cost technology

[2] This automatically implies that the firms in our sample are are multi-product exporters

trade and the transitory nature of a large fraction of transactions.

We present a series of findings. First, we document that the fraction of returning products is sizeable: approximately 20% of all products exported are returning products, 60% are one-off products and the remaining 20% are continuous products. Furthermore, firms tend re-launch products multiple times. Secondly, we find that the export value at the first launch varies considerably and is linked to the eventual path of product survival: products that fail and are then re-launched have on average a larger initial value than that of products that will be completely discontinued, but smaller than products that are never discontinued. This hints at different export strategies pursued by firms depending on the expected profitability of the new product. Third, after each break, returning products exhibit an increase in unit-value. Crucial is the finding that when comparing the unit-value growth over time spans of equal length, returning products show a growth which is larger than that of products exported continuously over that time period. This indicates that re-established trade spells are triggered by the launch of a new generation of products, possibly with a higher quality or improved features enabling firms to remain competitive on international markets.

The remainder of this paper is organized as follows. In Section 2 we detail the characteristics of our data-set, while in Section 3 we describe the relevance of returning products. In Section 4 we analyse the unit-value growth for returning products, first over the breaks, and then in rigorous comparison with continuous products. Section 5 outlines a series of possible explanations and the next steps to be pursued. Section 6 concludes.

2 Data

Our principal source of information is confidential data on Irish firms from the Central Statistics Office (CSO). This covers statistics on merchandise exports (both value and quantity) of manufacturing enterprises in Ireland broken down by product (CN 8-digit level) and market destinations, at annual frequency. We match these data with enterprise accounting variables (collected via the Census of Industrial Production). Our final data set covers the period from 1996 to 2015.[3]

The primary focus of our paper is on the product level of firm exports. Hence, we aggregate our data to this dimension eliminating the destination margin.

In our analysis we need to take into account several data issues. First, two different systems with different reporting thresholds are used to collect Irish trade data. The threshold for the intra-EU trade is the volume of above €635,000 per annum, whereas the extra-EU threshold is considerably lower and collects information on all transactions above €254.

Second, foreign trade data is recorded at the 8-digit level in the CN classification. Its main inconvenience is that some of the categories change every year reflecting changes

[3]A detailed description of the patterns of trade - particularly of Irish-owned firms - coming from this data is provided by Lawless, Siedschlag and Studnicka (2017).

in products. Since these changing CN codes might bias our calculations of the length of trade spell, we use concordance tables to transform the classification backwards to a constant CN 1996 terminology. Thus, we limit the product scope to products existing in 1996.[4] In addition, in order to avoid an excessive product entry/exit due to this high level of disaggregation (see e.g., Besedeš and Prusa, 2006a) we aggregate our product level data to HS 6-digit level product categories.

Finally, we have no information about the trade relationships before 1996: this creates a left-censoring problem which could in turn bias our figures on returning products.[5] To deal with it, we exclude from our analysis product spells starting in 1996.

3 Evidence on returning to exports

In this section we present some key statistics about the relevance of returning products. We begin by identifying the main categories of exported products based on the duration and continuity of the flows (subsection 3.1). Next, we provide evidence on the different strategies pursued by firms when launching products belonging to each of these categories (subsection 3.2).

3.1 Product categories

Returning products are identified as products which a firm stops exporting, reappearing at a later time in the export basket of this firm, with a break of at least one year. The restriction of the sample to continuous exporters implies, however, that firms which discontinue these products keep exporting other products during the break.

Continuous products are identified as products that a firms exports for over one year, without any interruption from one year to the other. A small fraction of these continuous products are exported throughout the export career of the firm.

Finally, one-off products are identified as products that survive for one year only, and never appear again in the export basket of the firm.

Table 1 shows the size of the sample under analysis together with the proportions of returning, continuous and one-off products. In order to make sure that the procedure adopted to deal with the issue of left-censored observations is not affecting the overall distribution of products into the three categories, we present two sets of figures. w

Eliminating all 1996 shipments as well as any other later shipment performed by firms which were already in the data in 1996, reduces the sample by about 60%, both

[4]Re-coding CN8 implies replacing code at time t backwards to $t-1$. That means that, for instance, re-coding the last year in our sample (2015) requires going back year by year from 2015 to 1996, applying 19 transformations. This procedure creates a problem when trying to replace codes from a shrinking category (i.e., when two or more CN codes at the time $t-1$ were replaced by only one CN code at the time t). In this case we merge them into one of the former codes in a random way. The re-coding procedure creates a loss of around 12 per cent of our data.

[5]A product exported in 1996 cannot be classified in any of the continuous, returning and one-off product categories, given its unknown export experience pre-1996.

Table 1: Proportion of returning products

	All firms		Controlling for censoring	
Sample				
No. firms	3,101		1843	
No. HS-6 codes	4,745		4,618	
No. products (firm HS-6 pairs)	108,911		84,163	
Product categories	No.	%	No.	%
One-off products	62,048	57	50,042	59
Returning products	24,218	22	17,476	21
Continuous products	18,682	17	14,659	17
Super continuous	3,956	4	1,620	2

Note: Super continuous products are continuous throughout the firm's life

in terms of the number of firms and the number of products exported. However, it is remarkable how this sharp reduction in sample size leaves the proportions of one-off, returning and continuous products roughly unchanged.

The majority of products exported by firms in Ireland last only one year.[6] This is a feature already observed for other small open economies, such as Denmark (Geishecker et al., 2016), which can be attributed in part to single orders received by foreign customers (i.e. passive exporting) and in part to experimentation of firms with new products. The next section will provide more insights for this rationale.

The fraction of returning products comes next in numbers: these are shipped for more than one year by a firm, but in a discontinuous way[7] We believe that the breaks in exporting that identify this group of products are not a random feature of the data, but could instead reveal something about firms' strategies to cope with the uncertain outcome of exporting after sustaining the costs to launch these products. For this reason, returning products are going to be center stage in this work.

Lastly, continuous products make up the remaining fraction of all shipments. In Table 1 we split this category into the group of continuous products, shipped for more than one year without interruptions, and super-continuous products, shipped without interruptions over the entire life of the firm. This latter subset of shipments is what

[6]With data at annual frequency, we cannot distinguish between export durations shorter than one year, such that we are unable to tell whether one-off shipments were truly just a single export event or whether there were multiple shipments over the year.

[7]Also for the identification of returning products, the availability of data at annual frequency could raise some concerns. This could be a problem for seasonal shipments which happen across the months of December/January, such that the identification of a gap year (or not) could be a consequence of the shipments happening each year around the same time but not exactly in the same month. Unfortunately we are unable to solve this issue with the data at hand.

a theory about persistent exporting would predict. These products, however, account for only about 5% of all products in our data. Therefore in the econometric analysis in Section 4 we group continuous and super-continuous products in one category, and use them as a comparison group for returning products.

3.2 Initial value

One of the main challenges of this paper is to motivate the attention on discontinuous exporting and returning products, in contrast to one-off and continuous exports. This section, therefore, proceeds in direction of uncovering systematic differences across the three groups of products under examination.

An important distinction arises when examining the value shipped the first time a product is exported by a certain firm. We refer to this as the initial value at launch.

Table 2 shows the results from running the following specification:

$$ln(in.val_{k,i,t}) = \beta_0 + \beta_1 One_{k,i,t} + \beta_2 Cont_{k,i,t} + \beta_3 SCont_{k,i,t} + \gamma_k + \eta_i + \delta_t + \epsilon_{k,i,t} \quad (1)$$

The dependent variable is the natural logarithm of the value of shipments at first launch, i.e. the first time a firm exports a certain product, with k, i and t denoting, respectively, products, firms and years. The model includes three mutually exclusive binary variables taking value 1 if a shipment belongs to the category of one-off, continuous and super-continuous products, with the excluded category being returning products. γ_k, η_i and δ_t denote, respectively, complete sets of HS-6, firm and year fixed effects.

Table 2: Initial Value

Product categories	
One-off Products	-0.454***
	(0.028)
Continuous Products	0.703***
	(0.049)
Super-continuous Products	3.286***
	(0.103)
HS-6 FE	yes
Year FE	yes
Firm FE	yes
R squared	0.225
Observations	84,121

Note: Robust standard errors clustered at HS-6 level in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2 shows a neat relation across the four product categories, in terms of the value exported at first launch and the eventual path of survival of the product. On one hand, the initial value of one-off products is, on average, 36% lower than the initial value of returning products. On the other hand, the initial value of continuous and super-continuous products is, respectively, twice and 26 times larger than the initial value of returning products.

It appears, therefore, that firms pursue different export strategies with products that are likely to have a different evolution on the export market. One-off products are, most likely, used to "test the water": the low value shipped at launch signals a cautious approach to exporting, possibly reflecting a lower investment into the development of the product. Products exported in a continuous fashion are items that firms bring to the market in larger amounts since the very beginning: this could be explained by the fact that firms have some knowledge about the likely success of the product or/and signal that a larger investment went into its development. Super-continuous products leave little uncertainty in their interpretation: firms start and end their experience as an exporter with those products; they are most likely at the core of the firm's activity and, in fact, they are launched in amounts which are a great deal larger than any other products exported.

Interestingly, returning products are in the middle of this ranking. With respect to the small shipments of products lasting one year only, products whose presence on the foreign market experiences a break are initially launched in larger values. Firms possibly make a more significant investment in these products, to not only "test the water", but to find some space on the market. In the event of an interruption in the shipment of these products, the relatively larger investment could push firms to make some effort to try to keep the product alive. In other words, once a firm introduces one of these products in its export portfolio, should it face some difficulty in exporting it, it is sensible to think that the firm will try to intervene on the product and re-launch it in the future. These considerations are the core of this paper and motivate the empirical analysis in the next sections.

4 Returning products: a break is something special

So far we have shown that returning products constitute a large share of the data (about 25%) and that there is a substantial difference in the value at their launch: 44% more than one-off products and about half of continuous products. We believe, therefore, that returning products are a category of their own, and not just a less successful bunch of otherwise continuously exported products. Returning products are likely to be less developed than continuous exports, but more developed than one-off products. This rationale is suggested by the initial value analysis and, if true, could imply that firms operate in order to bring temporarily failed exports back to the market. This section corroborates this idea further.

There are not many observable features about the products in our data; however, having information on both the values (in Euro) and the quantity (in kg or natural units) of each shipment, we are able to compute unit-values. Unit-value (i.e. value/quantity) is a measure of the price, and is often used as a proxy for quality.

In subsection 4.1 we describe the evolution of unit-values of returning products from before to after the breaks; in subsection 4.2 we perform an econometric analysis to contrast this evolution with that of products exported continuously.

4.1 Descriptive analysis

An interruption in exporting can compromise the investment a firm made to launch a new product. If a failure is experienced, firms might attempt to adjust some features of the product in order for it to regain competitiveness.

Table 3 shows the median and mean ratio of the before- over after-break unit-value, at each return. The first feature that stands out is that not only returning products are a sizeable share of all exports (Table 1), but that many products are re-launched multiple times. Crucially, at each break, products that return to exporting exhibit a higher unit-value with respect to before the break.

Table 3: Unit-value ratio over breaks

	Median	Mean	No. Products
All UV ratios	1.02	3.96	16,793
1st return	1.01	3.86	16,793
2nd return	1.06	3.65	7,215
3rd return	1.06	3.64	2,591
4th return	1.08	7.37	695
5th return	0.95	2.13	95

Table 4 provides a more rigorous analysis of the unit-value change over the breaks. Given that products return multiple times, but that the distribution over number of returns is very uneven, we separate returning products depending on how many times they are re-launched. Grouping products into these finer categories is relevant to isolate products that jump in and out of exporting in a random way, from products that fail and are re-launched after an intervention by the firm.

With this more stringent separation across groups of returning products we find again that, at each return, the unit-value increases. Only for the fifth return it is found that the median unit-value ratio is less than 1, but we are inclined to treat this as an exception rather than the norm, given the large number of cases where both mean and median ratios are instead found to be greater than 1.

In addition, when we look at the persistence of the increase in unit value we find that it is permanent and does not return back to a lower value in subsequent years (Table 5).

Table 4: Unit-value ratio over breaks, by subgroups of products

No. returns	No. products	1st return	2nd return	3rd return	4th return	5th return
		Mean UV ratio				
1	9,578	4.07				
2	4,622	3.92	4.07			
3	1,898	3.13	2.95	3.80		
4	600	2.86	2.96	3.14	7.71	
5	95	1.11	1.66	3.67	5.18	2.13
		Median UV ratio				
1	9,578	1.01				
2	4,622	1.02	1.08			
3	1,898	0.94	1.05	1.09		
4	600	0.88	0.92	0.92	1.09	
5	95	0.89	1.15	1.06	0.98	0.95

Table 5: Unit-value ratio after a break

	Mean (median) UV ratio			
Time	1st return	2nd return	3rd return	4th return
1	4.19 (1.01)	3.76 (1.06)	3.92 (1.05)	6.26 (1.06)
2	3.63 (1.03)	3.27 (1.06)	5.89 (1.17)	4.35 (1.14)
3	4.25 (1.09)	4.04 (1.10)	3.61 (1.12)	5.58 (1.20)
4	4.02 (1.08)	4.84 (1.10)	4.11 (1.04)	4.94 (1.20)
5	4.84 (1.03)	4.26 (1.12)	4.09 (0.99)	5.55 (2.18)
6	4.17 (0.97)	4.64 (0.99)	5.34 (1.03)	
7	5.42 (0.99)	4.42 (1.27)	4.42 (0.85)	
8	4.24 (1.02)	3.23 (1.32)		
9	3.67 (0.84)	3.93 (1.15)		
10	3.00 (0.97)	3.39 (1.07)		

Note: Time indicates current spell length after a break.

The descriptive features picked up by Tables 3 and 4 point in direction of a pattern: if a product drops out of exporting and is re-launched after an interruption of at least one year, it tends to come back with a higher unit-value, i.e. a higher price.
It appears therefore that, over the break, firms intervene on the failed product. At this stage we are unable to distinguish whether the higher price is indicative of improved features and quality, or whether the firm has enough market power to sell the returning product at an increased price. However, before attempting to discern among the causes of the unit-value rise, we must try to identify whether this unit-value rise is indeed something peculiar to returning products, and not just an overall tendency of all products exported over the time period we are examining. The obvious comparison group is the category of continuous products. For this reason, in the following section we rigorously tests whether the breaks are indeed something special; in other words, whether firms export products that experienced a break differently compared to when they keep exporting them continuously.

4.2 Regression analysis

In this section we estimate whether, over a certain time span, returning products exhibit a different change in unit-value compared to products exported continuously. This exercise goes in direction of testing the rationale that the breaks in between two export spells can spur firms to introduce a change in their export strategy.

Our methodology compares, within time spans of equal length, the unit value change of returning and continuous products. The dependent variable is computed in the following way: for each time span s between 2 and 19 years[8], we compute the end- over beginning-span unit-value ratio of all products which are exported, either continuously or discontinuously. Formally:

$$UV(s)_{k,i,t} = \frac{UV_{k,i,t}}{UV_{k,i,t-s}} \qquad \forall \; s \in [2, 19] \tag{2}$$

We then run the following regression, separately for each time span s, to test whether the unit-value ratio was affected by exporting the product in a discontinuous way:

$$UV(s)_{k,i,t} = \alpha_0 + \alpha_1 Cont(s)_{k,i,t} + \alpha_2 Discont(s)_{k,i,t} + \sum_{n=3}^{9} \alpha_n X_{i,t} + \lambda_t + \mu_k + \xi_{k,i,t} \tag{3}$$

where $Cont(s)_{k,i,t}$ denotes a binary variable taking value 1 if the product was exported continuously over time span s and $Discont(s)_{k,i,t}$ denotes a binary variable taking value 1 if the product was exported discontinuously over the time span s. The reference category are products which return to exporting at the end of time span s and experienced a break of exactly s years. $X_{i,t}$ denotes a vector of firm level controls including the number of products exported, the number of destinations served, the years of export activity (i.e. experience), the number of employees, a dummy for foreign ownership and

[8]This is the longest export spell in our data.

value-added per employee.[9] λ_t denotes a set of year dummies. Finally, μ_k denotes a set of HS-6 product code fixed effects, implying that the estimated differences in unit-value change between continuous and returning products are estimated *within* HS-6 product categories.
An alternative estimation approach that we pursue is based on specification 4:

$$UV(s)_{k,i,t} = \beta_0 + \beta_1 Flows(s)_{k,i,t} + \sum_{n=3}^{9} \beta_n X_{i,t} + \mu_k + \lambda_t + \epsilon_{k,i,t} \tag{4}$$

The difference with specification 3 is in the way the effect of export breaks is identified. Instead of separating the groups of continuous and returning products with binary variables, we exploit a continuous measure, $Flows(s)_{k,i,t}$, corresponding to the number of times a product was exported by a firm within a certain time span s. This implies that $Flows(s)_{k,i,t}$ will take the maximum value for continuous products[10], and smaller values the more and the longer the breaks experienced by a returning product. Tables 6 and 7 show the results from running specifications 3 and 4.

Starting from Table 6, the coefficients of our two main variables of interest are (almost) always negative. With respect to returning products experiencing a break of exactly time s, products exported continuously experience a lower change in unit-values. This result is significant for time spans of two, three, four, eleven and thirteen years, and its size appears to be increasing with the length of the spell.

[9]All continuous firm-level variables are in logs.

[10]For products exported continuously within time span s, $Flows(s)_{k,i,t}$ takes value $s+1$.

Table 6: Unit-value change, by product categories

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time span (s)	s=2	s=3	s=4	s=5	s=6	s=7	s=8	s=9	s=10	s=11	s=12	s=13
Discont. products		-1.139***	-1.469**	-0.615	0.147	-0.661	-2.008	-0.274	-1.851	-2.090	-0.728	2.856
		(0.390)	(0.655)	(0.649)	(0.823)	(1.035)	(1.998)	(1.196)	(1.338)	(2.234)	(1.330)	(2.289)
Continuous products	-1.087***	-1.979***	-2.823***	-2.143***	-1.785**	-2.759***	-3.411*	-1.786	-4.383***	-5.258**	-2.393*	0.628
	(0.169)	(0.351)	(0.587)	(0.753)	(0.792)	(1.006)	(1.896)	(1.173)	(1.531)	(2.351)	(1.335)	(2.156)
No. destinations	-0.198**	-0.247**	-0.266*	-0.256	-0.665**	-0.816**	0.216	-0.797**	-0.611*	-0.303	-0.469	-0.513
	(0.0781)	(0.107)	(0.159)	(0.200)	(0.290)	(0.361)	(0.454)	(0.388)	(0.335)	(0.358)	(0.435)	(0.520)
No. products	0.0324	0.00454	-0.0439	-0.0676	-0.0150	0.130	-0.320	0.368	-0.00445	0.0755	0.302	0.299
	(0.0847)	(0.110)	(0.182)	(0.163)	(0.260)	(0.214)	(0.335)	(0.443)	(0.238)	(0.284)	(0.423)	(0.494)
Experience	0.0125	0.343*	-0.0282	-0.915	-0.371	-0.132	0.350	-1.656	-3.091	-5.486	-2.907	-6.258*
	(0.143)	(0.190)	(0.331)	(0.833)	(0.858)	(1.147)	(1.425)	(1.988)	(2.817)	(4.307)	(4.269)	(3.371)
Employment	0.198***	0.210***	0.332***	0.395***	0.285**	0.838***	0.546***	0.690*	0.561**	0.513**	0.369*	0.661*
	(0.0421)	(0.0646)	(0.0880)	(0.0909)	(0.134)	(0.302)	(0.205)	(0.372)	(0.243)	(0.230)	(0.218)	(0.341)
Irish	0.433***	0.397**	0.125	0.374	0.255	0.436	0.551	-0.505	0.269	0.555	0.668	1.036
	(0.157)	(0.171)	(0.238)	(0.295)	(0.351)	(0.403)	(0.436)	(0.528)	(0.442)	(0.629)	(0.489)	(0.820)
VA per worker	0.126**	0.238**	0.341*	0.205	0.300	-0.126	0.0246	-0.340	0.381	0.0867	0.402	0.435
	(0.0637)	(0.0927)	(0.176)	(0.169)	(0.317)	(0.328)	(0.325)	(0.517)	(0.403)	(0.544)	(0.399)	(0.541)
Constant	1.764***	1.478**	2.731**	3.295	2.998	3.295	2.393	7.479	9.555	17.30	8.140	12.54
	(0.446)	(0.601)	(1.112)	(2.110)	(2.796)	(2.936)	(2.783)	(4.939)	(7.696)	(12.68)	(11.52)	(8.451)
Observations	46,136	36,039	28,473	22,618	18,128	14,648	12,029	9,666	7,791	6,348	5,021	3,828
R-squared	0.006	0.006	0.006	0.005	0.005	0.007	0.004	0.007	0.012	0.012	0.006	0.012
Number of groups	2,725	2,466	2,217	2,023	1,787	1,628	1,532	1,349	1,195	1,104	1,001	885
Product FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Dependent variable is the unit-value ratio detailed in 2. All continuous firm level variables are in logs. Robust standard errors clustered at HS-6 level in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Unit-value change, by number of flows

	(1) s=2	(2) s=3	(3) s=4	(4) s=5	(5) s=6	(6) s=7	(7) s=8	(8) s=9	(9) s=10	(10) s=11	(11) s=12	(12) s=13
No. Flows	-0.894***	-0.865***	-0.804***	-0.564***	-0.541***	-0.503***	-0.511***	-0.332***	-0.478***	-0.530***	-0.234***	-0.327***
	(0.159)	(0.162)	(0.149)	(0.147)	(0.120)	(0.127)	(0.135)	(0.120)	(0.101)	(0.152)	(0.0762)	(0.110)
No. destinations	-0.202***	-0.252**	-0.276*	-0.269	-0.696**	-0.849**	0.195	-0.816**	-0.663*	-0.350	-0.493	-0.585
	(0.0779)	(0.107)	(0.160)	(0.199)	(0.292)	(0.368)	(0.452)	(0.387)	(0.341)	(0.361)	(0.429)	(0.510)
No. products	0.0336	0.00789	-0.0306	-0.0398	0.0388	0.187	-0.300	0.413	0.0716	0.147	0.353	0.406
	(0.0847)	(0.110)	(0.182)	(0.161)	(0.257)	(0.212)	(0.339)	(0.439)	(0.239)	(0.290)	(0.406)	(0.480)
Experience	0.0113	0.337*	-0.0194	-0.911	-0.388	-0.126	0.136	-1.781	-3.318	-6.072	-3.143	-7.109**
	(0.143)	(0.189)	(0.329)	(0.838)	(0.870)	(1.169)	(1.398)	(1.986)	(2.750)	(4.355)	(4.260)	(3.377)
Employment	0.202***	0.215***	0.341***	0.407***	0.298**	0.860***	0.557***	0.695*	0.572**	0.514**	0.386*	0.690**
	(0.0423)	(0.0647)	(0.0884)	(0.0912)	(0.135)	(0.304)	(0.202)	(0.371)	(0.248)	(0.234)	(0.218)	(0.342)
Irish	0.436***	0.403**	0.126	0.377	0.264	0.434	0.540	-0.485	0.261	0.545	0.628	1.099
	(0.157)	(0.171)	(0.238)	(0.293)	(0.349)	(0.400)	(0.434)	(0.525)	(0.441)	(0.642)	(0.483)	(0.827)
VA per worker	0.130**	0.246***	0.351**	0.219	0.333	-0.0985	0.0521	-0.290	0.458	0.204	0.439	0.531
	(0.0636)	(0.0932)	(0.177)	(0.171)	(0.319)	(0.330)	(0.332)	(0.517)	(0.400)	(0.537)	(0.402)	(0.547)
Constant	3.397***	2.981***	3.997***	4.599**	5.003*	4.634	3.783	9.083*	10.90	19.85	9.428	19.40**
	(0.584)	(0.633)	(1.119)	(2.128)	(2.873)	(3.104)	(2.908)	(4.935)	(7.079)	(13.09)	(11.56)	(9.018)
Observations	46,136	36,039	28,473	22,618	18,128	14,648	12,029	9,666	7,791	6,348	5,021	3,828
R-squared	0.005	0.005	0.006	0.005	0.005	0.007	0.005	0.007	0.013	0.014	0.006	0.013
Number of groups	2,725	2,466	2,217	2,023	1,787	1,628	1,532	1,349	1,195	1,104	1,001	885
Product FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Dependent variable is the unit-value ratio detailed in 2. All continuous firm level variables are in logs. Robust standard errors clustered at HS-6 level in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

No significant difference is found for discontinuous products, with respect the base category.[11] Even though the number of regressions with significant coefficients is limited, the results in Table 5 provide some insights on the fact that unit-values exhibit a greater change over time if products experience a break in exporting. This confirms our rationale that firms will intervene on the product (alter the price or the quality) in case the export spell is interrupted.

Table 6 provides substantially more robust evidence of this behavior. A larger number of flows over a given spell is negatively associated with the change in unit-value. This result is very stable and statistically significant across the regressions for all time spans. It appears, therefore, that the more frequently a firm exports a certain product, the lower is the change in its unit value.

4.2.1 Alternative approach

In this section we explore the idea that the evolution in products' unit-value might be related to the life-cycle of the product (see e.g., Vernon, 1996). Products exported over a certain number of years, but at a different point of their life-cycle, might undergo changes in unit-value dictated by factors such as the novelty of the product or firms' market power. These factors are not necessarily related to how a product has been exported (i.e. continuously or discontinuously), and could confound our identification strategy. The results exposed in the previous section could potentially be affected by life-cycle pricing strategies, since the dependent variable (2) is computed over all possible time spans s within the export duration of a product, but regardless of whether time span s is at the beginning or at the end of a product's life-cycle.

In order to verify that our results are not driven by pricing strategies at different stages of product development, we compute the ratio of the unit-value after the first s years of each export spell with respect to the initial unit-value (at the beginning of first spell in case of multiple spells). Formally:

$$UV(s)_{k,i,t} = \frac{UV_{k,i,t+s}}{UV_{k,i,t=1}} \qquad \forall \; s \in [2, 19] \tag{5}$$

Computing the unit-value ratio in this way allows to compare products exported continuously and discontinuously over the same period of the product life-cycle: if this latter affect firms' pricing strategy, it should do so in the same way for the two groups of products. Table 8 and Table 9 present our results. As in the previous section the coefficients of our variables of interest are negative and most of the time significant.

At this stage we are able to confirm our initial idea that breaks in exporting are more than just noise in the data and therefore should not be neglected by researchers. Firms appear to make use of the time away from the export market to amend features of products that were temporarily unsuccessful. There is, most likely, an ongoing learning

[11] Note that there might be a different unit-value change between the categories of continuous and discontinuous products, although this effect is not tested at this stage.

process taking place every time a firm attempts to export, leading to returning to exports after a failure.

Table 8: Unit-value change, by product categories, same life-cycle

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time span (s)	s=2	s=3	s=4	s=5	s=6	s=7	s=8	s=9	s=10	s=11	s=12	s=13
Discont. products		-0.343	-1.582*	-1.059	0.421	0.192	-3.127	0.874	-1.757	-0.259	-0.610	2.317
		(0.455)	(0.876)	(1.289)	(0.849)	(1.073)	(3.182)	(1.136)	(2.481)	(1.402)	(0.980)	(1.968)
Continuous products	-1.327***	-0.915***	-2.451***	-2.361	-1.727**	-1.514	-3.384	-0.481	-4.036	-4.772**	-2.138*	0.586
	(0.338)	(0.338)	(0.812)	(1.529)	(0.682)	(1.464)	(2.553)	(1.159)	(2.524)	(2.135)	(1.091)	(1.984)
No. destinations	-0.0773	-0.115	0.00496	-0.0825	-0.632	-1.552*	1.341	-0.260	-1.275	-0.485	-0.352	-0.236
	(0.158)	(0.163)	(0.256)	(0.302)	(0.505)	(0.923)	(1.074)	(0.401)	(0.819)	(0.445)	(0.638)	(0.455)
No. products	-0.173	-0.185	-0.521	-0.0873	-0.122	0.337	-0.622	-0.222	-0.363	0.754	1.237	0.807
	(0.164)	(0.220)	(0.408)	(0.317)	(0.405)	(0.467)	(0.891)	(0.581)	(0.472)	(0.520)	(0.920)	(0.528)
Experience	0.535**	1.094***	0.559	-0.686	2.631	1.171	6.234*	6.053*	1.030	-9.270	-3.503	-3.811
	(0.250)	(0.313)	(0.588)	(1.451)	(1.672)	(2.065)	(3.293)	(3.192)	(4.653)	(5.734)	(4.610)	(4.613)
Employment	0.0798	0.0809	0.482***	0.283	0.0857	1.091	0.321	0.186	0.920*	0.385	0.156	0.563
	(0.106)	(0.141)	(0.182)	(0.176)	(0.269)	(0.805)	(0.362)	(0.262)	(0.520)	(0.404)	(0.499)	(0.473)
Irish	0.186	0.118	-0.528	0.365	0.00153	1.236*	-0.106	-0.520	0.276	0.0458	0.743	-0.585
	(0.376)	(0.302)	(0.582)	(0.464)	(0.555)	(0.711)	(0.671)	(0.763)	(0.854)	(0.823)	(0.718)	(0.728)
VA per worker	0.202	0.265*	0.424*	0.483*	0.941	-0.285	0.0946	-0.453	0.624	-0.233	0.344	-0.398
	(0.145)	(0.155)	(0.251)	(0.282)	(0.751)	(0.676)	(0.604)	(0.641)	(0.663)	(0.805)	(0.342)	(0.435)
Constant	1.647*	0.226	1.217	1.394	-5.922	-0.433	-12.71*	-9.162	-1.191	26.94	7.932	9.885
	(0.939)	(1.002)	(1.745)	(4.242)	(6.508)	(3.811)	(6.822)	(6.823)	(13.12)	(17.53)	(13.07)	(11.65)
Observations	11,947	9,545	7,702	6,287	5,199	4,202	3,594	2,895	2,419	2,190	1,882	1,594
R-squared	0.012	0.012	0.009	0.011	0.013	0.014	0.010	0.020	0.026	0.026	0.016	0.020
Number of groups	2,477	2,211	1,964	1,799	1,560	1,411	1,331	1,151	1,017	930	856	762
Product FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Dependent variable is the unit-value ratio detailed in 2. All continuous firm level variables are in logs. Robust standard errors clustered at HS-6 level in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9: Unit-value change, by number of flows, same life-cycle

	(1) s=2	(2) s=3	(3) s=4	(4) s=5	(5) s=6	(6) s=7	(7) s=8	(8) s=9	(9) s=10	(10) s=11	(11) s=12	(12) s=13
Time span	-1.074***	-0.374**	-0.876***	-0.554*	-0.368***	-0.366	-0.479**	-0.0867	-0.264*	-0.513**	-0.240***	-0.188
	(0.331)	(0.178)	(0.249)	(0.298)	(0.133)	(0.246)	(0.213)	(0.100)	(0.150)	(0.223)	(0.0926)	(0.117)
No. destinations	-0.0752	-0.113	-0.000995	-0.0713	-0.644	-1.581*	1.310	-0.250	-1.299	-0.483	-0.349	-0.287
	(0.158)	(0.164)	(0.253)	(0.305)	(0.504)	(0.938)	(1.065)	(0.400)	(0.822)	(0.449)	(0.635)	(0.459)
No. products	-0.175	-0.188	-0.521	-0.0836	-0.0669	0.391	-0.639	-0.185	-0.323	0.859	1.264	0.889*
	(0.164)	(0.221)	(0.408)	(0.314)	(0.410)	(0.488)	(0.890)	(0.578)	(0.477)	(0.526)	(0.914)	(0.525)
Experience	0.544**	1.116***	0.455	-0.724	2.766	1.040	5.313*	6.442*	1.322	-9.701*	-4.441	-4.838
	(0.251)	(0.312)	(0.552)	(1.473)	(1.765)	(2.048)	(3.089)	(3.311)	(4.485)	(5.699)	(4.683)	(4.644)
Employment	0.0832	0.0846	0.489***	0.286	0.0937	1.106	0.338	0.196	0.948*	0.421	0.181	0.596
	(0.106)	(0.141)	(0.184)	(0.177)	(0.268)	(0.812)	(0.351)	(0.266)	(0.529)	(0.395)	(0.492)	(0.470)
Irish	0.187	0.126	-0.552	0.349	0.0476	1.234*	-0.105	-0.495	0.276	0.0766	0.746	-0.448
	(0.377)	(0.301)	(0.585)	(0.450)	(0.568)	(0.706)	(0.692)	(0.759)	(0.850)	(0.825)	(0.711)	(0.767)
VA per worker	0.204	0.268*	0.438*	0.501*	0.972	-0.268	0.0892	-0.418	0.695	-0.0818	0.369	-0.345
	(0.144)	(0.155)	(0.251)	(0.283)	(0.755)	(0.679)	(0.647)	(0.644)	(0.655)	(0.795)	(0.346)	(0.436)
Constant	3.600***	0.836	3.109*	2.472	-5.013	1.388	-10.33	-9.446	-2.695	29.66*	11.30	15.65
	(1.323)	(1.133)	(1.715)	(4.220)	(6.725)	(4.099)	(6.774)	(7.116)	(12.66)	(17.57)	(13.19)	(12.15)
Observations	11,947	9,545	7,702	6,287	5,199	4,202	3,594	2,895	2,419	2,190	1,882	1,594
R-squared	0.011	0.012	0.010	0.011	0.011	0.014	0.011	0.019	0.024	0.026	0.018	0.019
Number of groups	2,477	2,211	1,964	1,799	1,560	1,411	1,331	1,151	1,017	930	856	762
Product FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Dependent variable is the unit-value ratio detailed in 2. All continuous firm level variables are in logs. Robust standard errors clustered at HS-6 level in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

5 Channel

In this section we aim to shed light on what explains the larger change in unit-value of returning products, in comparison with continuous products.

The unit-value change can be indicative of at least two strategies pursued by firms when facing a break in exporting:

1. An increase in quality, resulting from an improvement in the features of the products. This could be needed to achieve higher competitiveness with respect to other more successful exporters.

2. An increase in price, necessary to make up for the revenue lost over the break. After sustaining the cost to introduce the product to exporting, a firm with enough market power might adopt a different pricing strategy in the attempt to recover some of the initial investment.

To be completed.

6 Conclusion

To be completed.

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