The role of firm-to-firm relationships in exporter dynamics[*]

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Abstract

This paper investigates the role of firm-to-firm relationships in export market dynamics. First, I provide evidence that exporters grow in a foreign market by accumulating their customer base. Second, I show that the customer base can explain up to 30% of the growth in a destination market. Third, I explore potential mechanisms and find that exporters reduce their prices to expand existing firm-to-firm relationships. Fourth, I study how firm-to-firm relationships adjust in response to changes in market access by exploiting the trade policy uncertainty associated with the renegotiation of the UK-EU trade relationship and the depreciation of Sterling following the Brexit referendum. I find that French exporters with long-lasting relationships in the UK are less affected by the referendum shock and exhibit higher exchange rate pass-through. Overall, my results indicate that the customer base is a crucial margin for export market growth and for evaluating firms' heterogeneous responses to changing market conditions.

Keywords: exporter dynamics; firm-to-firm relationships; prices; Brexit referendum; exchange rate pass-through

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1 Introduction

Almost all economic transactions require both a supplier and a customer for a good or service. The number of customers that a firm serves — the firm's customer base — is important in explaining many economic phenomena. International trade is unique in that the barriers of distance, culture and language make matching the two sides of the relationship even more difficult. The customer base is central to explaining why so many exporters remain small, as exporters find it increasingly costly to reach more customers (Arkolakis, 2010). Firm-to-firm relationships also are important for understanding relative international price movements as exporters build market share (Drozd and Nosal, 2012) and exploit relationship-specific investments (Heise, 2019). The role of the customer base also appears central to understanding how firms respond to different shocks with implications for the international elasticity puzzle (Fitzgerald and Haller, 2018). Despite the growing importance of the customer base in these studies, there is little direct evidence on how firms accumulate customers over their life cycle, nor whether exporters actively adjust their prices in a customer relationship.

This paper uses rich customs data for France to shed light on the role of firm-to-firm relationships in exporter dynamics. I document novel stylised facts for French exporters, showing that firm-to-firm relationships play an important role in exporter dynamics, and this role affects exporters' growth and their responses to shocks.

First, I show the dynamics of firm-to-firm relationships in the life cycle of exporters at a destination, and I decompose the contribution of the customer base in the growth of French exporters in foreign markets. The literature has not yet provided direct evidence for the role of the customer base in exporter dynamics. Arkolakis (2010) develops a theory of marketing costs to explain why there are large numbers of small exporters in each destination market. In each market, firms invest in marketing to reach more customers, but the cost of attracting each additional customer increases with the number of customers reached. Firms, therefore, do not serve the market in its entirety, and it is possible for less productive exporters to enter a market but reach relatively few customers. Fitzgerald et al. (2020) incorporate the

customer accumulation mechanism of Arkolakis (2010) in a dynamic setting to explain how exporters grow. Consistent with these theories, I show empirically that the customer base is an important driver in firm export dynamics. That is, firms accumulate customers as they grow in the early years of an export spell, and they lose customers in the final years of an export market spell. I find that after 8 years, the average French exporter doubles its customer base. I also find that the more customers that an exporter sells to upon initially entering a market makes it more likely that the exporter will survive longer in that market. Finally, I decompose the contribution of the customer base in a firm's total value of exports to a destination market, and I show that the customer base can explain up to 30% of the growth in a destination market. Further, the contribution of the customer base remains constant throughout the life cycle, providing evidence of the importance of continued investment by firms in their customer base.

Second, I investigate French exporters' pricing dynamics in firm-to-firm relationships. I explore the mechanisms through which firms grow in export markets by analysing the evolution of prices in firm-to-firm relationships. I find evidence that French exporters reduce their prices throughout the life cycle of specific customer relationships. After 9 years, the average relationship-specific component of the price declines by more than 2% from the initial price. Such dynamics in relationship-specific prices over the life of a customer relationship shed light on possible firm pricing strategies. If I assume that exporters' marginal costs are constant across customers, I can conclude that the reduction in prices is due to changes in relationship-specific markups. However, I also find that the price reduction tends to be strongest for differentiated or high-quality products. This evidence suggests that the decline in prices may be driven by the customisation of production and related customer-specific improvements in productivity, rather than adjustments in customer-specific mark-ups.

Third, I exploit the Brexit referendum as a quasi-natural experiment to investigate the effect of exchange rate shocks and uncertainty on export value, volumes and prices. I exploit the Brexit referendum in a difference-in-difference strategy to estimate how French firms

adjust before and after the Brexit referendum (first difference) in the UK relative to other EU countries (second difference). Consistent with Fernandes and Winters (2021), I find that, because of the Brexit shock, the growth of export values, quantities and prices declines relative to other EU countries. However, I go one step further by investigating whether the length of a firm-to-firm relationship plays a role in these results. I find that French exporters with long-lasting relationships are less affected by the referendum shock, experiencing lower reductions in export value, quantity and prices. These results are consistent with the view that long-term relationships are more likely to use either implicit or explicit contracts and so they are more resilient to shocks (Monarch and Schmidt-Eisenlohr, 2016; Heise, 2019). Finally, I also find that the exchange rate pass through, caused by the Brexit referendum, is higher when the relationship is longer. This finding confirms the conclusion of Heise (2019) that the length of a firm-to-firm relationship is crucial in evaluating the pass-through of shocks on prices. To conclude, this novel evidence highlights the importance of considering the customer margin in evaluating the impact of shocks on exporters.

1.1 Related literature

Arkolakis (2010) was the first to theorise that exporters reach individual consumers rather than the market in its entirety. Therefore, investing in marketing and advertising allows firms to reach an increasing number of consumers in a country. Fitzgerald et al. (2020) extend the theory of the role of the customer base in a dynamic model, and they use customs data for Ireland to calibrate a model where firms accumulate their customer base to match the evolution of their export revenue in a destination market. I contribute to this literature by showing that French exporters accumulate foreign buyers over their life cycle. This paper sheds light on the dynamics of customer accumulation and the contribution to firm growth in a market. In particular, the finding that customer accumulation makes a significant contribution to exporter dynamics supports the explicit role of the customer base in models of international trade. I also contribute to a recent body of empirical research about how

firms grow large and successful. These studies documents that firms grow by adding new products (Argente et al., 2020) or through the intensive margin by adjusting their prices (Bastos et al., 2018; Piveteau, 2019; Berman et al., 2019; Heise, 2019). Consistent with this literature, I find that firms grow by adding new customers and by reducing their prices in a customer relationship. The latter finding is, however, in contrast with some recent works (Fitzgerald and Priolo, 2018; Fitzgerald et al., 2020) which conclude that firms' growth relies exclusively on non-price mechanisms, such as advertising and marketing.

A recent body of empirical research investigates the role of firm-to-firm relationships in response to shocks. Monarch and Schmidt-Eisenlohr (2016) highlight the importance of long-lasting relationships for US importers and their suppliers abroad, with long-term relationships being more resilient in the 2008-09 financial crisis. Heise (2019) examines how relationships between firms affect the pass-through of shocks. Using U.S. import data, Heise (2019) shows that long-term relationships display a higher responsiveness of prices to cost shocks than new relationships. Specifically, in an importer-exporter relationship, the pass-through of exchange rate shocks into import prices is two thirds higher when the relationship is four years older. Martin et al. (2018) reveal significant heterogeneity in the duration of individual relationships, and they show that macroeconomic uncertainty in destination markets can affect trade patterns by impeding the creation of new business relationships. Consistent with Monarch and Schmidt-Eisenlohr (2016) and Heise (2019), I show that long-lasting relationships are less responsive to cost shocks.

Recent literature has increasingly focussed on firm-to-firm relationships in international trade, which is reviewed by Bernard et al. (2018a). Eaton et al. (2021) use information on Colombian exporters and their US importers to develop a model, where exporters search for importers and learn about relationships, to explain patterns of entry and survival. Bernard et al. (2018b) develop a model with relationship-specific costs and firm heterogeneity to match empirical findings based on Norwegian importer-exporter data. Also using the French customs data, Lenoir et al. (2019) study how search frictions, captured empirically by stocks

of migrants, distort competition by preventing buyers from identifying the most productive sellers. Eaton et al. (2015) develop a model of firm-to-firm trade where buyers connect randomly with sellers. It generates predictions that are consistent with the data for French manufacturers and customers in the European Union. Other papers have focused on the implications of firm-to-firm relationships to switching costs (Monarch, 2018), relationship stickiness (Martin et al., 2018) and the division of the gains from trade (Bernard and Dhingra, 2016). I complement this literature by documenting novel facts on the crucial role of firm-to-firm relationships in explaining exporter dynamics.

This paper is organised as follows. Section 2 describes the data. Section 3 documents the role of firm-to-firm relationships in export market dynamics. Section 4 presents results of the analysis of how exporters adjust to a shock to market access in the context of the Brexit referendum. Section 5 concludes.

2 Data and descriptive statistics

The empirical analysis is conducted using detailed export data covering the universe of French firms.[1] The working data set covers all transactions that involve a French exporter and an importing firm located in the European Union in the 1996-2017 period.[2] The data are based on records of cross-border transactions collected by French customs. Each transaction shows the identifier of the exporting firm, the anonymised version of the VAT identifier of the importer, the date of transaction (month and year), the product category (at the 8-digit level of the combined nomenclature), the country of destination and the value (in Euros) and quantity (in kg) of the shipment for firms above the customs reporting threshold. To define exporters at the firm-CN08 product level, I ensure a consistent concordance across CN08 products over the sample period following Behrens et al. (2020). Because this methodology may cluster a large number of products in the same product category, I follow Fontaine et al.

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[1]For more information on the data see, Bergounhon et al. (2018).

[2]In 2017, exports to the European Union accounted for 60% of French exports.

(2020) by replicating the main results for two five-year periods, 2002–2006 and 2012–2016, which are not affected by major revisions to the combined nomenclature.

Besides implementing the cleaning suggested in Bergounhon et al. (2018), I deal with the cases in which physical trade flow may not be geographically confounded with financial trade flow. For instance, when a French firm ships a good to a plant in Germany of a UK VAT-registered firm, the trade flows are dropped to avoid any confounding factors in the analysis. The number of observations excluded is however, small: 3% of total transactions representing 5% of the total value of exports in 2017. Furthermore, when studying price dynamics, I follow the work of Fontaine et al. (2020) by excluding transactions below 100 euros and removing prices that deviate from the median (in a firm-product-year) by more than 200%.

The main shortcoming of the data is that French firms have a legal obligation to submit a full declaration of their intra-EU exports if their total foreign sales were above 250,000 French Franc in 1996-2000, above 100,000 euro in 2001-2006, above 150,000 euro in 2007-2010 and above 460,000 euro since 2011. Otherwise, they have to submit a simplified declaration, including all the variables listed before, except for the product category. In the analysis, I define an exporter at the firm-CN08 product level. This excludes all exporters not reaching in a year an export value above the reporting threshold. One potential concern is that the exclusion of these below-threshold transactions may create selection bias in the results. I deal with this issue by including below-threshold declarations to make sure that my conclusions are not affected by this selection bias.[3]

In 2017, there were more than 278,000 exporter-products and 500,000 importers, constituting more than 3.2 million exporter-importer-product relationships. Table A1 in the Appendix shows descriptive statistics on the number of French exporters, EU importers and exporter-importer relationships across destination countries.

Exporters selling to multiple customers account for a disproportionate share of export

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[3]Since below-threshold transactions miss the product dimension, for this analysis, I aggregate the data at the firm level.

sales in a destination. At least 50% of French export value was accounted for by exporters serving at least 2 customers in each destination country (Figure 1). Each French exporter sold to 2.2 buyers, on average, in a destination market in 2017. However, the distribution of the number of buyers is highly skewed. More than 70% of French exporters sold to one buyer only and 90% of firms connected with fewer than 3 businesses in a destination, but some firms sell to over 100 businesses in a destination.[4]

Figure 1: Firm-product-market customers distribution
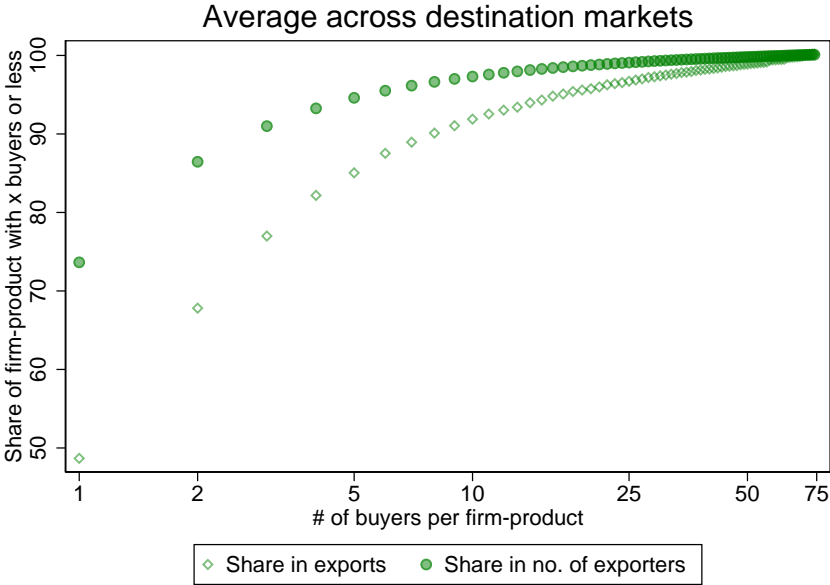
I have shown that French exporters selling to multiple buyers make up around half of French exports. However, there is significant heterogeneity in the average number of customers each exporter serves across markets. French exporters have an average of 6.3 Italian importers but only 1.3 Latvian buyers. Figure 2 shows the share in exports of single-buyer exporters for each European market. Single-buyer exporters account for a small fraction of exports in large and close economies, such as Germany, Belgium, UK, Italy and Spain.

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[4]There is also heterogeneity in the number of customers that French exporters serve in each destination, even in narrowly defined product categories.

Figure 2: Firm-product-market customers distribution
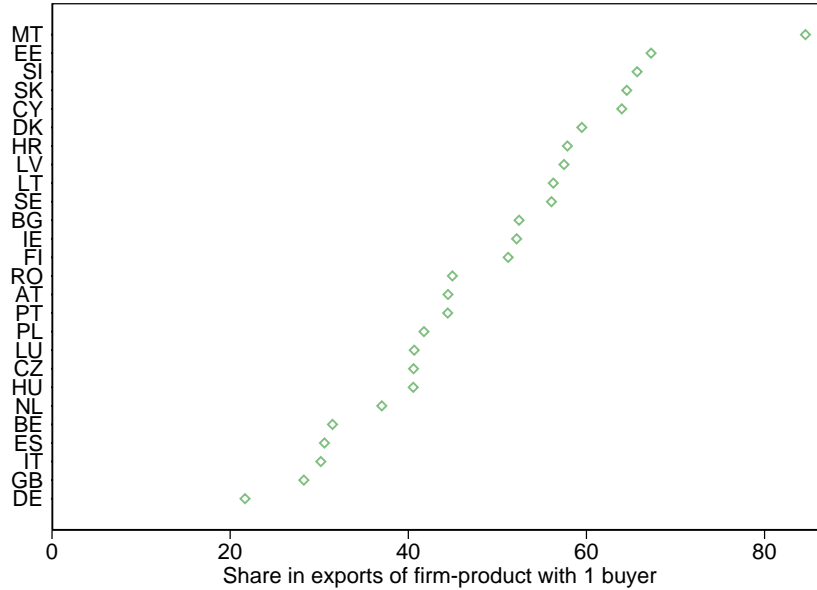
To investigate further the determinants of the distribution of buyers across destination markets, I estimate a gravity model for the years 1996 to 2015.[5] Table 1 summarises the results. Column (1) shows that the number of buyers in a destination market is explained mainly by the size of the bilateral trade relationship between a French exporter and an European country. Market tenure in a destination market also matters in determining the number of buyers, suggesting that French exporters accumulate buyers over time. Columns (2) and (3) show the results, including several gravity variables. The number of buyers is also explained by their geographical proximity to France, with more buyers in closer and larger destination markets and in countries using the euro. In contrast, the number of buyers is significantly smaller in remote markets (as shown by the coefficient of *Distance*). These findings about GDP and geographical distance are consistent with what Bernard et al. (2018b) found for Norwegian exporters. However, wealthier destination markets (measured by their level of GDP per capita) are negatively associated with the number of buyers, suggesting that trade to richer countries is more concentrated in fewer buyers.

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[5]The gravity variables are taken from the CEPII database, and are available until 2015.

Table 1: Gravity model, 1996 - 2015

Dep. Var. (log)	(1) # buyers	(2) # buyers	(3) # buyers
Export (log)	0.170***	0.170***	0.171***
	(0.000475)	(0.000475)	(0.000476)
Market tenure	0.0294***	0.0292***	0.0299***
	(0.000313)	(0.000309)	(0.000300)
GDP (log)		0.428***	0.0931***
		(0.0118)	(0.000673)
GDP per capita (log)		-0.370***	-0.124***
		(0.0130)	(0.00129)
Distance (log)			-0.0465***
			(0.00206)
Contiguity			0.0762***
			(0.00164)
Common language			0.191***
			(0.00241)
Common currency			0.0823***
			(0.00126)
Observations	15,313,488	15,313,488	15,313,488
R-squared	0.570	0.570	0.568
FE	fpt-dt	fpt-d	fpt

Notes: The dependent variable is the log number of buyers in a destination market in a year. $Export(log)$ is firm-product's export value to a destination; $Market\,tenure$ is the number of years that a firm-product has been continuously exporting to a destination; $Distance\,(log)$ is the log of the weighted distance between France and the destination market; $GDP\,(log)$ is the log of the destination's GDP; $GDP\,per\,capita\,(log)$ is the log GDP per capita in the destination market. Column (1) includes firm-product-year and market-year fixed effects; column (2) includes firm-product-year and market fixed effects; column (3) includes firm-product-year fixed effects. The Stata command used is *reghdfe*. Robust standard errors are in parentheses. The p-values read as follows: *** p < 0.01, ** p < 0.05, * p < 0.1.

3 Role of the customer base in export market growth

In this section, I exploit the unique information on the identity of customers in the French export data to decompose the role of accumulating a customer base for the growth of firm exports. Then I explore potential mechanisms in the dynamics of firm-to-firm relationships.

3.1 Customer accumulation in export markets

The empirical strategy is based on Fitzgerald et al. (2020).[6] In particular, I study the relationship between firm-product tenure in a market and the number of buyers by estimating the following specification:

$$log(Y_{ipdt}) = \beta'(Tenure_{ipdt} \otimes Spell\ Length_{ipdt}) + \gamma Cens_{ipdt} + \eta_{ipt} + \delta_{pdt} + \varepsilon_{idt}, \quad (1)$$

where Y_{ipdt} is exporter i-product p's number of buyers in the destination market d in time period t. $Tenure_{ipdt}$ is a vector of dummy variables for seller i-product p's tenure in destination market d, $Spell\ Length_{ipdt}$ is the spell length of seller i-product p to destination country d, $\otimes$ denotes the Kronecker product of these two terms. $Cens_{ipdt}$ is a dummy variable to account for censored observations.[7]

This specification allows to control for supply-side factors that affect a firm's performance in any given time period using firm-product-year fixed effects η_{ipt}, and to control for common demand shocks across French exporters using product-destination-time fixed effects δ_{pdt}.[8] Moreover, I separately identify the dynamic life cycle contribution of market tenure from selection effects in different spell lengths.[9] I address issues of selection by separating dynamics over the market tenure of an exporter from the performance of firms with different spell lengths. As a result, the vector β includes the coefficients of interest, which capture the effects of selection in the base values of each spell length, and the life cycle dynamics in the

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[6]This approach was introduced by Fitzgerald et al. (2020) to study Irish exporters' growth trajectories in a destination market. I build on this method to look at customer accumulation in a market and also growth trajectories in each exporter-importer relationship.

[7]A detailed explanation of how these variables are constructed is available in Section C in the Appendix.

[8]The empirical strategy is identified by French exporters selling to multiple countries. As a result, exporters selling to only one country are removed from the analysis. These exporters represent a minority; French exporters selling to multiple countries accounted for 95% of export value in 2017.

[9]If I do not condition on the spell length of an exporter, I might incorrectly capture dynamics over the time an exporter operates in a market. For example, exporters might be more likely to exit from markets where there is a low demand. Then by pooling across all export episodes, I observe that the number of buyers would increase over the duration in a market, even if there are no dynamics in each export episode. Separately estimating the dynamics of each export episode by its spell length allows to identify the effects of selection, as well as different dynamics across export episodes of different spell lengths.

evolution of each outcome for each spell length.

The results presented in Figure 3 show evidence of both selection effects across different spell lengths and life cycle dynamics. In particular, I find two new results on the dynamics of the customer base in export markets: (i) there is a pattern of selection where firms that serve a market for a longer duration have more customers when they first enter the market; (ii) across all spell lengths, French exporters exhibit a life cycle pattern, accumulating customers at the start and losing customers towards the end of an export spell. The first finding highlights that the customer base plays a key role in stabilising a firm activity in an export market. The literature has largely documented that firms are likely to exit destination markets in their first years of activity (Monarch, 2018; Eaton et al., 2021). I complement this evidence by showing that French exporters are less likely to exit markets where they enter with a larger number of buyers. Moreover, recent studies of how exporters grow in foreign markets show that exporters grow in size by increasing their quantities. My second finding extends this research, showing that the accumulation of customers is another channel through which exporters can grow in a foreign market.

Figure 3: Firm-product-market customer accumulation by spell length and tenure
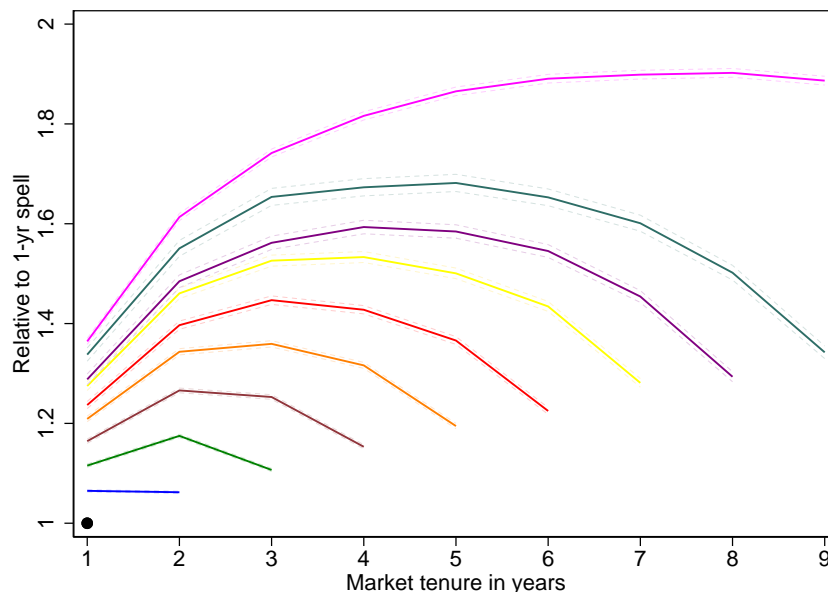
Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted. For each trajectory, the omitted category is that of spells of exactly one year, where the dependent variable of these 1-year spells is normalised to 1 and all other coefficients are relative to the 1-year spell.

3.1.1 Robustness

The key result from equation 1 is robust to alternative specifications and various cuts of the data.[10] I run four main sets of robustness checks.

First, I estimate different specifications. I vary the level at which spell lengths and market tenure are top-coded and the key stylised facts stay consistent. Figures B1 to B3 show the baseline results with market tenure and spell length top-coded at 8, 12 and 14 years. One potential concern about the baseline specification is that there may be some dimension of idiosyncratic demand that is observable to firms, but not to researchers, and firms may choose to enter markets that are more attractive along this dimension earlier than less attractive markets. In Figure B4, I augment the baseline specification with firm-product-cohort fixed effects. I find that the growth in the number of buyers is flatter than

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[10]See Section B in the Appendix for the results. Results are presented graphically for brevity. However, full regression output tables are available upon request.

the baseline results for the first two years. Otherwise, the findings are both qualitatively and quantitatively unchanged. In Figure B5, I also control for the value of a firm export in a destination market in order to condition the trajectories for the size of the firm. The results are qualitatively unchanged, although the magnitude of the coefficients is roughly halved.

Second, the literature on exporter dynamics suggests that these results may be driven by firms' learning about demand in a destination market. In this case, exporters re-entering an export market may differ from first-time exporters, having previously learnt about that market demand. Accordingly to this prediction, I define market tenure as the number of non-consecutive years a firm has been selling to a destination market. This measure avoids re-setting to zero the counter every time the firm exits the market, and it accounts for the role of learning in explaining exporter dynamics. Figure B6 confirms the life cycle pattern in the accumulation of buyers by market tenure and spell length, using this alternative definition of market tenure. However, while the growth in the number of buyers is lower, the life cycle pattern is more marked with this definition of market tenure. Moreover, I allow trajectories to differ between 'first timers', firms entering a market for the first time, and 're-enters', firms already exporting at least one product to that market (Figures B7 and B8). First timers have higher growth rates than re-entering firms in the first years. However, with more market tenure, the rates of first timers decline faster than for re-enters. Finally, I allow trajectories to differ between the first time a firm-product enters a market and the case when the firm-product re-enters that market (Figures B9 and B10). The key results are qualitatively replicated, while the main difference is that the growth in the number of buyers is slightly steeper for first timers than for re-entering firm-products.

Third, these findings may be heterogeneous across different types of firms. First, I esti-mate the life cycle trajectories across firm sizes (measured by total value of exports). Figures B11 and B12 show that the key finding is qualitatively unchanged. The main difference is that the life cycle pattern in buyer accumulation is more pronounced for small and medium exporters (below the 75th percentile of the distribution of export values) and less for big ex-

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porters (above the 75th percentile). In particular, the comparison of the top trajectories (i.e. 10+ spell lengths) indicates that only big exporters are capable to continuously accumulate buyers over time. The trajectory for small and medium exporters becomes flat after 6 years. This suggests that acquiring new buyers is costly and firms must be able to invest to grow. Second, when I look at firms serving up to 4 destination markets, the main conclusions are unchanged. The results are reported in Figures B13 and B14.

Fourth, I deal with several shortcomings in the data that may affect the findings. As a first check, to deal with the fact that I observe firms exporting above the reporting thresholds (see discussion in Section 2), I replicate the key stylised facts using the whole universe of French exporters, including below-threshold transactions. The results reported in Figure B15 are qualitatively unchanged, and they are consistent with the main conclusions, downplaying the role of selection bias in affecting my results. Another issue in the data is that, because of EU enlargement, the number of export markets changed during the time considered in the analysis. As a result, the data include 14 countries in 1996, then 10 countries are added in 2004, 2 more (Bulgaria and Romania) in 2007 and Croatia in 2013. To deal with the heterogeneity in the set of destination markets, which could bias the results, I replicate the key findings only for the EU funder countries. The results are presented in Figure B16. It shows that the main conclusions are unchanged. I also control for partial-year effects. The fact that firms may enter or exit markets in different months of a calendar year may affect the observed relationship between the number of buyers and tenure (Bernard et al., 2017). This should be especially problematic in the analysis since I look at changes with respect to the first year of activity. If a firm enters a destination market in December, its exports will be significantly lower than a twin firm that started exporting in January. I correct for this issue by excluding the first year of activity in an export market for each firm-product. The results shown in Figure B17 are qualitatively unchanged, even though, as expected, they show a smaller growth in buyers in the second year of activity. As a final check, to deal with the clustering of products in the same product category because of product concordance, I

run the baseline specification on two sub-periods, 2002–2006 and 2012–2016, which are not affected by major revisions of the combined nomenclature. The results presented in Table A2 confirm the main conclusion that French exporters accumulate customers with tenure in a destination market.

3.2 Decomposition of the role of the customer base in exporter dynamics

The results presented above show that exporters accumulate buyers in a destination market over their life cycle. However, how much does the buyer margin account for in the firm's growth in a destination market? I decompose the value of exports into the number of buyers and the average value per buyer, with results presented in Table 2.[11] These results are obtained by taking the ratio of the beta coefficient associated with the number of buyers and the beta associated with the value of exports (estimating equation 1). The results show that the customer base accounts for an increasing proportion of the higher export value in longer spell lengths, contributing around 18% for the higher value of 2-year spells and 28% of the higher value of the longest spells. The contribution of the customer base to the trajectory of the value of exports over the life cycle also is constant with tenure in the market across all spell lengths. The fact that the contribution of the customer base remains constant throughout the life cycle suggests the possibility that firms must continuously invest in their customer base. While Bernard et al. (2018b) and Carballo et al. (2018) show that the buyer margin explains a large fraction of the cross-sectional variation in export to a destination market, I also find that the customer base is a crucial and increasing factor in firms' export growth.

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[11] $Value_{idt} = number\,of\,customers * avg\,value\,per\,customer$

Table 2: Contribution of the customer base to export values

Spell length	2	3	4	5	6	7	8	9	10
Market tenure									
1	0.18	0.20	0.23	0.25	0.25	0.27	0.26	0.27	0.27
2	0.18	0.19	0.22	0.23	0.24	0.25	0.25	0.26	0.26
3		0.21	0.22	0.23	0.24	0.26	0.25	0.26	0.26
4			0.23	0.23	0.24	0.26	0.26	0.26	0.27
5				0.25	0.23	0.25	0.26	0.27	0.27
6					0.26	0.26	0.26	0.27	0.27
7						0.28	0.26	0.26	0.27
8							0.27	0.26	0.27
9								0.29	0.28
10									0.28

3.3 Price dynamics in firm-to-firm relationships

I now turn the attention to investigate the evolution of prices with each customer over the tenure of the relationship. This analysis provides information on the dynamics of pricing in a customer relationship. It shows how the mechanisms for exporter growth operate. I estimate the regression specification:

$$log(Price_{ipjt}) = \beta' Relationship\ Length_{ipjt} + \gamma Cens_{ipjt} + \eta_{ipdt} + \delta_{pjt} + \varepsilon_{ijdt}, \qquad (2)$$

where $Price_{ipjt}$ is exporter i-product p's price charged to customer j in time period t. $Relationship\ Length_{ipjt}$ is a vector of dummy variables for seller i- product p's tenure (in years) with customer j. $Cens_{ipjt}$ is a dummy variable accounting for censored observations. The vector β is the set of coefficients of interest, capturing the evolution of prices over the tenure with a customer. Moreover, I control for supply-side factors that affect a firm's performance in any given time period within a destination using exporter-product-destination-year fixed effects η_{ipdt}. As a result, the coefficients of interest are identified by French exporters selling to multiple buyers within a destination country. I also control for customer specific factors (common to all French exporters) using product-customer-year fixed effects δ_{pjt}. To

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identify the tenure in exporter-product-buyer relationships, I use the approach as detailed in Section C. Table C2 in the Appendix presents summary statistics across censoring types (uncensored, left-censored, right-censored and left-right censored). It is interesting to note that uncensored relationships represent roughly 75% of the sample, accounting for 45% of exports. I also find that shorter relationships (uncensored relationships) trade less and set higher prices compared to long-lasting relationships (left-right censored relationships). These findings are in line with Heise (2019) who uses firm-to-firm import data for the United States.

Figure 4 presents the results of estimating equation 2. I find that relationship-specific prices exhibit significant dynamics over tenure in a customer relationship. After 9 years, the average relationship-specific component of the price decreases by more than 2% from the initial price. The evidence that there are dynamics in relationship-specific prices over the duration of a customer relationship sheds light on possible firm pricing strategies. If I assume that relative marginal cost is constant in a relationship (as done in recent works), I can conclude that the reduction in prices is due to changes in relationship-specific markups.

This finding is in line with some recent work. I complement the work of Heise (2019) who finds that US importers' prices decline by roughly 3% after 5 years of activity (using monthly data). Moreover, using customs data at the destination level for France and Portugal, Berman et al. (2019) and Bastos et al. (2018) find (using different econometric techniques) a decreasing relationship between prices and tenure in an export market. In particular, Berman et al. (2019) establish that (on average) a product price is 7% lower than the initial price after 7 years in the market. Using data on consumer food sales from Nielsen, Argente et al. (2020) also find that prices decline 2% a year on average, with the price being almost 8% lower than the price at entry by the end of the fourth year of activity. Instead, this finding is in contrast with Fitzgerald et al. (2020) who, using customs data for Ireland, find no dynamics for prices over the tenure in a destination market.

Figure 4: Firm-product-buyer price by relationship length
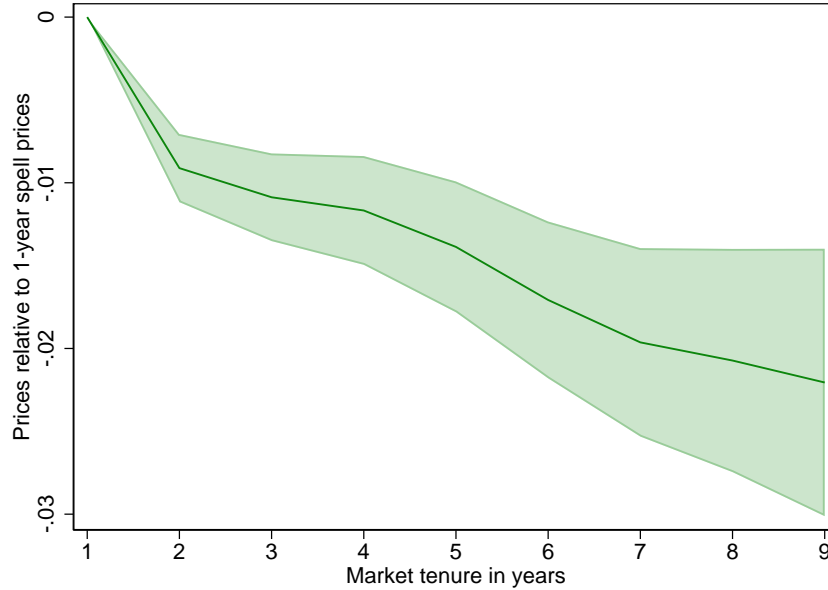
3.3.1 Robustness

The key result from Figure 4 is robust to alternative specifications and various cuts of the data. The results of these analyses are reported in Table A3 in the Appendix.

First, I test that my conclusions are robust to alternative specifications. As shown in Table D3 in the Appendix, prices decline even when controlling for selection of spell length. For instance, products sold for 9 years to the same buyer experience a total decrease in price of 4% compared to the price set the initial year.[12] The use of product-customer-year fixed effects is, however, highly demanding, forcing a large number of observations to drop out of the analysis. In column (2), I replicate the baseline specification using product-market-year fixed effects to control for demand factors common across all French exporters. The magnitude of the coefficients is lower, partly confirming the key finding. The coefficients show an initial decrease in prices until year 3 of a relationship, then there are no dynamics

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[12]The results for revenues and quantities are presented in the same section. Consistent with Fitzgerald et al. (2020), I find that both revenues and quantities show a life-cycle trajectory with tenure in a customer relationship, increasing in the initial years and decreasing before exiting the relationship.

in years 4 and 5, and prices increase in the last years. In column (3), I control that the results are not driven by the presence of censored observations by dropping them from the analysis. The results are unchanged. Finally, as discussed in Section 2, over a long time period, the product concordance groups together an increasing number of product categories, potentially undermining the precision of the unit values. I thus look at the dynamics of prices in the 2002-2006 and 2012-2016 periods. As shown in column (7) and (8), the results remains consistent in the 2002-2006 period, but that is not the case in the 2012-2016 period, where there are no price dynamics.

Moreover, I verify that the results hold across different types of products. First, I use Rauch (1999)'s product classification to distinguish between differentiated and homogeneous goods based on whether the goods are traded on organised exchanges (possessing a reference price) or not. As shown in column (4), I find that price declines tend to be strongest for differentiated products. This finding provides suggestive evidence that the price reduction may be driven by the customisation of production and related customer specific productivity improvements. Second, while I are not able to adjust prices to account for quality, I build on the approach of Khandelwal et al. (2013) and Martin and Mejean (2014) to estimate quality for each good sold by a firm in a relationship. I then aggregate these estimates at the destination market level and those relationships with quality above (below) the median quality value (calculated at the year-product-country level) are considered as high (low) quality. Since the quality estimates are defined in deviation with respect to the mean quality of exports, for each year, across French firms serving the same destination market, I identify the quality of a relationship throughout its spell at the year of entry in the destination market.[13] The results in column (5) and (6) confirm the conjecture that in customised relationships prices decline as a result of productivity improvements.

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[13]I thus assume that each relationship's relative position in the distribution of qualities is constant over time.

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4 Firm-to-firm relationships in response to shocks

In this section, I explore how French exporters adjust their firm-to-firm relationships in response to shocks that affect their access to export markets. I exploit the natural experiment of the 2016 Brexit referendum to test how firms adjust their patterns of trade to the UK in response to an unexpected increase in trade policy uncertainty and a concurrent depreciation of Sterling, both reducing competitiveness and market access for French exporters.

4.1 Predicted response of French exporters to the Brexit referendum

The UK's decision to leave the European Union, based on the Brexit referendum on 23rd June 2016, meant that the UK entered into a renegotiation period to determine the new trading relationship with the EU. This ended in January 2020. The renegotiation of a trade agreement introduces the uncertainty that future tariff rates or barriers could increase. This was the case for the trading environment between the UK and all the EU trading partners. It became possible that the trading relationship could include tariff barriers (if, for example, no free trade agreement was agreed between the UK and EU), as well as non-tariff barriers such as changes in regulations and increased delays from customs procedures. [14] The Brexit referendum also initiated a significant depreciation of Sterling, which made French exports less competitive in the UK market.[15] The combination of trade policy uncertainty and

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[14]Immediately following the referendum, the UK government announced that it intended to leave the EU Customs Union and renegotiate a new trade agreement with the EU. The outside option, or threat point, was that tariffs for UK exporters to the EU were clearly defined by the EU's WTO commitments. If negotiations were to break down and the UK were to leave with no trade agreement in place, the UK would revert to trading with the EU as a WTO member. However, the threat point tariffs for EU (including French) exporters to the UK in such a scenario were less clearly defined. The UK would have the option of creating its own WTO tariff commitments as a member of the WTO. Indeed, in March 2019, the UK published its 'No Deal' tariff schedule, which departed significantly from the EU's applied most favoured nations tariffs.

[15]Sterling fell by 10% against the euro on 24th June 2016 when the result of the Brexit referendum was announced. This will have affected French exporters by increasing UK inflation and making French exports less competitive in the UK market (either by mechanically increasing the Sterling cost of Euro-denominated exports or lowering the Euro value of Sterling-denominated exports).

currency movements equated to a loss of competitiveness and reduction in market access for French exporters to the UK. In the next section, I explore how they respond to these shocks.

4.2 Intensive margin

The result of the Brexit referendum on the 23rd June 2016 was unexpected by forecasters and the markets. Betting markets predicted only a 30% chance of a leave vote over the year running up to the referendum, a probability which had dropped to just 12% on the day of the referendum itself. I exploit this unexpected change in market access for French exporters in a difference-in-difference strategy to investigate how French firms adjust their firm-to-firm relationships in response to changing demand conditions. I estimate the impact of this reduction in access to the UK market before and after the referendum result (first difference) and relative to other EU markets (second difference). I define an indicator for the Brexit referendum $Brexit_{dt}$ that takes a value of 1 for French exporters who sell to the UK in the period after the Brexit Referendum (June 2016), and a value of zero for all other destinations and time periods. This analysis is based on the monthly export data to measure the pre- and post- referendum periods correctly. I build on the empirical strategy of Fernandes and Winters (2021) and estimate the following specification:

$$\Delta lnY_{ipbt} = \beta_1 Brexit_{dt} + \gamma\pi_{dt} + \delta\Delta lnRGDP_{dt} + \delta_{ipd} + \alpha_t + \varepsilon_{ipbt} \tag{3}$$

where ΔlnY_{ipbt} is defined as the year-over-year growth (log difference from the same month in the previous year) in export value, quantity and price for firm i-product p with buyer b in destination market d at time t. I also include a full set of time (α_t) and firm-product-destinations δ_{ipd} fixed effects. The former set of fixed effects controls for the general economic conditions facing French exporters in a particular month, while the latter absorbs any time-invariant unobservable characteristics specific to a firm, product and destination. $\Delta lnRGDP_{dt}$ is the log difference in quarterly real GDP of the importer, from the same quarter in the previous

year. π_{dt} is the year-over-year monthly inflation of the destination country, using the consumer price index. Standard errors are clustered by country to account for correlation of observations in a country.

Table 3 reports the results from estimating equation 3. I find that the coefficient for the interaction term of interest is negative and statistically significant for export value, quantity and price. This suggests that, because of the Brexit shock, export values, quantity and price growth rates fell, relative to other countries, in an exporter-product-importer relationship. These estimates are in line with the results of Fernandes and Winters (2021). Using customs data for Portugal, Fernandes and Winters (2021) show that the exchange rate shock associated with Brexit led to a reduction in export price to the UK. This analysis complements and confirms their work by looking at the effect of Brexit on exporter-importer dynamics. The export value and quantity response estimate in columns (1) and (2) implies a 4.7% and 1.2% reduction in export and quantity growth after the shock, relative to other markets. Finally, the coefficient in column (3) indicates a 3.5% decrease in prices.[16]

The same conclusions hold in columns (4) to (6), which control for exporter-product-importer and time fixed effects, thus identifying the effect of variation over time in exporter-importer relationships.

Table 3: Intensive margin responses to Brexit

VARIABLES	(1) $\Delta \ln(\exp)$	(2) $\Delta \ln(\text{quantity})$	(3) $\Delta \ln(\text{price})$	(4) $\Delta \ln(\exp)$	(5) $\Delta \ln(\text{quantity})$	(6) $\Delta \ln(\text{price})$
Brexit	-0.0473***	-0.0122**	-0.0350***	-0.0481***	-0.0133**	-0.0349***
	(0.00680)	(0.00582)	(0.00129)	(0.00686)	(0.00584)	(0.00128)
Observations	9,620,724	9,617,463	9,617,463	9,620,128	9,616,685	9,616,685
R-squared	0.058	0.061	0.051	0.089	0.090	0.079
Controls	YES	YES	YES	YES	YES	YES
FE	fpd-t	fpd-t	fpd-t	fpb-t	fpb-t	fpb-t

Notes: Observations are by firm-product-buyer-month. Foreign country inflation, using the consumer price index, and real GDP growth rates are always included. Stata command used is *reghdfe*. Robust standard errors, clustered by country, are reported in parentheses. The p-values read as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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[16]This result is in line with Fernandes and Winters (2021) who find a coefficient of 0.25 when estimating the same specification for Portuguese exporters.

4.3 The role of the length of a relationship

In the previous section, I showed that, following the referendum shock, on average, French firms reduced export volume and export price growth to the UK market. However, that does not imply that all exporters adjust their prices. Some firms may have more pricing power, so in this section I test whether that pricing power is related to the length of their relationships with UK importers. As shown by Heise (2019), long-term relationships are more likely to use either implicit or explicit contracts, so they might exhibit higher pass-through of shocks. To test for this hypothesis, I estimate the following specification:

$$\Delta ln Y_{ipbt} = \beta_1 (Brexit_{ct}) + \beta_2 Relationship\,Length_{ipbt} + \beta_3 (Brexit_{ct} \times Relationship\,Length_{ipbt})$$
$$+ \gamma \pi_{dt} + \delta \Delta ln RGDP_{dt} + \alpha_{ipd} + \alpha_t + \varepsilon_{ipbt} \tag{4}$$

I augmented the previous specification with an interaction term between the dummy to indicate the Brexit shock and the length of the relationship (measured in years) between an exporter i and importer b for a product p. The results from estimating equation 4 are presented in Table 4. I obtain a positive coefficient on the $Brexit_{ct} \times Relationship\,Length_{ipbt}$ interaction for all the dependent variables (significant at the 1% level). This confirms that export value, quantity and price growth to the UK were higher for longer relationships. This implies that long-lasting relationships are less responsive to negative shocks and that the exchange rate pass-through is higher when the relationship is longer. This novel evidence highlights the importance of considering the customer margin in evaluating the impact of shocks on exporters. It also confirms the findings of Heise (2019) that the length of a firm-to-firm relationship is crucial for evaluating the effect of shocks on the pass-through of prices.

Table 4: Heterogeneous responses across relationship length

VARIABLES	(1) $\Delta \ln(\text{exp})$	(2) $\Delta \ln(\text{quantity})$	(3) $\Delta \ln(\text{price})$
Relationship Length	-0.0220***	-0.0211***	-0.000902
	(0.00286)	(0.00262)	(0.000551)
Brexit	-0.137***	-0.0639***	-0.0733***
	(0.0112)	(0.0115)	(0.00358)
Brexit x Relationship Length	0.0155***	0.00890***	0.00662***
	(0.00212)	(0.00202)	(0.000578)
Observations	9,620,724	9,617,463	9,617,463
R-squared	0.058	0.061	0.051
FE	fpd-t	fpd-t	fpd-t

Notes: Observations are by firm-product-buyer-month. Foreign country inflation, using the consumer price index, and real GDP growth rates are always included. Stata command used is *reghdfe*. Robust standard errors, clustered by country, are reported in parentheses. The p-values read as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.3.1 Robustness

I now assess the robustness of the findings. The results of these analyses are shown in Section E.

I start by analysing the sensitivity of the results using different control groups. In Table E1, I estimate the same specifications as those reported in Table 3, but in columns (1) to (3), the sample is restricted to non-Eurozone countries. This compares exports to the UK market with exports to other non-Eurozone countries. In columns (4) to (6), the sample is Eurozone countries. The coefficients of the interaction term remain positive and statistically significant at the 1% level, and they are of similar magnitude. In Table E2, I restrict the sample to include only Belgium, Germany, Italy, Spain and the UK (as done in Martin et al. (2019)) to compare the changes in firm-to-firm relationships in the UK with EU countries with similar trade patterns and levels of economic development. The conclusions hold for this sub-set of countries.

Finally, I verify that the findings hold for an alternative measure of the strength of a relationship. Following Heise (2019), I use the cumulated number of transactions in an

importer-exporter relationship as a measure of the intensity of that relationship. As for relationship length, the higher the number of transactions, the more likely that the relationship presents either an implicit or an explicit contract. Table E3 confirms my conclusions.

5 Conclusions

This paper provides novel evidence for the importance of firm-to-firm relationships in evaluating exporter dynamics in foreign markets. In particular, I make three empirical contributions: (i) I show that the customer base plays a prominent role in export market growth, accounting for up to 30% of the growth in export value; (ii) I find evidence of prices falling in a firm-to-firm relationship over time, suggesting that firms engage in price dynamics in order to grow in a foreign market; (iii) I find that long-lasting relationships reduce the responsiveness of exporters to cost shocks and increase exchange rate pass-through.

First, I provide direct evidence that firms accumulate customers over their tenure in a destination market. The more customers that an exporter sells to upon initially entering a market makes it more likely that the exporter will survive for more years in that market. Firms also accumulate customers over their tenure in a destination market, and firms double their customer base by their eighth year in a market. This increase in customer base accounts for 30% of the growth in export value, with the remainder driven by firms increasing the average size of each relationship.

Second, I also find that prices decline over time in firm-to-firm relationships. After 9 years, the average relationship-specific component of a price decreases by more than 2% from the initial price. These pricing dynamics suggest that firms might grow market share through price activities, either by adjusting their customer-specific mark-ups or by increasing their productivity (and so reducing their customer-specific marginal costs). I also find evidence that suggests that the decline in prices may be driven by the customisation of production and related improvements in customer-specific productivity, rather than adjustments

in customer-specific mark-ups. These facts, namely that exporters grow by accumulating customers and reduce their prices in relationships, should be taken into account when modelling market penetration and export market growth.

Third, firm-to-firm relationships play a crucial role not only in explaining exporter growth in a market but also in informing how exporters respond to shocks to market access. In the context of Brexit, which represented an adverse (potential) shock to market access, I complement the literature by showing that French exporters have not only been growing less in the UK relative to other EU markets, but also that French exporters reduce their prices to balance the depreciation of the Sterling in the aftermath of the Brexit referendum. I also provide evidence consistent with Monarch and Schmidt-Eisenlohr (2016) and Heise (2019) by showing that long-lasting relationships are less responsive to the Brexit shock. The length of a relationship is thus a crucial margin of adjustment that should be taken into consideration when evaluating firms' responses to cost shocks.

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6 Appendix

A Additional tables

Table A1: French exporters and EU importers, 2017

| | Number of | | |
	Exporters-Product	Importers	Triplet
All	333,487	582,552	4,448,717
AT	35,709	16,580	109,926
BE	160,275	75,748	807,969
BG	16,958	3,943	25,255
CY	11,106	1,558	14,191
CZ	37,489	9,216	69,352
DE	128,753	118,641	726,766
DK	30,893	9,068	71,891
EE	11,944	2,168	17,511
ES	119,893	70,577	570,055
FI	21,913	6,202	46,397
GB	91,916	47,432	331,894
HR	11,617	2,582	16,696
HU	25,099	6,140	41,828
IE	22,169	5,971	44,524
IT	109,731	91,477	697,524
LT	13,470	2,832	19,529
LU	57,448	7,596	116,921
LV	10,812	2,029	14,844
MT	9,296	1,215	11,770
NL	73,271	37,008	245,203
PL	51,652	18,240	109,574
PT	55,970	20,088	154,472
RO	32,113	7,632	53,676
SE	34,771	11,560	80,684
SI	15,295	3,291	24,170
SK	16,429	3,758	26,095

Table A2: Dynamics of number of buyers: sub-periods

VARIABLES	(1) 2002-2006	(2) 2012-2016
Market tenure = 2	0.1000***	0.0447***
	(0.00255)	(0.00207)
Market tenure = 3	0.164***	0.0651***
	(0.00391)	(0.00322)
Market tenure = 4	0.213***	0.0749***
	(0.00637)	(0.00492)
Market tenure = 5	0.238***	0.0500***
	(0.0111)	(0.00873)
Cens	0.399***	0.303***
	(0.00201)	(0.00148)
Observations	3,190,066	4,896,136
R-squared	0.588	0.575

Notes: Observations are by firm-product-market-year. All specifications include firm-product-year and product-market-year fixed effects. Omitted category is spells that last one year. Stata command used is *reghdfe*. Robust standard errors are reported in parentheses. The p-values read as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Price dynamics in firm-to-firm relationships

VARIABLES	(1) Baseline	(2) fpdt-pdt FEs	(3) No Censored	(4) Differ	(5) Homogen	(6) High quality	(7) Low quality	(8) 2002-2006	(9) 2012-2016
Relationship Length = 2	-0.00912***	-0.00351***	-0.00958***	-0.00999***	-0.00492**	-0.0337***	0.0205***	-0.0122***	0.000358
	(0.00105)	(0.000231)	(0.00111)	(0.00116)	(0.00224)	(0.00201)	(0.00177)	(0.00273)	(0.00260)
Relationship Length = 3	-0.0109***	-0.00284***	-0.0121***	-0.0121***	-0.00515*	-0.0323***	0.0275***	-0.0197***	0.00123
	(0.00135)	(0.000304)	(0.00143)	(0.00151)	(0.00278)	(0.00247)	(0.00237)	(0.00431)	(0.00424)
Relationship Length = 4	-0.0117***	-0.00227***	-0.0130***	-0.0128***	-0.00833**	-0.0314***	0.0275***	-0.0179**	0.00770
	(0.00167)	(0.000383)	(0.00177)	(0.00188)	(0.00335)	(0.00298)	(0.00305)	(0.00847)	(0.00737)
Relationship Length = 5	-0.0139***	-0.000460	-0.0156***	-0.0155***	-0.00901**	-0.0308***	0.0300***	-0.0181	-0.00521
	(0.00202)	(0.000466)	(0.00212)	(0.00228)	(0.00390)	(0.00350)	(0.00380)	(0.0176)	(0.0168)
Relationship Length = 6	-0.0171***	0.000601	-0.0190***	-0.0187***	-0.0104**	-0.0376***	0.0332***		
	(0.00242)	(0.000560)	(0.00254)	(0.00276)	(0.00456)	(0.00410)	(0.00472)		
Relationship Length = 7	-0.0196***	0.00160**	-0.0222***	-0.0227***	-0.00837	-0.0423***	0.0451***		
	(0.00290)	(0.000666)	(0.00304)	(0.00334)	(0.00531)	(0.00487)	(0.00582)		
Relationship Length = 8	-0.0207***	0.00209***	-0.0233***	-0.0242***	-0.0141**	-0.0417***	0.0472***		
	(0.00344)	(0.000771)	(0.00359)	(0.00400)	(0.00607)	(0.00576)	(0.00695)		
Relationship Length = 9	-0.0221***	0.00404***	-0.0256***	-0.0275***	-0.0126*	-0.0425***	0.0519***		
	(0.00412)	(0.000890)	(0.00433)	(0.00482)	(0.00725)	(0.00683)	(0.00844)		
Relationship Length = 10	-0.0352***	0.00602***	-0.0399***	-0.0433***	-0.0265***	-0.0433***	0.0753***		
	(0.00334)	(0.000674)	(0.00362)	(0.00413)	(0.00498)	(0.00539)	(0.00728)		
Cens	-0.0354***	-0.00563***		-0.0349***	-0.0338***	-0.0696***	0.00811***	-0.00850***	0.00856***
	(0.00150)	(0.000400)		(0.00185)	(0.00231)	(0.00252)	(0.00281)	(0.00235)	(0.00223)
Observations	7,338,672	35,943,112	6,013,567	6,103,613	1,178,664	3,102,789	1,531,912	1,403,732	1,368,583
R-squared	0.955	0.947	0.953	0.936	0.959	0.947	0.974	0.971	0.978
FE	fpdt-pbt	fpdt-pdt	fpdt-pbt	fpdt-pbt	fpdt-pbt	fpdt-pbt	fpdt-pbt	fpdt-pbt	fpdt-pbt

Notes: Observations are by firm-product-buyer-year. All specifications include firm-product-market-year and product-buyer-year fixed effects. Omitted category is relationship length that last one year. Stata command used is *reghdfe*. Robust standard errors are reported in parentheses. The p-values read as follows: *** p < 0.01, ** p < 0.05, * p < 0.1.
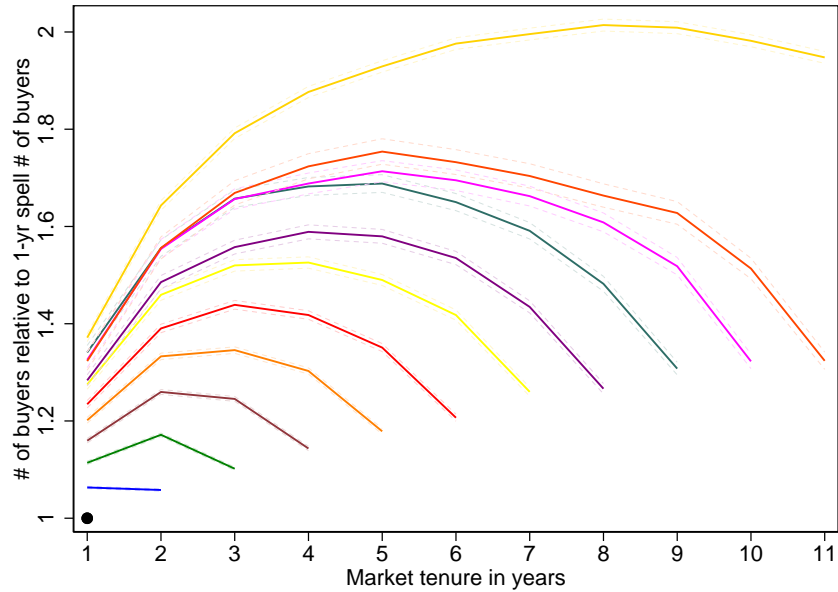
B Robustness - Customers accumulation

Figure B1: Firm-product-market customer accumulation: top-coded at 8 years
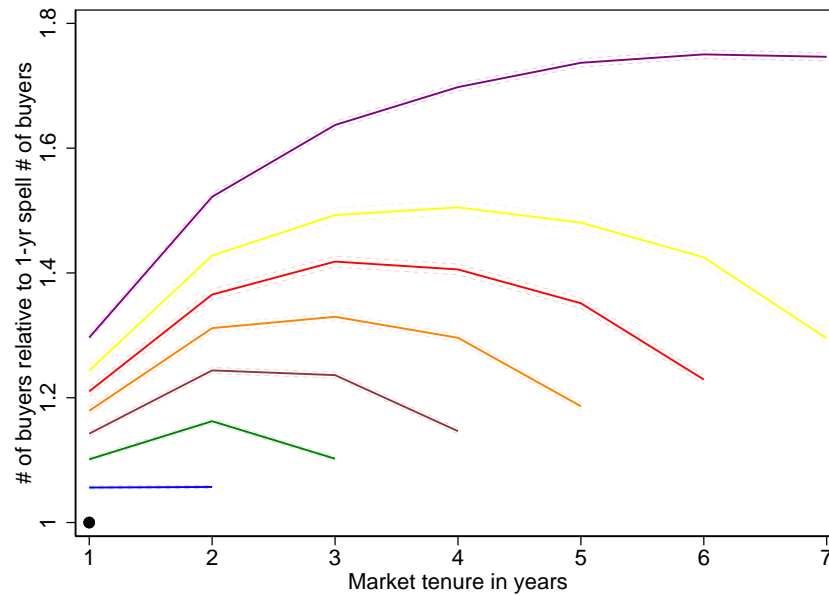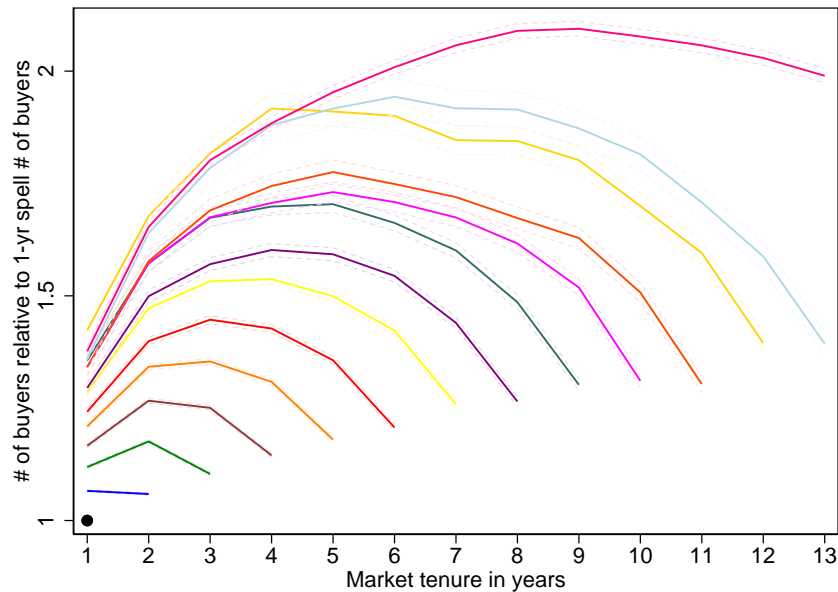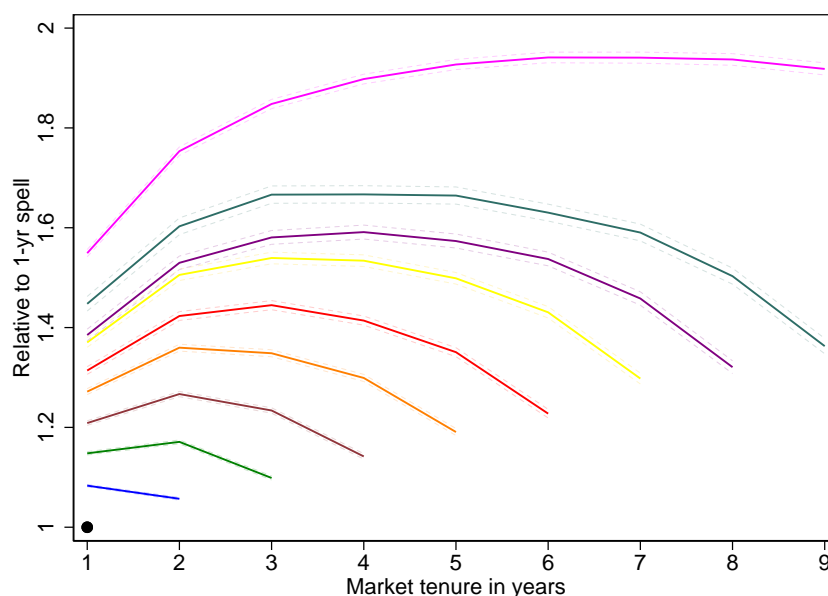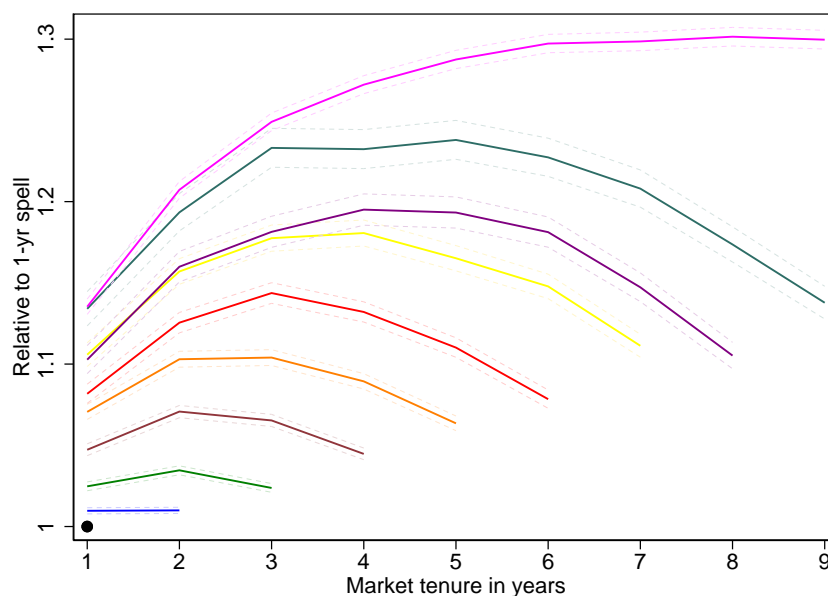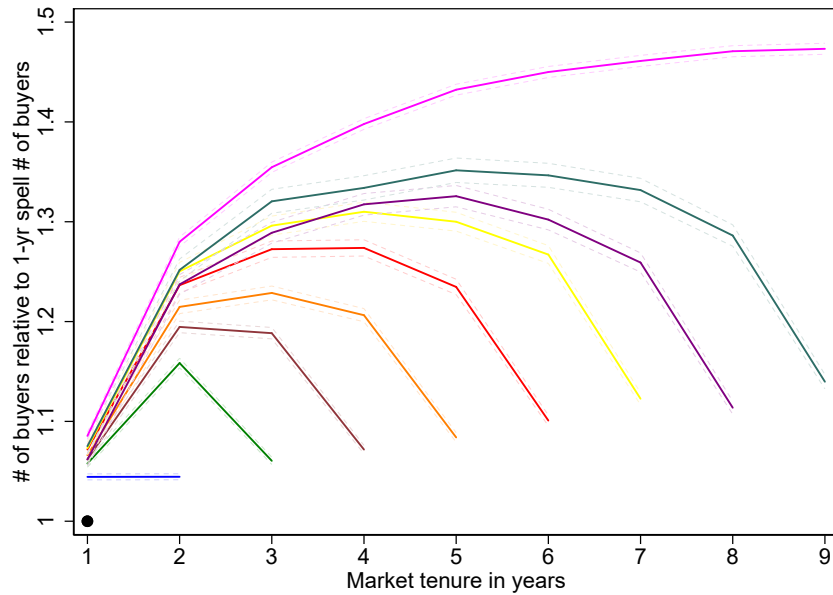

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

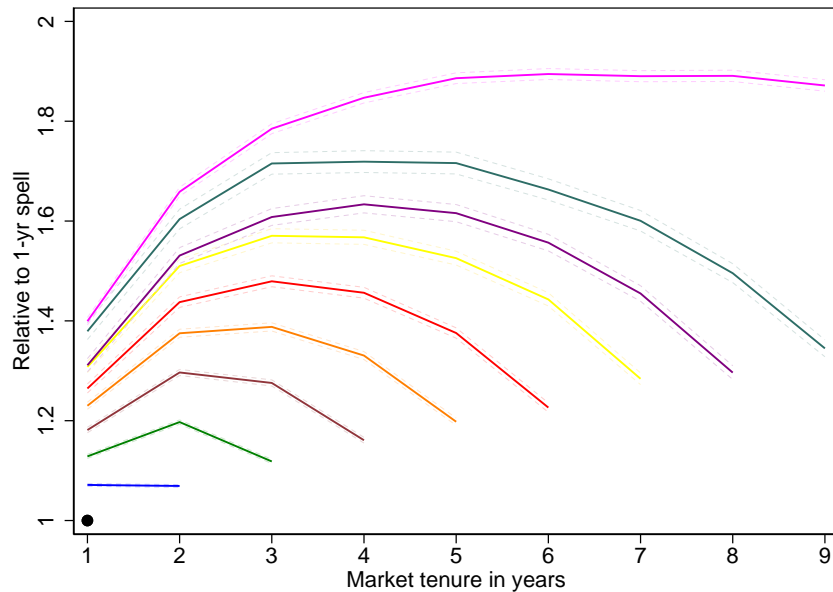Figure B2: Firm-product-market customer accumulation: top-coded at 12 years

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

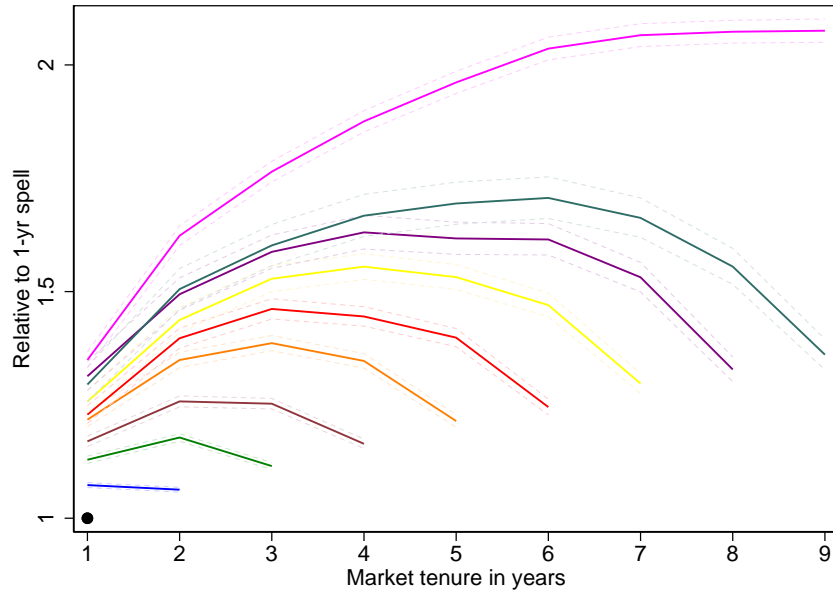Figure B3: Firm-product-market customer accumulation: top-coded at 14 years

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B4: Firm-product-market customer accumulation: firm-product-cohort fixed effects

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

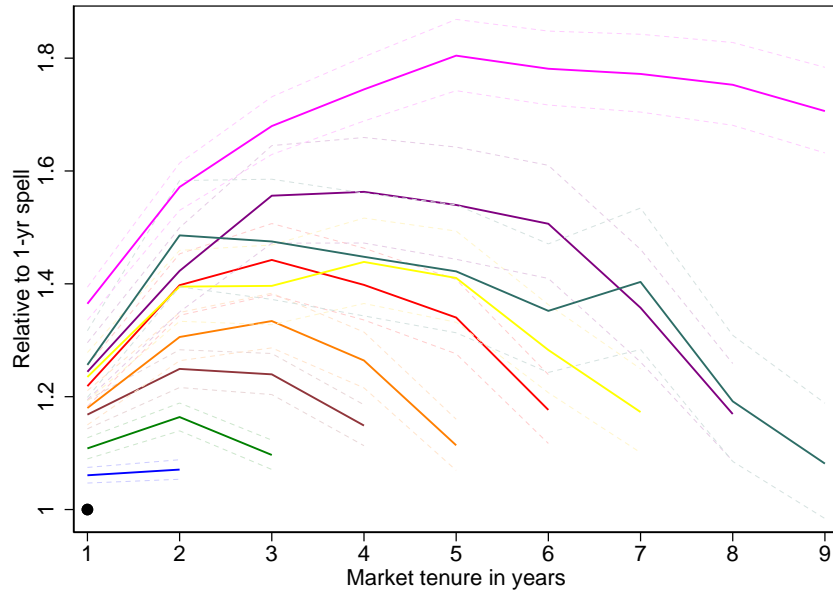Figure B5: Firm-product-market customer accumulation: control for export value

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

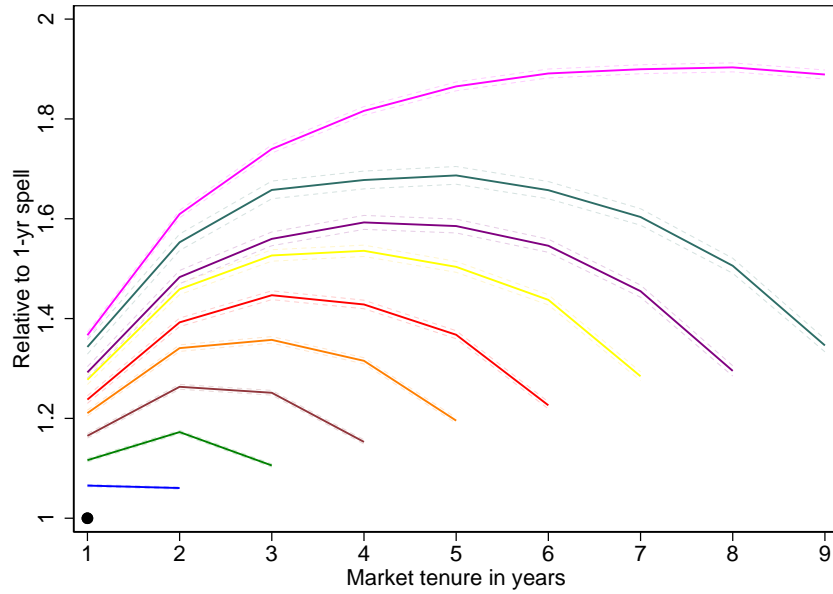Figure B6: Firm-product-market customer accumulation: non-consecutive years

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B7: Firm-product-market customer accumulation: first-time

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B8: Firm-product-market customer accumulation: re-entry
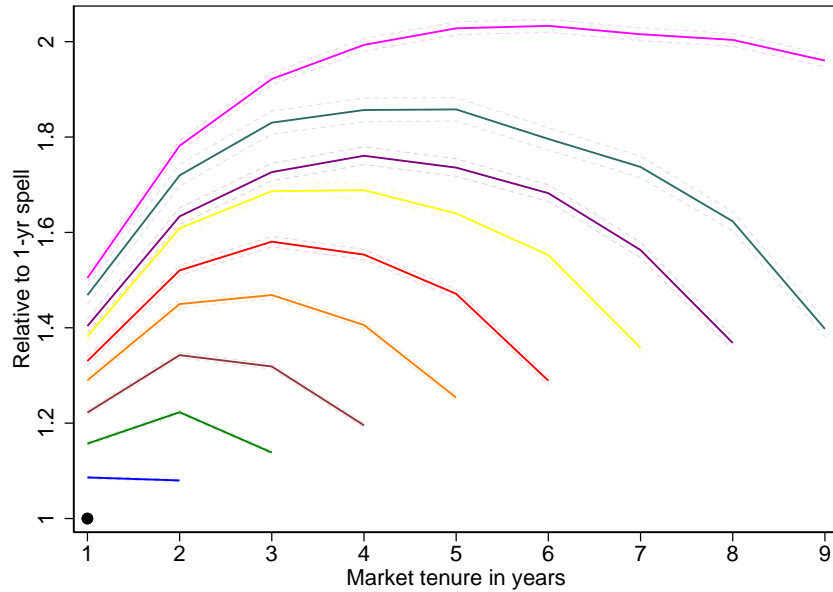

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

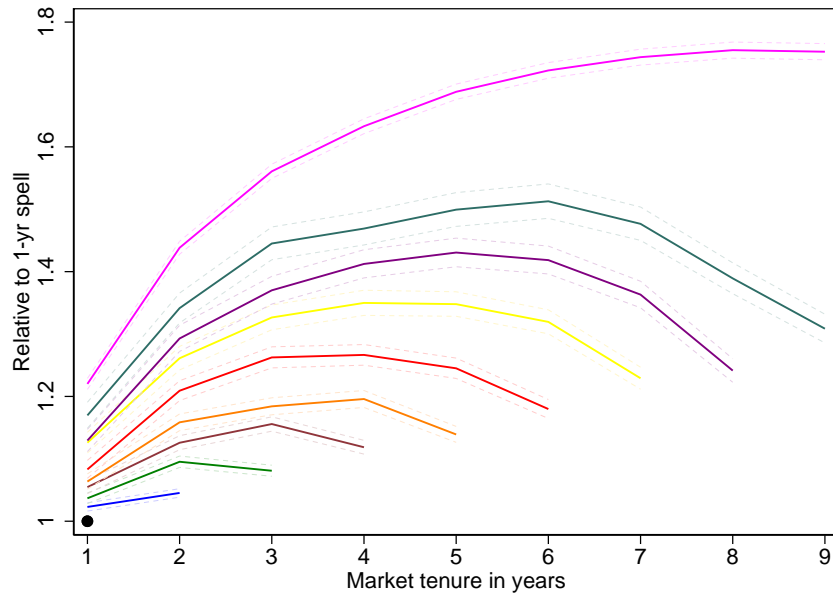Figure B9: Firm-product-market customer accumulation: first-time product

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B10: Firm-product-market customer accumulation: re-entry product

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B11: Firm-product-market customer accumulation: $\leq 75^{th}$ percentile
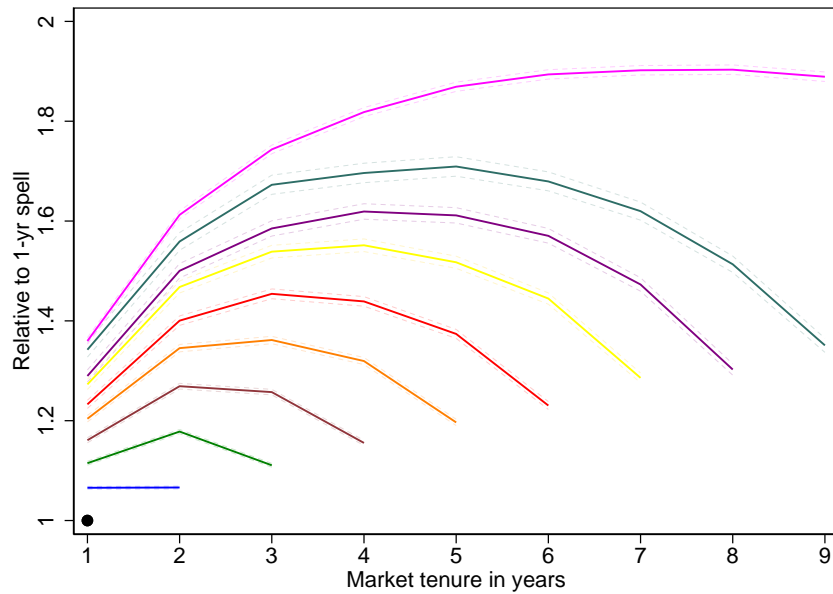

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B12: Firm-product-market customer accumulation: $> 75^{th}$ percentile
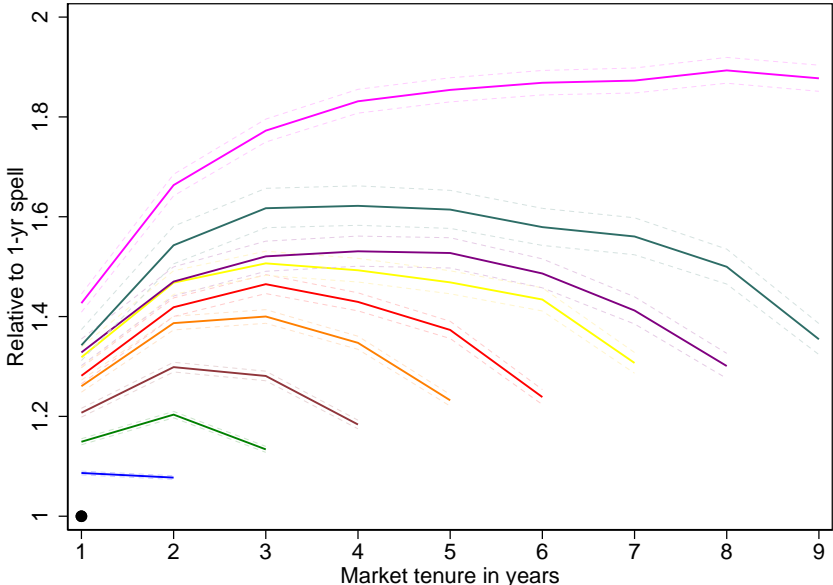

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

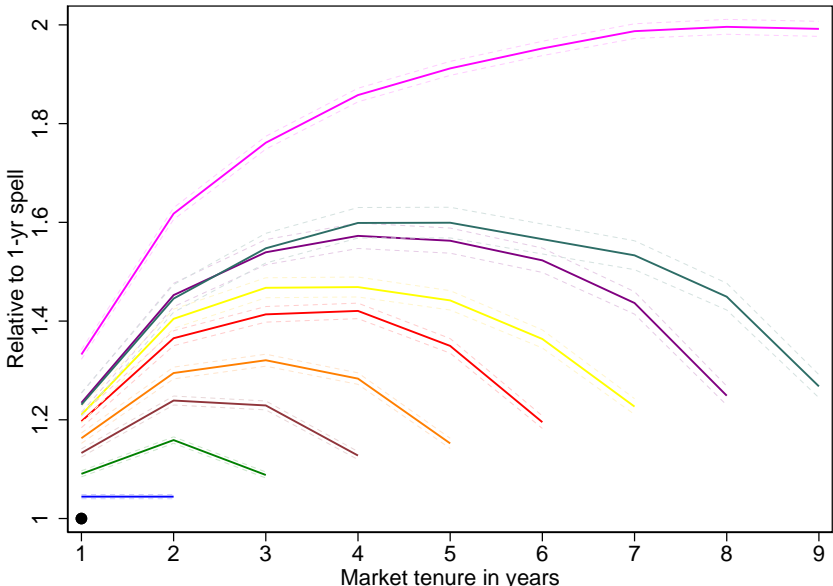Figure B13: Firm-product-market customer accumulation: ≥ 4 countries

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B14: Firm-product-market customer accumulation: < 4 countries

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B15: Firm-product-market customer accumulation: below threshold transactions
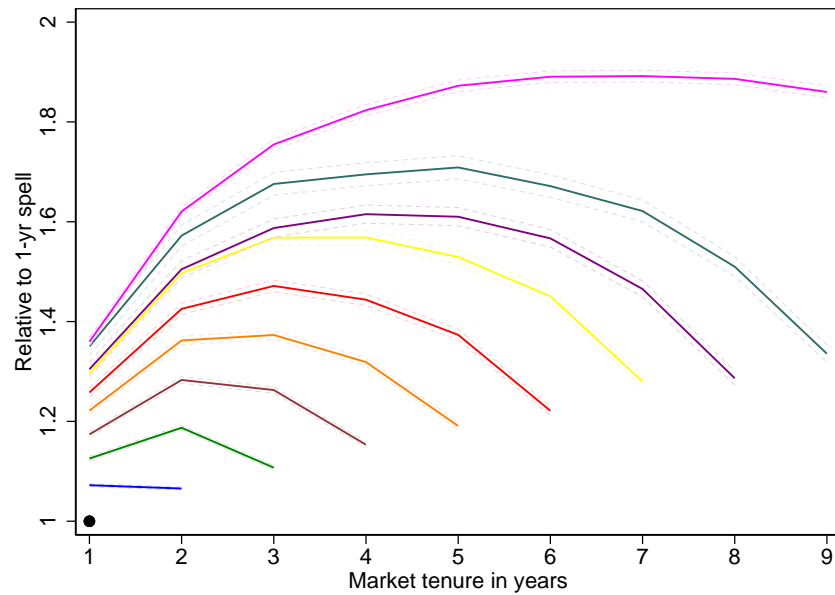

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B16: Firm-product-market customer accumulation: founders EU members only
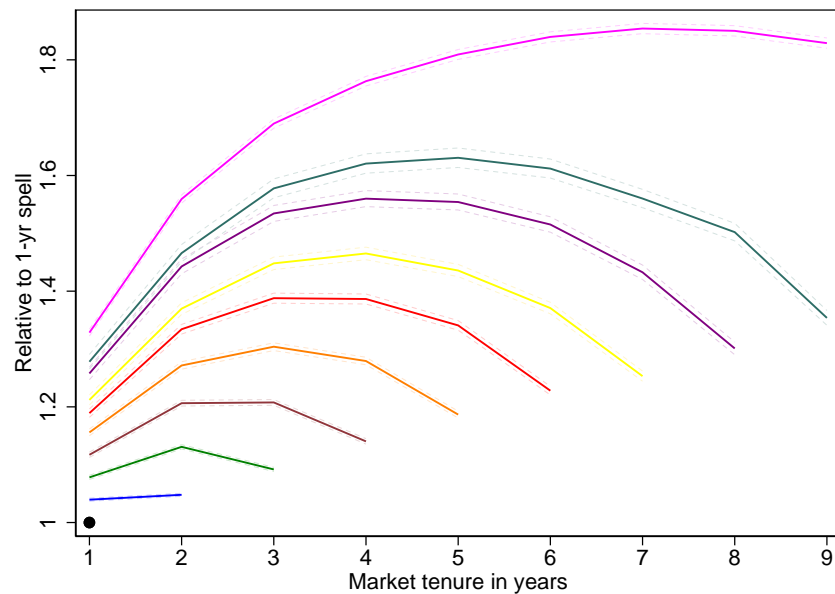

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

Figure B17: Firm-product-market customer accumulation: partial-year effect

Notes: Figure shows the evolution of the number of buyers at the firm-product-market level with market tenure, allowing trajectories to differ by export spell length. Trajectories are conditional on firm-product-year and product-market-year fixed effects. 95% confidence intervals are plotted.

C Definition of tenure and spell length

I define *Tenure* as the length of time that a firm has been exporting to a given destination in each spell. Table C1 provides an illustration of how these measures of market tenure and spell length are constructed. I set *Tenure* equal to 1 in the first year a firm exports to a given market after not exporting in the previous period. I are not able to retrieve this measure of market tenure when I do not observe a firm's entry in a market (in Table C1 I show this in Markets A and E). For instance, since the period of analysis starts in 1996, I do not know if firms were or not exporting to a destination market in the year 1995. These observations are controlled for in the analysis using a dummy variable *Cens*. The variable *Tenure* is then incremented by 1 in each subsequent year of continuous participation. If the firm exits a market for some period, *Tenure* is reset to 1 when the exporter re-enters (e.g. Market C in Time 4). I define the *Spell Length* of the relationship as the total number of years that a firm exports to a given market continuously. I top-code both *Tenure* and *Spell Length* at 10 years in the baseline specification. To ensure a correct assignment of spell lengths, I exclude spells still active in the final year of the panel and whose length is right-censored at a level below the top-code (in Table C1 I exemplify the right-censored case in Market D). I analogously define the *Relationship Length* and relationship *Spell Length* for export episodes at the exporter-product-importer level. The relationship *Spell Length* is the total number of years that a French exporter will sell to a specific customer in a foreign market. The *Relationship Length* is the number of years that an exporter is selling a product to an importer.

Table C1: Tenure and spell length variables

Time	1	2	3	4	5	6
Market/Buyer			Participation			
A	X	X	X	X	X	X
B			X	X	X	
C		X		X		
D				X	X	X
E	X					
Market/Buyer			Market Tenure/Relationship Length			
A	cens	cens	cens	cens	cens	cens
B			1	2	3	
C		1		1		
D				1	2	3
E	cens					
Market/Buyer			Spell Length			
A	cens	cens	cens	cens	cens	cens
B			3	3	3	
C		1		1		
D				cens	cens	cens
E	cens					

Table C2: Summary statistics by censoring type

Censoring type	Share in exports	Share in n. of obs	Market tenure	Spell length	Revenue (in Euro)	Quantity (in kgs/units)	Price (in kgs/units)	Price (in kgs)
Uncensored	.44	.73	1	2	798	38	20	27
Left	.17	.8	2	5	2785	156	16	22
Right	.33	.18	3	6	1878	98	17	20
Left-Right	.6	.1	22	22	40141	2391	14	15

Notes: Summary statistics are for the whole sample. Median values are shown for market tenure, spell length, value, quantity and price.

D Size dynamics in firm-to-firm relationships

In this section, using the French customs data at the exporter-product-importer level, I build on the empirical strategy of Fitzgerald et al. (2020) by estimating the regression specification:

$$log(Y_{ipjt}) = \beta'(Relationship\,Length_{ipjt} \otimes Spell\,Length_{ipjt}) + \gamma Cens_{ipjt} + \eta_{ipdt} + \delta_{pjt} + \varepsilon_{ijdt}, \quad (5)$$

where $Y_{ijpdt} \in \{value, quantity, price\}$ are measures of exporter i-product p's outcomes with customer j in time period t. $Relationship\,Length_{ipjt}$ is a vector of dummy variables for firm i- product p's tenure with customer j, $Spell\,Length_{ipjt}$ is the final spell length of the relationship between exporter i-product p and customer j, $\otimes$ denotes the Kronecker product of these two terms. $Cens_{ipjt}$ is a dummy variable accounting for censored observations. The vector β are the coefficients of interest which will capture the effects of selection in the base values of each spell length and the life cycle dynamics in the evolution of each customer outcome over the tenure for each spell length. Moreover, I control for supply-side factors that affect a firm's performance in any given time period in a destination using firm-product-market-year fixed effects η_{ipdt}. As a result, the coefficients of interest are identified by French exporters selling to multiple buyers in a destination country. I also control for customer specific factors (common to all French exporters) using product-buyer-year fixed effects δ_{pjt}.

I present the results in Figure D1 with the size of the relationship measured by value in Euros and in Figure D2 by quantity (in kg and units). The main finding is that the size of specific customer relationships grows with the duration of the relationship. The value of a customer relationship increases in the initial years of the relationship and falls in the latter years of the relationship for all spell lengths. There is also a selection effect with a higher value of initial exports predicting longer spell lengths of the relationship. The size of exports to a specific customer exhibits a life cycle profile similar to the dynamics shown in Heise (2019) for US importers and at the destination level in Fitzgerald et al. (2020) for Irish exporters.

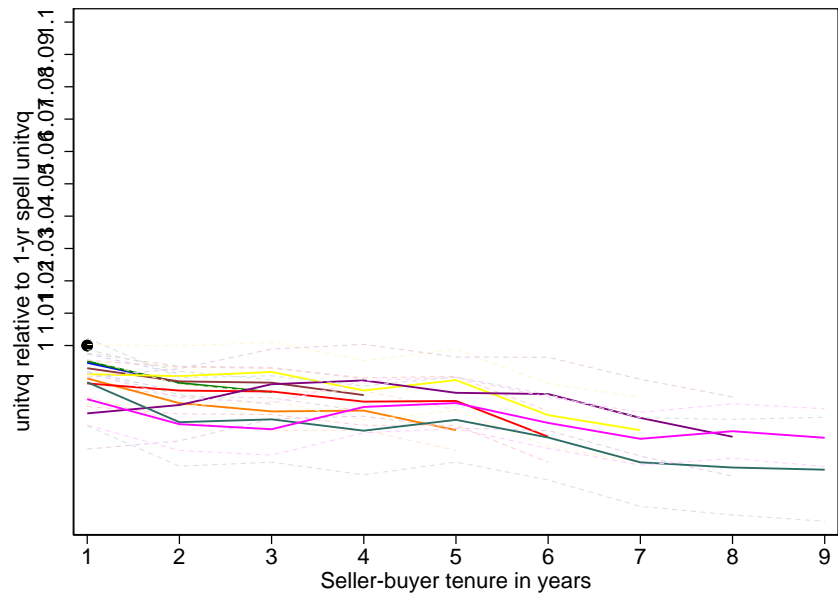Figure D1: Firm-product-buyer value by spell length and tenure
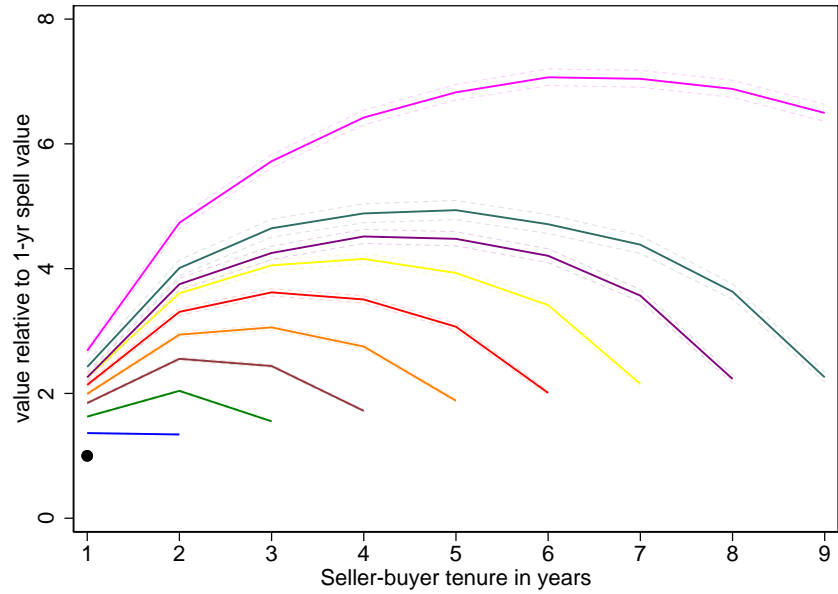
Notes: Figure shows the evolution of export values at the firm-product-buyer level with relationship tenure, allowing trajectories to differ by relationship spell length. Trajectories are conditional on firm-product-market-year and product-buyer-year effects. 95% confidence intervals are plotted.

Figure D2: Firm-product-buyer quantity by spell length and tenure
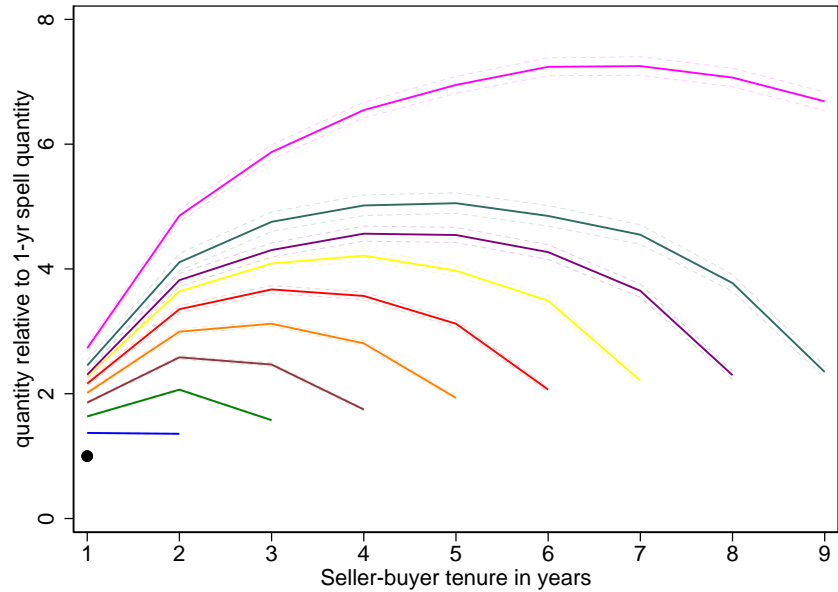
Notes: Figure shows evolution of quantities (in kg and units) at the firm-product-buyer level with relationship tenure, allowing trajectories to differ by relationship spell length. Trajectories are conditional on firm-product-market-year and product-buyer-year effects. 95% confidence intervals are plotted.

Figure D3: Firm-product-buyer value by spell length and tenure

Notes: Figure shows evolution of export values at the firm-product-buyer level with relationship tenure, allowing trajectories to differ by relationship spell length. Trajectories are conditional on firm-product-market-year and product-buyer-year effects. 95% confidence intervals are plotted.

E Robustness - Brexit analysis

In this section, I provide additional sets of results to verify the robustness of my conclusions across different samples and using an alternative definition of firm-to-firm relationship.

Table E1: Heterogeneous responses across relationship length: non-Eurozone and Eurozone sample

VARIABLES	(1) Δ ln(exp)	(2) Δ ln(quantity)	(3) Δ ln(price)	(4) Δ ln(exp)	(5) Δ ln(quantity)	(6) Δ ln(price)
Length	-0.0211***	-0.0201***	-0.00103	-0.0395***	-0.0372***	-0.00238
	(0.00293)	(0.00264)	(0.000614)	(0.00788)	(0.00630)	(0.00178)
Brexit	-0.137***	-0.0640***	-0.0730***	-0.202***	-0.124**	-0.0777***
	(0.0117)	(0.0125)	(0.00385)	(0.0431)	(0.0383)	(0.00895)
Brexit × Length	0.0158***	0.00921***	0.00663***	0.0254**	0.0185**	0.00698***
	(0.00227)	(0.00219)	(0.000629)	(0.00804)	(0.00731)	(0.00124)
Observations	8,400,425	8,397,569	8,397,569	2,083,223	2,082,568	2,082,568
R-squared	0.056	0.058	0.049	0.069	0.072	0.059
FE	fpd-t	fpd-t	fpd-t	fpd-t	fpd-t	fpd-t

Notes: Observations are by firm-product-buyer-month. Foreign country inflation, using the consumer price index, and real GDP growth rates are always included. Stata command used is *reghdfe*. Robust standard errors, clustered by country, are reported in parentheses. The p-values read as follows: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table E2: Heterogeneous responses across relationship length: similar countries sample

VARIABLES	(1) Δ ln(exp)	(2) Δ ln(quantity)	(3) Δ ln(price)
Length	-0.0205***	-0.0195***	-0.00101
	(0.00360)	(0.00325)	(0.000763)
Brexit	-0.136***	-0.0643**	-0.0721***
	(0.0142)	(0.0156)	(0.00521)
Brexit × Length	0.0161***	0.00964**	0.00652***
	(0.00329)	(0.00323)	(0.000747)
Observations	6,676,113	6,673,769	6,673,769
R-squared	0.054	0.056	0.046
FE	fpd-t	fpd-t	fpd-t

Notes: Observations are by firm-product-buyer-month. The countries included in this analysis are Belgium, Germany, Italy, Spain and United Kingdom. Foreign country inflation, using the consumer price index, and real GDP growth rates are always included. Stata command used is *reghdfe*. Robust standard errors, clustered by country, are reported in parentheses. The p-values read as follows: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table E3: Heterogeneous responses across relationship length: number of transactions

VARIABLES	(1) Δ ln(exp)	(2) Δ ln(quantity)	(3) Δ ln(price)
Intensity	-0.00220***	-0.00215***	-5.52e-05
	(0.000196)	(0.000184)	(4.41e-05)
Brexit	-0.100***	-0.0532***	-0.0469***
	(0.00884)	(0.00853)	(0.00237)
Brexit $\times$ Intensity	0.000993***	0.000771***	0.000220***
	(0.000140)	(0.000133)	(3.71e-05)
Observations	9,577,651	9,574,641	9,574,641
R-squared	0.058	0.061	0.050
FE	fpd-t	fpd-t	fpd-t

Notes: Observations are by firm-product-buyer-month. *Intensity* is measured as the cumulative number of transactions in a relationship over time. Foreign country inflation, using the consumer price index, and real GDP growth rates are always included. Stata command used is *reghdfe*. Robust standard errors, clustered by country, are reported in parentheses. The p-values read as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.