Firms Export Dynamics: Experience vs. Size*

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Abstract

This paper provides evidence about the respective impact of export experience and size on the dynamics of firms in foreign markets, a critical input in models of firms dynamics. The analysis uses a census of French exports by firm-destinations-product over the period 1994-2008 with a monthly frequency. A first result is that the growth of exporters between the first and the second year of experience in the export market is biased upwards when the growth rate is computed using calendar years instead of the birth date. Our estimations show that, controlling for size, export experience is negatively related to net growth of exports for surviving exporters. Controlling for export experience, the relation between average size and net growth of exports is non-monotonic. Finally, churning in foreign markets is decreasing with export experience and (sharply) with size.

JEL classification: F02, F10, F14.

Keywords: International trade, Firms' heterogeneity, Firms' dynamics, Churning.

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1 Introduction

International trade models have emphasized the importance of firm heterogeneity in explaining the cross-sectional distribution of firm size in domestic and foreign markets. Sales and exports are extremely concentrated among a limited number of very large firms, whereas a large number of small exporters ship one product to a single destination (Eaton et al., 2004). This distribution of the size of exporters is influenced by the process of entry and exit, as new exporters tend to be small, grow fast and have a low rate of survival (Eaton et al., 2007; Freund and Pierola, 2010). Understanding the relative contribution of experience and size in firms' performance, i.e. understanding whether we need to think about the experience of a firm given its size, is central to the explanation and modeling of firms' dynamics on domestic or foreign markets.

Models of firm dynamics can indeed be divided into two broad categories. When firm dynamics arise from persistent productivity shocks (Hopenhayn, 1992), size is the only dimension of firm heterogeneity and net growth depends only on firm size. Many models of firm dynamics on export markets predict that determinants of size are Markov and that current size is sufficient to assess future size (Luttmer, 2011; Impullitti et al., 2011; Arkolakis, 2011; Chaney, 2011; Klette and Kortum, 2004). Another class of models following Jovanovic (1982) emphasizes the role of learning and gives an additional role for age experience on (export) markets in firm dynamics (Ruhl and Willis, 2008; Eaton et al., 2011).[1] The contribution of size and/or experience to individual firms' growth is therefore a critical input for these models and ultimately an empirical question.

This paper exploits a comprehensive transaction level dataset of French exporters to provide stylized facts on the importance of experience and size of individual exporters for their growth in foreign markets. Our data allow us to identify new exporters and track them on foreign markets over a long period of time; we therefore compare new exporters to the universe of French exporters, accounting for the whole size distribution.

Thanks to the details on product and destination available in trade data, we go beyond net growth and investigate the behavior of firms on different markets by showing how the growth in continuing markets and the process of churning in foreign markets (i.e. entry and exit from a destination and/or a product) are related to experience and size. Firms indeed tend to modify very frequently the portfolio of products that they sell abroad (Bernard et al., 2010; Iacovone and Javorcik, 2010) and the range of destinations

[1] Cooley and Quadrini (2001) introduce credit constraints in a model of firm dynamics and show a relation between growth and both size and age. Cosar et al. (2011) consider the impact of labor market imperfections on firm dynamics.

in which they are active (Lawless, 2009). In the aggregate, this churning of products and destinations by exporters has an important contribution to the aggregate growth of exports in the long run (Bernard et al., 2009). Our methodology allows us to quantify the contribution of churning of products and destinations to the growth of firms' exports.

The analysis requires dealing with several important statistical issues (Dunne et al., 1989; Davis and Haltiwanger, 1992; Davis et al., 1996; Haltiwanger et al., 2010). First, since size and experience of individual firms are correlated, their respective relationship with growth must be analyzed jointly.[2] Second, we provide evidence that the growth rate between the first and second year of export is considerably upwardly biased, because its construction relies on calendar years. Neglecting the month of entry on the export market (birth date) leads to underestimate the export revenue by new exporters by 32% the first year, and therefore to overestimate the growth rate of export the second year.[3] Third, Haltiwanger et al. (2010) show that the choice of the measurement of firms' size is an important issue. Our analysis mostly uses the average size of exporters in years $t-1$ and t, as this measure is less likely to be affected by transitory shocks that could influence our estimates due to regression to the mean effects.

Our analysis confirms the importance of considering the experience together with the size of exporters to explain the growth of exporters in foreign markets. Conditional on size, the net export growth of surviving firms progressively declines with experience. The relation between average size and net growth of exports is non-monotonic, confirming that the Gibrat's law hold for exports (Sutton, 1997). Firm size is however clearly related to gross margins of exports: the contribution of churning of destination and products within individual firm is negatively related to firm size, and decrease dramatically for large exporters. Young exporters are therefore more volatile in export markets because of both their large turnover and their within firm churning of products and destination markets.

Our empirical analysis is related to the industrial organization literature documenting the effects of firms' size and age/experience on their growth performance, regardless of the export status. Dunne et al. (1989) show that the rate of failure of US manufacturing plants is decreasing with plant size and experience. Conditional on survival, the growth rate of employment by plants is also decreasing with experience and size. Haltiwanger et al. (2010) however find no clear patterns between size and growth of employment for US firms, once their experience is controlled for. They confirm that young firms grow

[2]The correlation between experience and size classes in our data set is 0.6.

[3]A symmetric downward bias arises for exit, because firms export only a few months before the year of exit.

faster and are also more volatile. Our data allow us to analyze these relationships on the export market and to identify the portfolio of destination markets and products of individual firm and follow its churning over time.

Evidence regarding export activity has concentrated on the dynamics of new exporters, regardless of size. Most of new exporters do not survive more than a few years. They typically start small, and surviving exporters export much larger volumes by the second year, expand to additional markets or export new products (Eaton et al., 2007; Freund and Pierola, 2010; Albornoz-Crespo et al., 2010; Iacovone and Javorcik, 2010). Our analysis complements these findings by identifying jointly the respective role of experience and size on the net growth and churning of exporters in foreign markets, and by comparing over time new exporters to the whole distribution of French exporters, of different experience and size.

The paper is organized as follows. The next section describe the data and methodological and measurement issues we deal with. Section 3 presents the empirical analysis of net growth and section 4 focuses on the churning of products and destinations within firms.

2 Data and methodology

2.1 Data

Our data set, provided by French customs, reports export flows of all individual French firms at a *monthly* frequency, over the period 1994-2008. Each individual trade flows are reported with firm-product-country dimensions, with products defined at he 6-digits in the Harmonized System (HS).[4] Firms are identified year using its SIREN number, allowing us to follow them over time.[5]

We define the experience as exporters according to each firm's year of entry into export. New exporters in year t are those that export in t but do not appear in customs statistics before (since we have export data beginning in 1994 but use only the 2001-2007 period, new exporters do not export at least 7 years prior to their entry into foreign markets). Our definition of new exporters is more restrictive than existing papers (Eaton

[4]Because of the HS revisions in 2002 and 2007, we use concordance tables provided by the United Nations Statistical Division to translate product codes into a single nomenclature for computing growth rate over 2001/02 and 2006/07.

[5]Official changes in SIREN code are recorded but we cannot rule out switches of SIREN code for some firms over time. Our results are robust to the exclusion of firms belonging to a French or foreign group its year of entry into the export market or the top/bottom 1% firms in terms of growth rate (see column (8) in Table C2).

et al., 2007; Albornoz-Crespo et al., 2010) that focus on firms exporting in t but not in $t-1$.[6] We are thus able to allocate each firm to a cohort. A firm is considered as being part of the cohort of year t if no trade was registered in the preceding years. Firms can then survive as an exporter in each of the following years, or exit. We do not consider multiple spells of export by a firm and remove switchers after their first exit (at least one year) of the export market.

Retrieving the information on experience for incumbent exporters requires to have as many years backward and forward; we therefore restrict our sample to the period 2001-2007 in order to be able to allocate all firms, new as well as incumbent exporters, to an experience category. We allocate all French exporters over the 2001-2007 period into 6 groups depending on their number of year of experience on the export market and 1 group of experienced exporters (with more than 6 consecutive years of export experience).

Details regarding the data are provided in Appendix A.

2.2 Growth rate of firm level exports

Our analysis of the dynamics of firms' exports relies on growth rates of individual export flows, x_{ijkt}, from firm i to destination country j in product category k and year t. Due to the large number of entries and exits at the firm, destination or product level, we follow Davis and Haltiwanger (1992)[7] and compute the growth rate of each individual export flow x_{ijkt} as:

$$g_{ijkt} = \frac{x_{ijkt} - x_{ijkt-1}}{\frac{1}{2}(x_{ijkt} + x_{ijkt-1})}. \tag{1}$$

g_{ijkt} corresponds to the growth rate of an individual export flow x_{ijkt} between year t and $t-1$. The denominator is defined as the mean of x_{ijk} in t and $t-1$, and ensures that the growth rate can be computed as soon as there exists a positive trade x_{ijk} in t or $t-1$. This growth rate has several properties that makes it very useful in our analysis. First, new export flows and trade flow disruptions are assigned respectively the values 2 and -2. This pattern enables to take into account the contributions of entry and exit to the growth of firms' exports. Second, it is a good approximation of the log first difference around zero and shares its properties of symmetry. In addition, this growth rate is bounded between the values of entry and exit, 2 and -2.

[6] See Conconi et al. (2012) for a similar definition.

[7] This growth rate has become standard in the analysis of firm and labor market dynamics.

The contribution of each individual export flow x_{ijk} can be aggregated to compute the net growth of exports of any firm i as follows:

$$G_{it} = \sum_{jkt} \omega_{ijkt} \times g_{ijkt} \quad \text{where} \quad \omega_{ijkt} = \frac{x_{ijkt} + x_{ijkt-1}}{\sum_{jkt} x_{ijkt} + \sum_{jkt-1} x_{ijkt-1}}. \tag{2}$$

ω_{ijkt} is the share of trade flow x_{ijkt} in firm i's value of foreign sales. Appendix B provides the distribution of the growth rate (G_{it}) of French exporters used in this paper over the period 2001-2007. The large mass of firms at the extreme of the distribution (firms' entries and exits) confirms the dynamics of exporters status: 51% of firms enter/exit every year on average. The weighted distribution (by average exporters' size) of firm export growth exhibits much thinner tails. Another pattern that emerges from this distribution is that many firms exhibit large absolute growth rates, either for expanding or declining exporters.

For any firm i, we can distinguish the contribution of continuing trade relationships (the net intensive margin), and the contribution of the creation (positive extensive margin) and disruption (negative extensive margin) of trade relationships. The growth of the firms' exports can be expressed as the sum of the contributions of the net intensive and gross extensive margins:

$$G_{it} = G_{it}^{I} + G_{it}^{E+} + G_{it}^{E-} \quad \text{where} \quad \begin{cases} G_{it}^{E+} & = & \sum_{jk} \omega_{ijkt} \times g_{ijkt} & \text{if } g_{ijkt} = 2 \\ G_{it}^{E-} & = & \sum_{jk} \omega_{ijkt} \times g_{ijkt} & \text{if } g_{ijkt} = -2 \\ G_{it}^{I} & = & \sum_{jk} \omega_{ijkt} \times g_{ijkt} & \text{otherwise,} \end{cases} \tag{3}$$

where G_{it} is the net growth of exports of firm i between t and $t-1$, G_{it}^{I} is the net contribution of the intensive margin, G_{it}^{E+} is the gross contribution of the positive extensive margin, and G_{it}^{E-} is the gross contribution of the negative extensive margin. Given the three dimensions of the French Customs trade data, firm (i), destination (j) and product (k), we are able to further decompose the extensive margin into several components listed below:

- entry or exit of exporters (firm-level extensive margin);
- add or drop of product-and-destination, continuing exporter (DP);
- add or drop of products, continuing exporter and destination (P);
- add or drop of destinations, continuing exporter and product (D);

- add or drop of trade relationship, continuing exporter, product and destination (Other).

The empirical analysis presented in the paper relates the net growth rate of a firm (G_{it}) and its components (G_{it}^{E+} and G_{it}^{E-}) to the experience and the size of exporters of the exporter.

2.3 Bias # 1: net growth in the first and last years

A major issue regarding the firm experience on export markets is the bias related to the calendar year in the first two years of export. For example, a firm may start exporting in December of the first year, and then export the same amount each month of the second year. Using export reported on a calendar year would therefore bias downward the level of export the first year relative to the second. In that case, the growth rate of exports between the first and the second year would be artificially high. We address this statistical issue by computing the growth rate of new exporters on reconstructed years using the exact month of entry rather than calendar years. So, the monthly frequency in the data is used only to compute properly the yearly growth rate of new exporters.

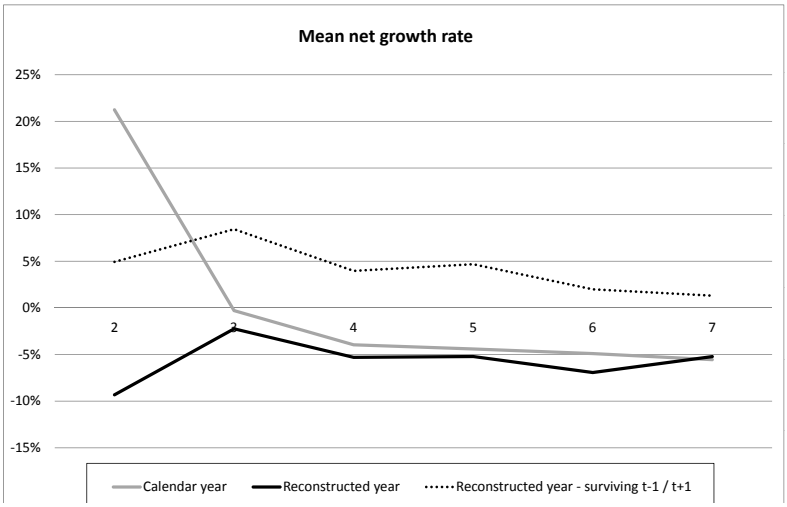
Figure 1 illustrates this statistical bias in the computation of growth rates of firms' exports between years $t-1$ and t, for exporters that survive between the two years. When calendar years are considered, the average growth rate of new exporters between the year of entry and the second year is above +20%; the growth rate then plummets by the third year (black curves). Using the birth month of exporters yields a completely different pattern (Figure 1). The average growth rate of new exporters, conditional on survival, is negative in the second year and similar to growth rates in subsequent years. The discrepancy in growth rates due to the calendar year bias amounts to 0.306 in the second year. This implies that average exports revenues of a cohort of new exporters are underestimated by 32% the first year of export when using the calendar year.[8]

The negative average growth of exporters is explained by the fact that many exporters will exit in the following years, and decline before exit. This second (symmetric) statistical bias is related to the fact that firms may export only a few months during their year of exit. Given that more firms exit during the first years of export activity, we can expect that this bias is more important when we compute the growth rate for young exporters. Restricting the sample to exporters surviving between $t-1$ and $t+1$ (dotted line in Figure 1), the average growth rate becomes positive and the relation

[8]The conventional growth rate g (exports in t minus exports in $t-1$ divided by export in $t-1$) is related to our growth rate as follows: $g = 2G/(2-G)$.

between experience and exports growth becomes more negative (especially due to the larger correction for the exit year among young exporters). In the econometric analysis, we consider this possibility by keeping in-sample only those firms that survive between t-1 and t, or alternatively those surviving between t-1 and t+1.

Figure 1: Net growth rates of exports by experience: calendar vs. corrected years



2.4 Bias # 2: measurement of the size of exporters

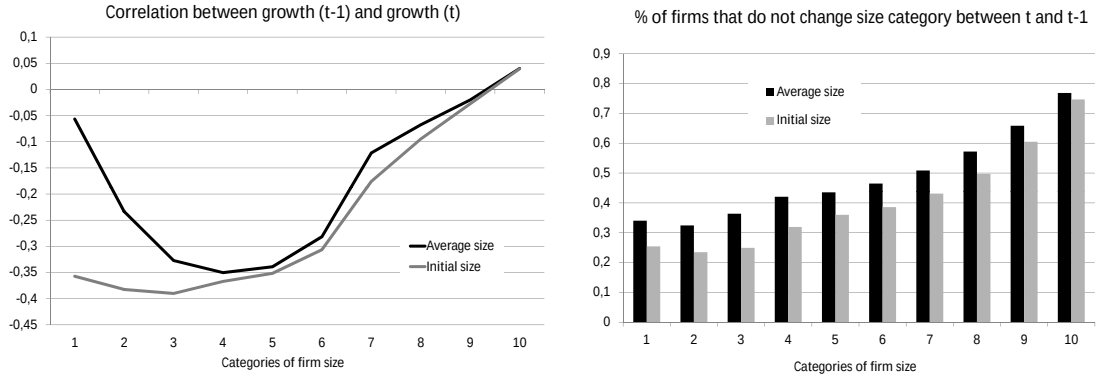
The relation between the size and growth of firms is potentially biased due to regression to the mean effects. A firm experiencing a positive transitory shock is likely to report a negative growth rate the following period, leading to a spurious correlation between firm size and growth rate (Davis et al., 1996; Haltiwanger et al., 2010). Consequently, using base year $t-1$ as size criteria is likely to create a negative bias while the opposite is true regarding the use of end year t as a size criteria. To mitigate these potential biases, Davis and Haltiwanger (1992) suggest to measure firm size using the average of firm size over $t-1$ and t. Haltiwanger et al. (2010) report that using this size methodology or a more complex dynamic size classification methodology developed by the US Bureau of Labor Statistics yields similar results.

Our empirical investigation therefore follows the suggestion by Davis and Haltiwanger (1992) that we apply to the case of exporters. Our preferred measure of the size of exporters is computed as the average value of firms' exports in years t and $t-1$. For comparison purposes we also provide results using the initial value of firm exports as

a proxy for the size of exporters. Using this measure of size, exporters are clustered into 10 classes of firms' size that reflect the deciles of the distribution, considering all exporters that are active in $t-1$ or t.[9]

The left panel of Figure 2 presents the correlation between the growth rate of firms' exports in t and the growth rate in $t-1$ by category of size. The correlation is negative whatever the measure of size, confirming the existence of a negative serial correlation in firms' exports growth. The serial correlation, however, is less important when the observations are clustered using the average size classes rather than the initial size classes, especially in the case of small firms. This confirms that estimations using the average size categories of exporters are less likely to be affected by regression to the mean effects.

Figure 2: Serial correlation in net export growth by firm size category



To complete the diagnosis, the right panel of Figure 2 reports the percentage of firms that do not change size category between $t-1$ and t. This percentage is increasing with the size of firms, confirming that small firms are more subject to idiosyncratic shocks that affect their ranking in terms of size. This is however less the case when the average size is used, as this measure tends to average out these idiosyncratic shocks. This confirms that the average of exports between years $t-1$ and t is a more consistent measure of the size of exporters. We use preferably this measure of size in our empirical analysis.

[9]For exporters that start exporting in t, the initial size in $t-1$ is zero and we use instead the size in t. Firms that exit are also considered in the distribution as the initial and average measures of size remain positive.

3 Net growth of exports and firm size and experience

3.1 Estimation strategy

This section presents the estimates of the effects of experience and size on the expected net growth of exporters in foreign markets (G_{it}). As discussed above, our growth rate summarizes the dynamics of starters, quitters and continuers. The expected growth can be further decomposed into the probability of survival ($Prob(X_{it} > 0)$, and the growth of continuers conditional on survival ($G_{it}|X_{it} > 0$), with X_{it} being firms' total exports value in year t. All these variables are considered in the set of dependent variables (Ω_{it}) in our estimations.

We use a non-parametric methodology by regressing the dependent variable (Ω_{it}) on firm size classes and experience classes:

$$\Omega_{it} = \sum_{m=1}^{6} \alpha_m experience_{mit} + \sum_{n=1}^{9} \beta_n size_{nit} + \gamma_k + \gamma_t + \epsilon_{ijkt}. \quad (4)$$

Since firm size and experience are likely to vary by industry, we include HS2 sector fixed effects (γ_k) in our regressions.[10] We also include year fixed effects (γ_t) to account for cycles or aggregate shocks likely to hit a particular cohort of exporters. The (excluded) reference categories are experience=7 and size=10.[11] This estimation strategy allows to measure the partial effect of experience or size on exports growth. In Appendix D, we show that the additive model of Equation 4 is a good approximation of a fully saturated model suggested by Angrist and Pischke (2009) for bounded dependent variables.

To facilitate the reading, all results are summarized in figures below. We report the estimated coefficients relative to the unconditional mean of the omitted category (respectively size class 10 or experience class 7).[12] Detailed estimation results are reported in Appendix C: Table C1 reports results when the dependent variable is the probability of survival and Table C2 for net growth. Table C3 presents some robustness analysis using the initial size instead of average size. We first discuss the effect of size in the next section and then turn to experience in the following.

[10] Each firm is allocated into its main HS2 sector according to its export in t and $t-1$.

[11] When the dependent variable is the growth rate of exporters (G_{it}), it takes the value $G_{it} = 2$ in the year of entry (i.e. when Experience = 1). In that case the coefficient on the Experience = 1 variable reflects the average growth of the reference category (i.e. the value of the coefficient - 2).

[12] $\widehat{G}_{it}(Size = n) = \overline{G}_{it}(Size = 10) + \hat{\beta}_n$ and $\widehat{G}_{it}(Experience = m) = \overline{G}_{it}(Experience >= 7) + \hat{\alpha}_m$.

3.2 Net growth and size

Figure 3 reports the estimated expected growth of a firm in foreign markets by size category (top panels) and its two components, the probability of survival (middle panel) and the net growth conditional on survival (bottom panels). We report results controlling or not for firm experience in export markets, to disentangle the respective role of experience and size.

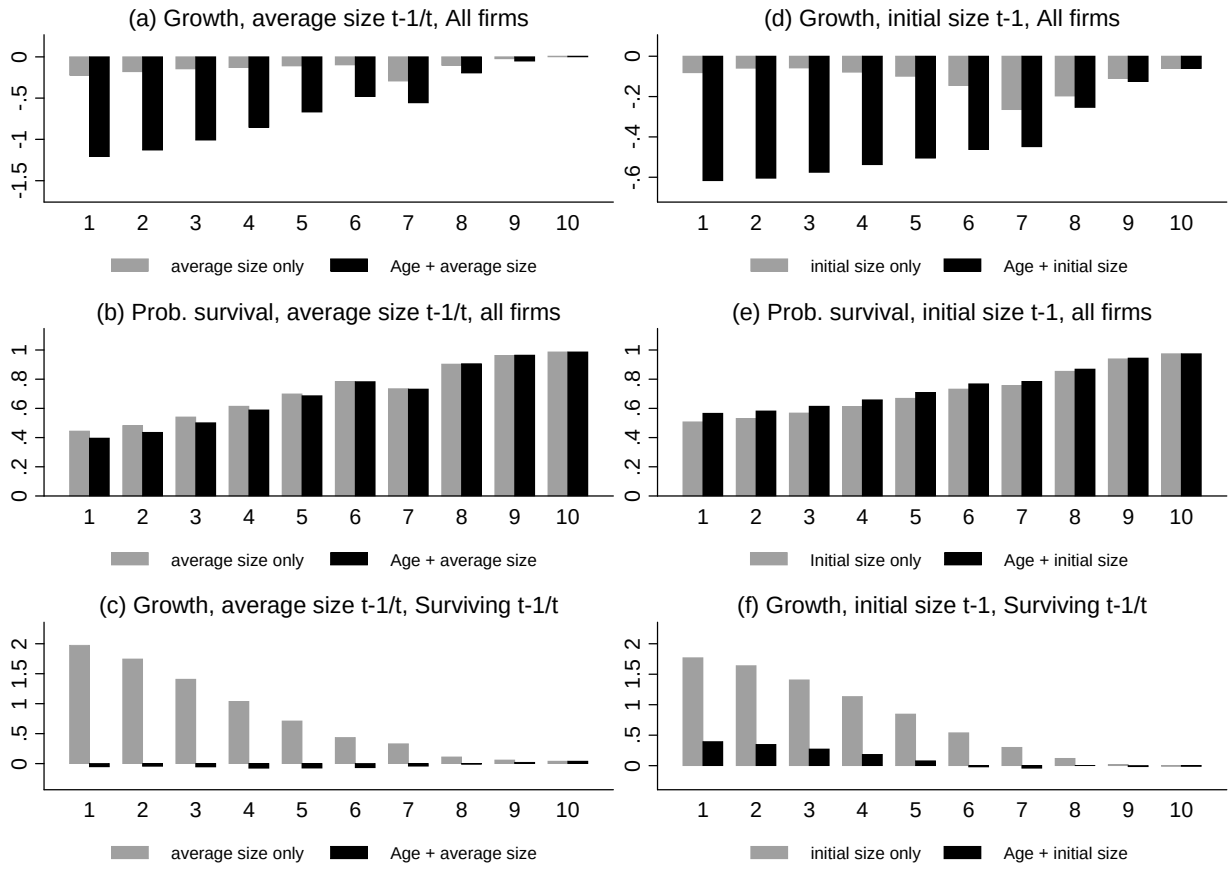
Panels a, b and c of Figure 3 present the results using our preferred measure of size, *average size*. Considering all exporters in Panel (a), we find a positive relation between the average size and growth when the experience of exporters is not controlled for (grey bars). Most exporters have negative growth rates, especially in small average size categories. Controlling for the experience of exporters (black bars) steepens the positive relation between size and growth: independently of the experience of exporters, the expected growth rate of small exporters is clearly negative, whereas the expected growth rate of large exporters is slightly positive.

The positive relation between expected growth and size is however driven by the high rate of attrition among small exporters shown in panel b ($G_{it} = -2$ for exporters that exit): the probability of survival is increasing with the average size of the exporter, starting from a survival probability of around 40% for the first decile of exporters to nearly 100% for the 10th decile. This pattern holds when controls for the experience of exporters are included in the econometric specification.

On the contrary, the net growth of surviving exporters is not systematically related to size when we control for experience (panel (c) of Figure 3). The correlation between size and experience matters here: without controlling for experience, we find a clear negative relation between size and growth of surviving exporters (grey bar), which is biased by the fact that small exporters are young. Controlling for experience (black bar), we find a non-monotonic relation between net growth and size. Restricting the sample to exporters surviving between t-1/t+1 does not change this pattern. Our estimation results therefore tend to confirm the Gibrat's law for export sales of surviving exporters.

Estimations using the initial size of exporters suggest that regression to the mean effects are quite strong (Panels d, e and f of Figure 3), consistently with the negative correlation between G_{it} and G_{it-1} shown in Figure 2. In particular, for surviving exporters (Panel f), net growth and initial size are inversely related when the estimation does not control for the experience categories, as it was the case with the average size. Controlling for exporter's experience however leads to a different relation between size and growth: growth is decreasing with the initial size (Panel f), whereas no clear relationship

Figure 3: Exports growth and exporter's size



emerges between the average size and growth (Panel c). This empirical pattern is consistent with regression to the mean effects in the presence of negative serial correlation, which is especially important among small exporters.[13]

3.3 Net growth and experience

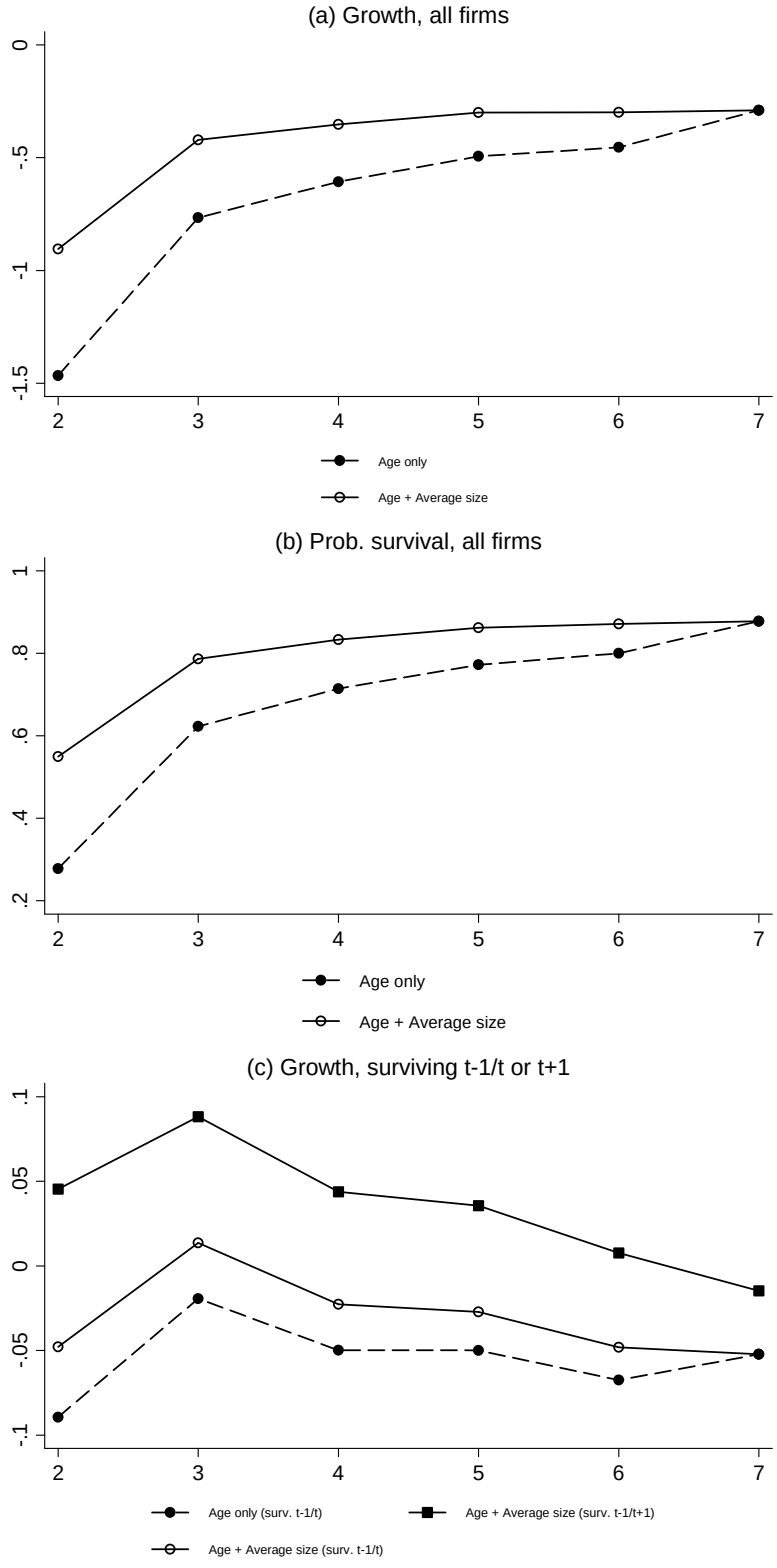
Results regarding the effects of the experience of exporters on their growth in foreign markets are summarized in Figure 4. Panel (a) of the Figure reports the relation between firms' experience and expected net growth when all exporters are considered, including those that exit in year t and have a growth rate $G_{it} = -2$. This growth rate is strictly a positive function of the experience of the exporter, and is always negative especially after one year in the export market. This pattern is explained by the high rate of attrition among young exporters that is reported in Panel (b): less than 30% of new exporters survive after one year. As this rate of attrition is also related to the small size of new exporters, which makes them more vulnerable to idiosyncratic shocks, controlling for size increases the rate of survival among them.

Considering the growth rate for surviving exporters in the panel (c) of Figure 4, there is no clear relationship between experience and growth when the estimation does not control for the average size of the exporter. Controlling for the average size, we can observe a negative relationship between experience and growth by the third year only, conditional on survival in t. Since many of the firms that survive in t will actually exit in t+1, the last year of exports is incomplete and this generates a downward bias in the growth rate. Our results on the restricted sample of exporters surviving between t-1 and t+1 confirm that the growth rate is higher for all groups of experience, but the correction is larger for young exporters, which are more likely to exit. Most importantly, the results show that the growth rate of exports is the largest in year 3 and decreasing with the experience of surviving exporters in foreign markets.

Overall, our results show that the high rate of attrition among young exporters creates a positive relationship between the expected growth rate and the experience of firms in foreign market. Part of this result is explained by the small size of new exporters. Conditional on survival, export growth tend to decline as firms get more experience in export markets.

[13]The result obtained by Haltiwanger et al. (2010) regarding employment dynamics by US establishments point to a similar bias using the initial size measure.

Figure 4: Exports growth and exporter's experience



4 Churning of product and markets within firm

The net growth of exports individual exporters hides important information about the way exporters expand their foreign sales along destinations and products and reallocate their portfolio of markets (product/destination), i.e. the churning within firms. In this section, we focus on the contribution of these extensive margins of firms' exports, net and gross. The net extensive margin is defined by Equation 3 as the net contribution of new markets (*destination* × *product*) to the growth of individual exporters, and can be decomposed into the positive and negative gross extensive margins. Estimation results are reported in Appendix Tables C4.

4.1 Exporters' size and churning

We start with the effects of exporters' size on these margins. Panel (a) of Figure 5 shows that, consistently with the results on net growth, size exhibits a non monotonic relationship with the net extensive margin. Controlling for experience, small firms have better performances along the net extensive margin than medium firms, but the largest exporters outperform all other firms.[14]

Beyond net extensive margins, Panel (b) of Figure 5 underlines that churning on foreign markets (*destination* × *product*) contributes to a large share of the growth of exports of small and medium firms. The importance of churning declines sharply for large exporters. Small and medium exporters therefore simultaneously enter and exit foreign markets, and these new flows represents a large share of their exports every year. The portfolio of markets and products of large exporters is much more stable.

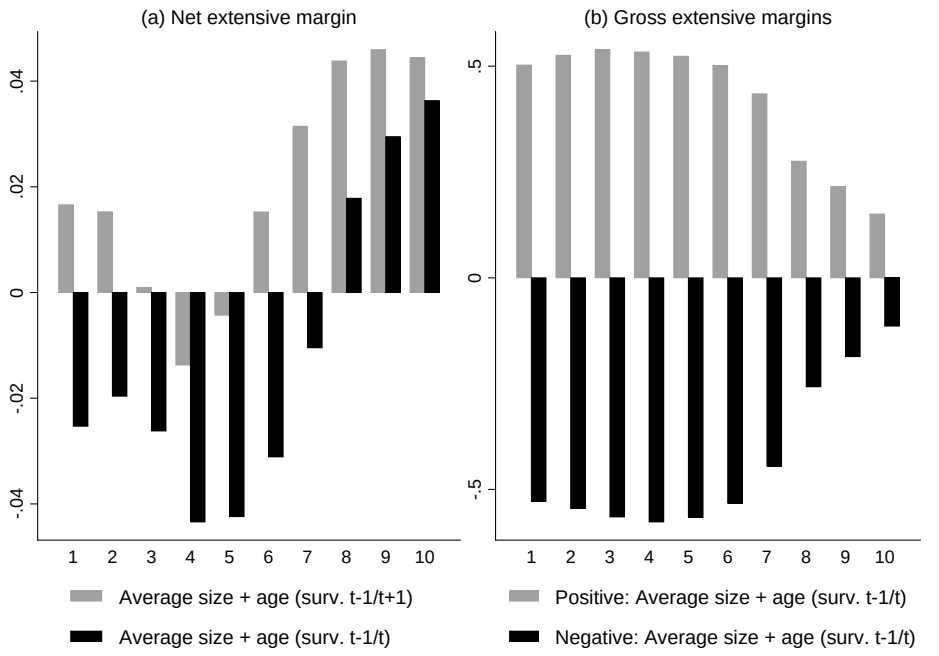
Overall, Figure 5 shows different dynamics of net and gross extensive margins. Large exporters have low (positive and negative) gross extensive margins but a positive contribution of the net extensive margin to the growth of their export. On the contrary, smaller exporters have more churning of products and destinations but the net contribution of entry and exit to the growth of their export is lower than large exporters.

4.2 Exporters' experience and churning

We now turn to the relationship between experience and churning (Figure 6). Again, the contribution of the net extensive margins exhibits similar pattern across categories of experience than those found for net growth. Panel (b) of Figure 6 presents the

[14] For brevity, we report results using the average size measure on the sample of exporters that survive between t-1 and t.

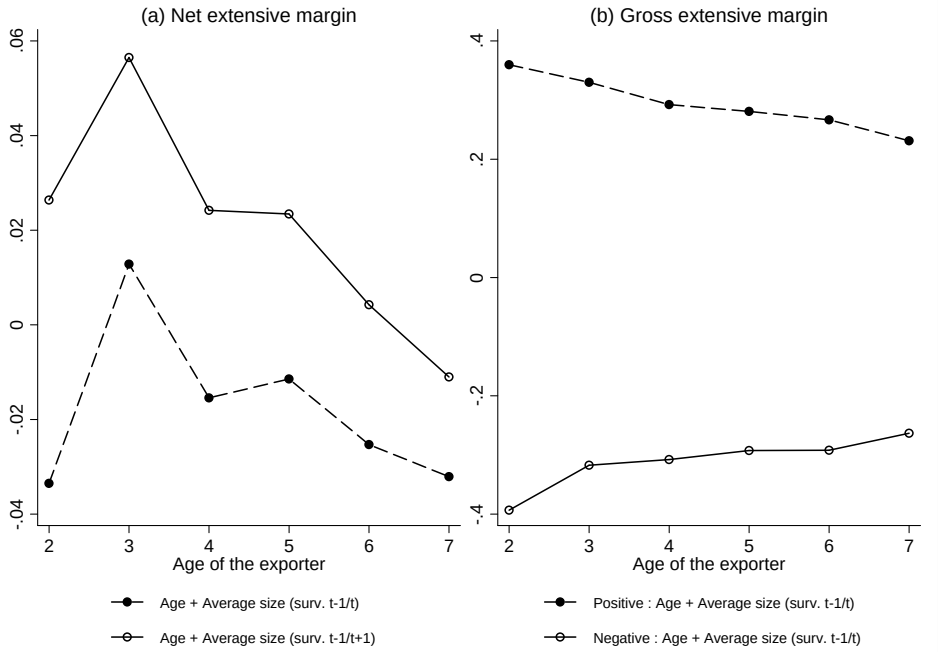
Figure 5: Average size and extensive margins of firm-level exports



gross contributions of the positive and negative extensive margins: both of them tend to decline progressively with the experience on the export market. Young surviving exporters enter and exit more foreign markets than mature ones, and this contributes significantly to their exports. The gross contributions of entry and exit however remain significant for experienced exporters, which contrasts with the results for size.

To summarize the results, small and, to a lesser extent, young exporters therefore contribute disproportionably to the volatility of trade flows for two reasons: their turnover on the export market is larger, and surviving firms have a larger churning of products and destinations over time.

Figure 6: Experience and extensive margins of firm-level exports



4.3 The components of the extensive margins: churning of products, destinations or both?

Figures 7 and 8 present the detailed components of the extensive margin of surviving exporters, decomposing into all four dimensions: add/drop product-and-destination (DP), add/drop a product on a continuing destination (P), add/drop a destination for a continuing product (D), and add/drop a trade relationship for a continuing product and destination (Other).

The main component of the gross extensive margin is the churning of products. Firms change their portfolio of markets mainly through changes in their portfolio of products, either on new markets or on markets they already serve. The significant contribution of the destination-and-product (DP, panel (a) in Figures 7 and 8) extensive margin suggest that firms are likely to serve new destinations with new products, and that a product often stops being exported when the firm leaves the country. The large churning of the

portfolio of exported products within firms suggests a rich product cycle dynamic on each specific export market and changing core products over space and time.

The smaller gross contribution of the extensive margins for large experienced exporters is mainly accounted for by lower product and destination-and-product gross margins. Product churning is not much important for large exporters, which are more stable in terms of export markets. On the other end of the spectrum, small and, to a lesser extent, young exporters account for a large share of the volatility of trade flows, through their churning of products.

Figure 7: Average size and the detailed margins of firm-level exports

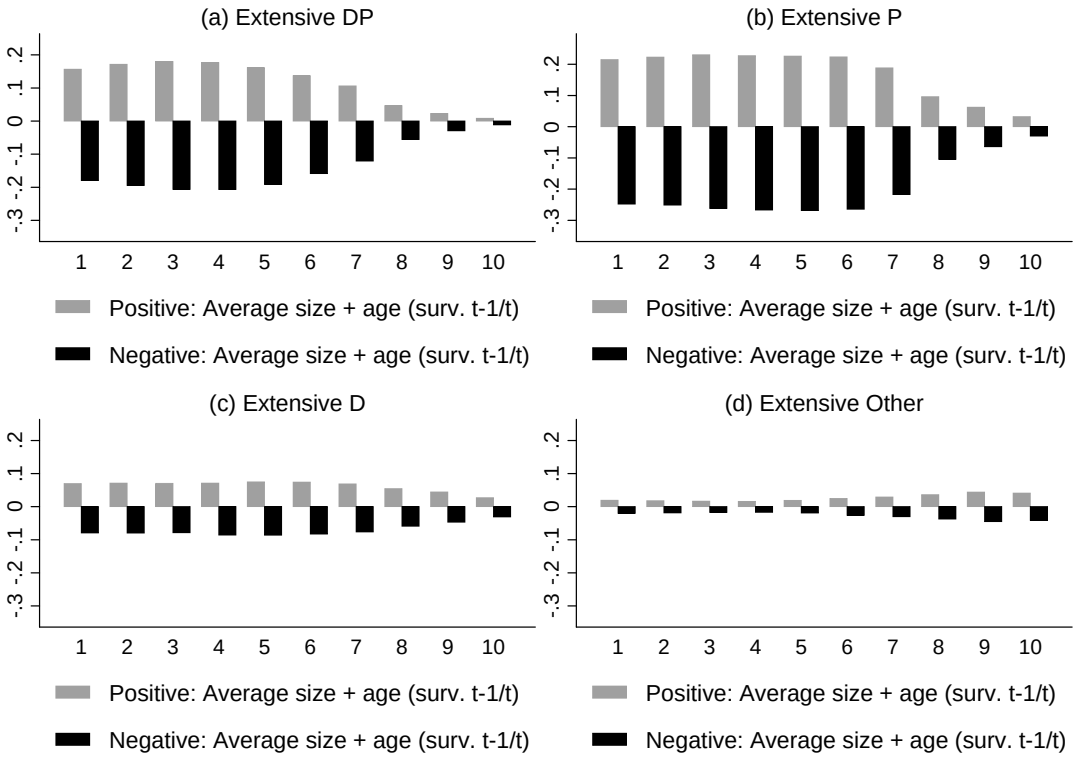
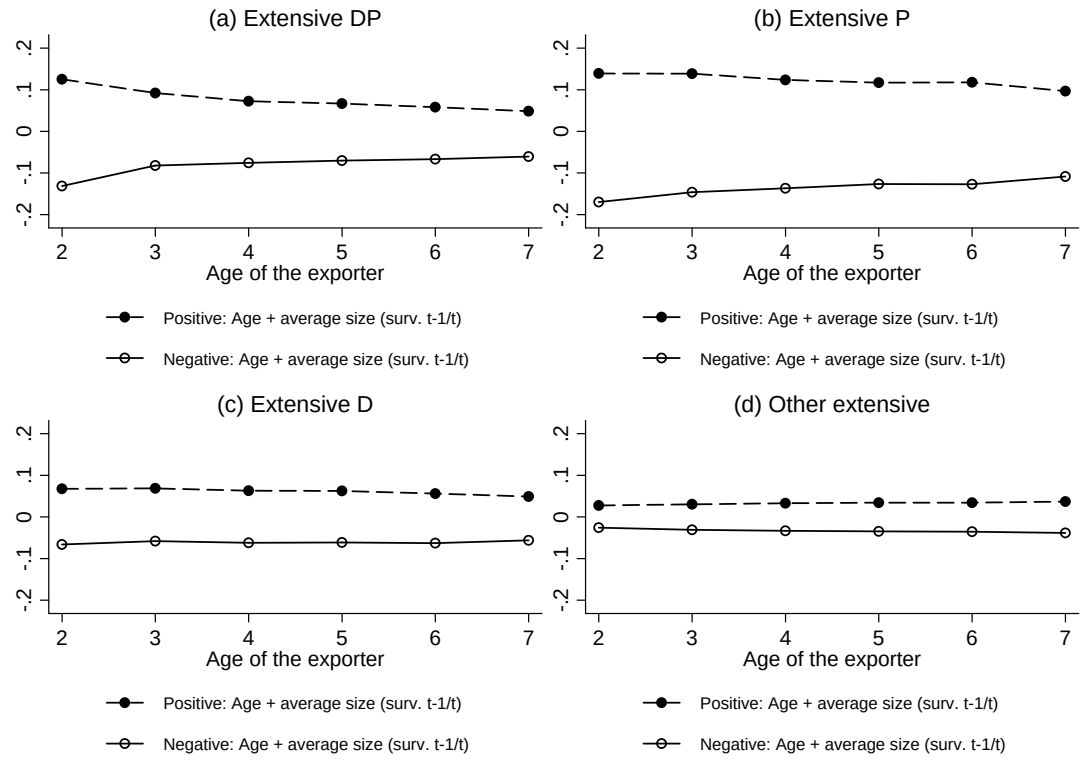


Figure 8: Average size and the detailed margins of firm-level exports



5 Conclusion

This paper aims at providing a new set of stylized facts regarding the growth and within-firm churning of exporters in relation to their experience and to their size. Our empirical analysis is based on a comprehensive transaction level dataset of French exporters. We find that net growth of surviving firms is negatively related to the experience of the firm in the export market, while the impact of size is non-monotonic. The growth premium of new exporters decreases progressively over time. The significance of firm experience on export market, beyond the effect of size, points to the existence of some form of learning on foreign markets. However, we find that small and, to a lesser extent, young exporters contribute disproportionably to export volatility through both firm turnover on the export market and within firm churning (entry and exit) of product and destination markets.

Our empirical analysis also points to several important statistical issues when studying the dynamics of exporters. Our results show a distinct role for experience and size of exporters. First, since young exporters are also small, considering jointly experience and size is important to disentangle the contribution of each to growth patterns. Second, we confirm that the choice of measurement of exporters' size is important. Finally, since exporters are likely to start exporting in the course of a year, using calendar year biases downwards export revenues in the first year of export, and artificially magnifies the growth between the first and second years. This bias is large and amounts to an underestimation of new exporter's revenue of 32% on average.

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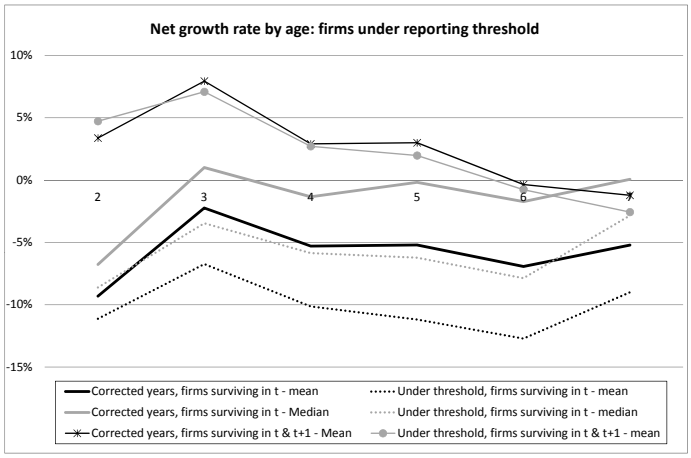
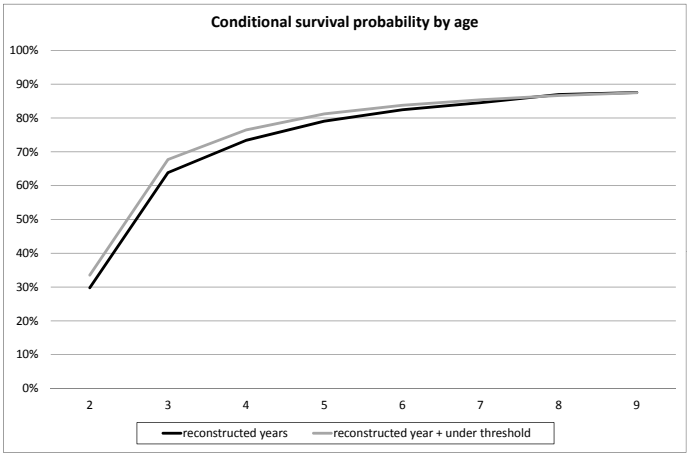
Appendix A: reporting thresholds in the French customs data

Two different thresholds apply for individual firms when declaring their exports. When exporting to a non-EU country, the threshold is 1,000 euros. When exporting to a Member state, the declaration is compulsory if the yearly cumulated value of exports to all other EU Member states is larger than 150,000 euros. This threshold has however changed since 1995, as well as the composition of the EU: we thus reapply this threshold to individual firms' exports to the 26 EU Member states over the full period. Exporters under the EU threshold however fill a simplified declaration without product or destination details. We use this information to compute individual firms' experience on the export market.

Some 91396 firms export on average each year in our dataset, of which on average 35046 are under the EU threshold of declaration. Figure 5 show that excluding firms under the threshold biases slightly downwards the conditional survival probability of new exporters. Regarding net growth rate (left panel of Figure 5), excluding exporters under the EU threshold biases upwards the level of growth rates, but does not affect the profile of mean or median growth over time. This bias is smoothed out when restricting the sample to firms that survive between $t-1$ and $t+1$.

Figure A1: Net growth rates and survival of exporters by experience: threshold effects





Appendix B: Descriptive statistics

Distribution of observations across export experience and size categories

This appendix Section provides summary statistics regarding the distribution of observations in experience×size cells using the full sample of observations (Table B1), or alternatively using the sample of firms that survive at least one year in the export market (Table B2).

The number of observations in Table B1 declines with experience in the export market: 23% of observations correspond to firms that start exporting and did not export in the past, but 3.3% of observations only correspond to firms that survive until year 6. Then, about one third of observations correspond to firms with 7 years or more of experience in the export market. Observations are, however, homogenously distributed across size categories when we consider the full sample of observations in Table B1, whereas the share of observations tend to increase with size when we concentrate on surviving exporters in Table B2.

Considering each experience category separately, the numbers reported in Table B1 show that firms with little experience in the export market tend to be ranked in small size categories, whereas experienced exporters (7 years or more of experience) tend to be ranked among large exporters. This pattern is also true for the population of surviving exporters (t-1/t) in Table B2: those of experienced exporters that tend to exit are also ranked in small size categories.

Despite the obvious positive correlation between average size and experience in the export market, substantial heterogeneity can be observed around the diagonal of the size-experience matrix. For instance, considering all firms in the sample, about 20% of observations correspond to exporters ranked in size categories 6 to 10. Considering mature exporters, about 14% of observations of that category correspond to firms ranked in average size categories 1 to 5.

To complete the description of the correlation of experience and average size in the export market, Table B3 reports an OLS estimation of the correlation between the two variables, controlling for year dummies or sector and year dummies. As expected, the correlation is positive and highly significant: more experienced firms in the export market have also a larger size in terms of exports. The point estimate of the correlation is 0.5, which also confirms that both variables are not perfectly substitutes.

Table B1: Share of cell in total number of observations (in %)

		Experience							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Average size	**1**	4,5	4,4	0,5	0,2	0,1	0,1	0,3	**10,1**
	2	4,3	4,1	0,7	0,3	0,2	0,1	0,5	**10,1**
	3	3,9	3,8	0,8	0,4	0,2	0,2	0,8	**10,0**
	4	3,3	3,5	0,9	0,5	0,3	0,2	1,2	**10,0**
	5	2,7	3,0	1,0	0,6	0,4	0,4	2,0	**10,0**
	6	2,0	2,3	1,1	0,8	0,6	0,5	2,9	**10,0**
	7	1,3	1,5	1,0	0,8	0,6	0,5	3,7	**9,4**
	8	0,6	0,8	0,8	0,7	0,6	0,6	6,0	**10,0**
	9	0,3	0,5	0,5	0,5	0,5	0,5	7,4	**10,2**
	10	0,2	0,3	0,4	0,4	0,4	0,4	8,2	**10,2**
	Total	**23,0**	**24,2**	**7,5**	**5,1**	**4,0**	**3,3**	**32,9**	**100,0**

Table B2: Share of cell in total number of observations among surviving t-1/t (in %)

		Experience							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Average size	**1**	6,2	0,1	0,0	0,0	0,0	0,0	0,0	**6,3**
	2	5,9	0,4	0,2	0,1	0,1	0,0	0,2	**6,9**
	3	5,4	0,8	0,4	0,2	0,1	0,1	0,6	**7,6**
	4	4,6	1,3	0,7	0,4	0,3	0,2	1,2	**8,7**
	5	3,7	1,6	0,9	0,6	0,5	0,4	2,1	**9,8**
	6	2,7	1,7	1,1	0,8	0,7	0,6	3,4	**11,0**
	7	1,8	1,1	0,9	0,8	0,7	0,5	3,8	**9,6**
	8	0,8	0,9	0,9	0,9	0,8	0,7	7,5	**12,6**
	9	0,5	0,6	0,7	0,7	0,6	0,6	10,0	**13,6**
	10	0,3	0,5	0,5	0,5	0,5	0,5	11,2	**14,0**
	Total	**31,9**	**8,8**	**6,4**	**5,0**	**4,2**	**3,7**	**40,0**	**100,0**

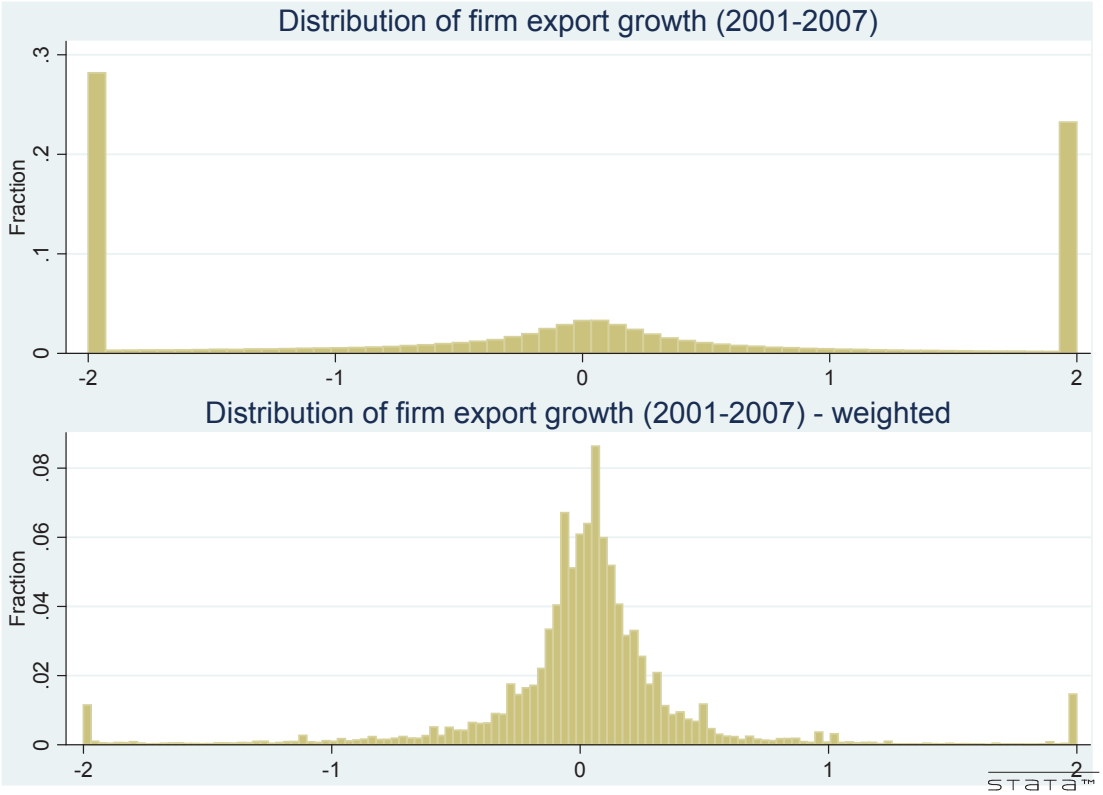
Table B3: Correlation between experience and size categories

	(1)	(2)
Dependent Variable	Experience	
Average size	0.554^a	0.551^a
	(0.001)	(0.001)
Constant	0.793^a	0.760^a
	(0.006)	(0.030)
Fixed effects	year	sector + year
Observations	527,305	527,305
R-squared	0.411	0.422

Note: ^{a} significant at 1%. OLS estimations in columns (1) and (2).

Distribution of firm export growth

Figure B1: Distributions of firm export growth (2001-2007)



Appendix C: Estimation results

Table C1. Effects of experience and size on the probability of survival

	(1)	(2)	(3)	(4)	(5)
Dep. Variable			$Prob(X_{it} > 0)$		
Measure of size		Average (t-1/t)	Average (t-1/t)	Initial (t-1)	Initial (t-1)
Sample	All	All	All	All	All
Experience exporter=1	0.135^a		0.422^a		0.314^a
	(0.001)		(0.002)		(0.001)
Experience exporter=2	-0.600^a		-0.328^a		-0.421^a
	(0.002)		(0.002)		(0.002)
Experience exporter=3	-0.255^a		-0.092^a		-0.134^a
	(0.003)		(0.002)		(0.003)
Experience exporter=4	-0.164^a		-0.045^a		-0.072^a
	(0.003)		(0.003)		(0.003)
Experience exporter=5	-0.106^a		-0.016^a		-0.034^a
	(0.003)		(0.003)		(0.003)
Experience exporter=6	-0.078^a		-0.007^b		-0.020^a
	(0.003)		(0.003)		(0.003)
Size exporter =1		-0.542^a	-0.590^a	-0.467^a	-0.408^a
		(0.002)	(0.002)	(0.003)	(0.002)
Size exporter =2		-0.504^a	-0.551^a	-0.444^a	-0.393^a
		(0.002)	(0.002)	(0.002)	(0.002)
Size exporter =3		-0.445^a	-0.485^a	-0.406^a	-0.360^a
		(0.002)	(0.002)	(0.002)	(0.002)
Size exporter =4		-0.371^a	-0.397^a	-0.362^a	-0.317^a
		(0.002)	(0.002)	(0.002)	(0.002)
Size exporter =5		-0.287^a	-0.300^a	-0.306^a	-0.266^a
		(0.002)	(0.002)	(0.002)	(0.002)
Size exporter =6		-0.202^a	-0.204^a	-0.243^a	-0.207^a
		(0.002)	(0.002)	(0.002)	(0.002)
Size exporter =7		-0.252^a	-0.254^a	-0.218^a	-0.190^a
		(0.002)	(0.002)	(0.002)	(0.002)
Size exporter =8		-0.083^a	-0.080^a	-0.121^a	-0.106^a
		(0.001)	(0.002)	(0.002)	(0.002)
Size exporter =9		-0.023^a	-0.022^a	-0.036^a	-0.030^a
		(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.898^a	0.981^a	0.973^a	0.974^a	0.974^a
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)
Observations	527,305	527,305	527,305	527,305	527,305
R-squared	0.392	0.172	0.508	0.125	0.448
Sector FE	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes

Note: Robust Standard errors in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. The probability of survival is obtained using a linear probability model estimated with OLS. Coefficients are used in Figures 3 and 4 to predict the effects of experience and size on the probability of survival.

Table C2. Effects of experience and size on firms' growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Variable		G_{it}				$G_{it}\|X_{it}>0$		
Measure of size		Average (t-1/t)	Average (t-1/t)	Average (t-1/t)	Average (t-1/t)	Average (t-1/t)	Average (t-1/t)	Average (t-1/t)
Sample	All	All	All	Surv. t-1/t	Surv. t-1/t	Surv. t-1/t	Surv. t-1/t+1	Surv. t-1/t Groups excl.
Experience exporter=1	2.319^a		2.910^a	2.057^a		2.106^a	2.063^a	2.109^a
	(0.002)		(0.004)	(0.002)		(0.003)	(0.003)	(0.004)
Experience exporter=2	-1.176^a		-0.615^a	-0.037^a		0.004	0.060^a	-0.004
	(0.004)		(0.005)	(0.006)		(0.006)	(0.007)	(0.007)
Experience exporter=3	-0.476^a		-0.131^a	0.033^a		0.066^a	0.103^a	0.067^a
	(0.006)		(0.006)	(0.006)		(0.006)	(0.007)	(0.007)
Experience exporter=4	-0.317^a		-0.063^a	0.002		0.030^a	0.059^a	0.035^a
	(0.007)		(0.007)	(0.006)		(0.007)	(0.007)	(0.008)
Experience exporter=5	-0.204^a		-0.010	0.002		0.025^a	0.050^a	0.028^a
	(0.008)		(0.007)	(0.007)		(0.007)	(0.007)	(0.008)
Experience exporter=6	-0.164^a		-0.009	-0.015^b		0.004	0.022^a	0.004
	(0.008)		(0.008)	(0.007)		(0.007)	(0.007)	(0.008)
Size exporter =1		-0.230^a	-1.217^a		1.934^a	-0.092^a	-0.054^a	-0.093^a
		(0.009)	(0.005)		(0.003)	(0.004)	(0.004)	(0.004)
Size exporter =2		-0.187^a	-1.138^a		1.706^a	-0.083^a	-0.055^a	-0.084^a
		(0.009)	(0.005)		(0.005)	(0.004)	(0.005)	(0.004)
Size exporter =3		-0.155^a	-1.016^a		1.369^a	-0.093^a	-0.078^a	-0.094^a
		(0.009)	(0.005)		(0.007)	(0.005)	(0.006)	(0.005)
Size exporter =4		-0.138^a	-0.862^a		0.998^a	-0.113^a	-0.098^a	-0.114^a
		(0.008)	(0.006)		(0.007)	(0.005)	(0.007)	(0.006)
Size exporter =5		-0.118^a	-0.677^a		0.671^a	-0.112^a	-0.081^a	-0.113^a
		(0.008)	(0.006)		(0.007)	(0.005)	(0.006)	(0.006)
Size exporter =6		-0.106^a	-0.489^a		0.397^a	-0.106^a	-0.063^a	-0.104^a
		(0.007)	(0.006)		(0.007)	(0.005)	(0.006)	(0.005)
Size exporter =7		-0.301^a	-0.565^a		0.291^a	-0.080^a	-0.036^a	-0.080^a
		(0.007)	(0.006)		(0.007)	(0.005)	(0.006)	(0.006)
Size exporter =8		-0.111^a	-0.203^a		0.071^a	-0.049^a	-0.017^a	-0.051^a
		(0.005)	(0.005)		(0.005)	(0.004)	(0.004)	(0.004)
Size exporter =9		-0.031^a	-0.060^a		0.021^a	-0.018^a	-0.002	-0.019^a
		(0.004)	(0.004)		(0.004)	(0.003)	(0.003)	(0.003)
Constant	-0.237^a	0.065^a	-0.060^a	-0.036^a	0.097^a	-0.005	0.014	-0.004
	(0.013)	(0.021)	(0.012)	(0.009)	(0.015)	(0.009)	(0.010)	(0.009)
Observations	527,305	527,305	527,305	380,687	380,687	380,687	263,357	336,635
R-squared	0.682	0.004	0.723	0.707	0.310	0.708	0.584	0.715
Sector FE	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes

Note: Robust Standard errors in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. Firms' growth is the net growth of exports. Coefficients are obtained using OLS estimations, and are used in Figures 3 and 4 to predict the effects of experience and average size.

Table C3. Effects of experience and size on firms' growth - robustness estimations with Initial size

	(1)	(2)	(3)	(4)	(5)
Dep. Variable	G_{it}		$G_{it}\|X_{it}>0$		
Measure of size	Initial t-1	Initial t-1	Initial t-1	Initial t-1	Initial t-1
Sample	All	All	Surv. t-1/t	Surv. t-1/t	Surv. t-1/t+1
Experience exporter=1		2.564^{a}		1.888^{a}	1.866^{a}
		(0.004)		(0.003)	(0.003)
Experience exporter=2		-0.931^{a}		-0.126^{a}	-0.065^{a}
		(0.005)		(0.006)	(0.006)
Experience exporter=3		-0.300^{a}		-0.026^{a}	0.013^{b}
		(0.007)		(0.006)	(0.006)
Experience exporter=4		-0.177^{a}		-0.037^{a}	-0.006
		(0.007)		(0.006)	(0.007)
Experience exporter=5		-0.092^{a}		-0.027^{a}	-0.001
		(0.008)		(0.007)	(0.007)
Experience exporter=6		-0.070^{a}		-0.037^{a}	-0.017^{b}
		(0.008)		(0.007)	(0.007)
Size exporter =1	-0.021^{b}	-0.556^{a}	1.779^{a}	0.402^{a}	0.616^{a}
	(0.010)	(0.006)	(0.005)	(0.005)	(0.009)
Size exporter =2	0.001	-0.544^{a}	1.647^{a}	0.356^{a}	0.522^{a}
	(0.009)	(0.006)	(0.005)	(0.005)	(0.008)
Size exporter =3	0.003	-0.515^{a}	1.414^{a}	0.282^{a}	0.368^{a}
	(0.009)	(0.006)	(0.006)	(0.005)	(0.007)
Size exporter =4	-0.018^{b}	-0.477^{a}	1.141^{a}	0.193^{a}	0.237^{a}
	(0.008)	(0.006)	(0.007)	(0.005)	(0.007)
Size exporter =5	-0.038^{a}	-0.444^{a}	0.853^{a}	0.086^{a}	0.107^{a}
	(0.008)	(0.005)	(0.007)	(0.005)	(0.006)
Size exporter =6	-0.085^{a}	-0.402^{a}	0.548^{a}	-0.011^{b}	-0.003
	(0.007)	(0.005)	(0.007)	(0.005)	(0.005)
Size exporter =7	-0.203^{a}	-0.388^{a}	0.308^{a}	-0.031^{a}	-0.008^{c}
	(0.007)	(0.005)	(0.006)	(0.004)	(0.005)
Size exporter =8	-0.137^{a}	-0.193^{a}	0.128^{a}	0.013^{a}	0.037^{a}
	(0.006)	(0.005)	(0.005)	(0.004)	(0.003)
Size exporter =9	-0.049^{a}	-0.064^{a}	0.028^{a}	-0.006^{b}	0.009^{a}
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)
Constant	0.016	-0.092^{a}	0.062^{a}	-0.038^{a}	-0.011
	(0.021)	(0.012)	(0.016)	(0.009)	(0.010)
Observations	527,305	527,305	380,687	380,687	263,357
R-squared	0.003	0.691	0.290	0.718	0.603
Sector FE	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes

Note: Robust Standard errors in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. Firms' growth is the net growth of exports. Coefficients are obtained using OLS estimations, and are used in Figures 3 and 4 to predict the effects of experience and initial size.

Table C4. Effects of experience and size on firms' net and gross export margins

	(1)	(2)	(3)	(4)
Dep. Variable	G^I_{it}	G^E_{it}	$G^E_{it}+$	$G^E_{it}-$
Measure of size	Average (t-1/t)	Average (t-1/t)	Average (t-1/t)	Average (t-1/t)
Sample	Surv. t-1/t	Surv. t-1/t	Surv. t-1/t	Surv. t-1/t
Age exporter=1	0.044^a	2.072^a	1.533^a	0.540^a
	-0.002	-0.003	-0.002	-0.002
Age exporter=2	0.010^b	-0.001	0.129^a	-0.130^a
	-0.004	-0.005	-0.003	-0.003
Age exporter=3	0.026^a	0.045^a	0.099^a	-0.054^a
	-0.005	-0.005	-0.003	-0.004
Age exporter=4	0.016^a	0.017^a	0.061^a	-0.044^a
	-0.005	-0.005	-0.004	-0.004
Age exporter=5	0.007	0.021^a	0.050^a	-0.029^a
	-0.005	-0.005	-0.004	-0.004
Age exporter=6	-0.007	0.007	0.035^a	-0.029^a
	-0.005	-0.006	-0.004	-0.004
Size exporter t/t-1=1	-0.027^a	-0.062^a	0.352^a	-0.414^a
	-0.003	-0.003	-0.002	-0.002
Size exporter t/t-1=2	-0.023^a	-0.056^a	0.375^a	-0.431^a
	-0.003	-0.003	-0.003	-0.003
Size exporter t/t-1=3	-0.027^a	-0.063^a	0.388^a	-0.451^a
	-0.003	-0.004	-0.003	-0.003
Size exporter t/t-1=4	-0.030^a	-0.080^a	0.383^a	-0.463^a
	-0.003	-0.004	-0.003	-0.003
Size exporter t/t-1=5	-0.031^a	-0.079^a	0.373^a	-0.452^a
	-0.004	-0.004	-0.003	-0.003
Size exporter t/t-1=6	-0.039^a	-0.067^a	0.351^a	-0.418^a
	-0.004	-0.004	-0.003	-0.003
Size exporter t/t-1=7	-0.034^a	-0.047^a	0.284^a	-0.331^a
	-0.004	-0.004	-0.003	-0.003
Size exporter t/t-1=8	-0.033^a	-0.018^a	0.125^a	-0.143^a
	-0.003	-0.003	-0.002	-0.002
Size exporter t/t-1=9	-0.011^a	-0.007^a	0.065^a	-0.072^a
	-0.003	-0.002	-0.001	-0.002
Constant	-0.013	0.003	-0.015^a	0.019^a
	-0.009	-0.005	-0.005	-0.005
Observations	380,687	380,687	380,687	380,687
R-squared	0.003	0.781	0.848	0.323
Sector FE	yes	yes	yes	yes
Time FE	yes	yes	yes	yes

Note: Robust Standard errors in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. The dependent variable is the net contribution of the intensive margin to exports growth in Column (1), the net contribution of the extensive margin in Column (2), the contribution of the positive extensive margin in Column (3) and the negative contribution of the extensive margin in Column (4). Coefficients are obtained using OLS estimations, and are used in Figures 5 and 6 to predict the effects of experience and average size.

Appendix D: Fully saturated dummy models

The main estimation strategy used in the paper follows Haltiwanger et al. (2010) (henceforth HJM) and Davis et al. (1996) (henceforth DHS) for the measurement of the growth rate taking into account entry and exit. The model is mainly an "additive model", where experience and size dummies are two sets of dummy variables that are used to explain exports growth at firm-level. Alternatively, one may use a fully saturated model with a multiplicative form. In that case, firm-level exports growth is explained by a full set of interaction terms between experience and size categories (e.g. experience=1 and size=1; experience=1 and size=2; experience=2 and size=1 etc.).[15]

As discussed by Angrist and Pischke (2009) pp. 48-51, only the fully saturated model fits perfectly the Conditional Expectation Function (CEF), regardless of the distribution of the dependent variable (in the case where the estimation is obtained using OLS). In our case, the dependent variable is the DHS growth rate, which is bounded by values [-2;2]. HJM and Huber et al. (2012) emphasize that in this case, there is a risk that predicted growth rates using estimated coefficients from the additive model fall outside of the [-2;2] bounds. The Fully Saturated Model (FSM) estimated with OLS therefore solves this problem and gives consistent estimates. The additive model (presented in the paper) is a good approximation of the FSM if the effects of experience on growth are similar across size categories and vice-versa (see Angrist and Pischke, 2009 p.51).

We provide below two estimations of the effects of experience and size on the net growth rate of exports by firm, ignoring for the sake of simplicity industry and year dummies (the FSM would require ideally to interact all size and experience dummies with the industry and year dummies). Estimates of the additive model (*à la* HJM) and the multiplicative model (FSM model) are provided for the whole sample of exporters, and also for the sample of surviving exporters only.

With the FSM model, coefficients for each size×experience category are obtained directly from the estimation. Taking the sum of the constant term and the coefficient gives the predicted growth for each size×experience cell (we have $10 \times 7 - 1$ coefficients corresponding to all size× experience interactions keeping one omitted category captured by the constant term). With the HJM model, we have 6 coefficients for experience (experience=7 is the omitted category) and 9 coefficients for size (size=10 is the omitted category). Predicted growth rates for each size×experience cell are obtained by taking the sum of the constant term, the coefficient for experience, and the coefficient for size.

[15] Throughout this exercize, we decided to ignore industry and year dummies which are used as controls in the main estimates provided in the paper.

The value taken by the constant term therefore reflects the predicted growth rate for experienced and large firms (experience=7 and size=10).

HJM show in their appendix section that the partial effect of experience (age) and size on firms' growth can be summarized by applying weights on each cell: constant size weights across experience categories, or constant experience weights across size categories. In our exercise, weights reflect the share of the number of observations of the size (experience) category over the total number of observations in the sample. For example, considering all firms in sample, 10% of observations are firms of size class 1, 10% of observations are observations of size class 2 and so on (see Table B1). These size-class weights will be considered as constant across experience categories. The predicted growth rate of each experience category will be computed as the weighted average of coefficients over that category using size weights.

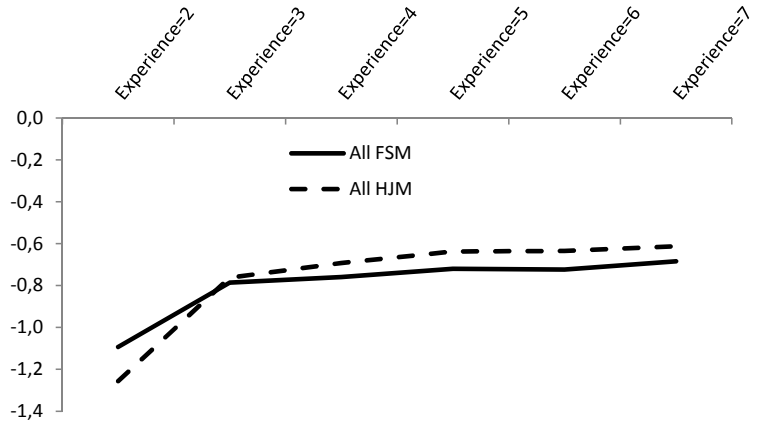
If we now consider experience categories, and considering all firms in sample, firms that start exporting represent 23% of observations, firms with 2 years of experience 24.2% and so on (see Table B1). These experience-class weights will be considered as constant across size categories. The predicted growth rate of each size category will be computed as the weighted average of coefficients over that category using experience weights. Similar calculations are applied when we restrict the sample to firms that survive at least one year or more, using appropriate weights summarized in Table B2.

The predicted growth of firms' exports by experience category (reflecting the partial effect of experience) is summarized in Figure D1 using alternatively the coefficients from the main empirical model used in the paper or the FSM, and different samples of exporters (all exporters in sample (a), those surviving at least one year in the export market (b), or those surviving at least two years (c)). In each case, the HJM model is a good approximation of the FSM model: controlling for the average size effect on exporters' growth, the net growth rate increases with firms' experience due to the low survival rate of young exporters. Considering firms surviving one or two years in the export market (with appropriate size weights), the net growth of firm-level exports is decreasing with export experience.

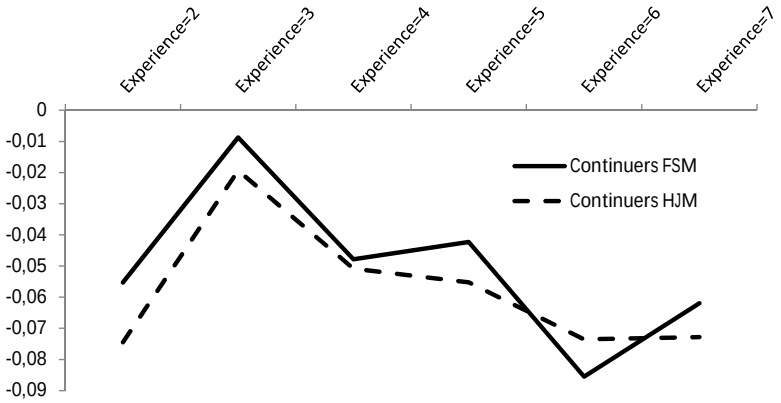
The predicted growth of firms' exports by size category (reflecting the partial effect of size) is summarized in Figure D2 using alternatively the coefficients from the main empirical model used in the paper or the FSM, and different samples of exporters (all exporters in sample (a), or those surviving at least one year in the export market (b)). In this case as well, the HJM model is a good approximation of the FSM model: controlling for the average experience effect on exporters' growth, the net growth rate increases with

Figure D1: Fully Saturated Model (FSM) estimates versus baseline estimates: export experience

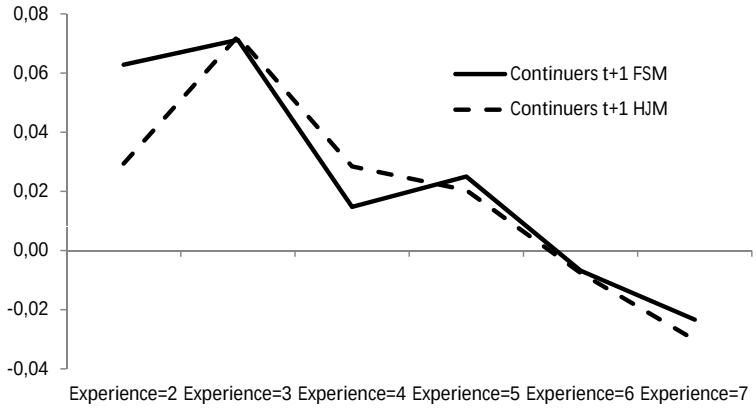
(a) All firms



(b) Firms surviving t-1/t



(c) Firms surviving t-1/t+1

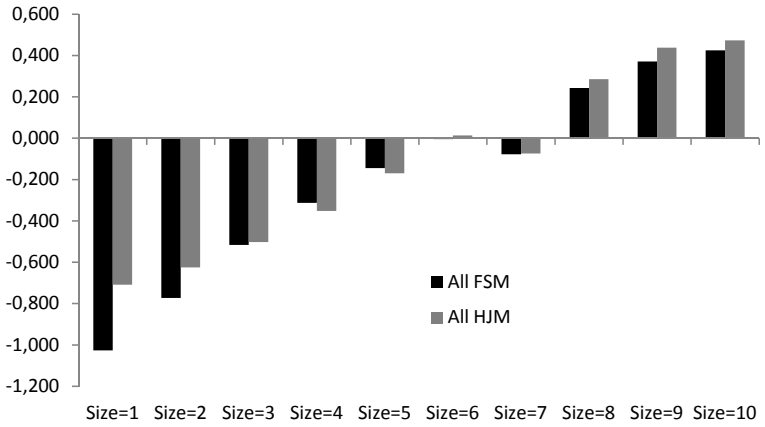


Note: Predictions based on the partial effect of experience in foreign markets on firms' exports growth, controlling for exporters' size. A constant size-distribution of firms is used across export experience categories to get these predictions. FSM stands for Fully Saturated Model. HJM stands for Haltiwanger, Jarmin and Miranda (2010) without the full interaction structure between experience and size categories. Compared to our main results presented in the paper, these estimations do not control for industry and year dummies.

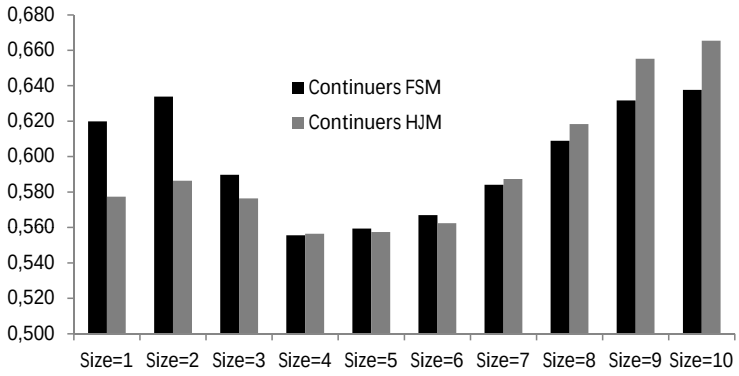
firms' size due to the low survival rate of small exporters. Considering firms surviving one year in the export market (with appropriate experience weights), we do not find a linear relation between the net growth of firm-level exports and the average size of the exporter. If any difference can be identified between models, the HJM model would tend to under-estimate the net growth by small firms. However, both models tend to validate that the Gibrat's law holds when the estimation controls form firm experience in international markets.

Figure D2: Fully Saturated Model (FSM) estimates versus baseline estimates: export size

(a) All firms



(b) Firms surviving t-1/t



Note: Predictions based on the partial effect of firms' export size on firms' exports growth, controlling for exporters' experience in foreign markets. A constant experience-distribution of firms is used across export size categories to get these predictions. FSM stands for Fully Saturated Model. HJM stands for Haltiwanger, Jarmin and Miranda (2010) without the full interaction structure between experience and size categories. Compared to our main results presented in the paper, these estimations do not control for industry and year dummies.