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Firm size and export performance: Evidence from Uruguayan manufacturing SMEs

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Abstract

Small and medium-sized enterprises (SMEs) are recognized as an important driving force in economic development, both in industrialized and developing countries. However, and despite their increasing active role in foreign markets, evidence drawn mainly from developed economies indicates that several obstacles constrain SMEs' international activities, affecting these firms' ability to seize opportunities and confront threats emanating from the globalization process. This paper provides a developing country perspective on this issue, empirically evaluating the determinants of Uruguayan manufacturing firms' involvement in export markets, with a focus on firm size.

Using firm-level panel data covering the period 1997-2005, this study investigates four dimensions of firms' export performance: export propensity, export intensity, product scope, and export survival. The results obtained show that SMEs underperform large enterprises in the four export dimensions considered, suggesting that the inherent resource constraints that characterize smaller firms would hamper their participation in export markets. Estimates also indicate that SMEs would be differently affected by some of the factors determining firms' export performance. These findings provide support for the argument that policymakers should develop specific initiatives regarding internationalization of SMEs. Given the important role played by SMEs in the Uruguayan economy, the improvement of their international insertion is crucial for strengthening the country's export performance, as well as for enhancing the impact of exports on the rest of the economy.

Keywords: small and medium-sized enterprises (SMEs), export performance, manufacturing, panel data

JEL classification: F14, D22, L60

Content

1. Introduction

Small and medium-sized enterprises (SMEs) play a crucial role in most economies, accounting for a substantial share of total employment. They are recognized as a driving force for wealth creation, making important contributions to innovation, productivity and economic growth (OECD, 2005). Compared to large firms, SMEs are considered to have a number of inherent advantages –such as superior operational flexibility and greater ability to innovate–, which would allow them to be more responsive to the business environment. However, they are generally more resource-constrained than large enterprises, in terms of financial capital and technical and managerial capabilities, which might limit the scope of these firms' activities.

Although in the past internationalization was mostly related with large firms, the contemporary globalization process creates new opportunities and incentives for SMEs to internationalize, while confronting them with increased foreign competition in their home market. By engaging in international activities, firms can benefit from pursuing larger and new niche markets, exploiting scale economies, accessing advanced know-how and technologies, and lowering costs. Internationalization is also a way of diversifying risk (by spreading sales across different markets), and provides opportunities for the exchange of knowledge and the enhancement of capabilities, strengthening the long-term competitiveness of the firm (Wilson, 2007).

Declining trade barriers, lower transport costs and advances in information and communication technologies have reduced many of the traditional obstacles to internationalization. Additionally, the increasing fragmentation of production processes across countries provides opportunities for all enterprises, regardless of size, to participate in international value chains. However, SMEs still face many barriers in the process of internationalization. According to OECD (2009), the most serious impediments for SMEs to internationalize are shortage of working capital to finance overseas operations, inadequate knowledge of international markets (limited information to locate/analyse markets and identify foreign business opportunities), and lack of relevant managerial skills and knowledge. These barriers are largely internal and would mainly reflect firms' limitations in regard to the key resources and capabilities they need to enter foreign markets.

Even though small size does not impede successful internationalization, evidence on SMEs' participation in international markets would suggest that the resource and capability constraints characteristic of smaller firms affect their ability to exploit the opportunities emanating from the globalization process. As a result, in spite of being worldwide the dominant form of business organization, the majority of SMEs is not actively involved in international markets and, for those that have internationalized, international activities are often limited (both in geographical scope and in comparison to domestic activities). This is clearly the case in Latin America and the Caribbean (LAC), where SMEs –which constitute more than 90 percent of enterprises– are notably underrepresented in the region's external sector (IDB, 2014).[1]

Most of the studies on firms' participation in international markets look at developed countries, and do not explicitly explore whether the determinants of firms' internationalization differ across firm sizes. As pointed out by Ottaviano and Volpe Martincus (2011) –referring particularly to the export behaviour of firms–, a priori there are good reasons to believe that firms of different sizes may be differently affected by the various factors determining their export decisions, and that the importance of these factors may also depend on the development level of firms' countries.

Resource constraints and barriers to entry are critically higher for SMEs than for large companies, limiting the scale of international activities undertaken by these firms (Acs et al., 1997; Karagozoglu and Lindell, 1998; Hollenstein, 2005 (cited in Pradhan and Das, 2012); IDB, 2014). Larger firms are in a better position to absorb the cost of entry into foreign markets, related to the gathering of information on foreign business practices and consumer preferences, the identification of business opportunities abroad, the adaptation of products to foreign markets, and the establishment of distribution and marketing channels abroad. In addition, they can afford to assume more risks, and their risks from foreign operations are less than those of small firms (Volpe Martincus et al., 2010). Furthermore, small firms from developing countries are generally confronted with greater difficulties than those from developed economies, as the conditions prevailing in these countries (such as a higher economic regime uncertainty, a poorer exporting infrastructure (in terms of

[1] Despite their prominence in LAC economies, less than 15 percent of LAC SMEs engage in direct exporting (18 percent if indirect exporters are included), and those that do export tend to sell only a few products to a very small number of markets. Many economies in the region even lag behind comparable emerging markets in SME export participation, diversification, and export sales (IDB, 2014).

transport, communication, and intermediation), and a more limited access to financing) tend to aggravate the problems that SMEs naturally face when trying to penetrate foreign markets (Ottaviano and Volpe Martincus, 2011).

This study attempts to contribute to the still scarce literature on the internationalization of SMEs in developing countries (particularly, in the Latin American region), by providing evidence on Uruguayan manufacturing firms. Within the context previously outlined, the focus of this paper is on examining the relationship between the size of the firm and its process of internationalization, specifically its export activity (the most frequent outward international activity carried out by SMEs). A firm-level panel covering the period 1997-2005 is used to empirically evaluate the determinants of four dimensions of firms' export behaviour: export propensity, export intensity, product scope, and export survival. Along with exploring to what extent the resource and internal capability constraints that often characterize smaller firms limit their involvement in export markets, the study evaluates whether the factors affecting SMEs' export decisions differ from those of the whole sample of firms.

The remainder of the paper is organized as follows. Section 2 presents a brief review of some of the most relevant theoretical literature on heterogeneous firms and trade (in which this study is framed), and refers to the empirical works on the relationship between firm size and exporting. Section 3 discusses the empirical strategy adopted in this study. Section 4 presents the data used. Section 5 discusses the econometric results. Finally, section 6 concludes.

2. Literature review

The relationship between firm characteristics and internationalization has attracted considerable research attention. Since the mid-1990s, a growing body of empirical literature has focused on the links between firm characteristics and exporting, showing that there exist substantial differences between exporting and non-exporting firms (in terms of size, productivity, capital and skill-intensity, and wages) (e.g., Bernard and Jensen, 1995, 1999, 2001; Roberts and Tybout, 1997; Bernard and Wagner, 1997). More recently, evidence has also shown that firms engaged in other international activities, such as importing, have different characteristics than those that are not internationalized. These

findings challenged both traditional and new trade theory, which emphasize the role of comparative advantage (i.e., the variation in opportunity costs of production across countries and industries), and a combination of economies of scale and consumer preferences for variety, respectively, as the basis for international trade, assuming a representative firm (at least within each industry). As a result, the focus of the international trade field shifted from countries and industries to firms and products, leading to the development of richer theoretical models that stress the importance of firm heterogeneity in generating international trade (Bernard et al., 2007a).

Heterogeneous-firm models capture the interaction between firm heterogeneity and international trade, explaining the differences in export behaviours among firms by differences in firm-specific efficiency and trade costs. Any factor that affects firms' efficiency levels or trade costs may therefore influence their export decisions. A first theoretical framework was developed by Melitz (2003), who introduced firm heterogeneity into Krugman's (1980) model of intra-industry trade under monopolistic competition and increasing returns to scale. Melitz's model is a dynamic industry model in which firms differ in productivity levels, produce horizontally differentiated varieties within the industry, and have to incur sunk fixed entry costs (both for their domestic market and for any potential export market).[2] Only firms whose productivity is above a certain threshold will find it profitable to pay the cost of entering the home market (i.e., firms with a productivity level below the zero-profit cutoff productivity would make negative profits if they produced, hence they exit immediately without producing[3]). Similarly, of the active firms in an industry, only those whose productivity exceeds the export cutoff level are able to cover the costs of exporting and, therefore, find it profitable to export; the less productive active firms will serve only the domestic market.

Melitz's model shows how the exposure to trade induces a domestic market selection effect (of firms out of the industry) and an export market selection effect, both of which reallocate market shares towards more efficient firms and contribute to an aggregate

[2] The coexistence of firms with different productivity levels within the same industry is the result of firms' uncertainty about their productivity before an irreversible entry decision is made. Prior to entry, firms (potential entrants) are identical. Once the sunk domestic market entry cost is paid, each firm draws its productivity from a fixed distribution that is common to all entrants. The export decision occurs after firms observe their productivity, which remains fixed after entry.

[3] All producing firms face subsequently a constant exogenous probability of exiting the market in each period, which is independent of firm's productivity and induces steady-state entry and exit of firms in the model.

productivity gain. The model is consistent with the evidence suggesting the existence of sunk export market entry costs (e.g., Roberts and Tybout, 1997; Bernard and Jensen, 2001; Bernard and Wagner, 2001), associated with items such as information requirements (about consumer tastes, market structure and regulations in foreign countries), the adjustments of product designs to foreign standards and regulations, and the establishment of distribution and marketing channels abroad. These entry costs affect how the impact of trade is distributed across different types of firms. The model also addresses a number of empirical regularities concerning the behaviour and relative performance of exporting firms: relatively few firms export; exporters tend to be more productive and larger than non-exporting firms (even prior to entering export markets); and trade liberalization induces reallocations of resources across firms within industries (both in developing and developed countries).

Bernard et al. (2003) (henceforth BEJK) was another important early contribution to the literature on firm heterogeneity and exporting. They developed an alternative theoretical framework, introducing imperfect competition into the static Ricardian model of trade of Eaton and Kortum (2002). The BEJK model also addresses several of the stylized facts of international trade. Similarly to Melitz (2003), reductions in trade costs are here related to within-industry reallocations and increases in aggregate industry productivity (as lower productivity, non-exporting firms exit, more productive existing non-exporters or new entrants begin to export, and high-productivity existing exporters increase their foreign sales). However, these reallocations occur through different channels in the two models. In contrast to Melitz (2003), in BEJK it is import competition that forces the least efficient (productive) domestic producers to exit, since they lose their position in the domestic market in favour of more efficient (lower cost) foreign firms producing the same variety.

The focus of much recent theoretical research in international trade has been on elaborating on the Melitz (2003) model, which has proved to be adaptable to a wide range of applications.[4] Bernard et al. (2007b) explore the interaction between comparative advantage and heterogeneous firms, adding firm heterogeneity, multiple factors of production and asymmetric industries and countries to the standard trade paradigm of Helpman and Krugman (1985). By combining factor endowment differences across

[4] Reviews of the theoretical literature on heterogeneous firms and trade can be found in Helpman (2006) and Redding (2011). See also Melitz and Redding (2012).

countries, factor intensity differences across industries, and heterogeneous firms within industries, the model is able to simultaneously explain why some countries export more in certain industries than in others (endowment-driven comparative advantage); why two-way trade is observed within industries (firm-level horizontal product differentiation combined with increasing returns to scale); and why, within industries, some firms export and others do not (self-selection driven by trade costs).[5]

Also along the lines suggested by Melitz (2003), Helpman et al. (2008) develop a model of international trade with heterogeneous firms in which the profitability of exports varies by destination. Firms differ in productivity and face fixed and variable costs of exporting, which depend on the characteristics of the importing and exporting countries (but not on firms' productivity). Under these circumstances only a fraction of the firms, those with higher productivity, find it profitable to export to each destination. Thus, the model is consistent with some important stylized features of the data: it predicts positive –though asymmetric– trade flows as well as zero trade flows across pairs of countries, and it allows the number of exporting firms to vary across destination countries (with larger numbers of firms exporting to larger destination markets).[6] As a result, the impact of trade frictions on trade flows can be decomposed into the so-called intensive (trade volume per firm) and extensive (number of exporting firms) margins, with the latter explaining a substantial proportion of the observed trade adjustments. These adjustments along the extensive margin are found to be typically driven by the export participation decisions of smaller firms (Ottaviano and Volpe Martincus, 2011).

The growing body of theoretical literature on heterogeneous firms and trade has been accompanied by a large number of empirical studies, stimulated by the increasing availability of firm-level data.[7] Although heterogeneous-firm models emphasize the role of sunk costs and firm productivity, the empirical literature has found that a number of other firm characteristics are also important determinants of firms' export decisions (Greenaway

[5] The Melitz model only considers symmetric countries, which implies that all trade is intra-industry trade and that the productivity gains from trade are symmetrically distributed across countries. In Bernard et al. (2007b) countries are identical in terms of preferences and technologies, but differ in their relative factor endowments. Also, the intensity of use of production factors (skilled and unskilled labour) varies across industries.

[6] The profitability of exports is higher for exports to countries with higher demand levels, lower variable export costs, and lower fixed export costs. For any country pair (i, j), it may be the case that no firm from country j is productive enough to profitably export to country i, and/or vice versa.

[7] For a review of this empirical literature, see Bernard et al. (2007a) and Wagner (2007, 2012).

and Kneller, 2007). Among the firm characteristics typically considered in this literature, the role of size has been extensively investigated.[8] Several studies show evidence of a positive relationship between firm size and the probability of entering export markets (see, e.g., Roberts and Tybout (1997) on Colombia, Bernard and Jensen (1999) on the US, Bernard and Wagner (1997, 2001) on Germany, and Girma et al. (2004), Greenaway and Kneller (2004), Gourlay and Seaton (2004), Kneller and Pisu (2007) and Harris and Li (2009) on the UK). Some of these studies also evaluate the link between firm size and export intensity, finding mixed results (e.g., Gourlay and Seaton (2004) show evidence of a positive relationship between the two variables, whereas in Kneller and Pisu (2007) no significant association is found).

The firm size-export nexus is considered to reflect economies of scale in production and export marketing, as well as larger firms' advantages (over smaller firms) in terms of the availability of financial and managerial resources to overcome entry costs and absorb the risks associated with internationalization. However, the relationship between size and exporting has been frequently found to be non-linear, exhibiting an inverted U-shaped pattern. This would indicate that once a certain threshold size is achieved, coordination costs cause further export expansion to be non profitable (Wagner, 2001).[9] Also, it would reflect that larger firms might have an incentive to expand their foreign-market penetration through foreign direct investment (FDI) (rather than exports), which often constitutes an alternative strategy for international expansion (Harris and Li, 2009).

The number of studies that evaluate the relationship between size and other dimensions of firms' export behaviour (besides export propensity and export intensity) is relatively small, due mainly to the limited availability of the required data. Barba Navaretti et al. (2011) analyse the internationalization of manufacturing firms in seven European countries (Austria, France, Germany, Hungary, Italy, Spain, and the UK). Among other results, they find that firm size is positively related to firms' export performance in all countries, in terms of the probability of exporting, the share of exports in total turnover, the number of foreign markets served, and the probability of exporting to distant countries. In addition,

[8] The focus of most empirical studies is not on firm size *per se*; rather, firm size is often included as a control variable. Caves (1989), Berry (1992) and Wagner (2001) provide reviews of some of the evidence relating firm size and export propensity.

[9] Conditional on having overcome entry barriers, the effect of size on export performance could become negative. As the scale of operation increases (i.e., firms grow larger), coordination costs increase and, at some point, further export expansion is not profitable.

they find evidence of a positive relationship between firm size and more complex internationalization strategies, such as FDI and international outsourcing.

Although an increasing number of empirical studies are directed at the analysis of SMEs' export behaviour, evidence from developing countries is still rather scarce. Ottaviano and Volpe Martincus (2011) analyse the factors that affect the export decisions of SMEs in Argentina, aiming at assessing whether they exhibit distinguishing patterns with respect to those observed for larger firms in developed countries. The estimation results suggest that sunk entry costs play an important role in Argentinean SMEs' export decisions, as current export market participation shows a strong positive association with previous export experience. Also, larger and more productive firms (i.e., those with higher employment levels and larger average sales per employee, respectively) are more likely to export; and sourcing intermediate inputs from abroad and investing in product improvement are as well associated with increased export probabilities. The authors also analyse whether firms' export behaviour differs across destination markets, comparing the Southern Common Market (MERCOSUR, the main destination of Argentinean manufacturing exports) with the rest of the world. They find that sunk entry costs and firm size are important for exports to both markets, though the effect of size is considerably larger for exports to MERCOSUR. The impact of labour productivity, sourcing from abroad and investing in product improvement is only relevant for firms exporting to MERCOSUR; while for exports to the rest of the world training activities seem to be a key factor.

Other empirical works on SMEs' export behaviour in developing countries include the studies by Yang et al. (2004) for Taiwan, Gumede (2004) for South Africa, and Pradhan and Das (2012) for India. In the three cases, SMEs' export decisions are positively affected by firm size, at least over a relevant range. Other influencing factors are research and development (R&D), technology imports, training investment, workforce skills, and labour productivity (Yang et al., 2004); firm age, access to information and financing, and enterprise linkages (Gumede, 2004); and firm age, technology imports, affiliation to foreign companies, credit availability, port and telecommunication facilities, competition in the domestic market, presence of foreign firms, and fiscal incentives (Pradhan and Das, 2012).

The various empirical studies on firms' export behaviour differ, among other things, in the econometric methods applied. An important issue that has to be accounted for in any

empirical analysis that relates firm characteristics and export activities is unobserved firm heterogeneity (like that associated with managerial skills or attitudes). Wagner (2003, 2008) shows the importance of controlling for these unobserved firm effects when evaluating the relationship between firm size and export behaviour. The author argues that, although not all large firms are successful exporters and not all successful exporters are large, factors that make a successful exporter seem to be found more often in larger firms (i.e., they are positively correlated with firm size). Ignoring this unobserved firm heterogeneity would lead to biased estimates; particularly in this case, the estimated coefficient on the firm size variable would be biased upwards. The same argument applies to the evaluation of other firm's international activities, such as importing or FDI. As is shown in section 3, problems of unobserved heterogeneity can be addressed by the use of appropriate econometric methods.

3. Empirical methodology

3.1 Estimation strategy

The starting point for explaining why some firms export and others do not is the existence of sunk costs (Girma et al., 2004), introduced in the theoretical literature by Baldwin (1988, 1989), Baldwin and Krugman (1989), Dixit (1989a, b), and Krugman (1989).[10] Many empirical analyses on firms' export behaviour are based on the dynamic discrete-choice model developed by Roberts and Tybout (1997), which separates the roles of profit heterogeneity and sunk costs in explaining firms' exporting decisions. The reduced-form model expresses each firm's current exporting status as a function of its previous export market experience (from which the importance of sunk costs can be inferred), observable firm's characteristics that affect its future profits from exporting (e.g., size, age, productivity, ownership structure), and time-specific effects (reflecting macro-level factors exogenous to the firm, such as exchange rates, trade-policy conditions, and credit-market conditions).

[10] These theoretical models suggest that the existence of sunk costs leads to persistence in firm exporting behaviour. This export hysteresis implies that transitory policy changes or macro shocks (such as real exchange rate movements) can produce effects in trade flows that persist after the stimulus that caused them has disappeared.

In Roberts and Tybout (1997), a profit-maximizing firm will enter export markets only if the present value of its profits exceeds the entry costs (in other words, if the expected profits net of entry costs are positive). In a multi-period setting and in the presence of entry costs, the expected profits of the firm *i* in period *t* can be expressed as[11]:

$$\Pi_{it} = \mathrm{E}_t\{\sum_{s=t}^{\infty} \delta^{s-t}[\tilde{\pi}_{is}(Q_{is}^*, \mathbf{z}_{is}, \mathbf{g}_s)|X_{is}]\}$$

$$= \mathrm{E}_t\{\sum_{s=t}^{\infty} \delta^{s-t}[P_{is}Q_{is}^* - C_{is}(Q_{is}^*, \mathbf{z}_{is}, \mathbf{g}_s) - N(1 - X_{is-1})|X_{is}]\} \quad (1)$$

where $\tilde{\pi}$ are the period-by-period profits, P_{is} is the export price of goods sold abroad by firm i in period s, Q_{is}^* is firm i's profit-maximizing level of exports in period s,[12] C_{is} is the variable cost of producing quantity Q_{is}^*, $\mathbf{z}_{is}$ is a vector of firm-specific characteristics, $\mathbf{g}_s$ is a vector of exogenous factors affecting profitability, X_{is} is a binary variable indicating the export status of firm i in period s, N is the entry cost that the firm must pay if it did not export last period (i.e., if X_{is-1}=0), and δ is the discount rate.

The firm chooses a sequence of output levels in order to maximize current and discounted future profits. The existence of sunk entry costs makes the decision rule dynamic, because exporting today implies an additional option value of being able to export tomorrow without facing again those costs. The value function for the dynamic programming problem is given by:

$$V_{it} = \max_{X_{it}\in[0,1]}\{\tilde{\pi}_{it}[X_{it} = 1] + \delta\, \mathrm{E}_t[V_{it+1}(.)|X_{it}]\} \quad (2)$$

or, equivalently:

$$V_{it} = \max_{Q_{it}^*}\{\tilde{\pi}_{it}[Q_{it}^* > 0] + \delta\, \mathrm{E}_t[V_{it+1}(.)|Q_{it}^*]\} \quad (3)$$

The firm will choose to export in period t (i.e., $X_{it} = 1$, or equivalently, $Q_{it}^* > 0$) if expected profits are greater than zero in present value (i.e., if current and expected future revenues are larger than the current period costs (C_{it}) plus any costs of entry):

$$P_{it}Q_{it}^* + \delta\,\{E_t[V_{it+1}(.)|X_{it} = 1] - E_t[V_{it+1}(.)|X_{it} = 0]\} > [C_{it} + N_{it}(1 - X_{it-1})] \quad (4)$$

[11] Based on Bernard and Jensen (1999, 2001), and Ottaviano and Volpe Martincus (2011).

[12] It is assumed that, if the firm enters the foreign market, it always produces the profit-maximizing level of exports (as it freely adjusts export levels in response to current market conditions).

Thus, the solution to the dynamic programming problem can be expressed as the following decision rule:

$$X_{it} = \begin{cases} 1 \text{ if } \hat{R}_{it} > C_{it} + N(1 - X_{it-1}) \\ 0 \text{ otherwise} \end{cases} \quad (5)$$

where $\hat{R}_{it}$ are the revenues of export sales today and any discounted increase in the value of the firm in the future from exporting today (i.e., $\hat{R}_{it} = P_{it}Q_{it}^{*} + \delta\{E_t[V_{it+1}(.)|X_{it} = 1] - E_t[V_{it+1}(.)|X_{it} = 0]\}$).

The actual decision to export in a particular period depends on whether the firm has exported in the previous period (i.e., its lagged exporting status), firm-specific characteristics ($\mathbf{z}_{it}$), and factors exogenous to the firm ($\mathbf{g}_t$). The theoretical decision rule can then be expressed as an empirical binary choice model of the form:

$$X_{it} = \begin{cases} 1 \text{ if } \boldsymbol{\beta}\mathbf{z}_{it} + \boldsymbol{\gamma}\mathbf{g}_t - N(1 - X_{it-1}) + \varepsilon_{it} > 0 \\ 0 \text{ otherwise} \end{cases} \quad (6)$$

As noted previously, an important issue in the estimation of equations like (6) is that there likely exist unobserved firm characteristics affecting the decision to export. Since these characteristics are potentially permanent, or at least highly serially correlated, they will lead to persistence in export behaviour, either in or out of the market. Thus, failing to account for these unobserved effects can result in the overestimation of the sunk entry costs, as the model will incorrectly attribute the persistence it induces in exporting status to these costs (Roberts and Tybout, 1997; Bernard and Jensen, 2001). It will also lead to biased estimates of the coefficients on the firm characteristics included as regressors (such as firm size, the main variable of interest in this study), which are very likely correlated with the unobserved firm heterogeneity. Following Roberts and Tybout (1997), this unobserved heterogeneity can be formally modelled assuming that the error term (ε_{it}) is the sum of two components: a permanent component that represents unobservable firm-specific factors that induce persistent differences in the returns from exporting (η_i), and a component that represents transitory exogenous shocks to exporting profits (ω_{it}).

In addition to export propensity, the existence of sunk entry costs may affect the scope of firms' involvement in export markets, in terms of the number of products exported and the number of export destinations. Each successive product and market entry may imply a new fixed cost and require very specific firm assets and capabilities that the largest firms

possess more readily than SMEs (IDB, 2014). Also, smaller firms may face greater obstacles to sustained export participation. Thus, firm size might not only be related to firms' decisions of whether or not to export, but also to firms' choices regarding their expansion in export markets and products, as well as to firms' survival in exporting.

This paper investigates four dimensions of firms' export behaviour: export propensity, export intensity, product scope, and export survival. It focuses on small and medium-sized firms. On the one hand, it aims at evaluating how being a SME relates to firm's export performance. In addition, the paper assesses whether the determinants of SMEs' export behaviour differ from those of the whole sample of firms.

The baseline equation, estimated separately for each of the measures of export performance considered as dependent variable (called generically Y_{it}), is:

$$Y_{it} = \gamma_0 + \gamma_{size} SIZE_{it-1} + \boldsymbol{\gamma}_z \mathbf{z}_{it-1} + \gamma_I I_i + \gamma_T T_t + \varepsilon_{it} \quad (7)$$

where the subindices *i*, *j* and *t* denote firm, industry and time, respectively. *SIZE* is the variable representing firm size, for which two alternative measures are considered (see below); **z** is a vector of other firm characteristics; I are industry dummies which control for unobserved time-invariant industry characteristics that may affect firms belonging to a particular sector[13]; T are time dummies to control for time-varying macroeconomic factors (such as business cycles and real exchange rate); and ε is the error term. Both the size measures and the other firm-level variables are lagged one year to reduce possible simultaneity problems (Bernard and Jensen, 1999; Ottaviano and Volpe Martincus, 2011).

There is no universal definition of SMEs, as variations exist across countries, sectors and even different governmental agencies within the same country. The most standard classification is based on the number of employees, while other definitions consider either a turnover ceiling or a balance sheet ceiling (generally combined with staff headcount thresholds). A classification criterion based both on the number of employees and sales would give a better insight into the relationship between firms' export behaviour and size (Calof, 1994).

[13] Industry dummies are defined at the three-digit level of the International Standard Industrial Classification (ISIC) revision 3.

According to the official definition of SMEs used in Uruguay by government agencies, a firm qualifies as SME if it employs up to 99 employees and has an annual sales turnover not exceeding 75 millions of indexed units (UI, for its Spanish acronym), currently equivalent to around 8 million US dollars.[14] Based on these criteria, this study considers two alternative measures of firm size. The first measure, more standard in the empirical literature, is based only on the number of employees (see Table 1).[15] The second measure is a size coefficient, computed as:

$$SC_{it} = 10\sqrt{\frac{EMP_{it}}{EMP_m}\frac{SALES_{it}}{SALES_m}} \quad (8)$$

where EMP_{it} is the firm's number of employees at time *t*, EMP_m is the reference number of employees (99 in this case), $SALES_{it}$ is the value of firm's annual sales at time *t*, and $SALES_m$ is the reference annual sales value (75 millions of UI).[16]

In evaluating how Uruguayan manufacturing SMEs perform in exporting, relative to large firms, the variable *SIZE* in equation (7) is given by: 1) an indicator variable that takes the value 1 if the firm's number of employees at time *t-1* is lower than 100 (0 otherwise), or, alternatively, 2) an indicator variable that takes the value 1 if the firm's size coefficient at time *t-1* is lower or equal to 10 (0 otherwise).[17] Also, with the aim of assessing whether export performance differs between small and medium-sized enterprises, separate indicator variables are considered in each case for these two firm categories (see Table 1).[18]

In addition, in order to evaluate whether the factors affecting SMEs' export decisions differ from those of the whole sample of firms, equation (7) is run separately for SMEs. Firms are classified in size categories based on the two size measures considered, which are

[14] The UI is a money analogue unit of account indexed to the consumer price index. The official definition of SMEs, laid down in the government decree 504/07, makes a distinction between micro (1-4 employees and annual sales not exceeding 2 million UI), small (5-19 employees and annual sales not exceeding 10 million UI), and medium-sized firms (20-99 employees and annual sales not exceeding 75 million UI). The panel used in this study does not include firms with less than 5 employees, since they are not encompassed by the activity survey from which data were obtained (see section 4).

[15] The employment ranges officially considered in Uruguay are the same as those adopted in IDB (2014) for the analysis of LAC SMEs.

[16] The size coefficient was adapted from that established in the Southern Common Market (MERCOSUR) Resolution 59/98.

[17] 10 is the value of the size coefficient for firms with 99 employees and annual sales of 75 million UI.

[18] According to the first size measure, small enterprises are those with an average number of employees lower or equal to 19, while medium-sized firms are those with 20-99 employees on average. When considering the size coefficient, a firm is classified as small if its average coefficient is lower or equal to 1.6, and it is considered a medium-sized firm if its average coefficient is higher than 1.6 and lower or equal to 10.

averaged over the sample period.[19] Now, the variable *SIZE* in equation (7) is (the natural logarithm of) the number of employees or the size coefficient.

Table 1
Firm classification criteria

Firm category	Employees	Annual sales (in UI)	Size coefficient
SMEs	5-99	<= 75 millions	<= 10
Small	5-19	<= 10 millions	<= 1.6
Medium	20-99	> 10 & <= 75 millions	> 1.6 & <= 10
Large	>= 100	> 75 millions	> 10

Source: Author's elaboration.

Table 2 presents the description of all the dependent and independent variables considered in the analysis.

Export propensity (i.e., the probability of exporting) is defined as a binary variable that equals 1 if the firm exports in period *t* (0 otherwise). The degree of each firm's involvement in exporting activities is evaluated by its export intensity (measured by the share of exports in firm's total sales) and export product scope (given by the proportion of exported products to total number of products produced by the firm).[20] Finally, export survival is assessed by a binary variable that identifies firms that exit export market in period *t* and do not re-enter it at a later date (0 otherwise).

As for the independent variables, a set of firm characteristics is included to take account of factors, other than size, that may influence firms' export behaviour: age, productivity, prior exporting experience, import status, foreign ownership, R&D intensity, skill (or human capital) intensity, and (physical) capital intensity. In addition, an index of market concentration is included.

[19] According to the first size measure, a firm is classified as SME if it has, on average, up to 99 employees. Based on the second measure, a firm is classified as SME if its overall size coefficient is lower or equal to 10. Given that average measures may be affected by extreme values, it was controlled that firms classified in each size category belong to that category –according to their yearly number of employees or size coefficients– at least 75 percent of the panel years. In the few cases where this condition did not hold, the classification was based on the firm's most frequent size category (i.e., the size class in which the firm is classified at least 50 percent of the panel years).

[20] The number of products is measured by the number of product codes as given by the Uruguayan Classification of Economic Activities (CLAEU, for its Spanish acronym), which is based on the ISIC revision 3 and the Central Product Classification (CPC) version 1.0.

Table 2
Description of dependent and independent variables

	Variable	Description
Dependent variables	Export propensity	1 if the firm exports at time *t*, 0 otherwise
	Export intensity	Share of exports in firm's total sales at time *t*
	Product scope	Ratio of number of exported products to total number of products produced by the firm at time *t*
	Exit	1 if the firm exports at time *t* and does not export at time *t+1* and beyond, 0 otherwise
Independent variables	Size	
	EMP	Firm's number of employees at time *t-1*
	SME1	1 if the firm's number of employees is lower or equal to 99 at time *t-1* ($EMP \leq 99$), 0 otherwise
	SE1	1 if the firm's number of employees is lower or equal to 19 at time *t-1* ($EMP \leq 19$), 0 otherwise
	ME1	1 if the firm's number of employees is higher than 19 and lower or equal to 99 at time *t-1* ($19 < EMP \leq 99$), 0 otherwise
	SC	Firm's size coefficient at time *t-1*
	SME2	1 if the firm's size coefficient is lower or equal to 10 at time *t-1* ($SC \leq 10$), 0 otherwise
	SE2	1 if the firm's size coefficient is lower or equal to 1.6 at time *t-1* ($SC \leq 1.6$), 0 otherwise
	ME2	1 if the firm's size coefficient is higher than 1.6 and lower or equal to 10 at time *t-1* ($1.6 < SC \leq 10$), 0 otherwise
	Age	Lagged log of number of years that the firm has been in operation
	Productivity	Lagged log of labour productivity (value added per employee)
	Export experience (3-year status)	1 if the firm exported in any of the three previous years, 0 otherwise
	Export experience	Number of years the firm exports during the sample period
	Import status	1 if the firm imported intermediate inputs at *t-1*, 0 otherwise
	Foreign ownership	1 if there is any presence of foreign capital in firm's total capital at time *t-1*, 0 otherwise
	R&D intensity	R&D expenditure over sales at time *t-1*
	Physical capital intensity	Log of capital-labour ratio at time *t-1*
	Human capital intensity	Proportion of skilled workers (professionals and technicians) in firm's total employment at time *t-1*
	Industry concentration	Herfindahl index of industry concentration (3-digit ISIC revision 3 level)
	Failure	1 if the firm fails at time *t+1*, 0 otherwise

Firm age is commonly controlled for, based on the premise that older firms are more experienced (i.e., they have accumulated learning and information over the past), and therefore are more likely to export and to have higher export-sales ratios.[21] Age may also be considered as reflecting cost differences across firms: if market forces induce inefficient producers to exit, then older firms tend to be more competitive in world markets, either because of cost advantages or because they have had time to move down a learning curve (Ottaviano and Volpe Martincus, 2011). Although some empirical studies confirm the positive relationship between firm age and export behaviour[22], the so-called born-global firms –which enter the international market immediately or soon after inception and, in some cases, rapidly generate a high percentage of their total sales abroad–, would show that youth is not necessarily an obstacle to internationalization (Fryges, 2006).

The relationship between firms' productivity and export activities has been extensively investigated. Two alternative, but not mutually exclusive, hypotheses have been proposed to explain why exporters can be expected to be more productive than non-exporting firms: 1) self-selection of the more productive firms into export markets (productivity causes exporting, because only the most productive firms are able to overcome the costs of entering export markets), and 2) learning-by-exporting (exporting makes firms more productive, through knowledge and technology transfers from foreign buyers and competitors, exposure to more intense competition, and exploitation of scale economies). While the self-selection hypothesis is confirmed in many empirical studies (suggesting the existence of sunk costs of entry into export markets), evidence for the learning-by-exporting hypothesis is mixed.[23]

In the presence of sunk entry costs, prior exporting experience is found to positively affect firms' current export decisions (by lowering the re-entry costs);[24] however, the effect would depreciate rapidly over time (i.e., recent participation in foreign markets would matter significantly more than the participation further in the past) (Roberts and Tybout, 1997). Similarly, firms' importing activities might impact positively on their later

[21] It is argued that older firms have learnt how to successfully conduct business and how to adjust business strategies to foreign environments (Kaiser and Kongsted, 2004).
[22] For references see Fryges (2006).
[23] For a survey on this literature see Greenaway and Kneller (2007), Wagner (2007), and Girma et al. (2004).
[24] The theoretical models developed by Baldwin (1988), Baldwin and Krugman (1989), and Dixit (1989a) predict that, due to sunk export costs, current foreign market participation is affected by previous export experience. Empirical findings are consistent with this theoretical prediction (e.g., Roberts and Tybout, 1997; Bernard and Jensen, 1999, 2001, 2004; Bernard and Wagner, 2001).

exporting activities, due to the existence of common sunk costs (Kasahara and Lapham, 2008). In addition, importing may increase firms' efficiency or product scope and quality (through access to higher quality or richer variety of inputs, and to new technologies embodied in foreign inputs), thus allowing firms to become more competitive in the international markets and start exporting (Aristei et al., 2013).

Foreign ownership has also been found to be positively related to firm's export activities (Kneller and Pisu, 2004; Clarke, 2005; Sjöholm and Takii, 2008; Cerrato and Piva, 2012). Wholly or partly foreign-owned enterprises are expected to export more, *ceteris paribus*, than wholly domestic-owned firms, because they may have access to superior production technology and management know-how (which would allow them to produce more efficiently), as well as to international marketing and distribution networks that facilitate exporting (Ramstetter, 1999; as cited in Van Dijk, 2002).

Other likely determinants of firms' export activities are innovation, human capital, and physical capital (i.e., fixed assets). Regarding innovation, several studies support the hypothesis that firms that start to sell into foreign markets are ex-ante more innovative (i.e., innovative firms would self-select into exporting, as innovation activities translate into competitive advantages that allow the firm to compete in international markets), although findings are not conclusive. Evidence that exporting activity spurs (product or process) innovation (i.e., there is a learning-by-exporting effect) is more limited (see Harris and Li, 2009; Aristei et al., 2013).[25] A drawback of these studies is that they are generally based on partial measures of innovation, like R&D expenditure, which do not take into account incremental improvements of products and processes. This would be especially relevant for SMEs or other firms in developing countries who do not have a formal R&D department, or where R&D spending is low because overall technical change is of an adaptive nature (Van Dijk, 2002; Pradhan and Das, 2012).

The impact of human capital on firms' export behaviour is related to that of technological capabilities. Accordingly, the argument proposed is that the greater the skill level of the workforce, the higher the propensity to export. Empirical findings tend to support this

[25] The learning effect induced by participation in international markets is often considered indirectly through the link between innovation and productivity growth (Harris and Li, 2009). Self-selection is consistent with theoretical models such as the one proposed by Atkeson and Burstein (2010), while the learning-by-exporting effect is in accordance with models of endogenous innovation and growth, such as Romer (1990) and Grossman and Helpman (1991).

proposition (see, e.g., Wagner, 2001; Bernard and Jensen, 2004; Alvarez, 2007; Cerrato and Piva, 2012). Similarly, physical capital intensity would enhance export activity since it embodies past innovations or reflects economies of scale (Van Dijk, 2002).[26]

Finally, the domestic market structure may also be related to firms' export behaviour, although there are two conflicting viewpoints regarding the sign of this relationship (Clougherty and Zhang, 2008). On the one hand, the supporters of the so-called national-champion rationale argue that greater industry concentration (low domestic competition) allows firms to gain scale economies, which can enable them to compete in export markets (therefore, high levels of market concentration would be positively correlated with exports). On the other hand, those supporting the rivalry rationale point out that domestic rivalry (high domestic competition) pressures firms to improve their performance and innovate, which would allow them to earn large shares and profits in export markets. Empirical studies would mainly support the rivalry rationale; therefore, domestic competition would enhance firms' export activity.

3.2 Econometric implementation

In evaluating the determinants of firms' export propensity, equation (7) is estimated as a correlated random effects (CRE) probit model, based on the extension of the Mundlak-Chamberlain approach (Mundlak, 1978; Chamberlain, 1980) proposed by Wooldridge (2010) for unbalanced panels. This method addresses unobserved firm heterogeneity by including the within-means of the explanatory variables as additional regressors. Following Mundlak (1978), the unobserved individual effects η_i are approximated by a linear function $\eta_i = \boldsymbol{\phi}\bar{\mathbf{z}}_i + \nu_i$, where $\bar{\mathbf{z}}_i$ is a vector of firm-specific time averages of the explanatory variables that are potentially correlated with η_i (with each $\bar{z}_i = \sum_{t=1}^{T} z_{it}/T_i$), and ν_i are the new unobserved individual effects (which are assumed to be uncorrelated with observed characteristics and the error term).[27]

[26] A potential explanation for findings that exporters are more capital- and skill-intensive than non-exporters, both in developed and developing countries, is technology-skill complementarity (for references, see Bernard et al. (2012)).

[27] A fixed effects logit model could also be used in this case. However, this model has the disadvantage that only the sub-sample of firms that have variation over time in the dependent variable (i.e., firms where export status switches at least once from 0 to l) can be included in the estimation. This would lead here to the exclusion of around 70 percent of the observations, and might introduce a selection bias towards small firms.

Export intensity is analyzed using a Mundlak-Chamberlain-type fractional probit model, based on the approach developed by Papke and Wooldridge (2008).[28] Fractional response models are particularly appropriate for dealing with dependent variables like the share of exports in total sales, which is defined only on the unit interval and has often many observations at the lower limit (as many firms do not export at all). The same approach is used to assess the determinants of the other fractional dependent variable considered as measure of firms' export performance, the proportion of exported products.

Finally, firms' export survival is evaluated using duration or survival methods, in order to deal with the problem of right-censoring of survival times (which, if ignored, may lead to inconsistent estimates of the covariates).[29] These methods model survival times indirectly, via the so-called hazard rate, a concept related to chances of making a transition out of the current state at each time period, conditional on survival up to that point (Jenkins, 2005). Also, unobserved individual heterogeneity is controlled for, to account for unobservable factors (such as managerial skills or attitudes) that may contribute to explain the observed survival outcomes (by inducing persistence in export status, either in or out of the market) (Esteve-Perez et al., 2007). Estimates are carried out using a discrete-time model, which is appropriate for grouped duration data (i.e., survival times grouped into number of years).[30] Specifically, a complementary log-log (clog-log) model is estimated.[31]

Also in this case, the set of explanatory variables considered are aimed at taking account of other factors that may be associated with firms' export survival, besides firm size. Here, the variables included are: age, productivity, foreign ownership, R&D intensity, human capital intensity, physical capital intensity, and the index of market concentration. Additionally, a measure of export experience is included, to control for duration dependence. Also, in order to control for the fact that a firm's exit from export market may be driven by the firm's shutdown, an indicator variable that takes the value one if the firm fails at time *t+1* (and zero otherwise) is added to the regressions.

[28] Also in this case, unobserved firm heterogeneity is addressed by including the firm-level time averages of the explanatory variables as controls.
[29] The presence of right-censored observations is generated because most firms are not observed from entry to exit; rather, the sample period generally ends before the relevant event (firm exit) has occurred. Consequently, the total length of time between entry to and exit from the export market is unknown.
[30] Although the underlying transition process (firm exit from export market) occurs in continuous time, the data are observed annually.
[31] The estimation is carried out using a Prentice-Gloeckler (1978) model augmented with a gamma mixture distribution to address for unobserved individual heterogeneity, as proposed by Meyer (1990).

A firm is considered to exit the export market at time *t* if it does not export at time *t*+1 and beyond.[32] Export experience is measured by the number of years the firm exports during the sample period, until it exits the export market (regardless of whether exporting is a continuous or intermittent activity along the period). Both exit from the export market and firm failure are defined considering information up to the year 2008 (i.e., three years after the end of the sample period).[33] These additional data allow identifying whether or not the firm exported after 2005, as well as whether it did or did not fail in this post-sample period.

4. Data and descriptive statistics

The empirical analysis carried out in this paper is based on an unbalanced panel of Uruguayan manufacturing firms, which covers the period 1997-2005.[34] The panel contains annual firm-level data (in 1997 constant prices) on sales, value added, capital,[35] intermediate inputs (disaggregated into domestically-purchased and imported), energy, and other expenditures.[36] It also includes data on employment and foreign capital participation, as well as detailed information on the products produced by each firm (disaggregated according to their domestic or foreign destination).[37]

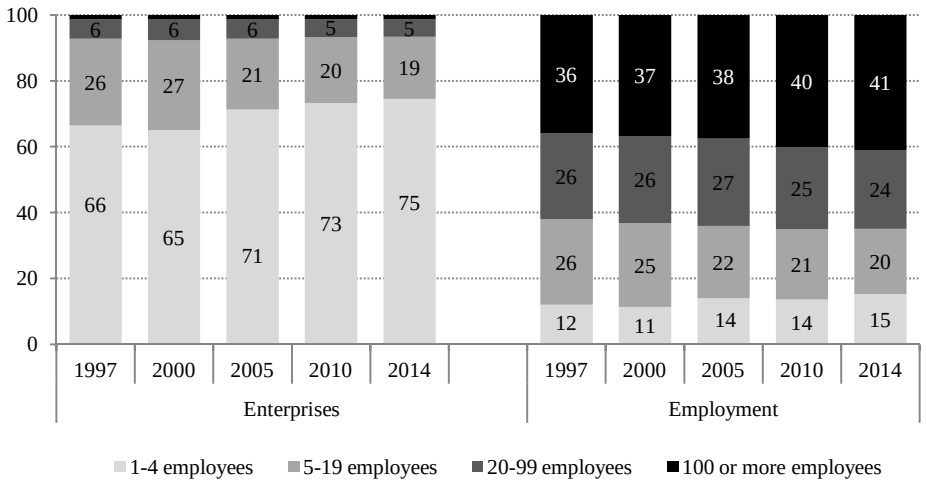
According to the National Institute of Statistics of Uruguay (INE), firms with fewer than 100 employees make up almost 99 percent of enterprises in the Uruguayan manufacturing sector, accounting for around 60 percent of sectoral employment (see figure 1). The vast majority of these firms are micro enterprises (1-4 employees), not encompassed in the

[32] Firms may switch in and out of exporting during the sample period. Only those firms that exit the export market and do not re-enter it are considered exiting firms.
[33] Data for 2006-2008 come from the EAEs.
[34] The panel dataset was constructed using survey data from the Uruguayan national statistics office: the IV Economic Census (year 1997), and the annual Economic Activity Surveys (EAE, for its Spanish acronym) (years 1998 to 2005). The EAE includes all formal firms with 50 or more employees and a random sample of those with 5 to 49 employees. From the Economic Census, which encompassed all formal manufacturing enterprises that were active in 1997, only those firms surveyed in the 1998 EAE were considered.
[35] The capital stock (tangible assets excluding land and buildings) was calculated using the perpetual inventory method, taking as initial stock the asset's book value of the first year available for each firm.
[36] The current price data were deflated using detailed price indices for each variable. For sales and intermediate inputs, firm-specific deflators were computed as the weighted average of the price indices (at the four-digit level of the ISIC revision 3) corresponding to all items produced and used as inputs, respectively, each year by the firm (where weights were given by the yearly share of each item in the firm's product/input basket).
[37] Survey data contain the value of each firm's sales, disaggregated by product into domestic sales and exports. Product codes are those of the Uruguayan Classification of Economic Activities (CLAEU, for its Spanish acronym), which is based on the ISIC revision 3 and the Central Product Classification (CPC) version 1.0.

manufacturing surveys from which the data used in this study were drawn. On average, over the period 1997-2005, small (5-19 employees) and medium-sized (20-99 employees) firms constituted around 30 percent of total manufacturing enterprises, and accounted for around 50 percent of total manufacturing employment. If micro firms are excluded, SMEs represented, on average, around 95 percent of enterprises and 60 percent of employment in the manufacturing sector.

As for this paper's dataset, the two classification criteria considered yield similar results in terms of the distribution of firms by size category (see Table 3). Firms classified as SMEs according to their average number of employees (i.e., those with an average employment lower than 100) represent 83 percent of total firms, with 30 percent of small firms and 53 percent of medium-sized enterprises. When firms are classified on the basis of their average size coefficient, the proportion of SMEs in the total number of enterprises is 84 percent, with 33 percent of small firms and 51 percent of medium-sized enterprises.[38]

Figure 1
Uruguayan manufacturing sector: Distribution of number of enterprises and employment by firms' size range, selected years



Source: Author's elaboration, on the basis of data from INE.

[38] Of those firms classified as SMEs according to their average number of employees, 98 percent are also classified as SMEs on the basis of their average size coefficient. As for the classification of SMEs into small and medium-sized enterprises, 93 percent of firms classified as small according to their average number of employees are also classified as small when considering their average size coefficient, and 86 percent of firms classified as medium-sized enterprises on the basis of their average number of employees are classified in the same category according to their average size coefficient.

The analysis of the yearly classification of firms shows that most enterprises in the dataset remain in the same size group over the sample period, particularly in the case of SMEs (see Table A1 in the appendix). Around 94 percent of firms classified as SMEs belong to that size category during the whole observation period. In the case of large enterprises, the fraction of firms that do not change their size group is around 60 percent when the number of employees is considered as classification criterion, and around 70 percent when classification is based on the size coefficient.[39]

Table 3 reports descriptive statistics for the firms in the dataset, averaged over the sample period. It shows significant differences between size groups, mainly in terms of sales, value-added, capital and labour, the more direct size-related variables. Also, large enterprises exhibit a considerably higher labour productivity (value added per employee) than SMEs, in particular when firms are classified on the basis of their size coefficient. Large firms are also more capital and skill intensive, and the presence of foreign capital is more frequent among them. Within SMEs, there are as well important differences between small and medium-sized firms. A common feature of all size groups is their very low R&D intensities, although the percentage of R&D-active firms (i.e., firms reporting positive R&D expenditure) is significantly higher for large enterprises.

Differences in size are also associated with firms' participation in international markets, both as exporters and importers (see Table 4). The proportion of firms that export is around two-fold higher for large enterprises than for SMEs; however, for exporting firms, the average share of foreign sales in total sales is similar for both size groups (around 42 percent and 36 percent, respectively, with both classification criteria). In addition, among exporting firms, the average share of exported products in the total number of products produced by the firm is almost the same for SMEs and large enterprises (around 60 percent). Remarkably, exporting small firms show higher average export shares than large enterprises, although the fraction of small firms that export is only around 15 percent (compared to more than 80 percent for large enterprises and around 60 percent for medium-sized firms). Similarly, the proportion of firms that import intermediate inputs is

[39] For firms classified as large according to their average number of employees, the fraction that changes their size class at least once over the sample period includes: 10 percent of firms that were in the SME group in their first year in the dataset and ended as large enterprises, 11 percent that started and ended as large firms, 17 percent that started as large and ended as SMEs, and less than 1 percent that started and ended as SMEs. When the classification criterion is the average size coefficient, these percentages are around 9, 8, around 12 and less than 2, respectively.

considerably higher for large enterprises (in particular, compared to small firms), while for input-importing firms the share of imports in total intermediates is quite similar for all size groups.

The analysis of the distribution of firms by export status shows that around 30 percent of the enterprises switch in and out of exporting during the sample period (see figure 2.A). This percentage is similar for SMEs and large firms; however, when non-exporting firms are excluded, the proportion of switchers is significantly larger among SMEs (more than 60 percent). In contrast, most exporting large firms are permanent exporters (i.e., they export every year of the sample period).

The group of enterprises that change their export status during the period 1997-2005 includes firms that begin as exporters and exit the export market (either temporarily or permanently), and firms that begin as non-exporters and start exporting during the sample period (either sporadically or permanently) (see figure 2.B). The share of firms that fail in exporting (i.e., firms that exit the export market and do not re-enter it) is higher for SMEs than for large enterprises, particularly among new exporters.

Table 3
Descriptive statistics, averages 1997-2005[a]

	All firms	Classification criterion: number of employees				Classification criterion: size coefficient			
		SMEs	Small enterprises	Medium-sized enterprises	Large enterprises	SMEs	Small enterprises	Medium-sized enterprises	Large enterprises
Firms									
Number	924	765	273	492	159	778	304	474	146
Percentage		82.8	29.5	53.2	17.2	84.2	32.9	51.3	15.8
Observations									
Number	5,898	4,701	1,436	3,265	1,197	4,793	1,581	3,212	1,105
Percentage		79.7	24.3	55.4	20.3	81.3	26.8	54.5	18.7
Output[b]	67.6	24.0	5.0	32.3	238.8	17.7	2.8	25.0	283.9
	(209.6)	(97.9)	(17.5)	(116.0)	(376.9)	(22.1)	(3.1)	(23.8)	(418.2)
Value added[b]	26.7	10.6	1.9	14.4	90.1	7.4	1.1	10.5	110.6
	(103.4)	(61.3)	(11.0)	(72.8)	(181.4)	(11.3)	(1.2)	(12.6)	(218.8)
Capital[b]	13.4	3.9	1.0	5.2	50.6	3.8	0.7	5.4	54.8
	(45.3)	(8.2)	(2.5)	(9.5)	(90.1)	(8.0)	(1.6)	(9.3)	(92.6)
Labour[c]	79.1	36.0	10.7	47.1	248.3	38.8	12.6	51.7	253.8
	(145.1)	(26.4)	(5.5)	(24.2)	(255.2)	(31.7)	(8.1)	(31.0)	(265.5)
Value added per employee[d]	276.0	254.6	169.9	291.8	360.3	194.6	99.7	241.3	629.1
	(1,104)	(1,209)	(990.1)	(1,292)	(502.7)	(572.1)	(198.8)	(680.0)	(2,221)
Age	28.1	25.9	19.9	28.6	36.4	25.9	19.8	29.0	37.4
	(16.4)	(15.0)	(13.1)	(15.0)	(19.0)	(14.8)	(12.5)	(14.9)	(19.4)
R&D status[e]	19.9	17.1	7.0	22.8	33.3	16.8	5.9	23.8	36.3
R&D intensity[fg]	0.08	0.07	0.04	0.09	0.08	0.08	0.04	0.10	0.08
	(0.43)	(0.46)	(0.44)	(0.46)	(0.32)	(0.46)	(0.42)	(0.48)	(0.29)
Human capital intensity[g]	2.5	2.0	0.8	2.6	4.1	1.8	0.6	2.5	5.1
	(5.9)	(5.2)	(3.5)	(5.8)	(7.7)	(4.9)	(2.9)	(5.5)	(8.6)
Physical capital intensity[d]	125.9	105.9	91.4	112.3	204.3	101.3	72.0	115.8	232.4
	(229.1)	(208.8)	(250.1)	(187.5)	(282.5)	(201.2)	(211.0)	(194.5)	(301.4)
Foreign capital[h]	9.4	6.4	2.2	8.7	23.9	5.7	1.0	8.6	29.5

Notes: [a] Standard deviations in parentheses; [b] Millions of constant Uruguayan pesos (base year 1997); [c] Total employment (number of employees); [d] Thousands of constant Uruguayan pesos (base year 1997); [e] Percentage of firms that were R&D active at least one year over the sample period; [f] R&D expenditure over sales; [g] In percentages; [h] Percentage of firms with foreign capital participation at least one year over the sample period.

Source: Author's elaboration.

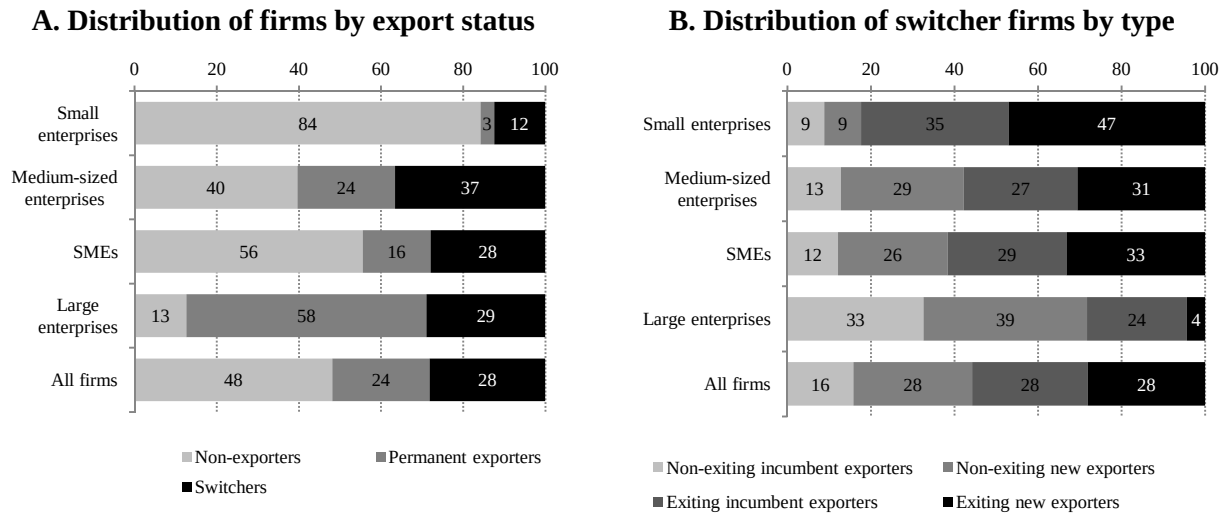
Table 4
Descriptive statistics, averages 1997-2005[a]

	All firms	Classification criterion: number of employees				Classification criterion: size coefficient			
		SMEs	Small enterprises	Medium-sized enterprises	Large enterprises	SMEs	Small enterprises	Medium-sized enterprises	Large enterprises
Exporters[b]	49.9	42.5	15.4	57.5	85.5	42.7	14.5	60.8	88.4
Export share[c]									
Exporting firms	38.3	36.3	43.0	35.7	41.5	36.1	42.5	35.5	42.1
	(34.7)	(35.3)	(33.1)	(35.4)	(33.5)	(34.9)	(34.6)	(34.9)	(34.0)
All firms	15.5	11.4	4.0	14.7	31.4	11.4	3.5	15.3	33.0
	(29.0)	(26.0)	(16.1)	(28.7)	(34.2)	(25.8)	(15.4)	(28.9)	(34.7)
Share of exported products[c]									
Exporting firms	60.9	61.1	69.4	60.2	60.7	61.1	67.8	60.5	60.7
	(30.3)	(31.6)	(28.4)	(31.8)	(27.9)	(31.1)	(28.0)	(31.3)	(28.7)
All firms	25.0	19.6	6.8	25.2	46.3	19.8	5.8	26.6	47.8
	(35.7)	(33.7)	(22.4)	(36.2)	(35.5)	(33.6)	(20.7)	(36.5)	(35.5)
Importers[d]	54.2	48.9	19.4	65.2	79.9	49.2	19.1	68.6	80.8
Import share[c]									
Importing firms	55.2	55.6	48.9	56.4	54.4	53.4	51.7	53.5	60.0
	(31.7)	(31.1)	(33.7)	(30.7)	(32.9)	(30.9)	(30.5)	(31.0)	(33.0)
All firms	26.9	23.6	7.0	30.9	39.6	22.8	6.7	30.7	44.4
	(35.4)	(34.2)	(21.3)	(36.1)	(37.1)	(33.3)	(20.6)	(35.4)	(38.7)

Notes: [a] Standard deviations in parentheses; [b] Percentage of firms that export at least once over the sample period; [c] In percentages; [d] Percentage of firms that import intermediates at least once over the sample period.

Source: Author's elaboration.

Figure 2
Distribution of firms within size groups, 1997-2005
(In percentages)



Notes: i) Non-exporters are those firms that never export during the period 1997-2005; Permanent exporters are those firms that export every year they are in the sample; and Switchers are those firms that change their export status over the sample period. ii) Incumbent exporters are those firms that enter the sample as exporters, while new exporters are those that start exporting after entering the sample. In both cases, exiting firms are those that exit the export market and do not re-enter it.

Source: Author's elaboration.

5. Estimation results

The aim of this paper is twofold. Firstly, it evaluates how being a SME relates to firm's export performance. In so doing, the study attempts to assess to what extent the resource and internal capability constraints that often characterize SMEs –not captured by the control variables– may limit these firms' involvement in export markets. In addition, the paper evaluates the determinants of SMEs' export behaviour, relative to those of the whole sample of firms. Unfortunately, the reduced number of observations available for large enterprises prevented from obtaining robust separated estimates for this size group.

This section presents the results obtained for the four dimensions of firms' export performance considered (export propensity, export intensity, product scope and export survival). Due to space considerations, and for greater comparability with the literature, the

analysis of the determinants of export behaviour is focused on the estimates pertaining to firms classified according to the number of employees.[40]

5.1 Export propensity

Table 5 presents the average partial effects of the size indicator variables on firms' export propensity, estimated from the CRE probit model. These results are obtained from the estimation of equation (7) on the whole sample of firms.[41] They show that the probability of exporting is on average 6 percent lower for SMEs than for large firms (see column 1), indicating a positive and statistically significant association between size and firms' likelihood to export. Consistently, exporting probability is lower for small enterprises, relative to medium-sized firms (see column 2).

Table 5
Average partial effects on Uruguayan manufacturing firms' export propensity, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	-0.0631***		-0.0460*	
	(0.0195)		(0.0250)	
Small enterprise (SE)		-0.0882***		-0.0477
		(0.0337)		(0.0351)
Medium-sized enterprise (ME)		-0.0633***		-0.0458*
		(0.0192)		(0.0245)
Observations	4,679	4,679	4,679	4,679
Log likelihood	-952.4	-946.4	-955.5	-952.6
Wald test	$\chi^2(72)$ = 596.89***	$\chi^2(74)$ = 593.46***	$\chi^2(72)$ = 589.76***	$\chi^2(74)$ = 587.61***
Akaike information criterion (AIC)	1,946.9	1,934.9	1,953.0	1,947.2
Bayesian information criterion (BIC)	2,082.3	2,070.4	2,088.4	2,082.7

Notes: i) All independent variables are lagged one period. ii) Time and industry dummies are included in all regressions. iii) Bootstrapped standard errors clustered by firm in parentheses (150 replications); *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

[40] Detailed results for firms classified on the basis of the size coefficient are available upon request from the author.

[41] All control variables specified in Table 1 are included in these estimates, although the analysis here is limited to the size indicator variables (for the complete results, see table A2 in the appendix). The same comment applies to tables 7, 9 and 11.

The estimated average partial effects are smaller (in absolute values) and their significance level is lower when firms are classified according to the size coefficient (see columns 3 and 4). In fact, for small enterprises the effect is not statistically significant. However, according to the goodness-of-fit measures reported in Table 5, estimates based on the number of employees would provide a better fit to the data.

The results on the determinants of firms' export propensity are presented in Table 6. They are obtained from the estimation of a version of equation (7) in which, instead of the size indicator variables, a measure of firm size is considered (here, the number of employees). The estimates are carried out for the whole sample of firms and for SMEs separately. In order to assess whether regression coefficients are statistically different for SMEs and large firms, a Chow-type test is performed.[42] According to this test's results, the equality of coefficients is rejected (see Table 6).[43] However, it should be noticed that, in the case of logit and probit models, traditional tests of equality of coefficients can lead to invalid conclusions if residual variation differs across groups. Since the alternative tests proposed to overcome this problem have significant limitations (Allison, 1999; Long, 2009), no conclusion is drawn here regarding the comparison of the coefficients in the export propensity regressions between size groups.

Estimates show evidence of a statistically significant positive relationship between size and firms' exporting probability. The average partial effects indicate that a one percent increase in firm size is associated on average with an around 0.08 percent rise in the probability of exporting. A similar percentage is obtained for firms classified according to the size coefficient. These results are in line with those reported in the existing empirical literature (e.g., Bernard and Jensen (1999) find that a one percent increase in employment raises the probability of exporting by 0.10 percent, while in Bernard and Jensen (2004)'s preferred specification this percentage is 0.13).

When the squared value of the size variable is added to the regressions (columns 2 and 4), to account for the possibility of a non-linear size-export relationship, the estimated coefficient is not statistically significant and the other variables are little affected (in terms

[42] The test is carried out by adding in the regression an interaction term between each explanatory variable and a dummy that takes the value 1 for SMEs and zero otherwise. The joint significance of the coefficients on these interaction terms is then tested.
[43] The equality of coefficients is also rejected for the regressions based on the size coefficient.

of their significance levels and the magnitude of their average partial effects).[44] Hence, there would not be evidence of a critical size threshold for the positive association between Uruguayan manufacturing firms' size and export probability.

Table 6
Average partial effects on Uruguayan manufacturing firms' export propensity, 1997-2005, by size group

	All firms		SMEs	
	(1)	(2)	(3)	(4)
Size	0.0807***	0.0810***	0.0774***	0.0785***
	(0.0183)	(0.0189)	(0.0238)	(0.0242)
Age	-0.0156	-0.0160	0.0023	0.0016
	(0.0504)	(0.0505)	(0.0605)	(0.0608)
Productivity	0.0209***	0.0210***	0.0265***	0.0264***
	(0.0061)	(0.0061)	(0.0067)	(0.0070)
Export experience (3-year status)	0.0252*	0.0251*	0.0286**	0.0284**
	(0.0135)	(0.0135)	(0.0132)	(0.0133)
Importing activity	0.0256*	0.0256*	0.0338*	0.0337*
	(0.0141)	(0.0141)	(0.0179)	(0.0177)
Foreign ownership	0.1484	0.1506	0.1296	0.1294
	(0.1093)	(0.1092)	(0.1889)	(0.1879)
R&D intensity	0.6910	0.6894	1.2735	1.2704
	(0.9146)	(0.9061)	(1.3165)	(1.2975)
Physical capital intensity	0.0232*	0.0230*	0.0187	0.0186
	(0.0119)	(0.0119)	(0.0154)	(0.0155)
Human capital intensity	-0.0082	-0.0076	0.1000	0.1010
	(0.1659)	(0.1658)	(0.1183)	(0.1194)
Industry concentration	-0.0055	-0.0050	0.0107	0.0123
	(0.0783)	(0.0770)	(0.1058)	(0.1042)
Observations	4,679	4,679	3,662	3,662
Size-squared	no	yes	no	yes
Log likelihood	-937.5	-937.4	-754.2	-754.2
Wald test	$\chi^2(72)$ = 564.91***	$\chi^2(73)$ = 564.32***	$\chi^2(72)$ = 461.75***	$\chi^2(73)$ = 460.15***
Akaike information criterion (AIC)	1934.9	1934.9	1552.5	1552.3
Bayesian information criterion (BIC)	2128.4	2128.4	1689.0	1688.9
Chow test	$\chi^2(11)$ = 39.10***			

Notes: i) Estimation results from CRE probit regressions on export propensity. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Bootstrapped standard errors clustered by firm in parentheses (150 replications); *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

[44] For SMEs, the coefficient on size becomes insignificant when the squared term is included (see Table A3 in the appendix). This could be due to the collinearity introduced in the model.

Regarding the other determinants of firms' export propensity, the results obtained show that prior export market experience and import status are significantly positively associated with SMEs' likelihood to export (the same holds for the whole sample of firms). This would point to the presence of sunk costs of entry into foreign markets, some of which are common to both activities. In addition, the results on import status could be related to the effect of foreign inputs on firms' international competitiveness. Estimates show that export probability is on average around 3 percent larger for SMEs that have exported over the three previous years, as well as for those that import intermediate inputs.

The results on prior export market experience are lower than those found in other studies (e.g., Bernard and Jensen, 2004; Ottaviano and Volpe Martincus, 2011). This reflects the fact that, as pointed out by Roberts and Tybout (1997), export hysteresis declines rapidly over time. For instance, Bernard and Jensen (2004) find that having exported in the previous period increases the probability of exporting in the current period by 39 percent, while exporting two years before increases this probability by 12 percent.

The hypothesis that exporting firms are more productive and they self-select also suggests the existence of sunk costs of entry into export markets, which only the most productive firms find it profitable to incur. This hypothesis would be confirmed here. The results obtained show that a one percent increase in labour productivity is associated on average with a nearly 0.03 percent rise in SMEs' probability of exporting.

For the other variables analyzed, no statistically significant association with SMEs' export propensity is found. However, estimates based on the whole sample of firms show evidence of a positive relationship of capital intensity with the probability of exporting. Also, the average partial effects of previous exporting experience, import activity and productivity are a little smaller than those obtained for SMEs. This would suggest that the association between the last three variables and firms' export propensity is weaker for large enterprises.

5.2 Export intensity

Table 7 reports the results on the association of firm size with export intensity, obtained from the estimation of equation (7) as a Mundlak-Chamberlain-type fractional probit

model.[45] They show a negative relationship between the size indicator variables and the share of exports in firms' total sales (i.e., a positive association between firm size and export intensity). However, this relationship is only statistically significant for firms classified on the basis of the number of employees. The estimated average partial effects indicate that export intensity is on average 2.4 percent lower for SMEs than for large firms. Again, the effect is larger for small enterprises than for medium-sized firms.

Table 7
Average partial effects on Uruguayan manufacturing firms' export intensity, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	-0.0238*		-0.0039	
	(0.0124)		(0.0133)	
Small enterprise (SE)		-0.0479**		-0.0027
		(0.0191)		(0.0223)
Medium-sized enterprise (ME)		-0.0248**		-0.0040
		(0.0123)		(0.0133)
Observations	4,679	4,679	4,679	4,679
Log likelihood	-968.4	-967.9	-966.1	-965.1
Wald test	$\chi^2(78)$ = 3317.80***	$\chi^2(80)$ = 2950.63***	$\chi^2(78)$ = 2916.89***	$\chi^2(80)$ = 3423.50***
Akaike information criterion (AIC)	2,094.7	2,097.8	2,090.2	2,092.2
Bayesian information criterion (BIC)	2,604.4	2,620.3	2,599.8	2,614.7

Notes: i) All independent variables are lagged one period. ii) Time and industry dummies are included in all regressions. iii) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Also in this case, the equality of coefficients across size groups is rejected (see Table 8), indicating that the determinants of export intensity would differ between SMEs and large firms. However, for SMEs most of the variables considered, including size, do not show a statistically significant association with the share of exports in firms' total sales. The exceptions are foreign ownership and R&D intensity, for which evidence of a positive association is found (albeit at the 10-percent significance level). Thus, although these two variables do not show a significant relationship with Uruguayan manufacturing firms'

[45] See also Table A4 in the appendix.

likelihood of exporting, they would be related with the intensity of these firms' involvement in export markets (at least for SMEs).

The estimated average partial effect shows that export intensity is on average 9 percent larger for SMEs with foreign capital participation (a similar percentage is obtained for the whole sample, with a higher significance level). This result would confirm the hypothesis that (wholly or partly) foreign-owned enterprises export more, *ceteris paribus*, than wholly domestic-owned firms, because they have better information about foreign markets and access to superior international marketing and distribution networks. As for R&D intensity, the results obtained indicate that a one percent increase in this variable is associated on average with an around 0.9 percent rise in the participation of exports in SMEs' sales. This would reflect the fact that innovation activities translate into competitive advantages that allow firms to compete more effectively in international markets. However, for both the results regarding export propensity and export intensity, it should be bear in mind that R&D intensity is an input measure of innovation and may not be an accurate indication of innovative activity (Gourlay and Seaton, 2004).[46]

The lack of evidence for an association between SMEs' size and export intensity needs to be further analyzed. It should be noticed that the descriptive statistics presented in section 4 show that, among exporting firms, the average share of exports in total sales is similar for SMEs and large enterprises (although the proportion of firms that export is around two-fold higher for the latter). Moreover, exporting small enterprises show almost the same average export share than large firms. Does this explain the results on firm size reported in Table 8? It seems not.

[46] Roper and Love (2001) find that for smaller firms both informal and more structured in-house R&D activity have a positive effect on export intensity, while for larger firms only the latter has a significant impact. Moreover, Sterlacchini (1999) points out that the relationship between innovation and export performance appears weak when innovation is measured exclusively by means of R&D indicators, since the impact of technological change on the export intensity of firms performing other innovative activities is underestimated.

Table 8
Average partial effects on Uruguayan manufacturing firms' export intensity, 1997-2005, by size group

	All firms		SMEs	
	(1)	(2)	(3)	(4)
Size	0.0183	0.0250*	0.0158	0.0129
	(0.0126)	(0.0129)	(0.0117)	(0.0135)
Age	0.0125	0.0116	-0.0123	-0.0125
	(0.0335)	(0.0331)	(0.0329)	(0.0326)
Productivity	0.0055	0.0068	0.0089	0.0089
	(0.0051)	(0.0051)	(0.0056)	(0.0056)
Export experience (3-year status)	0.0081	0.0082	0.0042	0.0046
	(0.0137)	(0.0136)	(0.0114)	(0.0115)
Importing activity	-0.0107	-0.0109	-0.0043	-0.0042
	(0.0112)	(0.0112)	(0.0119)	(0.0119)
Foreign ownership	0.0918**	0.0946**	0.0914*	0.0901*
	(0.0396)	(0.0398)	(0.0503)	(0.0502)
R&D intensity	0.9961	0.9719	0.9381*	0.9582*
	(0.6914)	(0.6547)	(0.5148)	(0.5264)
Physical capital intensity	0.0023	0.0020	-0.0031	-0.0029
	(0.0094)	(0.0095)	(0.0084)	(0.0084)
Human capital intensity	0.0215	0.0195	0.0089	0.0045
	(0.0793)	(0.0790)	(0.0858)	(0.0867)
Industry concentration	0.0182	0.0271	-0.0188	-0.0215
	(0.0483)	(0.0474)	(0.0408)	(0.0402)
Observations	4,679	4,679	3,662	3,662
Size-squared	no	yes	no	yes
Log likelihood	-969.6	-966.2	-609.5	-609.3
Wald test	$\chi^2(72)$ = 2932.02***	$\chi^2(73)$ = 3080.25***	$\chi^2(72)$ = 3229.71***	$\chi^2(73)$ = 3214.83***
Akaike information criterion (AIC)	2083.2	2078.5	1363.0	1364.6
Bayesian information criterion (BIC)	2547.6	2549.4	1809.8	1817.6
Chow test	$\chi^2(11)$ = 49.51***			

Notes: i) Estimation results from fractional probit regressions on export intensity. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

When firms are classified on the basis of the size coefficient, this size measure does show a significant positive linear association with SMEs' export intensity (results not reported).[47][48] In addition, estimates for the whole sample show evidence of a non-linear

[47] The estimated average partial effect shows that a one percent increase in the size coefficient is associated on average with an around 0.02 percent rise in SMEs' export intensity. The results on R&D intensity are similar to those obtained when size is measured by the number of employees, while foreign ownership does not show a statistically significant relationship with firms' export intensity.

relationship: although size becomes not significant when its squared term is included in the regression, the estimated coefficient on this last variable is positive and significant. This U-shaped relationship would indicate that export intensity only increases with firm size once a critical size level is achieved; however, the estimated coefficient is such that all firms are on the upward sloping part of the curve.[49]

Estimates based on the number of employees also show a non-linear relationship between size and the share of exports in total sales, for the whole sample of firms (see Table A5 in the appendix). In this case, the coefficient on size is not significant and has a negative sign, while that on size squared is positive and significant. Again, the relevant segment of this U-shaped curve is upward sloping, indicating that size and export intensity are positively related.

In the empirical literature, the findings on the association between size and export intensity appear contradictory. Several studies report a positive association (e.g., Kumar and Siddharthan, 1994; Wagner, 1995; Sterlacchini, 1999; Roper and Love, 2001), some find a negative relationship (e.g., Harris and Li, 2009), while others conclude that firm size and export intensity are not significantly related (e.g., Gabbitas and Gretton, 2003; Pla-Barber and Alegre, 2007).[50] These discrepancies would result from the non-linearity of the size-export intensity relationship, and from the use of different measures for firm size.

The achievement of economies of scale allows firms to increase their international competitiveness, and is considered one of the main factors behind the positive association between firm size and export behaviour. However, although economies of scale may be important in overcoming initial entry barriers to foreign markets, it is argued that they may be less significant in determining the extent of firms' export activity. Thus, conditional on having overcome entry barriers, the association between size and export intensity could

[48] Similarly, Pradhan and Das (2012) find a linear positive association between SMEs' size (measured by total sales) and export intensity, while for large firms there is evidence of a non-linear positive relationship.
[49] The estimated critical size level is around 0.06, while for the firms included in the sample (i.e., those with 5 or more employees) the minimum value of the size coefficient is 0.33.
[50] Kumar and Siddharthan (1994) study Indian enterprises, Wagner (1995) analyses German manufacturing firms, Sterlacchini (1999) investigates Italian manufacturing firms, Roper and Love (2001) examine Irish manufacturing plants, Harris and Li (2009) provide evidence for UK establishments, Gabbitas and Gretton (2003) analyse Australian firms, while Pla-Barber and Alegre (2007) focus on French biotechnology firms.

become negative (Harris and Li, 2009; Roper and Love, 2001), or not significant.[51] This would explain the inverted U-shaped relationship identified in many empirical studies, which suggests that the export intensity of medium-sized firms may be higher than that of large enterprises (Sterlacchini, 1999).[52]

Other studies suggest that competitive strategies, related to product quality and innovation, are more important than economies of scale. In this sense, Moen (1999) argues that small firms can overcome the lack of economies of scale through the development of competitive advantages linked to product uniqueness or technological sophisticated niche products. Thus, smaller firms can succeed internationally, enjoying high export intensities. The fact that, as seen above, the positive association between R&D intensity and export intensity is found here to be statistically significant only for SMEs could be indicative of a differentiated role played by innovation activities in enabling these firms to compete in export markets.

5.3 Product scope

The results on the relationship between firm size and export product scope (measured here by the ratio between the number of exported products and the total number of products produced by the firm) are presented in tables 9 and 10. As in the case of export intensity, estimates are obtained here from a Mundlak-Chamberlain-type fractional probit model.

The estimated average partial effects show that this dimension of Uruguayan manufacturing firms' participation in export markets is also positively associated with the size of the firm. As for the results reported in Table 9, they show a statistically significant negative relationship between the size indicator variables and the product scope measure, although only for firms classified on the basis of the number of employees.[53] The average partial effect indicates that export product scope is on average around 3 percent lower for

[51] Harris and Li (2009) find a positive relationship between size and whether an establishment can overcome entry barriers (i.e., export probability), and a negative relationship between size and export intensity, conditional on the establishment having internationalized.
[52] On the one hand, firms above a certain size might have an incentive to expand their foreign-market penetration through FDI, rather than exports. On the other hand, very large firms may be less oriented towards foreign markets, as they usually enjoy substantial domestic market power.
[53] See also Table A6 in the appendix.

SMEs than for large firms. This effect is larger for small enterprises than for medium-sized firms.

Table 9
Average partial effects on Uruguayan manufacturing firms' export product scope, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	-0.0297*		-0.0206	
	(0.0160)		(0.0195)	
Small enterprise (SE)		-0.0506*		-0.0172
		(0.0307)		(0.0354)
Medium-sized enterprise (ME)		-0.0302*		-0.0203
		(0.0157)		(0.0192)
Observations	4,677	4,677	4,677	4,677
Log likelihood	-1,289.4	-1,288.8	-1,289.4	-1,289.1
Wald test	$\chi^2(78)$ = 3265.17***	$\chi^2(80)$ = 4118.72***	$\chi^2(78)$ = 3246.17***	$\chi^2(80)$ = 3251.46***
Akaike information criterion (AIC)	2,736.9	2,739.6	2,736.8	2,740.2
Bayesian information criterion (BIC)	3,246.4	3,262.1	3,246.4	3,262.6

Notes: i) All independent variables are lagged one period. ii) Time and industry dummies are included in all regressions. iii) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

The equality of coefficients across size groups is again rejected (see Table 10), indicating that factors affecting firms' export product scope would differ between SMEs and large enterprises. For SMEs, estimates show evidence of a linear positive relationship between size and export product scope. The average partial effect indicates that a one percent increase in firm size is associated on average with an around 0.03 percent rise in the share of exported products. When the non-linearity of the size-product scope relationship is controlled for, the estimated coefficient on size squared is not statistically significant and the other variables are little affected (in terms of their significance levels and the magnitude of their average partial effects). In contrast, for the whole sample of firms there is evidence of a non-linear positive association between size and export product scope (see

Table A7 in the appendix). As in the case of export intensity, a U-shaped relationship is found here, although all firms in the sample are on the upward sloping part of the curve.[54]

Along with size, the other variables statistically significantly related with SMEs' export product scope are productivity, exporting experience, importing activity, and R&D intensity (as shown before, the first three variables are also associated with firms' export propensity, while R&D intensity is related with the share of exports in firms' total sales). The estimated average partial effects indicate that an increase of one percent in labour productivity is associated with an average 0.015 percent growth in the share of exported products (about one-half of the effect found for export propensity). In the case of prior export market experience, estimates show that export product scope is on average around 4 percent larger for SMEs that have exported over the three previous years (compared to around 3 percent for export propensity). As for import status, the estimated effect indicates that importing SMEs have on average an around 3 percent larger export product scope than those that did not import intermediate inputs (a percentage similar to that obtained for export propensity). Finally, the results on R&D intensity show that a one percent increase in this variable is associated with an average 1.8 percent rise in the share of exported products (twice the effect found for export intensity).

The results on productivity, exporting experience and importing activity would support the hypothesis that the existence of sunk entry costs may not only affect firms' decisions of whether or not to export, but also the scope of firms' involvement in export markets (in this case, in terms of the proportion of products exported). The same assessment can be made of firm size. Each successive product entry may imply new fixed costs and require firm assets and capabilities that the largest enterprises possess more readily.

The estimates for the whole sample show some differences with those obtained for SMEs (see columns 1 and 2 of Table 10). On the one hand, the effect of productivity and importing activity weakens, while that of R&D intensity becomes not significant. This suggests that the association between these variables and firms' export product scope would be feebler (or even not significant) for large enterprises. On the other hand, the

[54] For firms classified according to the size coefficient, evidence of a positive relationship of size with export product scope is also found (at the 1-percent significance level). The estimated average partial effects show that an increase of one percent in size is associated with an average rise in export product scope of around 0.05 percent for SMEs and 0.06 percent for the whole sample. In both cases, the relationship between the two variables would be linear.

effect of exporting experience is stronger for the whole sample (both in terms of magnitude and statistical significance), while foreign ownership becomes significant (at the 10-percent level). This last result could also be indicative of differentiated effects for large firms.

Table 10
Average partial effects on Uruguayan manufacturing firms' export product scope, 1997-2005, by size group

	All firms		SMEs	
	(1)	(2)	(3)	(4)
Size	0.0372**	0.0418**	0.0342**	0.0281
	(0.0172)	(0.0173)	(0.0171)	(0.0185)
Age	-0.0087	-0.0103	-0.0227	-0.0221
	(0.0435)	(0.0431)	(0.0431)	(0.0427)
Productivity	0.0099	0.0112*	0.0149*	0.0149*
	(0.0068)	(0.0067)	(0.0076)	(0.0076)
Export experience (3-year status)	0.0502***	0.0501***	0.0410**	0.0414**
	(0.0178)	(0.0180)	(0.0166)	(0.0165)
Importing activity	0.0248*	0.0247*	0.0335**	0.0335**
	(0.0140)	(0.0140)	(0.0139)	(0.0139)
Foreign ownership	0.0835*	0.0889*	0.0897	0.0867
	(0.0461)	(0.0468)	(0.0655)	(0.0655)
R&D intensity	1.1864	1.1593	1.8174*	1.8550*
	(0.8970)	(0.8789)	(0.9352)	(0.9557)
Physical capital intensity	0.0160	0.0156	0.0118	0.0124
	(0.0124)	(0.0124)	(0.0116)	(0.0116)
Human capital intensity	-0.0100	-0.0115	0.0147	0.0053
	(0.1226)	(0.1218)	(0.1309)	(0.1323)
Industry concentration	0.0807	0.0864	0.0370	0.0319
	(0.0712)	(0.0714)	(0.0657)	(0.0650)
Observations	4,677	4,677	3,662	3,662
Size-squared	no	yes	no	yes
Log likelihood	-1287.9	-1285.5	-843.6	-842.7
Wald test	$\chi^2(72)$ = 3431.61***	$\chi^2(73)$ = 3507.31***	$\chi^2(72)$ = 7609.56***	$\chi^2(73)$ = 9246.98***
Akaike information criterion (AIC)	2719.8	2717.1	1831.3	1831.4
Bayesian information criterion (BIC)	3184.3	3188.0	2278.1	2284.4
Chow test	$\chi^2(11)$ = 17.97*			

Notes: i) Estimation results from fractional probit regressions on export product scope. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

5.4 Export survival

The last dimension of export performance evaluated in this paper is firms' export survival. Non-exporting firms (i.e., firms that never export during the sample period) are excluded from the analysis. For firms that begin as non-exporters but start exporting during the sample period (entrants), pre-entry observations are dropped. For exiting firms, post-exit observations are as well excluded. Thus, for each firm, the analysis is based on the period from first observed entry into exporting until final exit from export markets (or the end of the sample period). Since there is not information available for the years before 1997, this analysis should be considered as an evaluation of the export survival of firms that were (continuous or intermittently) active in export markets during the sample period (regardless of whether they did or did not export before this period).

Table 11
Estimation results on Uruguayan manufacturing firms' export survival, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	1.200**		1.793***	
	(0.492)		(0.566)	
Small enterprise (SE)		2.459***		2.686***
		(0.701)		(0.772)
Medium-sized enterprise (ME)		1.027**		1.704***
		(0.495)		(0.567)
Observations	2,234	2,234	2,234	2,234
Log likelihood	-255.6	-252.0	-252.8	-251.2
Akaike information criterion (AIC)	619.2	614.0	613.7	612.3
Bayesian information criterion (BIC)	927.6	928.1	922.1	926.5
LR test of Gamma variance = 0	$\chi^2(1)$ = 33.01***	$\chi^2(1)$ = 27.14***	$\chi^2(1)$ = 32.75***	$\chi^2(1)$ = 32.40***

Notes: i) Independent variables are lagged one period, except for *failure* and *export experience*. ii) Time and industry dummies are included in all regressions. iii) Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. iv) The likelihood ratio test for the hypothesis that the Gamma variance is equal to zero shows that the absence of unobserved individual heterogeneity in the data is rejected.

Source: Author's estimations.

The results reported in Table 11 provide evidence of a positive relationship between size and Uruguayan manufacturing firms' export survival.[55] A positive (negative) coefficient

[55] The complete results are presented in Table A8 in the appendix.

indicates that the probability of exiting the export market increases (decreases) with the covariate. For SMEs the likelihood of survival in exporting is on average more than three times lower than for large enterprises, as measured by the hazard ratio.[56] When firms are classified on the basis of the size coefficient, this effect nearly doubles. In both cases, the hazard ratio is notably larger for small firms, relative to medium-sized enterprises.

The positive association between size and firms' export survival is also shown by the results presented in Table 12. For SMEs, a one percent increase in size is associated on average with an around 0.6 percent decline in the probability of exiting the export market (i.e., the hazard ratio is around 0.4). Similar results are obtained for the whole sample of firms. Also, as in the case of export propensity, no evidence of non-linearity in the relationship between size and firms' export survival is found here (see columns 2 and 5).[57]

These results reflect the fact that larger firms are in a better position to survive in export markets, as they are more likely to operate close to their minimum efficient scale (which translates into lower unit costs and raises the expected returns from exporting), and they may have better access to specific inputs (capital or labour) and information. In addition, the positive relationship between size and firms' chances of survival in export markets may reflect scale economy-based exporting (Esteve-Perez et al., 2007).

Along with size, the other variables that show a statistically significant association with firms' survival in exporting are export experience, firm age, industry concentration (only in the case of SMEs), and firm failure. The results on export experience indicate the existence of negative duration dependence in exporting. This implies that the likelihood of survival of Uruguayan manufacturing firms in export markets increases the longer they remain exporting. The estimated hazard ratio shows that one additional year of exporting is associated on average with an around 50 percent lower exit probability.

[56] The hazard ratio is the exponential form of the estimated coefficient. Hazard ratios larger (smaller) than one imply that the probability of survival decreases (increases) with the covariate.
[57] The results obtained for firms classified according to the size coefficient are similar.

Table 12
Estimation results on Uruguayan manufacturing firms' export survival, 1997-2005, by size group

	All firms			SMEs		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-1.016***	-1.471	-1.074***	-0.884**	-3.315	-0.961***
	(0.288)	(1.460)	(0.284)	(0.369)	(2.199)	(0.367)
Size-squared		0.0568			0.348	
		(0.177)			(0.303)	
Age	0.835***	0.836***	0.793***	0.766**	0.711**	0.752**
	(0.321)	(0.322)	(0.299)	(0.334)	(0.318)	(0.320)
Productivity	-0.146	-0.142	-0.122	-0.187	-0.178	-0.170
	(0.235)	(0.236)	(0.230)	(0.244)	(0.239)	(0.241)
Foreign ownership	0.707	0.674	0.695	0.917	0.880	0.971
	(0.593)	(0.601)	(0.580)	(0.678)	(0.659)	(0.676)
R&D intensity	-45.85	-45.54	-50.16	-30.98	-28.06	-32.48
	(55.97)	(55.89)	(55.40)	(47.43)	(46.14)	(45.62)
Physical capital intensity	0.183	0.172	0.183	0.219	0.191	0.228
	(0.179)	(0.182)	(0.172)	(0.184)	(0.182)	(0.182)
Human capital intensity	-1.160	-1.161	-0.779	-1.839	-1.427	-1.989
	(3.860)	(3.858)	(3.883)	(5.061)	(4.937)	(5.036)
Industry concentration	-5.007	-4.927	-5.178	-6.640*	-6.435*	-6.903*
	(3.521)	(3.530)	(3.473)	(3.884)	(3.826)	(3.881)
Failure	15.27***	15.28***	14.12***	14.30***	13.55***	13.88***
	(4.155)	(4.216)	(3.440)	(4.415)	(3.909)	(3.864)
Export experience	-0.795***	-0.796***	-0.191	-0.754***	-0.731***	-0.230
	(0.138)	(0.139)	(0.353)	(0.147)	(0.135)	(0.356)
Export experience-squared			-0.058*			-0.054
			(0.0350)			(0.0373)
Observations	2,234	2,234	2,234	1,402	1,402	1,402
Log likelihood	-250.1	-250.1	-248.8	-205.4	-204.7	-204.3
Akaike information criterion (AIC)	608.2	610.1	607.5	516.8	519.4	516.6
Bayesian information criterion (BIC)	916.6	924.2	921.6	794.8	807.9	799.9
LR test of Gamma variance = 0	$\chi^2(1)$ = 30.70***	$\chi^2(1)$ = 29.74***	$\chi^2(1)$ = 23.54***	$\chi^2(1)$ = 19.06***	$\chi^2(1)$ = 16.20***	$\chi^2(1)$ = 16.37***

Notes: i) Estimation results from cloglog regressions on export survival. ii) Independent variables are lagged one period, except for *failure* and *export experience* (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. vi) The likelihood ratio test for the hypothesis that the Gamma variance is equal to zero shows that the absence of unobserved individual heterogeneity in the data is rejected.

Source: Author's estimations.

The negative duration dependence would reflect the sunk costs of entry into export markets, which cause persistence in the exporting status (in order for firms to avoid future re-entry costs). Also, the negative duration dependence may be related to the updating costs (totally, or at least partially, sunk) that a firm needs to incur in order to continue

exporting.[58] These updating costs contribute to the accumulation of knowledge from international buyers and competitors, which rapidly depreciates when the firm exits the export market. This knowledge may generate a learning-by-exporting effect (not explicitly captured by other observed characteristics of the firms) that improves firms' export survival chances over time. Without controlling for unobserved individual heterogeneity, those unobserved firms' characteristics that are potentially permanent and may induce persistence in export status would lead to overestimate the entry (and re-entry) costs and the learning-by-exporting effects (Esteve-Perez et al., 2007).

Negative duration dependence may not be necessarily linear, if learning is more intense over the first exporting years. In order to test this, the squared term of export experience is included in the regressions. The results obtained show evidence of non-linearity in the pattern of negative duration dependence, but only for the whole sample of firms (see columns 3 and 6 of Table 12). In the case of SMEs, there would not be a threshold effect for the decline over time of the likelihood of export exit.

As for the other variables statistically significantly related with Uruguayan manufacturing firms' survival in export markets, firm age shows a negative association (i.e., older firms are more likely to fail in exporting than younger ones). This would result from the erosion of technology, products, business concepts, and management strategies over time (Esteve-Perez et al., 2004). However, other studies find that age enhances firms' probability of survival in export markets (e.g., Volpe Martincus and Carballo, 2009).

Industry concentration is positively associated with SMEs' export survival (at the 10-percent level). This result would reflect the fact that greater industry concentration allows firms to gain scale economies, enabling them to better compete in foreign markets. Finally, firm failure shows the expected negative association with the probability of surviving in export markets, which supports the obvious need to control for this variable.

[58] The updating costs are related to the adaptation of new products to changing export market conditions, changes in the marketing and distribution channels, etc. As accumulated sunk costs rise, entry costs increase over time, thus making re-entry increasingly costly (Esteve-Perez et al., 2007).

6. Concluding remarks

As a result of economic globalization, SMEs worldwide increasingly face more opportunities and challenges than ever before. However, and despite their increasing active role in foreign markets, evidence drawn mainly from developed economies suggests that several obstacles still constrain SMEs' international activities. This paper provides a developing country perspective on this issue, empirically evaluating the determinants of four dimensions of Uruguayan manufacturing firms' involvement in export markets (export propensity, export intensity, product scope, and export survival), with a focus on firm size.

The results obtained show that SMEs underperform, relative to large enterprises, in the four export dimensions considered. After controlling for the set of factors that may affect firms' export performance (including industry and macroeconomic conditions), export propensity, export survival and, to a lesser extent in terms of statistical strength, export intensity and product scope, are found to be lower for SMEs than for large firms. This would reflect SMEs' limitations in regard to the resources and capabilities they need to successfully participate in export markets.

Estimates also reveal that the role of size and other determinants of firms' export performance differs across the dimensions of export activity evaluated. Export propensity, export product scope and export survival show a statistically significant positive relationship with firm size, for both SMEs and the whole sample. This result would reflect economies of scale in production and export marketing, as well as larger firms' resource advantages to overcome entry costs and absorb the risks associated with exporting. Although the relationship between size and export activity is frequently found in the literature to be non-linear, from this paper's results there is not evidence of a threshold size for the positive association between Uruguayan manufacturing firms' size and export propensity, export product scope and export survival.[59]

In the case of export intensity, the findings on the association with firm size are mixed. While for SMEs the relationship is not statistically significant, the results for the whole sample show evidence of a non-linear association (suggesting that export intensity

[59] The only exception is a result obtained for the whole sample of firms, where a non-linear relationship is found for export product scope (with a positive sign for the relevant size range)

increases with firm size, for the relevant size range). When firms are classified on the basis of the size coefficient, this size measure shows a significant positive relationship with firms' export intensity (linear for SMEs and non-linear for the whole sample). The empirical literature also shows mixed findings on the association between size and export intensity, which would result from the non-linearity of the relationship and from the use of different measures for firm size.

In addition to firm size, prior export market experience is found to be positively associated with firms' likelihood to export, which would be a reflection of the existence of sunk costs of entry into export markets. The estimated significant positive relationship between export experience and firms' export survival is also indicative of the presence of sunk entry costs, which cause persistence in the exporting status. Additionally, the scope of exported products shows a significant positive association with firms' prior export market participation. In line with the existing empirical literature, these results corroborate the importance of export experience in shaping firms' export performance (e.g., Bernard and Jensen, 2004; Greenaway and Kneller, 2004; Kneller and Pisu, 2007; Ottaviano and Volpe Martincus, 2011).

Productivity and import activity are found to be positively related with firms' export propensity and the share of exported products. Thus, the results obtained are consistent with the hypothesis that exporting firms are more productive and they self-select, as only the most productive firms would be able to overcome the costs of entering export markets. They also show that importing firms are more likely to export and sell a larger proportion of their products abroad, which would reflect the existence of common sunk costs of entry into foreign markets, as well as the effect of foreign inputs on firms' international competitiveness.

Estimates also show that R&D intensity is positively associated with the degree of firms' involvement in export markets, measured by both the share of exports in total sales and export product scope. In contrast to firm size, export experience, productivity and import activity, the relationship between R&D intensity and firms' export performance is found to be statistically significant only for SMEs. This could indicate that the role of innovation activities in enabling firms to compete more effectively in foreign markets is more relevant for smaller firms, while large enterprises would base their international competitiveness

mainly on the achievement of economies of scale. However, further research is needed on this issue, as R&D intensity is an incomplete measure of innovative activity.

Foreign ownership is also significantly positively associated with firms' export intensity (for both SMEs and the whole sample) and export product scope (only for the whole sample). This result would confirm the hypothesis that (wholly or partly) foreign-owned enterprises export more, *ceteris paribus*, than wholly domestic-owned firms, since they have access to better information about foreign markets and to superior international marketing and distribution networks. However, no evidence is found for a significant association between foreign ownership and firms' export propensity and export survival.

Finally, firm age and industry concentration are statistically significantly associated with firms' likelihood to survive in export markets. For both SMEs and the whole sample, the results obtained show that older firms are more likely to fail in exporting than younger ones, which would be due to the erosion of technology, products, business concepts, and management strategies over time. As for industry concentration, it is found to be positively associated with SMEs' export survival, reflecting that greater industry concentration would allow firms to gain scale economies and to better compete in foreign markets.

The above findings provide support for the argument that policymakers should develop specific initiatives regarding Uruguayan manufacturing SMEs' internationalization. For a country like Uruguay, exporting is a feasible way to overcome the small size of the domestic market. However, SMEs' involvement in export markets has so far been limited by the resource and capability constraints that characterize these firms. Given the important role played by SMEs in the Uruguayan economy, the improvement of their international insertion is crucial for strengthening the country's export performance, as well as for enhancing the impact of exports on the rest of the economy.

As entry into export markets is costly, and public resources are scarce, it is crucial to make sure that export promotion policies are efficiently designed and targeted. Also, from a policy perspective, it is important to understand not only the factors driving firms' entry into exporting but also those influencing their degree of involvement in export activities, as well as those affecting export survival. In this sense, the analysis carried out in this paper may provide helpful information for the development of public programs aimed at stimulating and assisting Uruguayan firms' participation in export markets. However, it

would be necessary to conduct further research on the differences between SMEs and large firms. The analysis of differences across destination markets would also be worthwhile.

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Appendix

Table A1
Changes in firms' classification over the sample period

Firms classified as SMEs

		Last year				
		No change		At least one change		
		SME	Large	SME	Large	Total
Classification criterion: number of employees						
First year	SME	93.6		0.8	2.0	96.3
	Large			3.5	0.1	3.7
Classification criterion: size coefficient						
First year	SME	93.5		1.3	2.7	97.4
	Large			2.6	0.0	2.6

Firms classified as large

		Last year				
		No change		At least one change		
		SME	Large	SME	Large	Total
Classification criterion: number of employees						
First year	SME			0.6	10.1	10.7
	Large		61.0	17.0	11.3	89.3
Classification criterion: size coefficient						
First year	SME			1.4	8.9	10.3
	Large		69.9	11.6	8.2	89.7

Source: Author's elaboration.

Table A2
Determinants of export propensity in Uruguayan manufacturing, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	-0.706***		-0.522*	
	(0.239)		(0.286)	
Small enterprise (SE)		-0.843***		-0.492
		(0.291)		(0.322)
Medium-sized enterprise (ME)		-0.709***		-0.525*
		(0.232)		(0.283)
Age	-0.203	-0.158	-0.129	-0.113
	(0.486)	(0.500)	(0.490)	(0.512)
Productivity	0.213**	0.202**	0.193**	0.185**
	(0.0872)	(0.0885)	(0.0887)	(0.0916)
Export experience (3-year status)	0.308**	0.310**	0.297**	0.298**
	(0.120)	(0.121)	(0.122)	(0.124)
Importing activity	0.346*	0.349*	0.360*	0.365*
	(0.205)	(0.207)	(0.210)	(0.209)
Foreign ownership	1.305	1.250	1.329	1.300
	(0.885)	(0.836)	(0.910)	(0.891)
R&D intensity	4.110	3.693	3.992	3.588
	(9.592)	(9.767)	(9.667)	(9.718)
Physical capital intensity	0.0298	0.0383	0.0100	0.00227
	(0.154)	(0.161)	(0.151)	(0.159)
Human capital intensity	-0.319	-0.469	-0.208	-0.259
	(1.131)	(1.161)	(1.119)	(1.120)
Industry concentration	-0.110	-0.157	-0.0982	-0.121
	(0.820)	(0.804)	(0.810)	(0.823)
Observations	4,679	4,679	4,679	4,679

Notes: i) Estimation results from CRE probit regressions on export propensity. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) Time and industry dummies are included in all regressions. iv) Bootstrapped standard errors clustered by firm in parentheses (150 replications); *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Table A3
Determinants of export propensity in Uruguayan manufacturing, 1997-2005, by size group

	All firms		SMEs	
	(1)	(2)	(3)	(4)
Size	0.948***	0.886**	0.831***	0.647
	(0.234)	(0.391)	(0.260)	(0.870)
Size-squared		0.00838		0.0275
		(0.0536)		(0.116)
Age	-0.184	-0.188	0.0244	0.0176
	(0.593)	(0.595)	(0.650)	(0.654)
Productivity	0.245***	0.246***	0.285***	0.284***
	(0.0735)	(0.0741)	(0.0699)	(0.0727)
Export experience (3-year status)	0.267**	0.266**	0.279**	0.278**
	(0.135)	(0.135)	(0.118)	(0.119)
Importing activity	0.290*	0.289*	0.352*	0.352*
	(0.152)	(0.152)	(0.186)	(0.184)
Foreign ownership	1.620*	1.640*	1.325	1.324
	(0.978)	(0.969)	(1.642)	(1.635)
R&D intensity	8.112	8.093	13.68	13.66
	(10.62)	(10.52)	(14.10)	(13.95)
Physical capital intensity	0.272*	0.271*	0.201	0.200
	(0.140)	(0.140)	(0.166)	(0.168)
Human capital intensity	-0.0957	-0.0896	1.074	1.085
	(1.947)	(1.945)	(1.295)	(1.309)
Industry concentration	-0.0641	-0.0582	0.115	0.133
	(0.920)	(0.905)	(1.137)	(1.120)
Observations	4,679	4,679	3,662	3,662

Notes: i) Estimation results from CRE probit regressions on export propensity. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Bootstrapped standard errors clustered by firm in parentheses (150 replications); *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Table A4
Determinants of export intensity in Uruguayan manufacturing, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	-0.162*		-0.0271	
	(0.0833)		(0.0911)	
Small enterprise (SE)		-0.352**		-0.0190
		(0.151)		(0.155)
Medium-sized enterprise (ME)		-0.170**		-0.0279
		(0.0833)		(0.0916)
Age	0.0534	0.0538	0.0763	0.0693
	(0.220)	(0.219)	(0.221)	(0.221)
Productivity	0.0326	0.0356	0.0295	0.0342
	(0.0330)	(0.0335)	(0.0331)	(0.0331)
Export experience (3-year status)	0.0672	0.0672	0.0694	0.0747
	(0.0961)	(0.0960)	(0.0963)	(0.0951)
Importing activity	-0.0750	-0.0773	-0.0738	-0.0750
	(0.0772)	(0.0773)	(0.0780)	(0.0781)
Foreign ownership	0.578**	0.591**	0.570**	0.578**
	(0.248)	(0.250)	(0.251)	(0.251)
R&D intensity	6.968	7.283	6.852	6.844
	(4.449)	(4.621)	(4.492)	(4.488)
Physical capital intensity	-0.00945	0.0101	-0.0202	-0.0162
	(0.0549)	(0.0548)	(0.0548)	(0.0544)
Human capital intensity	0.100	0.121	0.203	0.225
	(0.544)	(0.545)	(0.550)	(0.551)
Industry concentration	0.122	0.119	0.100	0.109
	(0.323)	(0.321)	(0.326)	(0.328)
Observations	4,679	4,679	4,679	4,679

Notes: i) Estimation results from fractional probit regressions on export intensity. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) Time and industry dummies are included in all regressions. iv) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Table A5
Determinants of export intensity in Uruguayan manufacturing, 1997-2005, by size group

	All firms		SMEs	
	(1)	(2)	(3)	(4)
Size	0.126	-0.282	0.138	0.395
	(0.0868)	(0.207)	(0.102)	(0.426)
Size-squared		0.0522**		-0.0378
		(0.0239)		(0.0634)
Age	0.0860	0.0801	-0.108	-0.109
	(0.231)	(0.229)	(0.288)	(0.285)
Productivity	0.0380	0.0467	0.0776	0.0776
	(0.0351)	(0.0349)	(0.0489)	(0.0492)
Export experience (3-year status)	0.0559	0.0570	0.0367	0.0403
	(0.0954)	(0.0955)	(0.101)	(0.101)
Importing activity	-0.0731	-0.0745	-0.0376	-0.0366
	(0.0765)	(0.0766)	(0.103)	(0.103)
Foreign ownership	0.599**	0.618**	0.708**	0.699**
	(0.250)	(0.251)	(0.356)	(0.356)
R&D intensity	6.851	6.712	8.206*	8.385*
	(4.752)	(4.519)	(4.493)	(4.595)
Physical capital intensity	0.0160	0.0139	-0.0270	-0.0255
	(0.0647)	(0.0653)	(0.0737)	(0.0735)
Human capital intensity	0.148	0.135	0.0782	0.0396
	(0.546)	(0.546)	(0.751)	(0.759)
Industry concentration	0.125	0.187	-0.165	-0.188
	(0.332)	(0.327)	(0.357)	(0.352)
Observations	4,679	4,679	3,662	3,662

Notes: i) Estimation results from fractional probit regressions on export intensity. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Table A6
Determinants of export product scope in Uruguayan manufacturing, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	-0.153*		-0.107	
	(0.0811)		(0.0999)	
Small enterprise (SE)		-0.268		-0.0903
		(0.165)		(0.186)
Medium-sized enterprise (ME)		-0.157*		-0.106
		(0.0810)		(0.0999)
Age	-0.0423	-0.0333	-0.0363	-0.0304
	(0.221)	(0.220)	(0.219)	(0.220)
Productivity	0.0447	0.0429	0.0399	0.0375
	(0.0346)	(0.0344)	(0.0346)	(0.0350)
Export experience (3-year status)	0.270***	0.267***	0.268***	0.267***
	(0.0888)	(0.0877)	(0.0888)	(0.0878)
Importing activity	0.137*	0.136*	0.139*	0.141*
	(0.0740)	(0.0733)	(0.0746)	(0.0740)
Foreign ownership	0.395*	0.393*	0.387*	0.382*
	(0.228)	(0.228)	(0.231)	(0.231)
R&D intensity	5.885	6.012	5.763	5.768
	(4.574)	(4.631)	(4.573)	(4.578)
Physical capital intensity	0.0365	0.0462	0.0320	0.0278
	(0.0561)	(0.0566)	(0.0560)	(0.0556)
Human capital intensity	-0.0900	-0.0941	-0.0390	-0.0383
	(0.646)	(0.646)	(0.648)	(0.646)
Industry concentration	0.395	0.380	0.380	0.377
	(0.377)	(0.375)	(0.377)	(0.379)
Observations	4,677	4,677	4,677	4,677

Notes: i) Estimation results from fractional probit regressions on export product scope. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) Time and industry dummies are included in all regressions. iv) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Table A7
Determinants of export product scope in Uruguayan manufacturing, 1997-2005, by size group

	All firms		SMEs	
	(1)	(2)	(3)	(4)
Size	0.195**	-0.109	0.221**	0.707**
	(0.0899)	(0.165)	(0.110)	(0.351)
Size-squared		0.0387**		-0.0712
		(0.0182)		(0.0504)
Age	-0.0456	-0.0543	-0.147	-0.142
	(0.228)	(0.226)	(0.277)	(0.275)
Productivity	0.0517	0.0586*	0.0959*	0.0960*
	(0.0354)	(0.0353)	(0.0491)	(0.0490)
Export experience (3-year status)	0.257***	0.257***	0.258**	0.261***
	(0.0882)	(0.0891)	(0.100)	(0.0994)
Importing activity	0.130*	0.129*	0.215**	0.216**
	(0.0729)	(0.0733)	(0.0893)	(0.0894)
Foreign ownership	0.430*	0.457*	0.545	0.528
	(0.234)	(0.238)	(0.378)	(0.380)
R&D intensity	6.221	6.090	11.72*	11.97*
	(4.698)	(4.612)	(6.025)	(6.163)
Physical capital intensity	0.0839	0.0819	0.0760	0.0798
	(0.0650)	(0.0650)	(0.0748)	(0.0748)
Human capital intensity	-0.0524	-0.0605	0.0948	0.0345
	(0.643)	(0.640)	(0.844)	(0.854)
Industry concentration	0.423	0.454	0.238	0.206
	(0.373)	(0.375)	(0.423)	(0.419)
Observations	4,677	4,677	3,662	3,662

Notes: i) Estimation results from fractional probit regressions on export product scope. The results on the averages of the explanatory variables are not reported in the table due to space considerations. ii) All independent variables are lagged one period (for variable definitions, see Table 1). iii) The variable *size* is defined as the natural logarithm of the number of employees. iv) Time and industry dummies are included in all regressions. v) Robust standard errors adjusted for clustering at the firm level in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.

Table A8
Determinants of export survival in Uruguayan manufacturing, 1997-2005

	Classification criterion			
	Number of employees		Size coefficient	
	(1)	(2)	(3)	(4)
Small or medium-sized enterprise (SME)	1.200**		1.793***	
	(0.492)		(0.566)	
Small enterprise (SE)		2.459***		2.686***
		(0.701)		(0.772)
Medium-sized enterprise (ME)		1.027**		1.704***
		(0.495)		(0.567)
Age	0.670**	0.743***	0.648**	0.693**
	(0.277)	(0.285)	(0.275)	(0.282)
Productivity	-0.204	-0.160	-0.136	-0.0295
	(0.228)	(0.230)	(0.232)	(0.240)
Foreign ownership	0.669	0.646	0.880	0.841
	(0.572)	(0.570)	(0.592)	(0.596)
R&D intensity	-54.63	-48.93	-59.79	-54.07
	(58.45)	(54.67)	(60.82)	(58.91)
Physical capital intensity	0.256	0.178	0.296*	0.263
	(0.172)	(0.175)	(0.174)	(0.176)
Human capital intensity	-2.034	-1.087	-1.270	-1.054
	(3.947)	(3.748)	(4.005)	(3.978)
Industry concentration	-5.761	-5.148	-5.228	-5.270
	(3.570)	(3.423)	(3.388)	(3.373)
Failure	14.53***	14.06***	14.44***	14.50***
	(3.445)	(3.400)	(3.435)	(3.501)
Export experience	-0.790***	-0.781***	-0.788***	-0.784***
	(0.121)	(0.122)	(0.123)	(0.125)
Observations	2,234	2,234	2,234	2,234

Notes: i) Estimation results from cloglog regressions on export survival. ii) All independent variables are lagged one period, except for *failure* and *export experience* (for variable definitions, see Table 1). iii) Time and industry dummies are included in all regressions. iv) Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's estimations.