Marketing Learning by Exporting - How Export-Induced Marketing Expenditures Improve Firm Performance

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ABSTRACT

The learning opportunities from exporting are a core theme of International Business research. Learning by exporting research has primarily discussed the technological learning outcomes associated with exports. We integrate theoretical mechanisms from this literature into a model of learning in the marketing function. We hypothesize that firms that are confronted with novel pricing, packaging, distribution or design strategies on export markets will be able to exploit them productively, as evidence of learning by exporting in marketing. We test our predictions using panel data of Spanish manufacturing firms for 1990-2009 and find suggestive evidence for the positive effect of export-induced marketing expenditures on firm productivity. These learning effects are however lower compared with technological learning via R&D.

Keywords: Exports; learning-by-exporting; learning-by-exporting in marketing; productivity

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1. Introduction

The vast majority of firms interacts with foreign markets through exporting (Campa & Guillén, 1999). Exports enable firms to extend their product markets beyond national boundaries and often lead to broader international engagements in the future. Therefore, export decisions and their consequences are of central importance to management theory and practice (Salomon, 2006; Salomon & Shaver, 2005a). An especially intriguing part of exporting is the idea that firms might gain additional performance benefits from export activity on top of merely expanding their product markets. These additional performance gains are linked to the phenomenon labeled as "learning by exporting" (Clerides et al., 1998; Salomon & Shaver, 2005a). Accordingly, the topic received much attention in current international economics and international business literature (Bernard et al., 2012; D'Angelo et al., 2020; Geldres-Weiss et al., 2016; Love & Ganotakis, 2013; Segarra-Blasco et al., 2020; Silva et al., 2012). The mechanisms underlying learning by exporting are typically related to knowledge spillovers that firms may encounter abroad as they start exporting. The spillovers can come from a variety of sources such as foreign customers, suppliers or competitors and can be used to enhance the overall firm performance (Atkin et al., 2017; D'Angelo et al., 2020; Evenson & Westphal, 1995; Golovko & Valentini, 2014; Love & Ganotakis, 2013; Salomon & Shaver, 2005a).

The existing literature on the export-performance relationship traditionally links the positive effects of exports with general firm outcomes (specifically, productivity) and technological innovation outcomes (specifically, R&D, product innovations or patents) (Baldwin & Gu, 2004; Bao et al., 2012; D'Angelo et al., 2020; Golovko & Valentini, 2014; Love & Ganotakis, 2013; Segarra-Blasco et al., 2020). At the same time, research acknowledges that learning realized from export market interaction also includes rich market content in addition to technological information (e.g. Salomon, 2006a; Yeoh, 2004). Foreign environments

can serve as a source of new market information, where firms learn about technical standards of local markets, product requirements, customer preferences, or local competition (Petersen et al., 2008), giving rise to learning in marketing. The learning context, its content and the outcomes should be considerably different in these two cases.

In this study, we focus on learning by exporting in marketing. Our goal is to identify learning by exporting effects in a firm's marketing function *separately* from technological learning in the R&D function. In doing so, we address the gap in the learning by exporting literature, which either focuses exclusively on technological learning outcomes (Alvarez & López, 2005; Aw et al., 2007; Baldwin & Gu, 2004; Love & Ganotakis, 2013) or does not explicitly differentiate between technological and marketing learning (Salomon and Shaver, 2005a; D'Angelo et al., 2020). A notable exception is a recent paper by Ibeh and Kasem (2014), who investigate the effects of internationalization on the development of marketing learning for Syrian firms, albeit not specifically in the context of exports. We define learning by exporting outcomes as changes in productivity attributed to export activity after export entry (Bernard et al., 2012; Clerides et al., 1998; Salomon & Shaver, 2005a; Segarra-Blasco et al., 2020; Silva et al., 2012). Within our line of reasoning, learning by exporting in marketing has occurred when these export-induced marketing expenditures positively affect firm overall productivity in the aftermath of export entry. Moreover, we distinguish between export effects associated with marketing function that happen in preparation of export entry and after firms have entered the export markets. Finally, we compare those effects to the R&D outcomes of exports associated with technological learning by exporting.

We test our theoretical predictions using data on Spanish manufacturing firms between 1990-2009. We apply an integrated empirical approach, which combines a treatment model based on a matching estimator with a regression analysis of a production function. Our findings provide suggestive evidence for learning by exporting in marketing, showing that marketing expenditures associated with exports and made after export entry increase overall firm productivity. However, this learning effect in marketing is lower than the effect of technological learning in R&D. We find no support for positive performance effects from export-induced marketing expenditures that are made in preparation (ex-ante) for exporting.

Our paper contributes to international business and strategy research in three ways. First, we contribute to the learning by exporting literature by highlighting how exports can provide a distinct opportunity for firms to learn in their marketing function and improve their performance afterwards. We provide a theoretical framework that disentangles learning opportunities for marketing (ex-ante as well as ex-post) and compares the effects with technological learning through R&D function. Future research can build on our model to theorize about alternative learning opportunities from exporting, e.g., in recruitment strategies.

Second, we add to innovation literature by uncovering the sources for marketing learning and innovation. While existing studies have found that the performance potential from marketing innovations is at least comparable to that of technological innovations (Griffith & Rubera, 2014; Grimpe et al., 2017; Rubera, 2015; Rubera & Droge, 2013) we know comparatively little about the antecedents of these innovations. We show that export activity can provide incentives and knowledge sourcing opportunities for learning and innovating in marketing. Within our reasoning, export-induced marketing expenditures are not merely an instrument that pays off on export markets (Cavusgil et al., 1993) but facilitates learning much more broadly.

Finally, we offer a unifying empirical approach for testing a variety of mechanisms that underlie the export-performance link but have been treated in isolation by extant strategy and international business literature (Geldres-Weiss et al., 2016; Ibeh & Kasem, 2014; Segarra-Blasco et al., 2020). Our approach models firm management as conscious decision makers regarding the expenditures that are required to be successful on export markets (Lileeva & Trefler, 2010). This approach allows (a) addressing potential selection biases from assuming that export and investment decisions are independent and (b) comparing the contribution of export-induced and counterfactual expenditures, which could not be captured using alternative Heckman-type treatment approaches. Our empirical method should be useful for testing a broader variety of theories explaining export related changes and their outcomes, such as hiring or location choices.

2. Theory and hypotheses

We outline a theoretical framework that connects export decisions to learning in a firm's marketing function. We follow extant research on the export-performance link and define learning by exporting outcomes as productivity changes attributed to export activity after export entry (Bernard et al., 2012; Clerides et al., 1998; Salomon & Shaver, 2005a; Segarra-Blasco et al., 2020; Silva et al., 2012). However, instead of relating exporting to productivity changes directly, we posit that exporting triggers changes in firm's internal expenditure patterns and then link these export-induced expenditure changes to productivity outcome. More specifically, we argue that exporting activity is associated with changes in firm's marketing expenditures in the process of learning, in addition to R&D as prior research suggests (Lileeva & Trefler, 2010; Segarra-Blasco et al., 2020). We refer to these additional expenditures as export-induced marketing expenditures. We posit that learning by exporting in marketing has occurred if these export-induced marketing expenditures have a positive effect on a firm's overall productivity, i.e., they have enabled the focal firm to increase sales and/or achieve sales with fewer inputs.

We root our arguments on learning by exporting in marketing in organizational learning theory, which suggests that firms learn from their prior experience and adapt their organizational processes accordingly (Argote & Miron-Spektor, 2011; Levitt & March, 1988). Experiential learning occurs when firms encode a simplified version of the experience in organizational knowledge, processes or routines and use them in future actions (Levinthal & March, 1993). Learning from experience is linked to many positive performance outcomes (Anand et al., 2016 provide a recent review) but the distinction between experiential learning from exporting in marketing relative to R&D is not well understood. In the internationalization context, knowledge acquired through learning serves as a source of reinforcement or even change in the organizational routines (Aulakh et al., 2016). Analogously, through learning by exporting firms are able to acquire and transfer new knowledge, and accordingly modify behavior to build on these insights (Assadinia et al., 2019). In particular, firms are likely to update their beliefs about their markets, or competitors, and devise strategies to adjust and consequently respond to new external environments (Aulakh et al., 2016). Such adaptations are likely to be reflected in changes in internal investment patterns of new exporters.

Learning by exporting literature focuses on the specific relationship between export experiences and changes in firm behavior. This stream of research has mostly dealt with technological learning outcomes related to R&D (D'Angelo et al., 2020; Golovko & Valentini, 2014; Love & Ganotakis, 2013; Salomon & Jin, 2008; Salomon & Shaver, 2005a). We synthesize important mechanisms from reviewing this body of research and apply them to learning by exporting in marketing to develop hypotheses.

2.1. Learning by exporting in R&D

Learning by exporting research emphasizes two main channels through which technological learning and innovation may occur related to export entry (Golovko & Valentini, 2014; Salomon & Shaver, 2005a). First, firms may invest in R&D and product innovation before entering exports to facilitate export entry and subsequent successful performance abroad (Bustos, 2011; Cassiman & Golovko, 2011; Lileeva & Trefler, 2010). Second, learning by exporting happens after firms have entered export markets (Salomon, 2006; Salomon & Shaver, 2005a). The exposure to competing products, competitors and suppliers on foreign markets facilitates access to technological knowledge which provides opportunities for learning through combinations with the firm's existing knowledge stock (Salomon & Jin, 2008). We review both channels briefly.

Focusing on ex-ante export effects, existing research on the export–performance link emphasizes how firms anticipate challenges on export markets and make up-front investments in technological innovation accordingly. The decision to start export operations is largely determined by the expectations on profitability of the export market. At the same time, export markets may require new or better products due to advanced competition, challenging regulations, or unpredictable customer demands. Investments in technological upgrading in anticipation of export entry allow firms to make its current products more appealing to foreign customers, thus increasing the odds for success of export operations. Empirical findings confirm that firms tend to invest in technology upgrading and process or product innovations ex-ante export entry increasing their R&D expenditures (Alvarez & López, 2005; Baldwin & Gu, 2004; Bustos, 2011; Falk & de Lemos, 2019; Segarra-Blasco et al., 2020). While these expenditures are induced by exporting, they also broaden the firms' overall capacity for being innovative. To illustrate, Chinese car

manufacturers have increased their investments into car safety technologies in anticipation of demanding regulations on export markets such as the European Union which has also improved the safety features in cars sold in China.

Learning by exporting literature explains the technological effect of exports using a different mechanism, by which technological improvements occur *after* firms have entered export markets. Here, exports facilitate access to a variety of knowledge spillovers and information on product features as well as production technologies, which firms can incorporate to improve their innovation performance (Salomon & Shaver, 2005a). The sources of new knowledge are the foreign suppliers, buyers or competitors (Evenson & Westphal, 1995). Additionally, getting in touch with new information allows firms to create novel combinations with existing knowledge stocks resulting in new knowledge and innovation. Accordingly, research confirms the increase in innovation output due to exporting activity, specifically more product innovations and patents associated with export entry (Criscuolo et al., 2010; D'Angelo et al., 2020; Golovko & Valentini, 2014; Love & Ganotakis, 2013; Salomon & Shaver, 2005a). Therefore, export-induced R&D expenditures accompany foreign knowledge assimilation as well as utilization and are likely to result in higher performance in the post entry period.

In what follows we explain how ex-ante and ex-post learning effects can also occur for a firm's marketing function. We develop hypotheses for these and learning effects in marketing and compare those effects to learning in R&D.

2.2. Learning by exporting in marketing

While research acknowledges that learning from foreign market interactions relies on both technology and market content (Love & Ganotakis, 2013; Yeoh, 2004), the specific learning mechanisms occurring in exporters' marketing function are rarely isolated. At the same time, many opportunities exist for firms to learn and innovate in marketing, with such innovations happening independently from technological innovation (Griffith & Rubera, 2014; Grimpe et al., 2017).

Performance improvements related to marketing learning are typically linked to how the products are designed, distributed, promoted or priced (Waterschoot & Van Den Bulte, 1992). Research confirms

significant performance effects of marketing innovations equal to those of technological innovations (Grimpe et al., 2017). Yet, firms learn differently in the marketing function. The main source of new information is the product market itself (Slater & Narver, 1998). Exporting provides firms with such exposure to new knowledge and learning opportunities given that firms encounter new product markets.

A central challenge for firms planning to export are the knowledge gaps related to export market business environment (Petersen et al., 2008). To plan export entry and assess its feasibility, firms must be aware of the foreign market conditions, and such information is typically lacking or incomplete for domestic firms. By investing in marketing prior to exports firms can fill in these information gaps related to technical standards, competitors or foreign customer tastes and expectations. These preparations decrease market entry uncertainty. Indeed, ex-ante marketing activities are often related to learning about foreign market conditions and subsequent product adaptation (Anderson, 1960). Such product adaptation often increases the export entry costs yet pays off by better fulfilling the needs of new customers and building demand abroad (Calantone et al., 2004; Navarro-García et al., 2014). Similarly, firms invest in promotion strategies, e.g. packaging/labeling or new advertising approaches to enhance the product's appeal to new consumers (Cavusgil et al., 1993). Consistent with the importance of marketing for driving export performance, recent research finds the positive effect of marketing innovations on export growth of SMEs (Bodlaj et al., 2020).

Hence, firms are likely to improve their overall marketing capabilities in preparation for exporting. Marketing capabilities are complex coordinated patterns of skills, activities, and knowledge, including marketing communications, market information and sales management, which firms utilize to implement strategies that match their market environments (Kaleka & Morgan, 2019; Vorhies & Morgan, 2005). Research has shown that foreign environments facilitate marketing learning resulting in acquiring new and upgrading existing marketing capabilities (Ibeh & Kasem, 2014). These improved marketing capabilities can come in multiple forms, e.g., by hiring additional marketing professionals, obtaining customer databases and analytical tools or simply by extending its knowledge base about alternative marketing methods such as pricing, promotion and product placement, or distribution. In sum, export-induced

marketing expenditures that occur in preparation for exporting increase the firm's overall marketing capabilities and result in increased firm performance. We predict:

Hypothesis 1: Export-induced marketing expenditures prior to export entry increase the focal firm's productivity.

Learning in marketing can also occur ex-post export entry. The ex-post situation differs from the ex-ante one in the sense that firms can only anticipate differences between home and export markets ex-ante while they are directly exposed to market feedback ex-post. Information about marketing activities of competitors is typically easily observable on the new product market. Building on that information allows firms to overcome the liability of foreignness compared to local competitors (Zaheer, 1995) and to inform new customers about their products and brands (Bilkey & Nes, 1982; Schmidt & Sofka, 2009). Accordingly, research confirms that the marketing mix adaptation is one of the key factors necessary for successful export development (Navarro, Acedo, et al., 2010; Navarro, Losada, et al., 2010).

Exports offer opportunities for firms not only to learn about foreign customers and competitors, but also use the new insights for upgrading marketing capabilities, or even to enter new geographical markets. In this regard, certain geographical markets can serve as lead markets with anticipatory demand conditions for other international markets (Beise & Cleff, 2004). We therefore reason that similar to technological learning, firms have the opportunity to use exports markets for marketing learning. While part of the new information can be anticipated ex-ante, exporting firms become fully exposed to export market practices only once they are active in the market. In addition, operating on export markets provides firms with opportunities to experiment with alternative marketing choices and learn from feedback. These insights from export market customers and competitors can result in innovative ideas for upgrading overall marketing capabilities, thereby enhancing overall firm performance. The associated marketing expenditures, which accompany the process of learning, are thus likely to positively influence performance. We therefore propose:

Hypothesis 2: Export-induced marketing expenditures after export entry increase the focal firm's productivity.

2.3. Marketing learning versus technological learning by exporting

Finally, we compare the marketing effects of learning by exporting to technological effects.[1] We focus on marketing expenditures that take place *ex-post* export entry. Such "after entry" marketing expenditures originate from the exposure of the firm to export market knowledge pools, analogously to technological learning through R&D in the learning by exporting literature. We suggest that learning effects depend on the opportunities for absorbing and using this knowledge (Cohen & Levinthal, 1990). More precisely, learning effects are more likely to occur when export market knowledge can be identified on export markets, assimilated with the firm's existing knowledge stock, and exploited in the throughout the firm. Knowledge absorption can be difficult since it is often times embedded in products and requires prior related knowledge for its use (Cohen & Levinthal, 1989). In addition, part of this knowledge may be tacit and tends to be fragmented, so difficult to identify and use; it also requires effort to integrate (Zahra et al., 2000). In sum, firm's ability to absorb knowledge from export markets determines its ability to learn in both marketing and technology.

We reason that the absorption of technological knowledge for learning by exporting in R&D is comparatively easier than the absorption of market knowledge in the marketing function. While technological knowledge can be difficult to comprehend for laymen, it follows physical, chemical, or biological principles which can be evaluated by trained scientists and engineers across countries. Often time, technological standards appear which determine dominant technological approaches across countries, e.g. for mobile phone services (Shapiro & Varian, 1999). Cavusgil et al. (1993), among others, discuss how product adaptation for international markets is not generally pursued by high-tech firms, as technological content of the products is more universal. In contrast, large parts of export market knowledge remains embedded in the export market context and standardization across countries is less likely to occur (Kotler, 1986). This is due to the fact that countries differ significantly in the degree to which demand for certain

[1] We refer to earlier research which has studied the aspect of technological learning already, i.e., the relationship between exporting and R&D (Aw et al., 2007; Baldwin & Gu, 2004; Bustos, 2011; Lileeva & Trefler, 2010).

product is culturally accepted, administratively organized, geographically organized or economically feasible (Ghemawat, 2001). Hence, many experiences from export markets remain location-specific, i.e. they cannot be transferred to other countries without severe adaptation (Ghemawat, 2003). For example, an exporting firm might learn that its customers in China respond favorably to payment options using popular chat apps, but this insight is hard to utilize in countries that do not have the same digital infrastructure. More generally, exporting firms may experience innovative marketing approaches by export market competitors but these likely reflect the idiosyncratic demands of their customers and may not necessarily fit with other country needs. Technologies, though, can more reliably be transferred across geographical boundaries, assimilated, and exploited throughout the firm. These characteristics of technological and market knowledge imply that learning by exporting in R&D is comparatively more likely to result in positive firm performance than learning by exporting in marketing. Accordingly, we hypothesize:

Hypothesis 3: Export-induced R&D expenditures after exporting increase the focal firm's productivity more than export-induced marketing expenditures after exporting.

3. Empirical approach

To test our theoretical expectations, we need to establish which parts of a firm's marketing expenditures are induced by exporting and how such export-induced expenditures translate into firm performance. We use the same approach to R&D expenditures as a reference point for technological learning and for testing *Hypothesis 3.* We do so through a combination of a treatment effects analysis with a regression analysis and proceed in two steps. First, we estimate the effect of an exporting decision on marketing and R&D expenditures (*Treatment model*) to identify part of the expenditures related to export entry. Second, we estimate how these export-induced parts affect performance, measured as productivity (*Productivity model*), and compare them.

The choice of the method is driven by the following considerations. Despite the panel structure of our data, the unbalanced nature of it does not allow us to use panel data estimation methods. The focus of the paper is on identifying the parts of expenditures in marketing and R&D which are associated with export

entry, before and after the entry took place. The combination of the treatment and regression analyses – used for similar research questions in the past (Geldres-Weiss & Carrasco-Roa, 2016) - allows to achieve this separation, which is central to our theoretical reasoning and allows us to go further than to merely isolate the overall performance effect from exporting. The section on estimation strategy below provides methodological details on this procedure.

3.1. Data

We use the data from a survey of Spanish manufacturing firms "Encuesta sobre Estrategias Empresariales (ESEE)" for the years 1990-2009. We use the data up until 2009 to avoid any potentially confounding effect from the financial crisis in Spain which affected all firm decisions. The survey is conducted by the Fundación Empresa Pública with financial support of the Spanish Ministry of Science and Technology. It is administered to the population of Spanish manufacturing firms with 200 or more employees and to a stratified sample of small and medium firms, representative of the population of manufacturing firms with more than 10 and less than 200 employees. The sample maintains the representativeness of the manufacturing sector over time. Firms that exited the original sample during the sampling period are replaced by firms with similar characteristics drawn from the population. The initial sample is an unbalanced panel that covers the whole manufacturing sector of Spanish economy and includes 20 industries defined at the 2-digit level. The industry breakdown with the number of firms in each sector is provided in Appendix A. The ESEE dataset has been used by prior research on learning by exporting (e.g., Golovko & Valentini, 2014; Salomon & Jin, 2010; Salomon & Shaver, 2005a), allowing for the results comparison.

Since we are interested in estimating the impact of switching from being an exclusively domestic firm to an exporting firm, we focus on a subsample of firms that have started exporting during our sample period, as these are the firms subject to the treatment. These firms did not export at the beginning of the sample period, then started exporting and stayed in the export market for at least two years, i.e., their exporting is not a spurious event. In our analysis, we focus on the "first entry" episode, i.e., the first observed change in the export status of these firms from being non-exporters to exporters. Then, we

examine the marketing and R&D expenditures patterns of these firms around the entry moment with a one-year time window before and after entry. Prior studies compared exporting versus non-exporting firms based on a current export status of a firm. Our setting, although more restrictive, allows us to assess the effect of the *decision to enter the export market* on expenditures – we can trace the changes in behavior that are associated with the *first* change in export status, as we observe these firms before and after the export entry. Moreover, focusing exclusively on the first export entry allows us to avoid the potential confounding effect of export experience and effectively capture potential learning, which is more likely to happen when a firm experiences the export market for the first time.[2] The control group are the firms that never exported during the entire sample period. This leaves us with a sample of 9,223 firm-year observations (corresponding to 1,949 different firms), out of which 6% (or 541 firms) started to export and 94% (or 1408 firms) were never engaged into exports. The matching procedure reduces the effective sample to 788 firms – 394 firms entering the export market and 394 non-exporting firms as a matched control group. In the productivity regression we use the matching sample (788 firms) with the number of observations varying across models because of the time lags imposed.

3.2. Variables

3.2.1. *Dependent variables*

For the first part of our analysis – *the treatment model* - the dependent variables are marketing (*Mktg*) and R&D (*RD*) expenditures respectively, calculated in % of total sales. The former is measured by the ratio of marketing expenditures to total sales and the latter by the ratio of R&D expenditures to total sales. For the marketing expenditures, we use the information on expenditures on advertising, publicity, and public relations[3]. The ESEE questionnaire also asks whether a firm had spending on R&D activities in a given

[2] While we cannot be certain that all firms in our sample did not export before the sample start (both switchers and never exporting firms), it is unlikely that this has occurred for many firms. Exporting activity is generally characterized by persistence (e.g., Campa, 2004), i.e., if a firm enters the export market there is a high probability to continue exporting for substantial period. In the representative sample of the Spanish population of firms during the period 1990-2009, the probability that a firm continues exporting in the next year if it is currently an exporter is about 95% and only 6% of firms exit the export market, in line with the persistent nature of this activity.

[3] The information on marketing expenditures comes from the balance sheet of the firm (account 627 (Plan General Contable)), which firms had to report in the ESEE questionnaire.

year and if so, how much. We use the answer to this question to measure R&D expenditures related to technological activities of firms.

For the second part of the analysis – *the productivity model* - the dependent variable is firm performance. We use a productivity measure in line with prior export literature (Bernard et al., 2012; Segarra-Blasco et al., 2020). Productivity measures have the advantage that they capture all forms of performance improvements, including learning (e.g., increased sales due to improved products or marketing strategies as well as lower costs through improved manufacturing processes). More specifically, we calculate a variant of productivity measure based on the focal firm's annual value added, i.e., by subtracting expenditures for raw materials, consumables, and services from the firms' sales, and deflate it by industry specific producer price indices. We augment the classical production function introduced by Griliches (1986) by adding two types of inputs, namely marketing and R&D expenditures. Our production function can thus be presented as follows:

$$Y = AK^{\gamma}L^{\lambda}Mktg^{\beta}RD^{\delta}$$

with *Y* representing the firm's value added. A is the total factor productivity, K is a firm's physical capital, L represents labor, i.e., the log number of employees in a given year, Mktg captures marketing investment and RD captures R&D investment. The parameters γ, λ, β and δ denote the unknown output elasticities of inputs. By defining *Y* as the firm's value-added, raw material input is taken into account in *Y* and we do not have to include it as an additional variable on the right-hand side of the equation. To obtain a linear form of the above production function, we take natural logarithms. In the empirical estimation, we impose a lag of two periods between our explanatory variables and our dependent variable, productivity, to estimate the association between export-induced marketing and R&D expenditures and future productivity levels to avoid direct simultaneity (see e.g., Salomon and Shaver, 2005).

3.2.2. Independent and control variables

To estimate the propensity of firms to start exporting in the treatment model, we use several relevant covariates typically employed in the literature to model a firm's likelihood to export. Firm size (*Log*

employment) is the logarithm of the number of employees and takes into account that bigger firms are more likely to export (Bernard & Jensen, 1999). We use the percentage of foreign ownership (*Foreign ownership*) to control for the fact that firms with a higher foreign-owned capital are more likely to start exporting. The relevance of foreign capital in predicting the decision to export has been highlighted by prior literature (Aitken et al., 1997; Basile, 2001; Campa, 2004; Castellani, 2002; Cirera et al., 2015; Okubo et al., 2017; Sterlacchini, 1999). Foreign ownership may affect the choice to export as it can give firms additional information about the export markets through their foreign affiliates. Firms with foreign capital participation may also have better access to financial resources necessary to bear the extra costs associated with exports. Finally, foreign ownership may have an effect on corporate culture, making it more open and oriented towards riskier decisions (such as exports). Export decisions can also be triggered by the attractiveness of a firm's home market. We use a dummy variable, which reflects the evolution of the sector-level development of main product market (*Market growth*). Given that we focus on the sub samples of the export entrants and non-exporting firms, the main product market for these firms is likely to be the home market. This variable is based on a question in the questionnaire asking firms to report whether they perceive their main product market as growing, stable or shrinking. The variable *Market growth* takes the value of 1 if the main market is perceived as growing, and 0 otherwise. Stagnant or declining markets can trigger firms to explore new markets, e.g., through exporting. At the same time, growing existing markets can also promote exports, e.g. because of potential economies of scale can be realized (Salomon & Shaver, 2005b). Thus, the effect of the current market growth on the export decision can be positive or negative. Another important factor is the availability of financial funds for an export decision. The ratio of debt to value added (*Financial constraints)* controls for the possible financial constraints that firms may experience, which can affect the decision to start exporting. Further, we include capital intensity (*Capital intensity)* as a control variable to explain the decision to export (Bernard et al., 1995; Hansson & Lundin, 2004). We use *Employment costs,* measured as the logarithm of wages, as a relevant covariate in the export participation equation. Existing research finds positive association between employee compensation and exports for both high-skilled and low-skilled workers (Bernard & Jensen, 1999; Bernard et al., 2012;

Kandilov, 2009; Schank et al., 2007; Wagner, 2012), partially attributing it to self-selection of better, i.e. more productive (and higher-wage) firms, into exporting activities. Higher employment costs of exporters may also reflect the composition of the workforce of exporters. Exporting may demand more production quality, which in turn requires more intensive use of higher-wage skilled labor (Brambilla et al., 2012; Brambilla & Porto, 2016). A separate dimension of the propensity of a firm to export is the spatial distance and related transportation costs. We therefore include a control variable for the geographical location of firm headquarters within the provinces of Spain (*Location)*, as firms that are in proximity of a harbor or a border might have more options to export than firms that are located in more remote areas. Finally, the set of twenty industry dummies controls for unobserved heterogeneity and technological opportunity across sectors and the set of time dummies, one for each year, controls for common macroeconomic shocks.

Based on the predicted propensity score we perform the matching analysis, which allows us to separate marketing and R&D expenditures of an exporting firm into a part that was induced by the export decision and a counterfactual part, which the firm would have undertaken anyway (see next section for methodological explanation). These differentiated variables, namely export-induced marketing expenditures, counterfactual marketing expenditures, export-induced R&D expenditures and counterfactual R&D expenditures become the central *independent variables* in the second part of the analysis, in which we estimate a production function. We introduce the temporal component by calculating differences in an exporting firm's marketing and R&D expenditures with its matched control firm one year prior to exporting *(t-1)* (ex-ante), in the year of export entry (time *(t)*) and in the subsequent year *(t+1)* after exporting (ex-post).

In the production function equation, we include variables for capital and labor inputs as additional control variables. More precisely, we use the focal firm's physical capital, calculated as the log of its stock of tangible assets (*Capital*). Next, the log number of employees in a given year (*Log employment)* stands as a control for labor input as customary for production functions. Since we estimate an augmented production function (i.e., a knowledge production function), we also control for the focal firm's knowledge stock by including the patent stock (*Patent stock*) measured as the number of patent applications filed with

Spanish authorities divided by the number of employees. This characteristic should be held constant in our augmented production function in order for the knowledge input not to be confounded with other effects.

3.3. Methodological Approach

3.3.1. *Treatment model*

We start by estimating the average effect of exporting (the treatment) on firms' marketing and R&D expenditures, respectively. Using a treatment effects analysis allows us to assess how much an exporting firm would have spent on marketing or R&D if it would not have started to export. This counterfactual situation, i.e., expenditures of an exporting firm if it would be in a situation of not having exported, is never directly observable and has to be estimated. For our estimates to be unbiased, we must account for the fact that the decision to enter international markets by a firm is not random. A firm that decides to start exporting may differ in important characteristics from a firm that decides to stay local. In this study, we account for selection into exporting by using a non-parametric econometric matching estimator. Recent research demonstrates the usefulness of the propensity score matching approach with an application learning by exporting question (see Chang & Chung, 2017). More precisely, we employ a nearest neighbor propensity score matching that balances the samples of treated and untreated firms according to the probability of choosing to enter the export market. This probability is obtained from a probit estimation on the probability of switching export status. The matched pairs are then chosen based on the similarity in the estimated probability of starting to export. The construction of the control group depends on the algorithm chosen to conduct the matching. In our analysis, we conduct a variant of the nearest neighbor propensity score matching, namely caliper matching.[4]

Furthermore, on top of matching on the propensity score, we also require matched observations to be from the same year, industry, and region, as those criteria seem essential to build comparable pairs. This allows us to assign each export entrant with a matched twin, which had the same propensity to start

[4] Caliper matching aims at reducing the bias by avoiding matching treated firms with control firms above a certain "distance", i.e., those firms for which the value of the matching argument Zj is far from Zi. It does so by imposing a predefined threshold ε, above which an observation is deleted from the potential control group. More precisely, $||Zj–Zi||<\varepsilon$ for a match to be chosen (see Smith and Todd, 2005).

exporting in the same year, industry and region but remained local. The marketing and R&D expenditures of this matched twin serve as the counterfactual marketing and R&D expenditures of the focal firm, i.e., as the amount the focal firm would have invested if it had not started to export. Differences in expenditures can therefore be interpreted as induced by exporting.

In such a way, the fundamental evaluation question is as follows:

$$\alpha^{MktgTT} = \frac{1}{N^T}\sum_{i=1}^{N^T}\left(Mktg_i^T - Mktg_i^C\right) \quad (1)$$

where $Mktg_i^T$ indicates the expenditure of treated firms and $Mktg_i^C$ is the counterfactual situation, i.e., the potential outcome which a treated firm (*T=1*) would have realized if it would be in a counterfactual situation of not having received a treatment. For the untreated firms, $Mktg_i^C$ corresponds to their marketing expenditures. $T \epsilon \{0,1\}$ indicates the switch from being a non-exporter to being an exporter and N^T corresponds to the number of treated firms. R&D expenditures are evaluated analogously.

$$\alpha^{RDTT} = \frac{1}{N^T}\sum_{i=1}^{N^T}\left(RD_i^T - RD_i^C\right) \quad (2)$$

3.3.2. *Productivity model*

In a second step, we analyze how export-induced marketing and R&D expenditures contribute to firm productivity. We separate marketing and R&D expenditures into two components: expenditures which would have taken place even if a firm would not have started to export ($Mktg_i^C$ for marketing expenditures and RD_i^C for R&D expenditures) and those expenditures that were induced by the export entry (α_i^{MktgTT} and α_i^{RDTT} respectively). To obtain these effects at the individual firm level (*i)*, we calculate the difference between the overall marketing (R&D) expenditures and the counterfactual marketing (R&D) expenditures as follows:

$$\alpha_i^{MktgTT} = Mktg_i - Mktg_i^C \quad (3)$$

and

$$\alpha_i^{RDTT} = RD_i - RD_i^C \quad (4)$$

For non-exporters, $Mktg_i^C$ (RD_i^C) is equal to their marketing (R&D) expenditures, as export induced part α_i^{MktgTT} (α_i^{RDTT}) equals 0.

The productivity equation (5) displays the estimation for the contemporaneous period, i.e., period *t*.

$$Y_{it+2} = AK_{it}^{\gamma} L_{it}^{\lambda} Mktg_{it}^{\beta} RD_{it}^{\delta} \quad (5)$$

As explained above, we distinguish between expenditures that firms make prior to exporting (ex-ante) in (*t*-1) as well as in the post-entry period (*t*+1). We will thus re-estimate this equation using marketing and R&D expenditures in periods (*t*-1) and (*t*+1) respectively.

We induce a two-year time lag between the year of the export decision and the observed productivity outcome to account for potential simultaneity effects. The choice of two-year time lag is in line with prior empirical studies (e.g., Bernard & Jensen, 1999; Salomon & Shaver, 2005a). The augmented Cobb-Douglas production function is estimated using a method proposed by Levinsohn and Petrin (2003). This method exploits information on material input to account for unobservables. It takes time-invariant unobserved firm heterogeneity into account, such as for instance managerial quality able to influence within-firm value creation, and thus corrects for the inherent correlation between productivity shocks and input levels in the estimation of the production function. After having forwarded the dependent variable by two periods the sample for the second step equals to a total of 6,472 firm-year observations. The standard errors in these equations are bootstrapped to account for the fact the investment in marketing and R&D are estimated variables for the treated firms. Without bootstrapping the standard errors, we would omit the sampling variation and our standard errors would be subject to a downward bias (see e.g. Beck et al. (2016); Cameron and Trivedi (2005)).

3.3.3. Descriptive statistics

Before turning to the empirical results, we present the descriptive statistics of the initial sample in Table 1. The European Union classifies Spain as a member state with moderate innovation performance in its annual innovation scoreboard (European Commission, 2017) and this is also reflected in our sample. On average, a firm in the sample has an R&D intensity of 0.3% and a marketing intensity of roughly 0.7%.

Furthermore, the average firm has a size of 58 employees (23 at the median) and a share of foreign equity ownership of 3%. 24% of the firms estimate that their main market is growing and roughly 6% of the firms started to export during our observation period. The cross-correlations between these variables can be found in Appendix B.

Insert Table 1 about here

When comparing firms that started to export with firms that remained domestic, we see that on average exporting firms are significantly larger (with an average of 120 employees compared to 54 for non-exporting firms), have a significantly higher foreign ownership and indicated more often that their main product market was expanding. We further see that switching firms have significantly higher marketing and R&D expenditures when compared to non-exporting firms. However, we cannot determine based on descriptive comparisons how much of these additional expenditures can be attributed to the fact that they started to export and how much is due to other firm characteristics.

4. Results

4.1. Treatment model

We begin by estimating a propensity to start exporting, i.e., the export decision. Table 2 displays the results of the estimation on the likelihood of entering the export market. In line with previous findings, foreign ownership, growth of the main market, capital intensity and employment costs, as well as location and industry have a significant and positive impact on the export decision. Unlike prior studies, we find that the coefficient of size is positive but not statistically significant, indicating that size does not make a significant difference in terms of the probability of starting to export. A possible reason could be that Spain has a substantial domestic market which allows firms to reach economies of scale without necessarily opening foreign markets through exporting. A similar argument would not be true for countries with small domestic markets. In line with this logic, first-time exporters may be quite similar to non-exporting firms in terms of size, which is reflected in our sample. The financial constraints variable has the expected negative sign but is insignificant in its effect on the export decision.

Insert Table 2 about here

The probit estimation allows us to predict the propensity score for each firm in our sample on the likelihood to start exporting which we utilize in the subsequent matching estimation. Table 3 shows the results of the matching estimation. As can be seen from the t-test on mean differences between the treated (exporting) firms and the control group firms, all covariates are well balanced after the matching, pointing to the fact that our matching was successful and that we found a close neighbor for all treated firms. The only remaining significant differences are in the outcome variables.

Insert Table 3 about here

On average, we observe a significant difference in marketing expenditures between exporters and non-exporters already one year before export entry, albeit at statistically insignificant levels (0.15% points). The difference in marketing expenditures persists and gains statistical significance in the year of entry (time (t)) and one year after the entry (time (t+1). New entrants (period (t)) have an additional 0.34% points and 0.26% points (t+1) expenditure in marketing, respectively. Overall, our results confirm that export decisions are associated with positive changes in marketing expenditures in the year of entry and after the export entry, in line with our marketing learning reasoning.

As for R&D, we find no significant difference in R&D expenditures between treated and control groups in the pre-entry period (t-1). Exporting firms start to spend significantly more on R&D at the year of entry and the two years after they started to export. New exporters have R&D expenditures that are 0.19% and 0.25% points higher at times (t) and *(t+1)* respectively when compared with the matched control group. The results thus suggest that firms invest in R&D simultaneously or in response to the export entry, rather than in preparation, consistent with technological learning by exporting emphasized by prior research.

4.2. Productivity model

Next, we turn to the estimation on how export-induced parts of marketing contribute to productivity (*Hypotheses 1-3*). Models 1-3 in Table 4 present the estimation for different specifications for times (t-1), (t), (t+1) respectively.

Insert Table 4 about here

The results of Models 1-3 show that *export-induced* marketing expenditures start to pay off in terms of productivity only once firms become exporters. At time (*t*-1) (*Hypothesis 1*), the coefficient of export-induced marketing (α_i^{MktgTT}) is positive but statistically not significant. The export-induced parts of marketing expenditures become positive and significant at time (*t+1*) (*Hypothesis 2*), albeit only at 10% significance level. More precisely, at time (t+1) a 10% increase in export-induced marketing expenditures leads to 0.8% increase in a firm's future value added.[5] The results therefore confirm the positive effect of ex-post marketing expenditures associated with export entry on firm productivity. At the same time, the counterfactual marketing expenditures (i.e., those expenditures that firms would undertake anyway) are statistically significant in all three models at the 5% and 1 % significance levels with a comparable magnitude. The Wald test on the joint significance of the export-induced and counterfactual parts of marketing expenditures indicates that the variables are jointly significant at the 5% level (chi2 (2) =8.75**). Additionally, we conduct a sample split analysis between marketing-intensive industries and the rest of industries (tables available from the authors upon request). In line with expectations, the productivity effects of export-induced marketing expenditures occur in marketing intensive industries.

Turning to the comparison of marketing and R&D expenditures (*Hypothesis 3*) we observe a positive and significant (at the 5% level) contribution of *export-induced* R&D expenditures to productivity at times (*t*) and (*t*+1). At time (*t*), a 10% increase in export-induced R&D spending leads to a 1.1% increase in a firm's value added. Likewise, a 10% increase in export-induced R&D leads to 1.7% increase in productivity at (*t*+1). Our results on the positive contribution of export-induced R&D to productivity are supportive of technological learning documented by the positive effect of exports on firm's technological innovation (e.g., Salomon and Shaver, 2005a). The magnitude of the export-induced R&D coefficients is consistently higher than the one of export-induced marketing. We therefore can conclude that export-induced expenditures in R&D are more productive than export-induced marketing expenditures, supporting Hypothesis 3. The magnitude of the R&D coefficients for period (*t*+1) compared

[5] The expenditure variables enter the model in logarithms.

to (*t*) also shows that it takes longer for export-induced R&D spending to translate into productivity gains to their fullest extent.

Overall, the results indicate that the main changes in productivity are due to ex-post marketing expenditures undertaken after the actual entry takes place. Therefore, we find no support for *Hypothesis 1,* while our findings provide suggestive evidence for *Hypothesis 2* (at 10% significance level)*,* suggesting that further evidence should be accumulated for *Hypothesis 2* to receive full support*.* Moreover, we find overall support for *Hypothesis 3* showing that the contribution of export-induced R&D expenditures to productivity is consistently higher than that of marketing expenditures.

4.3. Additional analysis

Our main results confirm the positive change in the marketing expenditures associated with the export entry, in line with the learning by exporting effect in marketing. To further investigate the marketing learning effect, we conduct an additional analysis to take into account the fact that the mechanisms for the performance effects of export-induced marketing and R&D expenditures are not mutually exclusive. Additional performance benefits may stem from their interaction, for instance, by investing in marketing firms can improve the value creating and in particular, value capturing processes for their innovative products originating from R&D. Export-induced marketing expenditures, aimed specifically at foreign consumers, can create or extend complementary assets to effectively commercialize new products. In other words, both types of expenditures may be complementary in their effect on performance. We explore potential complementarity effects in Table 5. Models 1-3 (Table 5) show the results with the interaction between marketing and R&D for different time lags. In contrast to the expectations, we observe no additional contribution to productivity coming from the combined effect of export-induced marketing and R&D expenditures. On the contrary, the coefficients of the interaction terms are consistently negative and significant in two models. The finding suggests that the average firm faces a trade-off in terms of allocating the resources to R&D and marketing activities productively, i.e., spending on both R&D and marketing actually reduces the value added.

Insert Table 5 about here

4.4. Robustness analysis

Finally, we test the robustness of our findings against critical features of our econometric specifications. The reliability of our results hinges upon the correct specification of the matching analysis. Thus, we employ an alternative econometric technique that takes the selection on unobservables into account explicitly. More specifically, we check whether it provides the same conclusion on the export-induced marketing and R&D expenditures being affected by export decision (see e.g. Czarnitzki & Lopes-Bento, 2013). We use instrumental variable (IV) regression approach, which allows contrasting our findings with an alternative approach to model selection. To conduct our IV regression, we employ an instrument impacting the decision to start exporting without impacting marketing or R&D expenditures, namely the exchange rate by sector and technology class (please see Appendix C for the explanation of the exchange rate calculation).[6] The international trade literature shows that exchange rate fluctuations can significantly affect the export behavior of firms (Basile, 2001; Campa, 2004; Salomon & Shaver, 2005b). Home currency devaluation is expected to result in more firms entering the export market. A suitable exclusion restriction should not affect the dependent variables, i.e., marketing and R&D expenditures, at the same time. In addition to affecting the level of export sales favorable exchange rate shifts (significant enough) can also induce a firm to enter an export market (e.g. Campa, 2004). Accordingly, research finds the robust significant effect of the exchange rate on the participation decision in exports (Campa, 2004). This variable has been used as an instrument for similar purposes in prior studies (see e.g., Campa, 2004; Salomon & Shaver, 2005b; Golovko & Valentini, 2014). Given that the exchange rate variable is calculated at the sector level, we follow Moulton (1990) and cluster the standard errors by firm and industry to correct for a possible correlation between observations coming from the same industry.[7]

[6] We have also used an alternative instrument, the average propensity to export calculated at the industry level (excluding the focal firm) to increase the confidence in the IV estimation results. The findings are fully consistent with our prior findings, i.e., the matching approach of the main models as well as the initial IV estimation.
[7] We thank the anonymous referee for this suggestion.

The results of the estimation suggest that for both regressions the exchange rate variable fulfils the statistical tests for being a valid instrument. In the first stage, the IV is highly significant and the F-test is above 10. As displayed in Table 6, the results of the IV estimation are in line with what we observe in our matching estimation. Both marketing and R&D expenditures are positively and significantly affected by export decision. As IV is a linear specification and the matching estimator is a non-parametric estimator, the magnitude of point estimates is not directly comparable. Nonetheless, the significance levels and signs indicate that the results for marketing and R&D additionality hold when controlling for characteristics that are unobservable to the researcher. We limit ourselves to the presentation of the results of the contemporaneous period. Results on other time periods are similar .

Insert Table 6 about here

5. Discussion and conclusions

We have examined the learning in marketing effect from exporting on firm performance in search of novel insights into the learning by exporting phenomenon. More specifically, we argue that along with technological learning from exporting emphasized by prior literature, marketing learning takes place. We hypothesize that the decision to export triggers changes in firm expenditure patterns related to their marketing activities made in preparation as well as after export entry. These export-induced marketing expenditures are then associated with increased firm productivity as evidence of learning by exporting in marketing. Our findings indicate that export is associated with an increase in marketing expenditures in the aftermath of the actual export entry. Moreover, we find suggestive evidence for the positive effect of ex-post marketing expenditures (their export-induced part) on firm productivity. More empirical evidence should be accumulated for our finding to receive full support. Based on our empirical findings we can conclude that the learning by exporting phenomenon can also be characterized as “learning about and exploiting new markets” in addition to learning about new technologies as prior work has often implied.

Further, our study shows marketing expenditures that originate from the part that precedes the entry into the export market do not contribute to future performance. We suspect that this effect is due to the

fact that learning by exporting in marketing is more likely to occur when firms can observe the complex and often tacit interrelationships on export markets, e.g., novel marketing activities of competitors resonate with particular export-market customer groups. Export-induced marketing expenditures in preparation for exporting may not uncover this information. They are more likely designed to tailor the firm's marketing for the export entry per se, without major learning insights.

Finally, we find that export-induced expenditures in marketing do not reach the same productivity effects as export-induced R&D expenditures. Our results thus suggest that absorbing marketing knowledge across borders is comparatively more difficult since customer needs and tastes vary considerably between countries, providing fewer opportunities to transfer successful insights and practices between markets. Alternatively, technologies allow for learning opportunities based on the exposure to new technological knowledge which can be easily transferred across markets and realize in higher productivity.

Our study contributes to the learning by exporting literature by explicitly accounting for learning in marketing as an important part of learning process associated with export entry. Prior research on learning by exporting effect focused primarily on technological learning realized in R&D and technological innovation output (Baldwin & Gu, 2004; Love & Ganotakis, 2013) or did not differentiate between technological and marketing learning (D'Angelo et al., 2020; Salomon & Shaver, 2005a). Conceptually, we discuss the mechanism that underlies the relation between marketing knowledge accumulation and firm performance. Moreover, we set up an empirical test that distinguishes marketing learning from technological learning studied by prior research (Aw et al., 2007; Bustos, 2011) and compares their performance effects. More generally, we conceptualize the export decision as the trigger for changes in firm expenditure behavior that lead to changes in the outcomes. Extant literature on learning by exporting often directly links firm export status to performance outcomes (Clerides et al., 1998; Golovko & Valentini, 2014; Love & Ganotakis, 2013; Salomon, 2006). We explain how the export entry prompts firms to alter their expenditures and relate these changes to post-entry performance, thus making a first step towards uncovering the learning "black box". Furthermore, our methodological approach is well

suited for testing theories in which investment decisions are endogenously triggered, such as by exports, and it is crucial to differentiate performance effects from counterfactual expenditures, such as non-observable marketing or R&D expenditures of an exporting firm if it had not started to export. International business research is rich with such settings and could therefore benefit from the methodological approach we suggest in this study, e.g., entry mode choices and their investment as well as performance outcomes.

Next, we add to the emerging literature in strategy on marketing innovation, which exist separately from technological innovation (Grimpe et al., 2017). These studies consider expenditures in marketing innovation as exogenously given. Our paper identifies one of the sources of such expenditures, i.e., exporting activity. We show how exports trigger new marketing expenditures that may contribute to firm performance. Moreover, we uncover that not all export-induced marketing expenditures have the same potential. Export-induced marketing spending that are made in preparation to exporting have no significant learning by exporting effect.

In terms of practical implications, our findings give managers a better understanding of the kind of benefits they can expect from an export activity and where these benefits can originate from. While it is well-accepted that R&D expenditures are one of the primary sources of productivity growth, our results also show that that effect of export-induced marketing expenditures may not be underestimated. Accordingly, managers relying exclusively on the technological superiority of their export products are likely to miss additional opportunities.

What is more, our findings inform managers about the timing of export-induced expenditures regarding their performance effects. We find that these expenditures pay off when they follow the entry into export markets. Within our logic, learning by exporting in marketing occurs when firms observe valuable knowledge on export markets first-hand and appreciate its complex and tacit components. Hence, firms would be well served to organize for exploiting these learning opportunities. For example, they can rotate marketing professionals responsible for domestic and export markets with the goal of identifying and synthesizing best practices from export markets. Similarly, export market competitor

initiatives, e.g., the success of online marketing or digital sales channels, should be shared with the parts of the marketing department s. Circulating these insights within firms is useful after firms have started to export because firms have direct export market experiences that they can credibly share and compare.

6. Limitations and future research

We encounter several promising research opportunities while conducting this study. These opportunities set boundaries to what we can cover in a single paper but can provide fruitful impulses for future research.

First, our empirical setting allows us to capture marketing expenditures which reflect spending on advertising, publicity, and public relations. While these are relevant marketing expenditures for learning by exporting, they do not cover the full range of marketing activities done by firms which can be subject to learning effects. Additionally, our sample covers the period of 1990-2009, before the era of digital marketing, which changed the dominant approaches to marketing. Future research might use a broader set of measures for marketing activities, including digital marketing techniques, to paint a more fine-grained picture about the type of marketing capacities, instruments or decision making that firms adapt when they start exporting. Next, the nature of the industry related to its marketing activities may limit or foster the opportunities and intentions to learn from exporting in marketing. Future research may study in more depth how marketing-intensive industries are different from non-marketing intensive ones in terms of learning by exporting in marketing.

Second, our findings may not be easily generalizable across different types of enterprises based on their size. Our sample includes firms that had more than 10 employees, thus micro enterprises are not a part of our analysis. Moreover, the sample may be biased towards including larger firms, as we use the continuous measures of R&D and marketing expenditures in logarithms and small enterprises are less likely to perform marketing and especially R&D continuously. Future studies may focus on these underrepresented groups of firms, as learning by exporting might be especially relevant for them.

Third, we relate export-induced marketing and R&D expenditures to firm performance. This approach has the advantage of allowing a comparison between two types of learning by exporting.

However, we cannot capture direct learning outcomes which are hardly comparable between marketing, e.g., a novel pricing strategy, and R&D, e.g., patents. Future studies might be able to focus on learning by exporting marketing outcomes and differentiate them from the marketing improvements that the firm could accomplish before exporting.

Forth, we explore the learning effects of firms starting to export. While this is a crucial step in a firm's internationalization, the first entry is unlikely to remain the exclusive learning opportunity for exporting firms. Future studies may explore firms' export trajectories to get a better understanding of the dynamics of the learning effects in marketing. For example, research could focus on the export destination breadth and its effect on marketing learning, i.e., the effect of the number of export markets on learning. Future studies may also explore alternative modes of internationalization, e.g., joint ventures and the learning opportunities they provide.

Fifth, we theorize about export-induced changes to firm expenditures in marketing and their performance outcomes and use an elaborate matching approach to isolate these expenditures from the counterfactuals. More precisely, we set up a two-step empirical procedure that allows us to separate the parts of the marketing and R&D expenditures that are associated with the export entry and compare them. While we do our best to account for the potential endogeneity issues, we acknowledge that we cannot claim causality in our findings. To improve on that, future research can exploit the advantages provided by panel data and use empirical methods better suited for causal inference, such as (conditional) difference-in-difference approaches.

Finally, our empirical findings are limited to the sample period and the context of manufacturing firms in Spain. We use a dataset that provides many opportunities for studying our research question, e.g., covering many firms over long period of time, but does not allow capturing cross-country differences. Most notably, the national environment may shape a firm's motivation to learn from export markets. For example, Spain experienced a substantial economic crisis after the end of our sample period and future studies may focus on these crisis effects on marketing as well as technological learning from exporting. Other country level effects could constrain marketing learning from exporting in technologically leading

countries or propel it, e.g., in developing countries. Similarly, service firms have distinct marketing and learning conditions, e.g., in direct interaction with foreign customers. These conditions are likely to affect the strength of learning by exporting in marketing effects. Hence, we encourage comparative studies in these country contexts. Finally, our sample period covers the pre-crisis years ending in 2009. Including the period of financial crisis in the sample and possibly the recovery period afterwards would be an interesting question for future research to address.

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8. Tables

Table 1: Descriptive statistics. N=9,223

	Overall sample					By group of interest				
						Non-exporting firms N=8674		Exporting firms, N=549		t-test on mean differ-renice
Variable	Mean	Std. Dev.	Min	Max	Median	Mean	Std. Dev.	Mean	Std. Dev.	
Mktg (% in total sales)	0.72	1.84	0	41.41	0.17	0.69	1.77	1.26	2.57	p=0.000
RD (% in total sales)	0.25	1.54	0	63.73	0	0.23	1.50	0.52	2.16	p=0.000
Log employment	3.44	0.91	2.48	7.45	3.17	3.41	0.01	3.89	1.20	p=0.000
Foreign capital	2.90	15.54	0	100	0	2.47	14.31	9.75	27.84	p=0.000
Market growth	0.23		0	1		0.23		0.28		Pry =0.252[§]
Financial constraints	1.24	21.25	-588.02	1741.79	0.62	1.31	20.85	0.10	26.81	p=0.096
Capital intensity	5.53	3.57	0	12.69	6.86	5.46	3.58	6.60	3.06	p=0.000
Employment costs	13.18	1.16	9.94	18.03	12.92	13.15	1.13	13.71	1.41	p=0.000
Exporters	0.06		0	1		0		1		

[§]pry refers to the Pearson Chi2 test (Pearson chi2 = 1.3134 with Pr = 0.252) which we performed instead of the conventional t-test for the dummy variables. We thank an anonymous referee for this comment.

Table 2: Probit estimation on the likelihood to start exports. N=9,223

Variables	Coeff.	
Log employment	0.01 {0.001}	(0.08) [0.90]
Foreign capital	0.004 {0.0003}	(0.001) [0.00]
Market growth	0.063 {0.006}	(0.051) [0.21]
Financial constraints	-0.002 {-0.000}	(0.002) [0.19]
Capital intensity	0.03 {0.003}	(0.007) [0.00]
Employment costs	0.15 {0.014}	(0.06) [0.03]
Constant	-6.65	(130.25) [0.96]
Log-likelihood	-1916.90	
Overall model significance	LR chi2 = 328.69 [0.000]	
Joint significance of sector dummies	χ^2 (19) = 61.47 [0.000]	
Joint significance of region dummies	χ^2 (7) = 11.24 [0.1283]	
Joint significance of time dummies	χ^2 (17) = 62.70 [0.000]	

Notes: Marginal effects are listed in {}. Standard errors are reported in parentheses ( ), p-values are provided in brackets [ ]. The model contains a constant, industry, region, and year dummies (not presented). The Wald test is used to test for joint significance of sector, region, and time variables.

Table 3: Matching results

	Selected control group N = 394		Treated group N = 394		Mean difference	t-test on diff. in means
Variables	Mean	Std. Dev.	Mean	Std. Dev.		
Control variables						
Log employment	3.50	0.95	3.52	0.98	0.02	p=0.74
Foreign capital	1.10	9.99	1.10	9.99	0	p=1.00
Market growth	0.28		0.27		0.01	Pr =0.634[§]
Financial constraints	0.66	4.56	0.81	10.16	-0.14	p=0.79
Capital intensity	6.21	3.13	6.13	3.27	0.07	p=0.75
Employment costs	13.17	1.16	13.27	1.16	-0.10	p=0.23
Outcome variables						
$Mktg_{t-1}$ (N^T=379;N^{UT}=337)	0.70	1.38	0.85	1.55	-0.15	p=0.20
$Mktg_t$ (N^T=394;N^{UT}=394)	0.63	1.14	0.97	1.67	-0.34	p=0.001
$Mktg_{t+1}$ (N^T=353;N^{UT}=344)	0.57	1.12	0.84	1.50	-0.26	p=0.012
RD_{t-1} (N^T=381;N^{UT}=342)	0.40	3.59	0.41	1.69	-0.01	p=0.94
RD_t (N^T=394;N^{UT}=394)	0.20	0.91	0.39	1.92	-0.19	p=0.07
RD_{t+1} (N^T=352;N^{UT}=344)	0.16	0.81	0.41	2.03	-0.25	p=0.03

Notes: T-statistics are based on Lechner's (2001) asymptotic approximation of the standard errors that accounts for sampling with replacement in the selected control group. The number of treated firms in the matching corresponds to 394 rather than to 541 because common support could not be found for all the firms. Hence, the observations without common support were dropped.

For the outcome variables, N^T refers to the number of observations for the treated firms and N^{UT} to the number of observations for the control firms. Because of the time lags, we lose observations. Since we use sampling with replacement, the control group theoretically can be smaller than the treated group.

[§]Pr refers to the Pearson Chi2 test (Pearson chi2 = 0.2270 with Pr = 0.634) which we performed instead of the conventional t-test for the dummy variables. We thank an anonymous referee for this comment.

Table 4. Production function estimation; dependent variable: ln(value added)$_{t+2}$

	Model 1 time (t-1)	Model 2 time (t)	Model 3 time (t+1)
α_i^{MktgTT} *(t-1)*	0.01 (0.06) [0.87]		
$Mktg_i^C$ *(t-1)*	0.07 (0.03) [0.016]		
α_i^{MktgTT} *(t)*		0.004 (0.055) [0.94]	
$Mktg_i^C$ *(t)*		0.08 (0.025) [0.001]	
α_i^{MktgTT} *(t+1)*			0.08 (0.04) [0.06]
$Mktg_i^C$ *(t+1)*			0.08 (0.03) [0.012]
α_i^{RDTT} *(t-1)*	0.09 (0.04) [0.02]		
RD_i^C *(t-1)*	0.04 (0.035) [0.26]		
α_i^{RDTT} *(t)*		0.11 (0.053) [0.03]	
RD_i^C *(t)*		0.023 (0.027) [0.389]	
α_i^{RDTT} *(t+1)*			0.17 (0.059) [0.004]
RD_i^C *(t+1)*			0.042 (0.029) [0.148]
Foreign capital	0.059 (0.02) [0.006]	0.052 (0.018) [0.004]	0.048 (0.018) [0.01]
Patent stock	0.33 (0.60) [0.58]	0.069 (1.01) [0.946]	0.13 (0.83) [0.875]
Capital	0.013 (0.003) [0.000]	0.013 (0.003) [0.000]	0.012 (0.002) [0.000]
Log employment	0.909 (0.025) [0.000]	0.908 (0.021) [0.000]	0.908 (0.025) [0.000]
N of obs.	5625	6472	6388
Joint sig. of year dummies (chi2 (17))	245.25 [0.000]	376.84 [0.000]	457.62 [0.000]
Joint sig. of industry dummies (chi2 (20))	320.11 [0.000]	411.29 [0.000]	437.86 [0.000]

Notes: The production function is estimated using a production function estimation method proposed in Levinsohn and Petrin (2003). Standard errors are reported in parentheses ( ), p-values are provided in brackets [ ]. Standard errors in parentheses are bootstrapped. All models contain industry and year dummies (not presented). α_i^{MktgTT} and α_i^{RDTT} stand for export-induced parts of marketing and R&D expenditures, respectively. $Mktg_i^C$ and RD_i^C stand for the counterfactual parts of marketing and R&D expenditures respectively, i.e., expenditures which would have taken place even if a firm would have sold its products only in the domestic market.

Table 5. Interaction of export-induced marketing and R&D expenditures. Production function estimation; dependent variable: ln(value added)$_{t+2}$

	Model 1 time (t-1)	Model 2 time (t)	Model 3 time (t+1)
α_i^{MktgTT} *(t-1)*	0.017 (0.05) [0.743]		
$Mktg_i^C$ *(t-1)*	0.07 (0.02) [0.011]		
α_i^{MktgTT} *(t)*		0.017 (0.05) [0.44]	
$Mktg_i^C$ *(t)*		0.083 (0.025) [0.001]	
α_i^{MktgTT} *(t+1)*			0.10 (0.04) [0.013]
$Mktg_i^C$ *(t+1)*			0.08 (0.03) [0.025]
α_i^{RDTT} *(t-1)*	0.084 (0.065) [0.199]		
RD_i^C *(t-1)*	0.04 (0.02) [0.14]		
α_i^{RDTT} *(t)*		0.14 (0.039) [0.000]	
RD_i^C *(t)*		0.020 (0.02) [0.449]	
α_i^{RDTT} *(t+1)*			0.25 (0.06) [0.000]
RD_i^C *(t+1)*			0.041 (0.028) [0.14]
α_i^{RDTT}*(t-1)* * α_i^{MktgTT}*(t-1)*	-0.05 (0.06) [0.420]		
α_i^{RDTT}(t) * α_i^{MktgTT}(t)		-0.12 (0.048) [0.008]	
α_i^{RDTT}(t+1) * α_i^{MktgTT}(t+1)			-0.19 (0.07) [0.014]
Foreign capital	0.059 (0.016) [0.000]	0.051 (0.018) [0.006]	0.048 (0.02) [0.016]
Patent stock	0.33 (0.389) [0.394]	0.066 (1.13) [0.953]	0.128 (0.51) [0.801]
Capital	0.013 (0.002) [0.000]	0.013 (0.003) [0.000]	0.012 (0.002) [0.000]
Log employment	0.909 (0.028) [0.000]	0.908 (0.022) [0.000]	0.906 (0.020) [0.000]
N of obs.	5625	6472	6388
Joint sig. of year dummies (chi2 (17))	238.99 [0.000]	511.20 [0.000]	246.82 [0.000]
Joint sig. of industry dummies (chi2 (20))	370.13 [0.000]	422.95 [0.000]	258.66 [0.000]

Notes: The production function is estimated using a production function estimation method proposed in Levinsohn and Petrin (2003). Standard errors are reported in parentheses ( ), p-values are provided in brackets [ ]. Standard errors in parentheses are bootstrapped. Please see the note under Table 4 for variable explanations.

Table 6. IV regression instrumenting for the effect of the decision to export on marketing and R&D expenditures

	1st stage		2nd stage			
	Pr(Export = 1)		*Marketing expenditures*		*R&D expenditures*	
Variable	Coeff.		Coeff.		Coeff.	
Export			4.576	(1.14) [0.000]	2.327	(0.89) [0.010]
Log employment	0.01	(0.009) [0.248]	-0.211	(0.084) [0.013]	0.189	(0.132) [0.154]
Foreign Capital	0.001	(0.0003) [0.006]	0.0003	(0.003) [0.910]	-0.008	(0.002) [0.003]
Market growth	0.003	(0.005) [0.550]	0.126	(0.055) [0.023]	0.074	(0.041) [0.071]
Financial constraints	-0.000	(0.000) [0.395]	-0.0005	(0.0005) [0.379]	0.0001	(0.0003) [0.575]
Capital intensity	0.002	(0.0007) [0.000]	-0.006	(0.011) [0.587]	0.022	(0.007) [0.002]
Employment costs	0.01	(0.007) [0.090]	0.373	(0.180) [0.039]	-0.051	(0.104) [0.621]
Constant	0.288	(0.09) [0.001]	-8.10	(2.75) [0.003]	-2.55	(1.17) [0.029]
Exclusion restriction: exchange rate	0.003	(0.0002) [0.000]				
N of obs.	9203		9203		9209	
F(51, 19)			93.52	[0.000]		
F(50, 19)					2379.62	[0.000]
Joint significance of region dummies			29.88	[0.000]	22.32	[0.002]
Joint significance of time dummies			169.36	[0.000]	1009.50	[0.000]
F-test of excl. instr. (1st stage: marketing expenditures)			12 122.48	[0.000]		
F-test of excl. instr. (1st stage: R&D expenditures)					123.20	[0.000]

Notes: Standard errors are reported in parentheses ( ), p-values are provided in brackets []. Standard errors in parentheses are clustered at the firm and industry level. All models contain industry, region, and year dummies (not presented).

9. Appendices

Appendix A

Table A.1. Industry distribution

NACE code	Industry	Number of firms
101-109, 120	Food and tobacco	1,564
110	Beverages	182
131-133, 139, 141-143	Textiles	1,043
151,152	Leather and footwear	213
161,162	Wood and wood products	376
171, 172	Paper	202
181, 182	Publishing and printing	711
201-206, 211, 212	Chemical products	272
221, 222	Plastic and rubber products	400
231-237, 239	Non-metal mineral products	916
241-245	Metallurgy	106
251-257, 259	Metallic products	1,254
281-284, 289	Machinery and equipment	340
261-268	Office machinery and computing	163
271-275, 279	Electronics and electronic equipment	485
291-293	Autos and motor vehicles industry	179
301-304, 309	Other transport equipment	137
310	Furniture	539
321-325, 329	Miscellaneous manufacturing	141
	Total	9,223

Appendix B

Table B.1. Cross-correlations (N=9,223)

		1	2	3	4	5	6	7	8
1	*Mktg*	1.000							
2	*R&D intensity*	0.065**	1.000						
3	*Log employment*	0.223**	0.109**	1.000					
4	*Foreign capital*	0.119**	0.012	0.325**	1.000				
5	*Market growth*[§]	0.045***	0.049***	0.101***	0.016	1.000			
6	*Financial constraints*	-0.011	-0.001	-0.005	-0.017	0.005	1.000		
7	*Capital intensity*	0.095**	0.08**	0.25**	0.11**	0.161***	0.009	1.000	
8	*Employment costs*	0.24**	0.10**	0.92**	0.32**	0.096***	-0.007	0.27**	1.000

Note: ** (*) indicate a significance level of 1% (5%).

[§] For Market growth (dichotomous variable) and the rest of the variables (continuous variables) the correlation coefficients are calculated as point-biserial correlations.

Appendix C

Calculation of the exchange rate variable.

Following Campa (2004), we calculate the exchange rate variable as an index that measures the weighted average of the behavior of the bilateral exchange rates between the euro and the foreign currency of each potential export destination. The exchange rate index reflects the changes in the peseta (the Spanish national currency before euro introduction) with respect to other foreign currencies during 1990-2009. Higher values of index correspond to peseta depreciation periods. The ESEE survey data distinguishes between three broad export destinations – EU (European Union) countries, other OECD countries, and the rest of the world. For the EU destinations, the peseta-euro bilateral exchange rate is used. With an introduction of euro in 1999, we fix the peseta/euro ratio but allow the ratio of peseta to vary with respect to other currencies. For other OECD countries, we use the behavior of the peseta relative to the US dollar, and for the rest of the world, we use the nominal effective exchange rate of the peseta relative to a trade weighted basket of currencies for Spain. We use the percentage of export sales that goes to a particular market destination as corresponding weights. For exporting firms, the information on the export shares to these destinations is provided in the survey. The survey reports the information on the export destinations only once in four years, i.e., we have these data for 1990, 1994, 1998, 2002, and 2006. We calculate industry average export shares to different destinations for 1990, 1994, 1998, 2002, and 2006. Subsequently, we use these percentages as weights for the respective yearly bilateral exchange rates. For the years 1991-1993, we use the data in 1990, for 1995-1997 we use the information available in 1994, for 1999-2001 we use market destinations in 1998, and so on. Thus, the exchange rate index is industry specific, i.e., it accounts for the fact that different industries may export to different markets and thus be differently affected by the relative exchange rate changes. Furthermore, we account for the fact that firms in different technology classes may be affected by the exchange rate differently. The exchange rate variable takes that into account. Prior research has shown that home currency depreciation is associated with higher export participation (e.g., Campa, 2004). We therefore expect the positive association between the exchange rate variable and the export decision of firms.