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The Role of Digitalization in Cross-Border E-Commerce Performance of Italian SMEs

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Abstract: The utilization of digital technologies is rapidly increasing businesses' capacities for innovation and growth, especially in the case of small and medium-sized enterprises (SMEs), with strong benefits in efficiency, competitiveness, and market reach. We aimed to study the impact of digital technologies on cross-border e-commerce (CBEC) in Italian SMEs, with regard to three main ICT areas: e-business, e-marketing, and e-commerce. Using a regression analysis, the study found that e-business tools have an unclear impact on cross-border e-commerce, while e-marketing tools, such as data tracking for medium-sized enterprises and social media for all SMEs, have a positive and significant impact on the online export performance. Finally, we examined the impact of being present on a marketplace rather than having a proprietary e-commerce website, and we found that having a presence on marketplaces such as Amazon or Alibaba is more effective than having a proprietary e-commerce website in terms of cross-border online sales. These results are useful both for policy makers and managers, since making informed decisions to develop SMEs is crucial for industrial strategy effectiveness.

Keywords: digitalization; e-commerce; SMEs



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1. Introduction

Small and medium-sized enterprises (SMEs) are vital to the European economy, and the Italian economy particularly, comprising 99.9% of all active businesses (4.4 million SMEs), approximately 80% of employment, and 70% of the gross value. SMEs play a vital role in Italy's economic growth and development, even more so because, as confirmed by Perez-Gomez et al., (2018) [1], small and medium-sized enterprises have a distinct advantage over large corporations in terms of flexibility. They are able to adapt to changing market conditions and customer needs more easily due to their more streamlined organizational structure, which allows for quicker decision making. SMEs also contribute to the diversification of the economy by offering a wide range of products and services, and it is crucial to understand the trends that SMEs need to watch to maintain their competitiveness. In particular, digitalization is an important trend for SMEs to retain leadership. The adoption of digital technologies can help SMEs improve their efficiency, reach new customers, and increase their competitiveness [2]. The relationship between digitalization and SMEs is, therefore, very strict, and it is plain that the former can help SMEs to attain a competitive advantage, a higher level of internationalization, and better performances.

To this end, with this paper, we aimed to understand the impact of digital technologies on cross-border e-commerce for Italian SMEs. Overall, we observed that Italy is lagging behind its European counterparts in terms of digitalization and IT capabilities, although several national policies are addressing this topic and the initial data seem to show that they are succeeding. This paper deals with three main categories of digital technologies: e-business, e-marketing, and e-commerce. We show that e-business has a mixed impact

on CBEC, and the relationships need to be further analyzed, while e-marketing tools have a significant positive impact on the online export performance. In more detail, social media and data analyses are effective tools that companies should adopt if they want to compete and succeed in today's business environment. Furthermore, this paper aims to understand whether different e-commerce systems have an impact on export performance. Our results indicate that being present on renowned worldwide marketplaces is more effective than having a proprietary e-commerce website, probably because of more exposure and customer trust.

The paper contributes to the literature by investigating the relationship between various technology adoption factors and the presence of cross-border e-commerce: as a matter of fact, this research examines the relationship between e-business, e-marketing, and cross-border e-commerce and also explores the relationship among proprietary e-commerce, third-party marketplaces, and cross-border e-commerce, thus providing valuable insights into the factors that influence cross-border e-commerce that could be useful for companies looking to expand their operations in this area. In addition, this paper also takes the firm size into account as a control variable and as a moderator of the effect of the e-business, e-marketing, and e-commerce predictors.

This paper is organized as follows: Section 2 describes the literature background, linking digitalization to SMEs and putting forward the main hypotheses of this work. Section 3 introduces the methods and data used. Section 4 analyses the results and comments on them. A final section ends the paper.

2. Literature Review and Research Development

Digital technologies are rapidly transforming both businesses and society. How companies utilize these technologies has a significant impact on their ability to innovate and grow. The rapid advancement of digital technologies and digital infrastructure over the past decade has had a significant impact on business processes, organizations, and corporate culture, leading to the emergence of innovation processes, marketing models, and types of products/services [3]. The effective use of information and communication technologies (ICTs) has long been recognized as a key factor in business performance, particularly for small and medium-sized enterprises (SMEs) [4,5]. The adoption of such technologies can provide numerous benefits to small businesses, including an increased efficiency, competitiveness, and market reach [6]. Indeed, digital technologies can improve the operational efficiency of SMEs by optimizing process management and increasing market orientation through an advanced market knowledge [7]. They can also enhance the effectiveness of various business operations and improve an organization's ability to adapt to changing market conditions; to change their value proposition, value creation, and value capture mechanisms; and to define the scope and level of digitalization they wish to achieve [8]. Digitalization has also changed the way that consumers and businesses interact with each other [9]. Consumers now have access to numerous channels through which they can easily communicate with businesses and other consumers, and they encounter a growing number of touchpoints on their customer journey [10] and on smartization projects [11]. Hence, digital technologies can help small and medium-sized enterprises extend their value proposition and manage customer relationships through the use of new digital tools such as customer relationship management (CRM) software and social media [12]. In particular, the adoption of social media can have a positive impact on the financial performance of SMEs, helping to reduce marketing costs while improving customer relations [12]. However, a successful digital transformation to quickly respond to market and consumer needs requires an organization to have a wide range of internal digital capabilities [13]. One area of research has focused on the role of digitalization in improving the international capabilities of companies. The Internet is widely seen as a valuable tool for small and medium-sized enterprises looking to expand their exporting activities [14]. SMEs often face barriers to exporting, such as limited financial resources or a lack of information about and contacts in foreign markets [15]. Research has shown

that the Internet can provide numerous benefits to SMEs, including serving as a low-cost gateway to global markets [14]. Piscitello and Sgobbi (2003) [16] are among the early researchers to examine the relationship between the Internet and exports. They found that the adoption of Internet applications and information and communication technologies can provide small businesses with new opportunities to expand into foreign markets as both exporters and producers. Similarly, Hagsten and Kotnik (2017) [17] found that information and communication technologies are largely positively related to the exporting activities of small and medium-sized enterprises. Specific research on Italian SMEs has shown that innovation and digitalization have been identified as crucial factors in the success of international expansion [18]. These studies have demonstrated that SMEs can differentiate themselves from their competitors and gain a competitive advantage in the global marketplace by embracing new ideas and technologies. Through the use of ICTs, companies can reduce the costs of information-intensive activities such as communication management, sales, and marketing, allowing them to more easily expand their presence in foreign markets [19]. E-commerce, or electronic commerce, refers to the buying and selling of goods and services over the Internet, and it has become an increasingly important application of ICTs for internationalization, as it allows businesses to reach customers across borders without the need for a physical presence in those markets. Over the past decades, e-commerce platforms have made a significant contribution to global economic development. The rapid growth of the world's Internet population has provided numerous opportunities for companies of all sizes to use Internet-based e-commerce applications to effectively manage their interactions with consumers. Companies' participation in e-commerce has led to market expansion, internationalization, and resource optimization [20,21]. Although engaging in international activities has been recognized as an important factor in economic growth and can provide various advantages for a company's development, it also presents challenges, particularly for small and medium-sized enterprises due to their size and limited resources [22]. In this context, digital tools and technologies can serve as facilitators to help SMEs achieve their international business objectives, facilitating international trade and potentially leading to increased economic growth and development [17].

Despite the wide range of benefits of digitalization for SMEs, according to the OECD (2017) [23], the adoption of digital technologies remains relatively low among small businesses. Research by Li et al. (2018) [24] also suggests that the rate at which small and medium-sized enterprises adopt digital technologies is mixed. However, the widespread availability of non-proprietary and open-access technologies [25] can provide SMEs with opportunities to improve their technology infrastructure at lower costs [26]. To encourage small business to adopt digital technologies, Rahayu and Day (2015) [6] noted that it is not surprising that many political parties and governments place a high emphasis on policies to enhance digitalization, including e-business, as a way to stimulate economic growth and development. In Italy, SMEs make up 99.9% of all active businesses in the country (totaling approximately 4.4 million), and they provide employment for approximately 80% of the workforce. Additionally, SMEs contribute significantly to the gross value added of the economy, accounting for roughly 70%. It is clear that SMEs are a vital component of Italy's economic landscape, and digital capabilities are needed to maintain competitiveness in a globalized economy [27]. Indeed, the Italian government has implemented a number of policies aimed at promoting the digitalization of small and medium-sized enterprises. The rapid pace of technological change and the increasing reliance on digital technologies in business operations means that it is essential for employees to own a strong set of digital skills in order to be able to effectively use and work with these tools. By investing in the development and training of their employees, companies can ensure that they have a workforce that is equipped to thrive in the digital age.

Being that SMEs are pivotal actors in the economy, understanding the factors that help this category of firms succeed in a fast-paced and globalized competitive environment is crucial both for academic and policy purposes. It is also valuable from a managerial perspective, as it can provide insights into the potential benefits and drawbacks of various

approaches to innovation and how they impact export performance. Examining this typology of firms can, therefore, inform both academic research and practical decision making. This research aimed to study the impact of small and medium-sized enterprises' digital capabilities on their online export performance. To achieve this, we identified digital facilitators that can help SMEs expand internationally, and classified these facilitators into three categories: e-commerce, e-marketing, and e-business.

Overall, in the literature, it is clear that e-business can help a firm to internationalize. In our research, we wanted to understand if the level of e-business adoption is also relevant for internationalization through e-commerce.

Furthermore, the theoretical framework of this paper is based on the resource-based view (RBV). According to the RBV, a firm comprises a "bundle" of resources and can achieve a competitive advantage through the coordination and integration of these resources. The resource-based view emphasizes the importance of complementarities between resources, meaning that the presence of one resource can enhance the value of another. For example, pure ICTs (e.g., Internet speed) may not necessarily be a unique source of competitive advantage on their own, but when integrated with other valuable resources and processes (e.g., data tracking, e-commerce) within an organization, they can contribute to an improved firm performance [28]. The RBV highlights that even potentially imitable resources, such as e-business technology (e.g., ERP), can still add value to a company if they are effectively utilized in combination with other resources [29].

Based on this background, the following hypotheses were tested:

Hypothesis 1 (H1). *Enterprise resource planning (ERP) software adoption and knowledge will be positively associated with the presence of cross-border e-commerce.*

Hypothesis 2 (H2). *An Internet speed increase will be positively associated with the presence of cross-border e-commerce.*

Hypothesis 3 (H3). *The availability of a catalogue on a company's website will be positively associated with the presence of cross-border e-commerce.*

We believe that the positive relationship between e-marketing (which includes CRM tools, data analytics, and social media) and internationalization should also be verified in terms of e-commerce sales. Indeed, we developed hypotheses based on e-marketing tool adoption and the concurrent presence of specialists, such as data analysts, suggesting that they have a positive relationship with cross-border e-commerce. Hence, the subsequent hypotheses were also tested:

Hypothesis 4 (H4). *The adoption of CRM software and specialists will be positively associated with the presence of cross-border e-commerce.*

Hypothesis 5 (H5). *A presence on social networks will be positively associated with the presence of cross-border e-commerce.*

Hypothesis 6 (H6). *The usage of data tracking and analyses on website visitors will be positively associated with the presence of cross-border e-commerce.*

Finally, as previous studies on the impact of different types of e-commerce are contradictory [30], it was our ambition to contribute to the analysis of the different impacts of e-commerce tools:

Hypothesis 7 (H7). *The presence of third-party e-commerce will have a more relevant positive association with cross-border e-commerce than having standalone proprietary e-commerce.*

Finally, all the previous hypotheses were interacted with the firm size in order to test whether the effect of e-commerce, e-business, and e-marketing predictors is constant across the sample or is moderated by the firm size.

3. Materials and Methods

Our research was performed by analyzing the last wave of a survey carried out by the Italian National Statistics Institute (ISTAT), called the “Survey on information and communication technologies in businesses” (data available in the public repository <https://www.istat.it/en/archivio/177152>, accessed on 1 October 2023). The Italian National Institute of Statistics conducts this yearly survey on information and communication technologies to measure the degree of digitalization of Italian businesses. The survey provides the European Union with the information needed for a comparison among member States and an evaluation of national policies aimed at capturing the potential of technological progress. The goal is to measure the spread and level of use of basic ICTs (such as Internet or broadband), e-commerce (use of software such as ERP or CRM), e-invoices, computer security, robotics, computer skills, and decisions related to ICTs and the environment. The survey follows Commission Regulation No. 808/2004, which establishes the legal basis for harmonized statistics on information and communication technology (ICT) usage in enterprises. The survey is sample-based, collects representative data on businesses with at least 10 employees, and was led through self-compiled questionnaires in the year 2019, the last available year of survey. About 30,000 active businesses in all sectors of the economy were involved and selected by ISTAT using a stratified sample strategy. Being that our analysis focused on understanding the impact of digitalization in SMEs, we selected only companies with an annual turnover below EUR 50 million, in line with the European standard of classification. Furthermore, we only considered companies that offered the possibility to customers of placing orders via digital tools. Finally, in order to narrow our analysis on a specific sector, we selected only service companies as defined by an ISTAT or ATECO code, which include wholesale and retail trade; transportation and warehousing; accommodation and food services; information and communication services; real estate activities; professional, scientific, and technical services; rental and leasing services; travel agencies; and business support services. Hence, our final database included 1876 companies. The purpose of this study was to establish whether there exists an association among e-commerce, e-marketing, and e-business tools with cross-border e-commerce as the dependent variable of a regression model.

3.1. Dependent Variable

The dependent variable of our study was cross-border e-commerce (CBEC), which refers to the sale of goods to consumers in other countries through online channels such as e-commerce websites, online retailers, marketplaces, and other digital tools. This type of e-commerce allows businesses to expand their customer base and reach new markets beyond their domestic borders [31]. In our database, based on the ISTAT survey, CBEC was a binary variable with “0” meaning that the companies do not export services and goods online and “1” meaning that the companies declared in the questionnaire that they use digital tools to export. These tools include proprietary e-commerce, meaning a standalone company website; third-party e-commerce, such as Amazon; and EDI systems, which are processes that enable the electronic exchange of business information between companies using a standardized format. It eliminates the need for paper-based communication by allowing one company to send and receive information electronically to and from another company.

Due to the binary classification of the dependent variable, a probit regression analysis is performed in the following section of the manuscript, with CBEC as a dependent variable. According to econometric theory, the model was specified as follows:

$$P(Y_i = 1 | X_{1i}, \dots, X_{ki}) = \Phi(\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki}) = \Phi(X_i' \beta)$$

For categorical binary responses, it is not feasible to estimate a regression line, because the predicted value of the dependent variable may take values lower than zero or values that may exceed the value of one. Hence, the right choice was to model the probability of $Y = 1$ instead of the value of Y , by linking that probability with the Gaussian cumulative density function (indicated with $\Phi(\cdot)$), which also takes values in the interval $[0, 1]$, as can be seen at the right side of the equality. Indeed, a cumulative density function was able to monotonically transform the linear combination of the regressors $\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki}$ into values that were between zero and one and that were compatible with the distribution function specified in the left side of the equation.

Parameters $\beta_0, \beta_1, \dots, \beta_k$ were estimated using the maximum likelihood estimation method through the software Stata 18: according to this procedure, the parameters were estimated such that they maximized the likelihood that the process described by the model produced the data that were observed in the survey collected. In order to simplify the interpretation of the results, the estimates of the coefficients were replaced in the table with marginal effects. With regard to the above-mentioned point, the marginal effects of the variable X_j were calculated as follows:

$$\partial P(Y_i = 1 | X_{1i}, \dots, X_{ki}) / \partial X_{ji} = \Phi'(X_i' \beta) \beta_j$$

and can be easily interpreted as the variation in the estimated probability of observing cross-border e-commerce for a one-unit variation in a variable X_j . In the case of binary predictors, which are common in our model, marginal effects were computed from discrete changes in a dummy variable from 0 to 1. The set of the explanatory variables X_{1i}, \dots, X_{ki} could include both categorical and quantitative regressors, which were specified according to the list described in Section 3.2.

3.2. Explanatory Variables

The set of explanatory variables included the following ones:

E-business capabilities: the level of e-business capabilities was studied using 3 indicators based on the ISTAT survey, which were: (i) Internet speed; (ii) the usage of an enterprise resource planning tool; and (iii) the presence of a catalogue in the company's website. Regarding the presence of a catalogue, we considered it an e-business capability rather than e-commerce, since the catalogue could be only for exposition, without the possibility of purchasing any goods or services. Variables (ii) and (iii) were binary and (i) was a scale variable (from 1 to 5—lowest speed to highest speed).

E-marketing capabilities: the e-marketing capabilities were studied through the use of three variables for our database based on the ISTAT survey, which were (i) the usage of CRM software, (ii) the usage of data analyses, and (iii) a presence on social networks, which were all binary variables.

E-commerce capabilities: the companies were asked to report whether they used proprietary e-commerce websites or third-party e-commerce websites, which were both binary variables.

3.3. Control Variables

Previous research has identified firm size as a major factor for [32]. We followed that approach by using the number of employees (denoted as # of employees) as a control variable for the model. The number of employees was an ordered variable structured in three levels: level 1 (10–49 employees), level 2 (50–99 employees), and level 3 (≥ 100 employees). Due to the ordinal characterization of the variable and the small size of level 3, and to facilitate the interpretation, we decided to dichotomize the variable by collapsing levels 2 and 3 into one category. Hence, the variable was included in the model in a binary specification, taking a value of zero if the company had less than 50 employees and one if it had more than 50 employees. Furthermore, we included as a control variable the weight of the sales made via digital channels over the overall sales, as companies with a stronger digital presence may have an advantage in exporting their goods via e-commerce. By controlling

for this variable, the model can more accurately identify the true relationship between e-commerce exports and other factors, such as product quality or marketing efforts.

All the values of the variables were self-reported by the corporation management that filled in the survey, according to whether or not they satisfied the item included in the questionnaire. The full list of the variables (dependent, explanatory, and control variables) are listed in Table 1, with a brief description.

Table 1. Variables used in the regression analysis. ISTAT, Italian National Institute of Statistics.

Variables	Type	Variable Description
Cross-border e-commerce	Dependent variable	Cross-border e-commerce refers to the buying and selling of goods and services across national borders, typically online.
# of employees	Control variable	The number of employees refers to the total headcount of a company, including full-time, part-time, and temporary workers.
E-commerce sales over total sales	Control variable	E-commerce sales over total sales refers to the percentage of a company's total sales that are generated through online channels.
ERP software	E-business variable	ERP (enterprise resource planning) software is a type of software that helps companies to manage their business processes, including financials, operations, and supply chain management.
Internet speed	E-business variable	Internet speed refers to the speed at which data are transmitted over the Internet.
Catalogue	E-business variable	A catalogue is a comprehensive list of products or services offered by a company, typically in a print or digital format.
CRM software	E-marketing variable	CRM (customer relationship management) software is a type of software that helps companies to manage their interactions with customers, including sales, marketing, and customer service.
Social network	E-marketing variable	A social network is an online platform that enables users to connect, communicate, and share content with others.
Data tracking	E-marketing variable	Data tracking refers to the collection and analysis of data to gain insights into business performance, customer behavior, and market trends.
Proprietary e-commerce	E-commerce variable	Proprietary e-commerce refers to e-commerce platforms that are owned and operated by a specific company, typically for the purpose of selling its own products.
Third-party marketplace	E-commerce variable	A third-party marketplace is an e-commerce platform that enables multiple sellers to list and sell their products to a shared customer base.

of employees means "number of employees".

Table 2 reports some descriptive statistics, such as the mean (which has the same interpretation of the frequency of response as one for binary variables), the standard deviation, the minimum, the maximum, and the sample size.

As a preliminary step to the regression analysis, Table 3 reports the coefficients of correlations in order to prevent collinearity problems that could potentially undermine the results of the estimates, also in the frame of generalized linear models. Almost all the variables included in the model were dummies: hence, the Pearson and Spearman correlations yielded the same results. Therefore, the choice of the type of correlation matrix to be computed was not relevant in this context. The results in Table 3 display that, in almost all cases, the coefficients of correlations were below a threshold of 0.4. In only two cases, the correlation displayed a value of around 0.5. This did not necessarily produce any bias in the estimations of the model. In order to test this critical point, further evidence is displayed: VIFs for every variable were computed. The results do not include any values of VIF greater than 10 for any variable, according to the literature. In addition, the mean of the VIFs was largely below the threshold of five, as reported in Table 4. Hence, we were able to exclude multicollinearity pathologies in the regression.

Table 2. Descriptive statistics for the dependent and the explanatory variables used in the regression analysis.

Variables	Sample Size	Mean/Freq ($X_j = 1$)	Std Dev	Min	Max
Cross-border e-commerce	1876	0.362	0.481	0	1
# of employees (<50 vs. ≥ 50)	1876	0.315	0.464	0	1
E-commerce sales over total sales	1876	8.816	16.034	0	50
ERP software	1876	0.506	0.500	0	1
Internet speed	1876	4.531	1.243	1	5
Catalogue	1876	0.823	0.382	0	1
CRM software	1876	0.461	0.499	0	1
Social network	1876	0.846	0.361	0	1
Data tracking	1876	0.397	0.489	0	1
Proprietary e-commerce	1876	0.640	0.480	0	1
Third-party marketplace	1876	0.341	0.474	0	1

Note: authors' elaborations on survey data from the "Italian National Institute of Statistics"; # of employees means "number of employees".

Table 3. Correlation matrix for the explanatory variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
# of employees	(1)	1.0000									
E-commerce sales/total sales	(2)	−0.0466	1.0000								
ERP software	(3)	0.1758	0.0065	1.0000							
Internet speed	(4)	0.1612	0.0899	0.1662	1.0000						
Catalogue	(5)	0.0133	0.1687	0.0725	0.0792	1.0000					
CRM software	(6)	0.0851	0.0763	0.3260	0.1819	0.1179	1.0000				
Social network	(7)	0.0505	0.1210	0.0715	0.0803	0.1078	0.1607	1.0000			
Data tracking	(8)	0.0845	0.1161	0.0907	0.0830	0.1504	0.2338	0.2131	1.0000		
Proprietary e-commerce	(9)	0.0318	0.5887	0.0632	0.0838	0.2140	0.0718	0.1231	0.0856	1.0000	
Third-party marketplace	(10)	−0.0443	0.4763	−0.0602	−0.0092	0.1039	0.0156	0.1638	0.1130	0.3216	1.0000

Note: authors' elaborations on survey data from the "Italian National Institute of Statistics"; # of employees means "number of employees".

4. Empirical Results

Table 4 shows the results of the research hypotheses based on the application of probit regression models. The analysis was performed with the presence of cross-border e-commerce as the dependent variable and the technology adoption factors and controls as independent variables. Four models were defined, which were built with an increasing number of variables. Model A includes only control variables, and Models B, C, and D enrich the specification of Model A; more precisely, Model B includes e-business and e-marketing capabilities, on which six of the seven hypotheses were made. This model was tested through a step-by-step technique, with the first step including only e-business capabilities and the second including e-marketing capabilities, so that this research could better explain the real factors influencing cross-border e-commerce. Model C and Model D were developed to singularly study which kind of e-commerce is more effective for exports, with the first one including proprietary marketplaces and the second one including third-party e-commerce websites. In Model A, only control variables were included, and a significant level of relevance, measured in terms of a chi-squared test on the joint significance of the subset of newly added coefficients, was found to be in line with the idea that the firm size and the overall e-commerce are relevant and crucial for export propensity.

Table 4. Marginal effects for a probit regression model investigating the determinants of CBEC.

	Model A	Model B		Model C	Model D
	Step 1	Step 2.B	Step 3.B	Step 2.C	Step 2.D
Control variables					
# of employees (<50 vs. ≥ 50)	−0.021	−0.019	−0.026	−0.034	−0.015

Table 4. Cont.

	Model A	Model B		Model C	Model D
	Step 1	Step 2.B	Step 3.B	Step 2.C	Step 2.D
E-commerce sales over total sales	0.022 ***	0.022 ***	0.021 ***	0.015 ***	0.015 ***
E-business					
ERP software		−0.045 *	−0.044 *		
Internet speed		0.013	0.012		
Catalogue		0.016 **	0.016 *		
E-marketing					
CRM software			−0.027		
Social network			0.065 ***		
Data tracking			0.063 **		
E-commerce					
Proprietary e-commerce				0.193 ***	
Third-party e-commerce					0.280 ***
Observations	1876	1876	1876	1876	1876
Mean VIF	1.23	3.59	3.89	3.25	3.25

Note: *** denotes significance at a 0.01 level; ** denotes significance at a 0.05 level; * denotes significance at a 0.1 level. # of employees means “number of employees”.

Model B shows that Hypotheses 3, 5, and 6 are supported, as there was a significant positive relationship between these factors and the presence of cross-border e-commerce. Specifically, the availability of a catalogue on the company’s website, a presence on social networks, and the usage of data tracking and analyses on website visitors were found to be positively associated with cross-border e-commerce. In more detail, the presence of a catalogue on the company’s website increased the probability of observing cross-border e-commerce by 1.6%. The association of the dependent variable with social networks was stronger: the use of an online platform that enables users to connect, communicate, and share content increased the predicted probability of the presence of CBEC by 6.5%. Data tracking also played a key role in increasing CBEC, with an estimated marginal effect of 6.3%. On the other hand, with respect to Hypotheses 2 and 4, although the positive relationship with CBEC was confirmed by the analysis, it could not be validated, as it was not significant. This suggests that, while there may be a relationship between an Internet speed increase and cross-border e-commerce, as well as the adoption of CRM software and cross-border e-commerce, the relationships were not strong enough to be considered statistically significant. Hypothesis 1 was confuted, as the analysis showed a statistically significant and slightly negative relationship between ERP adoption and cross-border e-commerce. This would suggest that companies that adopt ERP systems may be less likely to engage in cross-border e-commerce. We will discuss the implications of this later. Overall, although most of the hypotheses were verified, these variables only explained a little of the pace of adoption of cross-border e-commerce for SMEs, in line with our expectations. The analysis showed that e-marketing capabilities have a positive relationship with cross-border e-commerce, as determined by a value for the marginal effect higher than zero for all the significant categories. Similarly, e-business capabilities had a positive relationship with cross-border e-commerce, excluding ERP.

With respect to Model 3.B, which is the most complete one in terms of the richness of the set of explanatory variables, Harman’s single-factor test was performed in order to test whether there existed a common factor that explained at least 50% of the total variability among the regressors. The results show that only 16.405% of the variance was commonly explained by the predictors. These results largely support the choice of including several regressors in the model.

In addition, Model C showed that there is a positive and significant relationship between cross-border e-commerce and proprietary e-commerce (+19.3%), as in our as-

sumptions. Finally, Model D showed that there is a positive and significant relationship between cross-border e-commerce and third-party marketplaces, with an average contribution of 28% to the increase in the likelihood of observing cross-border e-commerce for the companies falling in that category.

These results support Research Hypothesis 7 that the presence of third-party e-commerce has a more relevant positive association with cross-border e-commerce than having standalone proprietary e-commerce. The main objective of this research was to investigate the relationship between various technology adoption factors and the presence of cross-border e-commerce. The theoretical framework of this research was based on the resource-based view (RBV), which emphasizes the role of a firm's internal resources and capabilities in determining its competitiveness and performance [33].

The regression results displayed in Table 4 assume, according to past literature, that the effect of the covariates is constant for every type of enterprise and independent of the size of a company. Even if the analysis focuses on SMEs, a strong heterogeneity in terms of strategies also persists in the subset of micro, small, and medium-sized enterprises. According to Sanchez-Torres et al. [34], firm size is used as a moderator in the relationship between e-commerce and firm performance in the case of Colombia. Similarly, Martini et al. [35] used firm size interacted with e-commerce in the frame of the evaluation performance. In the frame of the present paper, we extended the empirical strategy mentioned in previous research [34,35] using the adoption of firm size as a moderator for all the independent variables, including e-marketing and e-business predictors. The results are presented in Table 5.

Table 5. Marginal effects for a probit regression model investigating the determinants of CBEC with moderation effects.

	Model B		Model C	Model D
	Step 2.B	Step 3.B	Step 2.C	Step 2.D
Control variables				
# of employees (<50 vs. ≥50)	−0.382 ***	−0.097	−0.095 *	−0.013
E-commerce sales over total sales	0.069 ***	0.068 ***	0.049 ***	0.049 ***
E-business				
ERP software	−0.056 **	−0.047 *		
Internet speed	−0.005	0.013		
Catalogue	0.015 *	0.017 *		
E-marketing				
CRM software		−0.039		
Social network		0.063 *		
Data tracking		0.030		
E-commerce				
Proprietary e-commerce			0.171 ***	
Third-party e-commerce				0.282 ***
Interactions				
ERP software × # of employees	0.034			
Internet speed × # of employees	0.075 ***			
Catalogue × # of employees	0.058			
CRM software × # of employees		0.043		
Social network × # of employees		0.006		
Data tracking × # of employees		0.107 **		
Proprietary e-commerce × # of employees			0.087	
Third-party e-commerce × # of employees				−0.004
Observations	1876	1876	1876	1876

Note: *** denotes significance at a 0.01 level; ** denotes significance at a 0.05 level; * denotes significance at a 0.1 level. # of employees means “number of employees”.

As we can see from the table above, the interaction with firm size did not modify the effect of e-commerce variables on CBEC in Model C or Model D. This demonstrates that the effects of proprietary or third-party e-commerce are significant and not modulated by the size of a firm. Interesting results enrich the discussion for e-marketing and e-business covariates: the interaction between the Internet speed and the number of employees was significant and positive in Model 2.B. This means that the Internet speed has a positive effect on increasing cross-border e-commerce, but only for medium-sized enterprises with more than fifty employees. The interaction effects were not significant with regard to ERP software or a catalogue, showing that those covariates had a stable effect across the sample. Moving to the interpretation of Model 3.B, the effect of data tracking was significantly moderated by the firm size. In more detail, data tracking was significant only in the subsample of medium enterprises, proving that the collection and analysis of data to gain insights was effective only beyond the threshold of fifty employees. More precisely, data tracking increased the estimated probability of cross-border e-commerce by 10.7% on average. Probably, data analytics require specialized and highly skilled profiles that are not compatible with micro and small firms, where the employees are probably required to multitask. This finding helps support the hypothesis that sectors where innovation and digitalization are spreading require an increase in the percentage of technology-specialized human resources [36].

The regression findings were helpful for testing the research hypotheses listed above. First, the positive relationship between catalogues and cross-border e-commerce was confirmed; catalogues are an essential aspect in the buying process for consumers when it comes to purchasing items online from foreign websites. They offer comprehensive information on the products, such as images, specifications, and pricing, which helps consumers make informed buying decisions. Indeed, catalogues have a significant impact on consumers' views of foreign products and their willingness to buy them. This study also revealed that catalogues aid in diminishing the perceived risk and uncertainty when purchasing from foreign websites. These tools are an efficient method for promoting cross-border e-commerce, as they furnish consumers with the necessary information to make well-informed purchasing decisions.

In addition to providing product information, catalogues can promote brand recognition and boost customer loyalty. In summary, catalogues play a vital role in promoting cross-border e-commerce by providing consumers with in-depth information on products, reducing the perceived risk and increasing their trust and confidence in foreign websites.

Our hypothesis on the positive relationship between the Internet speed and cross-border sales was not validated for the whole sample, although the relationship proved to be positive. Internet speed, according to the results in Table 5, is limited for the subset of medium-sized firms. This result was not completely surprising, since our findings are consistent with previous research, which has found that, while there are typically positive effects of broadband adoption when looking at higher levels of aggregation, such as the macro-level ICT-positive effect when examining the effects at the firm level, there is limited evidence of productivity gains specifically from broadband adoption. Theoretically, it is expected that broadband access will trigger growth-enhancing externalities of a general purpose technology [37], thus positively impacting firm performance by facilitating the development of new products, processes, and business models; participating in complex supply chains; targeting larger geographical markets; and attracting more clients. Some studies support this belief, such as the study conducted by Howell and Grimes (2010) [38], which suggests that high-speed broadband can have a positive impact on firm productivity. Similarly, according to Akerman et al. (2015) [39], cross-sectional data on broadband use and productivity, along with an instrumental variables approach, demonstrate that broadband use improves productivity in Norwegian firms. The study suggests that this occurs by increasing the productivity of skilled labor (as measured using formal qualifications), which, in turn, affects the distribution of wages. Likewise, Canzian et al. (2019) [40] conducted research using a gradual implementation of ADSL2+ in Italy and found that an improved

broadband had a positive impact on both firm revenue and overall productivity. However, in another study [41], the impact of broadband adoption on productivity was analyzed in small and medium-sized Italian manufacturing and service companies, and it was found that broadband adoption did not have a significant impact on productivity. However, when looking at specific types of broadband applications and sectors, some positive effects were identified. Similarly, according to Bertschek et al. (2013) [42], an examination of a sample of firms in the German manufacturing and services sectors revealed no correlation between broadband adoption and labor productivity. It is worth mentioning that, as technology advances and Internet speeds continue to improve, there have been growing arguments for investing in fast broadband infrastructure to allow for beneficial economic spillovers. Upgrading to faster state-of-the-art broadband infrastructure is essential to participate in today's knowledge economy with its ever-evolving ICT applications, such as cloud computing, complex supply chains, or business-to-business networks. Nowadays, firms and governments are considering significant investments and other forms of support for high-speed, next-generation broadband due to the expectation that high-speed broadband will increase the productivity of the firms that use it.

The positive relationship hypothesized between enterprise resource planning (ERP) systems and cross-border e-commerce was not validated by our research; instead, it showed negative and significant relationships between the two variables. This result is surprising, as it contradicts the previous assumption that ERP systems would have a positive impact on cross-border e-commerce. One possible conclusion and explanation could be that ERP system adaptations for international markets may lead to increased operational costs and inflexibility, needing wide IT support and knowledge that may be not available in a small enterprise [42,43]. Furthermore, according to a study by Bradford and Florin (2003) [44], the complexity of an ERP system plays a crucial role in determining its successful implementation. The study found that, when users struggle to achieve the desired outcomes from an ERP system, it often leads to frustration and a lack of willingness to use the system. It may be said that adapting ERP tools for exports is frustrating, leading employees to be less willing to explore cross-border e-commerce. Moreover, it may be inferred that ERP systems can lead to increased bureaucratic processes and a lack of autonomy for employees, which negatively affects the firm's ability to respond to customer needs in international markets. This can lead to longer lead times, higher costs, and lower customer satisfaction.

Our model did not validate the positive relationship between the use of CRM software and cross-border e-commerce, even if the relationship proved to be positive. It is clear and supported by the literature that CRM has the potential to help businesses gain a deeper understanding of customer behavior and needs. By collecting and analyzing data across the customer journey, CRM allows companies to tailor their responses and differentiate their products and services. This can have a significant impact on future marketing strategies, including communication, pricing, distribution, and branding. Studies by Campbell (2003) [45] and Ramaseshan et al. (2006) [46] agree on this finding. However, in line with our results, we did not find in previous research that CRM software is relevant for companies with online export ambitions. Nevertheless, we would still suggest that, since entering new markets can pose challenges for companies, as they must adapt to new customer needs and test new technology, firms should develop stronger technological skills and find new solutions. Additionally, operating in unfamiliar markets can lead to failures due to differences in customers, suppliers, and competitors, as noted by Simon (1955) [47]. These failures can lead to the development of new solutions that enhance the firm's capabilities and create a knowledge advantage over competitors. Conversely, a lack of these capabilities can be costly for the firm in its internationalization efforts, as highlighted by Eriksson et al. (1997) [48].

Our hypothesis on the positive relationship between social network presence and cross-border e-commerce was validated. This result further increases the knowledge on the matter, since the literature on this topic is still limited. Similarly, a study conducted by Pezderka et al. (2012) [49] found that companies that use the Internet to connect with their

clients and maintain a relationship with them have a better export performance. One of the possible reasons behind this result is that social networks can be a powerful marketing tool, as they allow companies to provide information on products and services, acquire new customers, enhance brand image, and increase brand awareness [50]. Additionally, social networks can enable firms to create online platforms, reduce marketing costs, and promote user interaction. The efficient use of social networks is about creating and influencing the consumer experience [51], and contemporary social network tools even enable firms to adopt location-based and context-based marketing [52]. Interestingly, and as a possible explanation of why social networks are relevant, Musteen et al. (2010) [53] found that firms that share a common language with their international ties are more likely to internationalize faster. Social networks can aid in this process by allowing companies to develop a common language with their international ties and to internationalize at a faster pace. Ibeh and Kasem (2011) [54] also found that social and business networks, both in-person and online via social networks, were important in explaining the speed of internationalization, with social ties being more influential in the initial stages. Furthermore, Kananukul et al. (2015) [55] demonstrated that social media can enhance brand trustworthiness, leading to increased brand loyalty and higher sales. Similarly, our model validated the positive relationship between data tracking, which includes data analysis, and cross-border e-commerce, even if the results seemed to be significant only for firms with more than fifty employees. This is consistent with the results of previous studies, since it has already been confirmed that data analyses, which involve customer information management and the collection and dissemination of customer-related information within the organization, as well as ensuring that the organization is responsive to this information, lead to an improved performance. Additionally, customer information management plays a crucial role in new product development for two main reasons. Firstly, by having a better understanding of customer needs, new products can be developed that align with those requirements, leading to fewer failures and higher financial returns. Secondly, customer information management is essential for properly segmenting customers based on their potential contribution to new product development [56]. Indeed, tracking and analyzing customer data on websites is crucial for companies because it allows them to gain valuable insights into customer behavior and preferences, which can inform business decisions and improve marketing strategies, customer engagement, and the overall customer experience, even more so if a company has an ambition to enter a different, unknown market. Nevertheless, implementing effective data-tracking systems requires a high degree of training and specialization in enterprises [57] that the organization in micro and small-sized firms probably does not allow. Our last two models aimed to study whether having a presence on third-party marketplaces has a better impact on cross-border e-commerce than having proprietary e-commerce. When companies want to sell products or services, they can reach buyers online through advertising on a website or by using an online marketplace. This includes quick access to a large marketplace, also known as an e-marketplace, which is a platform where multiple companies and brands can sell their products and services. These marketplaces can be managed by third-party companies that facilitate the sales for a variety of manufacturers. By using these platforms, companies can reach a wider audience and increase their sales potential. Our research has validated the hypothesis that having a presence on third-party online marketplaces is more relevant than hosting company-only e-commerce. The relevance of this result is high, since the results on the topic in the literature are contradictory [30]. It has already been proven that online marketplaces offer several advantages for companies' numbers of customers [58], high visibility, and brand recognition [59,60]; are a convenient first point of contact for buyers [61]; provide pre-existing technical solutions for payments and logistics; and provide a platform for testing products and exploring new sales markets. Additionally, marketplaces allow companies to launch small pilot batches of goods to gauge customer demand and gather feedback without making significant investments in sales and distribution channels. Overall, online marketplaces provide an efficient and cost-effective way for companies to

reach new customers and grow their business. However, there could be a downsize in outsourcing the e-commerce capacity, since third-party resellers often undertake aggressive marketing and pricing strategies, prioritizing their own profits over the interests of brand manufacturers. This disregard for the brand could be heightened by the tactics employed by online platforms, which exert increased pressure on prices for both offline and online retailers, reducing the positive effect that a higher exposure has on brands [62]. On the other hand, if an intermediary makes additional marketing investments to increase their own brand's popularity, the reputation gains will also accrue to the brand manufacturers [63]. Being that the impact of brand reputation is variable across different online marketplaces, it may be wise for companies relying on brand premiums to only offer their product via proprietary e-commerce, even if this reduces the probability of making the brand easily known [64]. Indeed, premium-priced brands may benefit from first-party operations, as these platforms may provide a more supportive environment for brands that prioritize their reputation. For luxury brands, entering a widely trafficked brand-aggregator platform can be a difficult balancing act and may seem contradictory to the concept of luxury [64].

5. Concluding Remarks

Digital technologies are significantly transforming both businesses and society. The way companies use these technologies can greatly impact their capacity for innovation and growth. Over the past decade, the rapid progress of digital technologies and infrastructure has had a substantial effect on business operations, organizations, and corporate culture, leading to the development of innovation processes, marketing strategies, and products/services. Past research has confirmed that information and communication technologies play a critical role in business performance, especially for small and medium-sized enterprises. The adoption of these technologies can bring numerous benefits to small businesses, including an increased efficiency, competitiveness, and market reach. Digital technologies can improve operational efficiency by streamlining process management and enhance market orientation through better market knowledge. The ambition of our research was to understand the impact of these digital technologies on cross-border e-commerce for Italian SMEs. Overall, we observed that Italy is lagging behind its European counterparts in terms of digitalization and IT capabilities, although several national policies are addressing this topic and the initial data seem to show that they are succeeding. We studied three main categories of digital technologies: e-business, e-marketing and e-commerce. Overall, our results show that e-business has a mixed impact on CBEC, and the relationships need to be further analyzed, while e-marketing tools have a significant positive impact on online export performance. In particular, social media and data analysis are effective tools that companies should adopt if they want to compete and succeed in today's business environment. Another ambition of our research was to understand whether different e-commerce systems have an impact on export performance. We demonstrated that being present on marketplaces such as Amazon and Alibaba is more effective than having a proprietary e-commerce website, probably because of more exposure and customer trust. Being that our analysis was based only on Italian SMEs active in the service sector, the research on CBEC and digital tools should be further expanded to other geographies and market segments. Furthermore, more digital tools could be included in the analysis to better understand which tools are more relevant.

This research provides valuable insights into the factors that influence cross-border e-commerce, and could be useful for companies looking to expand their operations in this area and determine how these factors interact with firm size. These findings could inform the strategies of companies looking to optimize their e-commerce experience and increase cross-border sales. Additionally, this research could be used by policy makers aiming to promote digitalization and cross-border e-commerce. By understanding the factors that are positively associated with cross-border e-commerce, policy makers can design policies and programs that support the development of these factors and promote cross-border e-commerce. Furthermore, this research could be useful for defining the digital strategy of

a company and understanding what resources and capabilities are necessary for a company to engage in cross-border e-commerce.

However, the results of our research are limited in that the positive relationship hypothesized between enterprise resource planning (ERP) systems and cross-border e-commerce has not been validated. This second result contradicts the previous assumption that ERP systems would have a positive impact on cross-border e-commerce. Future research could focus in this direction, in order to understand whether the adaptation of ERP systems for international markets may lead to increased operational costs and inflexibility, needing wide IT support and knowledge that may be not available in a small enterprise.

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