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The impact of E-commerce on the performance of firms in Vietnam

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ABSTRACT

Electronic commerce (E-commerce) has developed significantly with the Internet‘s support. It creates a new era of trading that removes physical barriers during transactions and brings economic profits for both sellers and buyers. Therefore, firms must take advantage of e-commerce to develop their market in the electronic world. In this paper, using panel data from 2012 to 2018, the authors examined the impact of e-commerce on the performance of firms in Vietnam which showed significant findings on how e-commerce influences the Vietnamese firms' performance. Firstly, e-commerce positively affects the performance of firms in Vietnam. Secondly, the impact of e-commerce on large enterprises is bigger than on small and medium-sized ones. Finally, the authors indicated the positive effects of e-commerce on domestic firms in Vietnam; however, the FDI firms in Vietnam are in contrast.

Keywords: E-commerce, the performance of firms, e-commerce platform, B2C, SMEs, e-commerce process, e-commerce business models, Vietnam
JEL classification: D00, L25, M15

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1. INTRODUCTION

E-commerce accelerated a global trend with the participation of various stakeholders and significant contribution in achieving economic growth. This process helps to remove the physical gap between buyers and sellers. Moreover, it can bring many benefits to them. The evolution or growth of e-commerce has created many e-markets and new channels for trading and sharing products. E-commerce is a new and innovative method that facilitates to purchase of a wide range of products from anywhere and at any time; thus, it brings new pros and cons for firms. Firstly, e-commerce is a fast, convenient, and effective way to collect market information [1, 2]. Firms have opportunities to collect enormous information and various data with a different approach that is suitable for business activities. Secondly, e-commerce helps to reduce the cost of production, marketing, and transaction [3, 4]. Thirdly, e-commerce improves the online business with better customer services and higher satisfaction [5-7]. Fourthly, it narrows the gap of geographic cross-border to advertise their products to the global market [8, 9]. Lastly, it creates new competitive advantages for firms[10-12]. Along with the e-commerce wave of the international market, the domestic e-commerce market in Vietnam also shows a massive boom. For example, by the end of 2019, about 1000 platform businesses followed this model [13]. Furthermore, there are four major reasons for the development of e-commerce in Vietnam. Firstly, the domestic logistics system has grown exponentially because of many established platform businesses. Secondly, online payment, including digital banks, electronic wallets (e-wallets), cash on delivery (COD), has risen sharply. Thirdly, the public administration with the digital signature system and public custom services have changed significantly to meet the domestic market demands. Lastly, the young population with the good absorptive capacity of technology pushed ahead of the domestic e-commerce market (70% of the population uses the internet) when Vietnam is the second largest online population in the ASEAN region and one of the most internet users in the Asia Pacific region [14]. The trend of e-commerce created the chances for Vietnamese firms to maximize their profits. According to the survey from Vietnam e-Commerce and Digital Economy Agency (2020) [13], the number of enterprises using e-commerce platforms increased rapidly about 17% in 2019. This trend was expected to continue when Vietnam was considered one of the most promising economic countries in the Southeast Asian region [15]. Therefore, this paper examines the impact of e-commerce on the performance of Vietnamese enterprises by using panel data from 2012 to 2018. It is expected that e-commerce could bring positive impacts to them in Vietnam, but the benefits depend on the characteristic of firms. The structure of this paper is as follows: Section one concisely provides the development of e-commerce and shortly reviews the trend in Vietnam. Section two describes the method to examine the impact of e-commerce on the performance of firms. Section

three and four are the discussion and conclusion parts respectively which give the final remarks of the paper.

2. BACKGROUND

2.1 The development of E-commerce

Since the 20th century, electronic commerce referred to data exchange for purchase orders and invoices electronically. After that, e-commerce was involved in business activities and services through the website [16]. There are various major types of e-commerce such as Business to Business (B2B), Business to Consumer (B2C), Consumer to Consumer (C2C), Consumer to Business (C2B), Mobile Commerce (M-commerce), Business to Administration (B2A) or Business to Government (B2G), and Consumer to Administration (C2A) [Table 1].

Table 1. Types of E-commerce

Type	Description
B2B	Based on web-based technology to buy, sell, or transfer information between two or more companies.
B2C	Involving the goods, products, services, or exchanging of information between the customers and the system.
C2C	Related to transactions among the users and a business model between two consumers directly.
C2B	The way of transferring services, goods, or information between clients and business or a business model where companies/institutions used products and services from the clients.
M-commerce	A business model where the purchase and selling of products, the exchange of information and services via the IoT devices such as mobile phones, laptops, personal digital assistants (PDAs), etc.
B2A/B2G	Related to all businesses between companies and public administration such as social security, employment, and legal documents.
C2A	All electronic transactions between clients and public administration services including tax and health services.

Source: [16-18]

The wave of e-commerce emerged in the wake of digital innovation and market transformation. The barriers between buyers and sellers have progressively fallen. For example, e-commerce transforms the marketplace and creates new channels of human activities and knowledge diffusion. Besides, it operates as the catalytic role to accelerate broad changes in the economy. Moreover, it has rapidly increased economic interactivities in many fields including banking, marketing, travel, etc. As the international market is concerned, there are powerful innovation technology forces that

boost e-commerce over the past two decades. Along with the accelerating wave of digital transformation, the e-commerce landscape increases intensely drastically in size and scale. More and more companies are trading online, including both the international market and the domestic one. The absolute value of the e-commerce market is growing rapidly. According to the OECD report (2019), many enterprises in OECD countries joined e-commerce with the share reaching 40% in some countries in 2017. In addition, among OECD countries, large enterprises are more likely to participate in e-commerce than SMEs, and this gap is becoming bigger and bigger. The number of consumers who buy online has increased quickly due to the convenience and variety of e-commerce products. In 2018, more than half of all individualities in OECD countries purchased online with approximately more than 20% since 2009. The number of young people who have high levels of education, income, and urban areas prefers to buy online [19]. The emergence of many new players has changed e-commerce radically effectively. Many e-commerce innovative business models are evolving [20]. Various companies have innovated the ways how to sell products online, even changed the mindset on how to produce digital products. Many factories used a wide range of digital technologies such as artificial intelligence, blockchain, the Internet of Things, data-driven technologies, big data, and autonomous delivery devices (robots) to facilitate e-commerce. Importantly, the enterprises' orientation in e-commerce plays a crucial role in stimulating e-commerce development. It implies that if firms are more ready to participate in the e-commerce process, they are more likely to change their strategy towards this trend [19]. According to the report of [19], the share of companies joining in e-commerce sales rose in most of the OECD areas. For instance, some other countries increased from an average of 16% and 23% in 2008 and 2017, respectively. Generally, the capacity of the enterprise's e-commerce application varies in different countries. Indeed, online sales participation in Western and Nordic businesses was around 10%, while in Central European countries was slightly lower. Meanwhile, the high share of e-commerce firms in New Zealand and Australia was about 40% in 2017. Along with this rising trend, many payment tools for the international and domestic markets also got the customers' belief. Moreover, the digital financial firm promptly widened the scope of e-commerce. The fast-evolving of platform businesses enables more different products to be sold. Consumers may find many convenient consumption models such as music services, film services, food deliveries, good deliveries, etc [19]. The growth of worldwide e-commerce markets has put them on the agenda of international economic institutions. The rapid pace of digital transformation, particularly the e-commerce market requires a novel perspective on a policy framework to ensure strong institutional support to accelerate digital innovation. The policymakers promise to build targeted, flexible, and coordinated policies to provide further e-commerce innovation in three policy fields. First, e-commerce must be measured and its policy should be more coordinated to unlock the potential of e-commerce. For instance, a suitable trade policy would help the rise of tradable services and their implications. The holistic approach relating to consumer protection, taxation, competition, trade, and the environment should have a coordinated mechanism to ensure a consistent system in e-commerce policy. Second, targeted policies can address e-commerce categories. The

range of convergence policy has been implemented to reduce regulatory uncertainty, foster an inclusive business environment, and help the SMEs not to lag in the digital transformation progresses. Third, public policies can support the creation of innovative e-commerce business models. The regulatory approaches to new e-commerce should concentrate on remaining an experimental, transparent, and flexible business environment to develop the potential of e-commerce innovation [19].

2.2 The impacts of adopting e-commerce toward firm performance

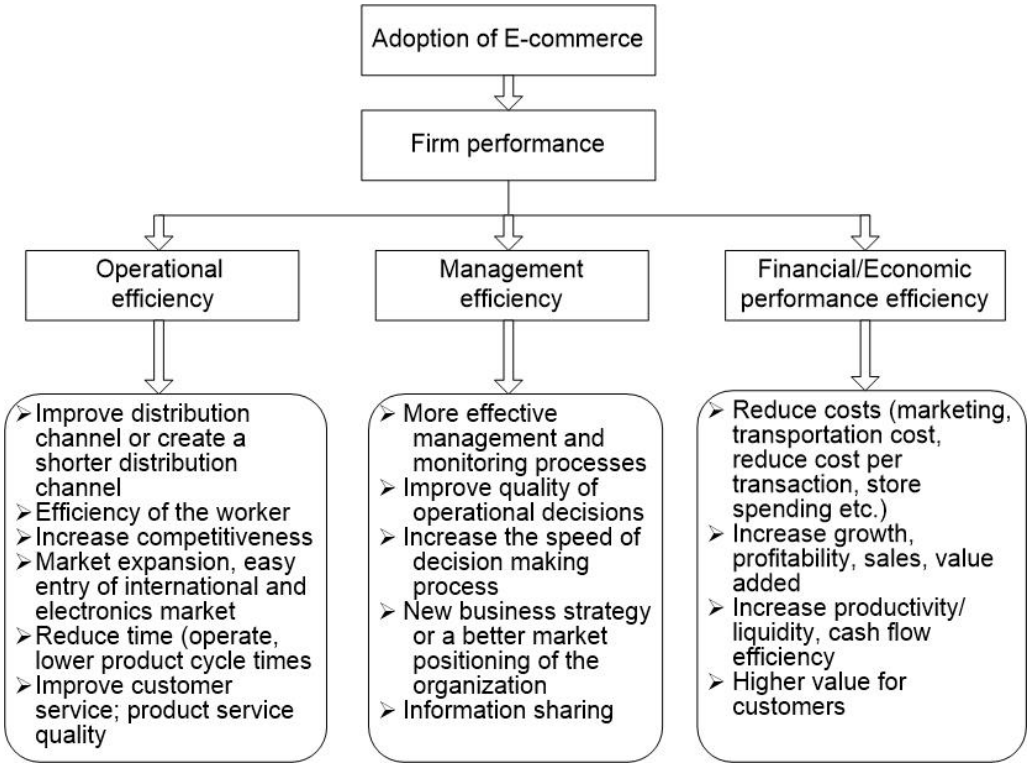

Figure 1. The impacts of adopting e-commerce on firm performance

As shown in [Figure 1], operational efficiency has a significant contribution to the firm's performance in several ways. It acts as a tool that addresses the desire of firms to improve the distribution channel, increase the efficiency of the worker, and decrease service costs while improving the quality of goods and increasing the speed of service delivery [21]. The system-level and process-level integrations eliminate human errors, reduce operational cost due to decreased inventory level and increased inventory turnover, reduce cycle time from order to delivery, and improve the quality of operational decisions due to timely data and shared information among different parties within and outside the firm [22]. It enables the development of infrastructure, understanding, and realization of technological competencies, which contributes to market expansions. E-commerce is one of the most innovative expansions of the technologies that enable enterprises' access to global communication and trade. It can help enterprises expand their businesses to a global market, increase sales, and reduce costs and profits[23, 24]. Operational efficiencies can be realized because of fewer stages in the transaction process and a reduction in staff required for transactional

processing [25, 26]. Moreover, by using a new virtual platform and visual information in e-commerce, enterprises can reduce time and distance for upgrading new technologies and knowledge for employees and customers during their transactions and products' delivery [27]. Besides Operation, management efficiency is also a critical pillar that helps better firm performance while adopting e-commerce in enterprises. Management effectiveness and monitoring processes in identifying the factors for sales and demand, ability to learn customers' core needs and requirements, and transform it to their expectations. Simulation of business processes is one of the most widely used applications for operational research. It facilitates the understanding requirement of the business system, identifying the different opportunities for changes, and evaluating those proposed changes on key performance indicators. This helps decision-makers to with new alternative business strategy or market positioning of the organization without disrupting the actual system operations[28-31]. Management is expected to act reasonably in transformational initiatives such as process integration with internal units and external partners by articulating a clear vision and strategy and setting the goals and measures about the initiatives [32]. Top management is expected to convey a strong commitment to the established goals and objectives and follow up with the execution by holding lower-level managers and employees accountable [33]. E-commerce provides a new method for organizations, suppliers, distributors, and users to do their businesses (cooperate, advertise, buy, and sell) in various channels [34]. Therefore, besides operational efficiency and management efficiency, e-commerce also affects the economic efficiency of enterprises. From an economic perspective, e-commerce strengthens firm performance by reducing costs [35]. Moreover, the adoption of e-commerce in the enterprise played a vital role in enduring success in many different competencies. E-commerce which is heterogeneously distributed across the firm that provided a viable approach in examining financial success [36]. In e-commerce, the company website provides the critical interface between a buyer and a seller [37]. A highly user-friendly website can act as an engine for the delivery of value-adding services. In linkage between website application and firm performances [38], value-added services focus on presale activities related to economic value-added, that is short-term performance. However, a recent shift in strategy from customer attraction to customer retention and customer satisfaction with customer loyalty requires a more holistic approach for firm performances both in the short and long term. Its application enhances the automation of business transactions and workflows.

2.3 The development of e-commerce in Vietnam

Fifteen years ago, e-commerce was imagined as an online sales model with several names e.g. muachung.vn, vinabook.com, hotdeal.vn, and nhommua.vn. These companies have brought vitality to e-commerce in Vietnam. There were over 100 online business sites following this model at the end of 2012 [39]. Furthermore, the sale of e-commerce in Vietnam was $700 million in 2012, which increased to $2.2 billion, $ 3 billion, and approximately $4 billion in 2013, 2014, 2015, respectively [40]. In addition, the sale of e-commerce for B2C transactions in Vietnam reached $ 8.06 billion in 2018 and $ 10.08 billion in 2019 [41]. The average e-commerce growth was 40% per year

since 2012. Unfortunately, the poor service quality of e-commerce leads to a decrease in consumption's belief at the beginning of e-commerce development. The year 2013 was considered the turning point for e-commerce in Vietnam. Many commercial companies of Vietnam were born, but their life cycles were short including nhanh.vn, mytour.vn, cucre.vn, baokim.vn, and ChoDienTu.vn. The reasons were mainly due to strong competitive pressures from foreign e-commerce businesses including amazon.com, ebay.com, Alibaba.com, Lazada.vn, and Zalora.vn. For instance, two large Vietnamese brands like Lazada and Tiki have survived in the high-competitive context regarding the rapid growth of logistics platform businesses and online payment systems. According to the survey of Nielsen company in Vietnam, there were about 58% of 35 million people accessing the Internet to purchase online [40]. Moreover, the electronics and mobile phone shopping centers have not missed the big chances of breaking into e-commerce. A good example of e-commerce investment in electronics and mobile phones area was Mobile phone's world company- namely Thegioididong. In 2013, the sales of this company were VND 7,822 billion with the profits increased by 25% totally compared to 2012 while profits from the online segment accounted for 15% [42]. The rapid growth of the e-commerce market had concerned Vietnamese policymakers. In the emerging stage of the e-commerce market in Vietnam, it was noted that the National Assembly enacted the Law on e-commerce in 2006. Regarding a series of legal documents that support the development of the e-commerce market including, The e-commercial Law 2006, The Intellectual Property Law 2009, The Law on Information Technology 2006, The Civil Code 2015 [43]. Recently, the legal document system on the e-commerce market has continued to be updated and added several other laws, including The Intellectual Property Law 2019, The Tax Management Law 2019. During more than 15 years of developing the e-commerce market, the central government has had frequent policies to support the development of the market with e-commerce; for example, Decision 222/2005 on the Master Plan of e-commerce 2006-2010, Decision 689/2014 on the national program of e-commerce development 2014-2020, and Decision 645/2020 on the master plan of national e-commerce development 2021-2025. Although the Vietnamese institution for e-commerce development did not complete yet, it has changed positively for more than fifteen years. Moreover, the Vietnamese government has many appropriate policies with long-term orientations for The Fourth Industry Revolution and business support. E-commerce is still a fast-evolving field; thus it creates more issues in policymaking.

Apart from the institutional factors, the participation of firms is an essential thing for the development of e-commerce. The participation capacity of domestic enterprises in e-commerce in Vietnam has increased rapidly. Based on the Vietnam e-Commerce and Digital Economy Agency (2020) survey, the strongest advertising method was a social network with (49%), the following ones were e-media (33%), email marketing (29%), and mobile apps (19%) in 2019. It was proved that the capacity of e-commerce applications in Vietnamese enterprises had changed significantly. Additionally, with the evolving platform business models, the number of enterprises' participation increased rapidly and achieved at 17% in 2019. Moreover, the available apps for Vietnamese enterprises in accounting and finance were about 80% in general.

However, everything has both sides, it still depends on which sectors the enterprise belongs to and how the extent to which the enterprise's business model is evolving online. Furthermore, the available apps for Vietnamese firms in some fields are low; for instance, in supply chain management (SCM) at 26%, in customer relationship management (CRM) at 30%, in enterprise resource planning (ERP) at 18% [41]. In the future, the South East Asia countries will be good places for e-commerce. Google & Temasak [15] showed that more than 90% of Southeast Asians used a mobile phone to connect to the Internet, and they were the most engaged in the world. Surprisingly, it is predicted that in 2025 the e-commerce size in this region can reach 102 billion USD. In Vietnam, the Internet economy's gross merchandise value accounts for 4% of GDP, the highest among Southeast Asian nations. That is why Vietnam is recognized as one destination for e-commerce and the internet economy in the future. Therefore, e-commerce should be one of the most important concerns in Vietnam's expectations. In fact, international and Vietnamese firms take part in the e-commerce process to maximize their potential profits. Several literature reviews built an important foundation to understand how E-commerce creates competitive advantages for enterprises [44, 45]. Numerous studies have been conducted to answer the question of how e-commerce influences an enterprise's performance [3, 45-47]. Interestingly, the impact of e-commerce depends on the size of the enterprise. It is noticed that from 2008 to 2017 both the share of firms joining in e-commerce and share of turnover achieving from e-commerce sales rose faster in large firms (10 and 7 percentage points, respectively) than in medium-size firms (9 and 3 percentage points, respectively) and small firms (6 and 3 percentage points, respectively). In recent years, the gap in e-commerce participation rates between large firms and SMEs has been widening [19]. However, it is notable that SMEs are significantly more than large firms to participate in web sales. Over the years 2010 to 2017, small e-commerce firms on average were likely to have significantly higher shares of e-commerce turnover achieving from web sales (53%) rather than exchange data interchange (EDI), and both compared to medium-sized (35%) and large firms (30%) in EU28. That could cause several papers to apply the theory to verify the effectiveness of e-commerce towards SMEs' performance[23, 48, 49]. They are improved to advance our understanding of the impact of e-commerce on SMEs' performance in different contexts. Given the increasingly important role of e-commerce in the performance of firms, there are a few studies on the impact of e-commerce on firms in Vietnam. Therefore, the article's goal is to explore the effectiveness of e-commerce on the performance of Vietnamese firms. It is expected that the impact of e-commerce on firms varies depending on the characteristic of firms.

3. METHODOLOGY

3.1. Model

To evaluate the relationship between e-commerce and firm performance, scholars around the world mainly use resource-based view theory (RBV) [34, 45, 49, 50]. These studies have shown that e-commerce is considered as one of the essential resources of enterprises. E-commerce is also considered as a dynamic capability of enterprises [51],

[50]. The investment or use of valuable resources such as e-commerce will bring many economic values and competitive advantages to businesses. Based on the e-commerce approach from resource theory, this paper also uses the log-linear production function by [52] to estimate the effect of e-commerce on the performance of firms in Vietnam. This log-linear production function changes the relationship between dependent variables and independent variables into elasticity; therefore, it is easier to compare the magnitude of estimated coefficients.

$$y_{ijt} = \alpha_i + \beta_1 k_{ijt} + \beta_2 l_{ijt} + \beta_3 ecom_{jt} + \beta_4 X_{ijt} + \varepsilon_{ijt} \quad (1)$$

Where i is firm (i), t is time (t), and j is the region (j). y is output, k is fixed capital, and l is the total labor of the firm (i). Ecom is the proxy for e-commerce in the region (j). X is a set of other control variables, including concentration index, human capital, and age of firm (i). All variables are in logarithm transformation. α_i is the firm-specific factor that capture heterogeneities across firms. The result of the Hausman test shows that the fixed-effect model is more suitable than the random-effect [Table 2].

Table 2. Hausman test

	Chi-square	Prob>chi2
H0: difference in coefficients not systematic	19317.84	0.0000

Source: author

The key variable in the model is *ecom* which represents e-commerce in Vietnam. The paper uses the index of business to consumer (B2C) to proxy for e-commerce which has been developed by Vietnam E-commerce Association (VECOM). The B2C e-commerce business model is the model that accounts for the largest market share in the Vietnamese e-commerce market and is applied by most Vietnamese businesses, especially SMEs. B2C focuses on satisfying the consumer needs of individual customers, as a result, companies that apply B2C can offer a variety of products or services such as consumer goods, clothing, food, resort services, vehicles, etc. The first benefit of B2C adoption is not limited in scope, and even domestic SMEs can sell to overseas customers. The second one is the relevance of the investment cost of the B2C model as well as the business can reduce many costs such as store rental costs, labor costs, and distribution channel management costs when applying this model. Moreover, e-commercial platforms and social networks in the B2C model are effective channels used by most SMEs to reach customers and the market[53, 54]. Therefore, the transaction between business and consumers is essential in the development of e-commerce. The index is constructed from 11 components:

- Building a business website;
- The frequency of updating information on the website;
- Social network sales application;
- Joining e-commerce platforms;
- Mobile version website;
- Mobile sales application;

- Allowing buyers to carry out the entire shopping process on mobile devices;
- Tracking order placement situation;
- Website/mobile application advertising;
- Online channel revenues;
- Per capita income.

Regarding these 11 components, the B2C index for each province is constructed which ranges from 0 to 100. The index had been calculated from 2012 to 2108 for provinces in Vietnam. Unfortunately, the B2C index had not covered all 63 provinces from 2012 to 2018. Therefore, the paper constructs the B2C index for six regions in Vietnam. The regional B2C index is an average of all available B2C indexes of provinces in one region within a year. The value of regional B2C can be seen in [Table 3].

Table 3. Regional B2C from 2012 to 2018

	2012	2013	2014	2015	2016	2017	2018
Red River Delta	53.08	58.85	60.94	63.16	62.39	69.29	74.85
Northern Midlands and mountain areas	49.50	45.16	49.69	41.45	34.50	33.21	35.92
North Central & South Central Coast	49.08	51.52	53.29	50.52	40.59	41.74	45.08
Central Highlands	47.30	45.96	51.01	42.72	33.67	37.40	40.43
South East	53.22	57.46	62.81	67.32	69.11	76.44	82.59
South West	48.30	47.51	51.19	45.10	37.62	40.79	43.17

Source: Author calculate based on Vietnam E-Business Index (EBI) Report from 2012-2019 [55-61]. Apart from the B2C index, VECOM constructs other indexes including B2B, G2B, and HI but there are some significant changes in the construction of these indexes. The B2C index is the most stable one, and that is why the paper chooses the B2C index to present for e-commerce in Vietnam. In addition, the study of [35, 62] has shown that the B2C index is appropriate to assess the influence of e-commerce on domestic enterprises as well as on business activities in the domestic.

3.2. Data

The paper uses strong balanced panel data, which includes 36,607 repeated firms from 2012 to 2018. The panel data is created from cross-sectional data from the Annual Enterprises Survey which has information about revenue, total labor, capital, workers' wage, location of firms, operating industries of firms, etc. In equation (1), y_{ijt} is logarithm transformation of the value-added of the firm i at time t in the region j. k_{ijt} is logarithm transformation of fixed asset of firm i used to produce output. l_{ijt} is logarithm transformation of the total number of workers of firm i. $ecom_{jt}$ is the

logarithm transformation of the B2C index of the region j at time t. X_{ijt} is a set of control variables including *concentration index, human capital,* and *age* of firm i at time t in region j. The *Concentration index* is a Herfindahl index of two-digit industry concentration. The index is log-transformed. *Human capital* is proxied by the ratio between the wage of one worker and the maximum wage level in the same sector. It is assumed that those who receive a higher wage level are more skilled. The *Age* of a firm shows how long a firm has been operating in a sector. When estimating, the sector dummy, and year dummy are added to control for a year and sector effects. The variable summary can be seen in [Table 4]. The variable correlation can be found in Annex.

Table 4. Variables description

Variable	Obs	Mean	Std. Dev.	Min	Max
Value added (mil. VND)	256,249	12756.150	115714.300	0.00	12400000
Total labor (person)	256,249	94.899	652.429	1.00	85206
Fixed asset (mil. VND)	256,249	14496.990	175739.100	0.95	40700000
Human capital (%)	256,249	6.809	7.329	0.00	100
B2C (index)	256,249	58.242	11.859	33.16	81.95
HHI (%)	246,162	.5969237	.9419473	.11050	7.989
Age	256,249	13.297	6.392	0.00	72.00

Source: Author

4. RESULTS

The estimation results can be seen in [Table 5]. The first column shows coefficients and standard errors for the whole sample. Coefficients of labor, capital, human capital, HHI, and Age are all positively and statistically significant. It can be seen that all of them had positive impacts on the value-added of firms from 2012 to 2018. Notably, a 1% increase in total labor can bring a 0.751% increase in value-added. Similarly, a 1% rise in capital and human capital can generate a 0.0636% and 0.00365% increase in firms' productivity. The sign and significance of the age's coefficient show that the operating period of a firm can boost its value-added. The core variable here is the B2C which represents e-commerce in Vietnam. A 1% increase in the B2C index might lead to an increase of 0.0007% in value-added firms. Remarkably, B2C is the type in which consumers can buy goods and services from sellers directly via a website or application. Therefore, it can be observed that firms are ready to sell their products online more than the conventional way.

Table 5. Regression results

	All firms	SME	Large	Domestic	FDI
	(coef and SE)	(coef and SE)	(coef and SE)	(coef and SE)	(coef and SE)
Ln(Labor)	0.7510*** (0.0043)	0.7647*** (0.0043)	0.4755*** (0.0101)	0.7530*** (0.0043)	0.6032*** (0.03060)
Ln(Capital)	0.0636*** (0.0018)	0.0622*** (0.0018)	0.0585*** (0.0054)	0.0639*** (0.0018)	0.0533*** (0.00750)
Ln(Human capital)	0.0365*** (0.0004)	0.0395*** (0.0005)	0.0153*** (0.0005)	0.0404*** (0.0004)	0.0134*** (0.00090)
B2C	0.0007** (0.0002)	0.0005* (0.0002)	0.0009+ (0.0005)	0.0008*** (0.0002)	0.0276 (0.06700)
HHI	0.0656*** (0.0029)	0.0702*** (0.0031)	0.0076 (0.0069)	0.0650*** (0.0030)	0.0996*** (0.02010)
Age	0.0094*** (0.0009)	0.0083*** (0.0009)	0.0189*** (0.0021)	0.0085*** (0.0009)	0.1338 (0.12000)
Sector dummy	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
N	256249	236185	20064	240775	15474
R_square	0.8449	0.7855	0.6143	0.8238	0.7750
F	1740.7548	1763.4297	119.06	1764.4533	205.14

Source: Author

Note: Standard errors in parenthesis are corrected for heteroscedasticity and autocorrelation.

Note: + p<0.1, * p<0.05, **p<0.01, *** p<0.001

The paper also examines the impact of B2C on the value-added of firms by size, which can be seen in the second and third columns of [Table 5]. Firms are grouped into small and medium-sized enterprises (SMEs) and large enterprises. Generally, B2C positively impacts on value-added of both SMEs and large firms. However, it seems that the impact of B2C on large firms is bigger with the magnitude of the B2C coefficient of 0.0009. The results show that if large and SME firms invest in e-commerce, the former might have more benefits. But certainly, it does not mean that SMEs should not be involved in the e-commerce process. Column 3 of [Table 5] shows that an increase in B2C can create a positive impact of 0.0005% on the value-added of SMEs. From other perspectives, Columns 4 and 5 of [Table 5] show domestic and FDI firms' estimation results. The coefficient of B2C at Column 4 is 0.0008, and it is significant at the 0.1% level. It indicates that domestic firms enjoy benefits from e-commerce. The coefficient of B2C at Column 5 is 0.0276, but it is not statistically

significant. This can be explained by the fact that FDIs are companies with a higher degree of globalization, so they will often tend to mainly use B2B e-commerce in business activities as well as the B2B e-commerce that will bring more efficiency than the B2C e-commerce [35]. Therefore, it is not possible to say that B2C may positively impact the value-added of FDI firms. The paper takes a further step by examining the impact of control variables on the link from B2C to the performance of firms. Interaction terms between B2C and human capital, age, and HHI are created. The results from the first column of [Table 6] show that HHI positively impacts the link from B2C to the value-added of firms in Vietnam. The coefficient of the interaction term between HHI and B2C is positively and statistically significant. It implies that companies in the robust industry take more benefits from e-commerce. It is similar to the impact of Age which can be seen from the last column of [Table 6]. Firms with longer operation times have more knowledge about the market and clients; therefore, they may gain more from B2C.

Table 6. Regression result 2

	All firms	All Firms	SME	Large	All firms
	(coef and SE)	(coef and SE)	(coef and SE)	(coef and SE)	(coef and SE)
Ln(Labor)	0.7507*** (0.0043)	0.7508*** (0.0043)	0.7640*** (0.0043)	0.4761*** (0.0257)	0.7515*** (0.0043)
Ln(Capital)	0.0636*** (0.0018)	0.0636*** (0.0018)	0.0623*** (0.0018)	0.0585*** (0.0075)	0.0633*** (0.0018)
Ln(Human capital)	0.0367*** (0.0004)	0.0350*** (0.0015)	0.0353*** (0.0017)	0.0227*** (0.0029)	0.0367*** (0.0004)
B2C	-0.0008** (0.0003)	0.0005 (0.0003)	0.0000 (0.0003)	0.0021* (0.0009)	-0.0079*** (0.0006)
HHI	-0.0752*** (0.0124)	0.0655*** (0.0029)	0.0698*** (0.0031)	0.0229** (0.0073)	0.0652*** (0.0029)
B2C*HHI	0.0025*** (0.0002)				
Age	0.0094*** (0.0009)	0.0094*** (0.0009)	0.0082*** (0.0009)	0.0197*** (0.0030)	-0.0174*** (0.0018)
B2C*HC		0.00001 (0.0000)	0.0001* (0.0000)	-0.0001** (0.0000)	
B2C*Age					0.0005*** (0.0000)
Sector Dummy	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y
N	246162.0000	246162.0000	226850.0000	19312.0000	246162.0000
R_square	0.8385	0.8387	0.7761	0.5732	0.8372
F	1832.0161	1827.7273	1853.8443	162.24	1830.4864

Source: Author

Note: Standard errors in parenthesis are corrected for heteroscedasticity and autocorrelation.

Note: + p<0.1, * p<0.05, **p<0.01, *** p<0.001

Results from columns 3 to 5 in [Table 6] show the impact of human capital on the relationship between B2C and the performance of all firms, SMEs, and large firms. For all firms, the coefficient of the interaction term is positive but insignificant. In the case of SMEs, the coefficient is positive and significant, but in the case of large firms, it is negative and significant. It can interpret that SMEs' human capital might help improve the impact of e-commerce, but large firms' human capital seems insufficient to boost the effect. However, the magnitude of the interaction terms is negligible; hence it is unlikely to confirm the impact of human capital in the case of Vietnam. It needs further research to clarify that impact.

5. DISCUSSION

Generally, the paper results indicate that investment in e-commerce can be positive for firms in developing countries, especially in Vietnam. Similarly, María Verónica Alderete proved that the adoption of e-commerce could bring positive and remarkable effects on SME sales by using a structural equation model [63]. In fact, it is a global trend, and all enterprises should find a suitable way to take advantage of this process. However, the impact of e-commerce on firms varies based on the characteristic of firms. E-commerce has more influence on the performance of large firms than SMEs [64]. The reason is that large firms have more advantages of long-term strategy and solid financial capital. Additionally, it seems that SMEs are not ready for the e-commerce process. Besides, SMEs face several challenges such as lack of capital, qualified employees, and suitable management. According to [65], they showed that 15% of large firms had spent more than 50% of the total investment on website/mobile applications while this number of SMEs was only 8%. Regarding the qualification and the number of employees in charge of e-commerce in large firms had increased from 42% in 2017 to 45% in 2018; meanwhile, the number of SMEs had decreased from 29% in 2017 to 26% in 2019 [61]. Additionally, the proxy for e-commerce in this paper is B2C. Although Vietnam has established several B2C platforms for SMEs, the proportion of them is still small. Two of these reasons are the incomplete platforms and problems in payment method, delivery, or conflicts between buyers and sellers. For example, e-payment issues are facing many challenges and major barriers such as an incomplete legal environment and the habit of using cash of Vietnamese people for a long time [66]. Therefore, it is risky for SMEs to join e-commerce. That leads to more vulnerability than the large firms. However, applying e-commerce is necessary to help Vietnamese SMEs reach customers and improve their competitiveness [67]. Moreover, the result of the paper shows that e-commerce only benefits Vietnamese firms. Besides, it can not conclude that FDI firms in Vietnam can take the positive impacts of E-commerce. Firstly, it can be seen that FDI companies are more advanced in terms of technology and management. However, the majority of FDI factories in Vietnam are investing in the manufacturing sector. Furthermore, Vietnam is not the end-user market; consequently, the FDI firms do not pay much attention to selling their products online in Vietnam.

6. CONCLUSION

E-commerce has become a new key trend in the world, and it can bring many potential benefits to enterprises. Firms can access to global market easier through e-markets where they can trade goods and services and learn new knowledge. In Vietnam, e-commerce has been developing rapidly recently, and that is a great chance for firms if they can seize it. Given the development of e-commerce in Vietnam, the paper examined the impact of e-commerce on the performance of firms. The authors indicate that e-commerce has more effectiveness on big firms than SMEs due to financial capital and long-term strategy. The authors found that firms should be active in e-commerce because it can facilitate their operations. Additionally, big enterprises have more technology and managerial skills advantages, which can offer more advantages from e-commerce than SMEs. Besides, the authors also expressed the positive impacts of B2C on the value-added to big and small enterprises. Finally, FDI firms in Vietnam seem not to be beneficial from selling goods and services online. Because most FDI firms in Vietnam operate in the manufacturing sector and Vietnam is not the end-user market.

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ANNEX

Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Value added	1.000						
(2) Total Labor	0.453* 0.000	1.000					
(3) Capital	0.313* 0.000	0.224* 0.000	1.000				
(4) Human capital	0.154* 0.000	0.039* 0.000	0.080* 0.000	1.000			
(5) B2C	0.037* 0.000	0.023* 0.000	0.019* 0.000	0.140* 0.000	1.000		
(6) HHI	0.017* 0.000	0.004 0.035	0.019* 0.000	0.297* 0.000	-0.015* 0.000	1.000	
(7) age	0.110* 0.000	0.085* 0.000	0.067* 0.000	0.095* 0.000	0.068* 0.000	0.036* 0.000	1.000

* shows significance at the 0.01 level