

The E-Commerce and Global Value Chains

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I. Introduction

Since the emergence of e-commerce in the mid-1990s, online transactions have continued to grow with the rapid development of the digital economy. In 2015, e-commerce accounted for 7.4% of global retail transactions, exceeding 19% in 2022, with this high growth rate continuing for the foreseeable future.¹ The proliferation of e-commerce is reshaping the nature of transactions not only in domestic markets, but also across borders, with at least 3% of e-commerce revenues in major economies now coming from cross-border e-commerce.² It is predicted that the cross-border B2C e-commerce market will grow tenfold in size over the next decade or so.

The expansion of channels of trade through advances in digital technology hasn't just

changed the way consumers buy goods from distant sellers. Businesses that trade goods and services for their production are also beginning to add e-commerce to their primary channels of trade. Although building an e-commerce system or entering into an online platform to find a suitable business partner is much more complicated than an individual buying a TV set from an overseas online marketplace, participating in e-commerce has fueled their growth by lowering firms' transaction costs and providing new opportunities to diversify their trading networks. In the future, more companies are expected to use digital channels for B2B transactions. For example, an international transportation company predicts that 80% of B2B sales will be made through digital channels by 2025.³

¹ Statista. E-commerce as percentage of total retail sales worldwide from 2015 to 2027. <https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide/> (accessed on September 20, 2023)

² Statista. 2023. "Cross-border e-commerce."

³ DHL. DHL Express Uncovers Next Wave of E-Commerce Growth. <https://www.dhl.com/kr-en/home/press/press-archive/2021/dhl-express-un>

There is no consensus on whether e-commerce will completely replace traditional B2B channels of trade. However, if e-commerce-based B2B transactions become a ubiquitous phenomenon, what will be the impact of this change on global value chains (GVC)? In this article, we briefly present the main findings of Yea et al. (2022), which examines the relationship between e-commerce and GVC, and present some policy implications that can be drawn from them.

II. E-commerce and GVC Participation: Firm-level Evidence in Korea

According to the existing literature, Internet use or increased access to the Internet has been shown to lead to increased exports of goods (Freund and Weinhold 2004; Fernandes et al. 2019; Clarke 2008) or services (Freund and Weinhold 2002; Choi 2010). There are some studies that have more directly analyzed the relationship between e-commerce and exports, such as Hortacsu, Martinez-Jerez, and Douglas (2009), Lendle et al. (2016), Lendle and Vezina (2015), Carballo et al. (2020), and Lee et al. (2017). These studies found that e-commerce participation has a significant impact on export growth. We sought to examine the impact of firms' use of e-commerce systems on firm participation in GVC. In contrast to previous studies that have primarily examined the use of external online platforms such as eBay,

we examined the case of firms that have adopted an e-commerce management system within their own organizations, in addition to the use of online platforms.

To conduct our firm-level analysis, we used the Survey of Business Activities (SBA) data provided by the Statistics Korea. The SBA data is collected from all corporations in Korea that are legal entities with more than 50 full-time employees and capital stock of more than KRW 300 million. It provides information on a firm's general financial accounting information, export and import activities, and export and import amounts to affiliated companies, as well as information on whether a firm has adopted an integrated e-commerce management system. The adoption of an integrated e-commerce management system means automating or creating an automated environment for processing business processes that occur in transactions between B2B online markets and firms or between firms. In this regard, firms that have adopted an integrated e-commerce management system can be considered to have actively participated in B2B e-commerce activities. The adoption of an integrated e-commerce management system by firms that we are interested in is included in the SBA data for the period from 2006 to 2014. Records of participation in GVC are not directly reflected in the SBA data. Instead, as in Antràs (2020) and Baldwin and Yan (2014), we considered firms that partici-

[covers-next-wave-of-e-commerce-growth.html](#) (accessed on September 20, 2023)

pated in both imports and exports to be participating in GVC. According to the data, on average, 24% of firms participated in GVC between 2006 and 2014. 86% of firms participating in GVC were in the manufacturing industry and 9% were in the wholesale/retail industry.

To investigate the impact of the adoption of an integrated e-commerce management system on firms' participation in GVC, we estimated a difference-in-differences model that compares the pre- and post-adoption differences between firms that adopted an integrated e-commerce management system and those that did not. Control variables included firm size, capital intensity, productivity, and other related variables. To address the selection bias, we used propensity score matching to construct treatment and control groups.

The analysis shows that firms that adopted an integrated e-commerce management system were significantly more likely to participate in GVC than firms that did not adopt the system. This effect was found to persist for several years after the adoption of an integrated e-commerce management system, and was also found to be present when analyzing manufacturing and wholesale/retail firms separately. The increase in the probability of participating in GVC due to the adoption of an integrated e-commerce management system was observed for both intra-firm and inter-firm transactions. It is worth noting that the increase in GVC participation through intra-firm transactions oc-

curred gradually after the adoption of an integrated e-commerce management system. By dividing the total factor productivity distribution of firms into four quartiles to estimate the effect of adopting an integrated e-commerce management system on GVC participation according to productivity level, we also found that, for firms with productivity level below the upper quartile, adopting an integrated e-commerce management system has a significant effect on the probability of participating in GVC. In other words, for firms with already high productivity, the adoption of an integrated e-commerce management system is not significantly related to whether or not they participate in GVC, while for firms with low productivity, the adoption of an integrated e-commerce management system plays an effective role in value chain participation. Considering that small firms have lower productivity on average, it is noteworthy that e-commerce has a positive effect not only on SMEs' export growth but also on their participation in GVC.

III. E-commerce and GVC Change: A Theoretical Framework

Through empirical analysis, we have shown that e-commerce increases firms' imports and exports and that these changes occur in both intra- and inter-firm transactions. We then turn to a theoretical model to examine the implications of firm-level e-commerce participation for aggregate value chain trade. We build a

multi-sector, multi-country general equilibrium model based on Caliendo and Parro (2015) by introducing e-commerce trade channels through which firms producing intermediate goods alternatively participate in cross-border transactions. The framework of Caliendo and Parro (2015), which features roundabout structures of intersectoral linkages and cross-border movements of intermediate goods to produce final goods, is useful for using world input-output tables for analysis. In our study, we use Asian Development Bank (ADB)'s Multiregional Input-Output (MRIO) tables for numerical simulations.

The novel features of our model are as follows. First, to describe firms' participation in e-commerce, we assume that firms engaging in e-commerce produce a "new" intermediate good that is traded in the e-commerce channel. Producing the new intermediate good requires "IT workers" and produced intermediate good as factor inputs. We assume that the productivity of the production function is randomly drawn from a new Fréchet distribution associated with the productivity distribution of intermediate good production. These assumptions reflect the possibility that a firm's participation in e-commerce may lead to the production of goods of a different nature as a result of digital transformation, or that the digitization of work may lead to an increase in productivity. On the other hand, it is also possible that in some cases participation in e-commerce does not increase a firm's productivity per se. Second, we assume that when intermediate goods producers export through e-commerce channels, they

are subject to a new parameter that is multiplied by their existing trade costs to determine the magnitude of their trade costs. This takes into account both the negative impact of new non-tariff barriers faced by e-commerce trade and the positive impact of trade facilitation brought about by e-commerce trade. Third, we assume that intermediate goods producers participating in e-commerce can also engage in cross-border trade in traditional ways that do not use e-commerce. Fourth, we assume that if an importer of intermediates participates in e-commerce, the importer can obtain intermediates through both traditional and e-commerce channels; otherwise, intermediates are imported only through traditional channels. These assumptions imply that firms importing intermediates are more likely to source intermediates from firms with lower marginal costs if they participate in e-commerce due to the wider channels of trade, making their output more price competitive compared to the firms that do not use e-commerce. However, for simplicity, we assume that the output of intermediates importers that participate in e-commerce is imperfectly substitutable with the output of intermediates importers that do not participate in e-commerce.

Based on this model, we conducted two simulation analyses. In the first simulation, we examined how GVC measures would respond to a reduction in trade costs associated with the e-commerce channel between Korea and its trading partners. The analysis shows that a reduction in trade costs associated with e-com-

merce significantly increases Korea's total exports and intermediate goods exports to China and the Asian region, and increases both Korea's backward and forward GVC participation. This suggests that as firms increasingly use e-commerce channels, value chain trade can be further facilitated unless the e-commerce channels completely replace traditional channels of trade. In the second scenario, we analyze the impact of increased trade costs on global value chains with and without cross-border e-commerce trade. The results show that the decline in exports and decrease in GVC participation due to increased trade costs is more pronounced in economies with cross-border e-commerce. In other words, the expansion of value chain trade through e-commerce may make the trade volume more responsive to trade costs.

IV. Implications

Our analysis of the relationship between e-commerce utilization and firms' value chain participation and overall value chain structural change provides the following two policy implications. First, the use of e-commerce can be an effective means of promoting SMEs' participation in global value chains. Governments that view exporting and value chain participation as a viable growth strategy for their firms should therefore actively consider supporting these SMEs in their digital transformation and e-commerce participation. Second, as long as e-commerce has not completely replaced traditional cross-border trade, efforts to reduce trade costs are still imperative. The adverse effects of trade shocks can be exacerbated by complex trade networks coordinated by e-commerce, so countries' efforts to maintain supply chains stability and eliminate tariff and non-tariff barriers to trade in goods will continue to be needed. [KIEP](#)

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