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Oikawa, Keita; Iwasaki, Fusanori; Sawada, Yasuyuki; Shinozaki, Shigehiro

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UNINTENDED CONSEQUENCES OF BUSINESS DIGITALIZATION AMONG MSMES DURING THE COVID-19 PANDEMIC

THE CASE OF THE PHILIPPINES

Keita Oikawa, Fusanori Iwasaki, Yasuyuki Sawada, and Shigehiro Shinozaki

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Keita Oikawa, Fusanori Iwasaki, Yasuyuki Sawada, and Shigehiro Shinozaki

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ABSTRACT

The coronavirus disease (COVID-19) pandemic profoundly impacted people's lives, social activities, and businesses. It particularly affected micro, small, and medium-sized enterprises (MSMEs), which account for the vast majority of firms and most of the labor force. Compared to larger firms, MSMEs were less able to absorb the pandemic's shocks, both in developed and developing economies. While digital technologies, such as e-commerce platforms, were often seen as effective tools for businesses where in-person communications are restricted, they did not guarantee the success of MSMEs. An Indonesian study showed that adopting digital technologies did not always result in positive business outcomes for MSMEs during the early stages of the pandemic (Oikawa et al. 2024a). This paper investigates whether e-commerce use in the Philippines strengthened MSME performance during the pandemic, based on a unique Asian Development Bank dataset on the impact of COVID-19 on Philippine businesses from 2020 to 2021. The findings reveal that internet or e-commerce use did not lead to better MSME outcomes during the strict lockdown in March 2020. In fact, performance sometimes worsened. However, by August 2020, the negative effects had lessened, and by March 2021, one year into the pandemic, a positive impact had emerged. These results are consistent with the Indonesia study by Oikawa et al (2024a).

Keywords: digitalization, digital financial services, access to finance, SME development, SME policy, Philippines

JEL codes: D22, G20, L20, L50

1 Introduction

COVID-19, the most devastating global health crisis in decades, first appeared in Wuhan, the People's Republic of China (PRC), in December 2019. It spread rapidly across the globe, including the Philippines, where the first confirmed case was a PRC female national diagnosed in Manila on 30 January 2020 (World Health Organization [WHO], 2020). On 7 March 2020, the first case involving local transmission was reported (WHO, 2020). In response, the Philippine government implemented an "enhanced community quarantine" (ECQ) across Metro Manila from 15 March to 14 April 2020, which was later expanded to all of Luzon island (Amit et al. 2021). The Philippines enforced one of the world's strictest COVID-19 lockdowns, which included widespread restrictions on mobility, mandatory use of masks, social distancing, and strong enforcement by the police and military, which included punitive actions for non-compliance (Hapal, 2021). Businesses, including MSMEs, were forced to navigate these stringent social restrictions.

MSMEs, which account for most businesses and labor in the country, were particularly affected. Compared to larger firms, MSMEs were more vulnerable to the economic shocks of the pandemic—a trend observed across both developed and developing economies (e.g., Bloom et al. 2021; Amin et al. 2023). Economic resilience is often considered in the short term. However, a significant decline in economic activity can lead to long-lasting or even permanent effects, known as scarring. For instance, employment losses, especially among younger workers, can result in prolonged inactivity and sustained job quality deterioration. Therefore, understanding MSME resilience is critical to ensure sustainable growth in emerging economies.

This study investigates whether e-commerce use, which was expected to help MSMEs continue operating during COVID-19, contributed to their resilience during the pandemic's first year, using a unique dataset on the pandemic's impact on Philippine businesses collected by the Asian Development Bank in 2020 and 2021. A previous study (Oikawa et al. 2024a) examined the same question using data from Indonesian businesses surveyed by ADB during the same period. The results, however, revealed an unintended consequence—e-commerce use did not contribute to MSME resilience during the first year of the pandemic. This implies that the digital transformation of MSMEs and society generally had not progressed sufficiently for businesses to absorb the initial COVID-19 shock.

While various studies examine the impact of COVID-19 on MSME resilience using surveys or transaction data, to the best of our knowledge, few specifically analyzed the impact of ecommerce or digitalization on their resilience during the pandemic's early stages. Bloom et al. (2025) analyzed the impact of COVID-19 on productivity using data from a monthly United Kingdom (UK) firm survey panel. They find that total factor productivity (TFP) fell by up to 5% during 2020–2021, mainly due to large reductions in within-firm productivity, though this was offset by positive between-firm effects (less productive sectors and firms contracted). They also found significant heterogeneity across firms and sectors, with the greatest impact on industries requiring extensive in-person activity. Dai et al. (2021) examined the resilience of firms and industrial agglomeration in the PRC, finding that there was greater resilience in counties with a higher degree of industrial concentration. Kong et al. (2021), using quarterly surveys of micro- and small firms on the PRC's Alipay platform, found that operational performance improved over time, with a higher percentage of newly established firms adopting online sales and electronic information systems compared to those established earlier. While these studies measure the pandemic's early effects, they do not examine whether digitalization contributed to a firm's resilience.

Our findings on the Philippines show that internet use or e-commerce did not lead to improved MSME performance during the strict March 2020 lockdown. In fact, business performance

sometimes worsened. However, by August 2020, the negative effects of digitalization had diminished, and by March 2021, a year into the pandemic, a positive impact emerged. These results align with those of the Indonesian study by Oikawa et al. (2024a).

These results lead to five key policy recommendations on digitalization that can enhance MSME resilience in the Philippines against similar future shocks. First, strengthening human capital by improving information technology (IT) skills within businesses is crucial to effectively adopt digital tools. Second, formalizing (registering) informal businesses will help the government better target support for digitalizing MSMEs. Third, improving information and communications technology (ICT) and physical infrastructure, particularly in rural areas, is essential to expand participation in the digital economy. Fourth, promoting various digital finance options including e-commerce and e-payments through modern business development services will help MSMEs better use digitalization. Finally, establishing a regulatory framework that ensures fair competition on digital platforms is vital to protect MSMEs from dominant market players.

The rest of this paper is organized as follows: Section 2 describes the broader situation and landscape of MSMEs in the Philippines. Section 3 outlines the empirical method used, followed by a detailed description of the dataset in Section 4. Section 5 presents estimation results, and Section 6 concludes with policy implications.

2 Philippine MSME Landscape and COVID-19 Impact

MSMEs are critical to Philippine economic growth.¹ Due to business closures affected by the pandemic, the number of MSMEs decreased by 4.3% in 2020 (952,969 firms) from the previous year (995,745 firms). The number of MSME employees also decreased by 2.4% in 2020 (5,380,815 workers) from 2019 (5,510,760 workers). However, due to the large government assistance in response to the pandemic, MSMEs showed a V-shaped recovery in 2021, with a 12.9% increase in number of MSMEs and a 1.5% increase in the number of MSME employees. This growth trend continued as of end-2023, when MSMEs numbered 1,241,766 firms, up 12.3% from 2022, and accounted for 99.6% of all firms. Wholesale and retail trade consistently had the highest share (48.6% in 2023), followed by "other services" (36.4%) including accommodation and food, other personal services, and finance. In 2023, 82.1% of MSMEs operated in the provinces, with 17.9% in the national capital region (NCR). During the same period, MSMEs employed 6,364,367 workers, or 66.8% of the total workforce, a 13.5% increase from 2022. Other services led MSME employment, accounting for 39.8%, followed by wholesale and retail trade (37.6%) and manufacturing (12.8%). Geographically, 75.4% of MSME employees worked in the provinces, with the remaining 24.6% in the NCR (ADB 2024b).

While the number of MSMEs has shown a recovery, at the macroeconomic level, the Philippine economy has yet to fully recover from the pandemic's impact. In 2020, gross domestic product (GDP) contracted sharply by 9.1%. The following year, it rebounded with GDP up by 5.7%. It rose by 7.6% in 2022, before easing to 5.6% growth in 2023. It outperformed major Asian economies due to strong domestic demand, including increased household consumption and investment

¹ Philippine MSMEs are defined based on total assets (excluding land) and number of employees. According to the Small and Medium Enterprise Development Council Resolution No.01 of 2003, a microenterprise holds assets not exceeding P3 million, a small enterprise has assets up to P15 million, and a medium-sized enterprise can have assets up to P100 million. By contrast, the Philippine Statistics Authority uses employment as its criterion—a microenterprise has fewer than 10 employees, a small enterprise has fewer than 100 employees, and a medium-sized enterprise has fewer than 200 employees (ADB 2024b). This study refers to the employment threshold of the MSME definition.

(ADB 2024a). However, the recent real GDP in the Philippines shows a substantial gap when compared to the linear extension based on the 2000–2019 trend growth prior to the pandemic (Figure 1). In 2023, the actual real GDP was approximately 13% lower than the extended value. Given the continued divergence between real GDP and the linear extension, it remains uncertain whether the Philippine economy will return to its pre-pandemic growth trajectory. This may suggest a scarring effect from the pandemic—a prolonged negative impact on the economy—which was not seen during the 2008–2009 global financial crisis.





Source: ADB Key Indicators Database (https://kidb.adb.org/) and authors' elaboration.

3 Empirical Method

This study empirically determines whether business digitalization positively impacted performance under COVID-19 restrictions. To isolate the pure digitalization effect under the social restrictions based on our datasets, we need to control for two factors: variations in the stringency of social restrictions and the potential endogeneity between performance variables and the digitalization variable. To control for the first factor, the difference-in-differences (DID) method is used. DID compares outcome changes between a treatment group exposed to an intervention and a control group that is not. It assumes both groups share a common trend, allowing researchers to estimate the counterfactual outcome for the treatment group. The difference between the observed changes in both groups is interpreted as the average treatment effect on the treated (ATET). Here, business performance metrics like sales growth are the monitored outcomes, with COVID-19 restrictions as an exogenous treatment. To control for the second factor, inverse probability weighting (IPW) is used. This method assigns weights to observations based on the inverse of their propensity score, which represents the probability of a firm using the internet.

To calculate ATET using DID, two comparable groups are needed—one treated, the other not. DID leverages differences in the timing of interventions. One group experiences the intervention earlier, making it the treatment group, while the other becomes the control. The study uses the timing of COVID-19 restrictions across Philippine provinces to define these groups and outlines the empirical model used to estimate ATET, along with the province pairs analyzed.

Empirical Model

As outlined below, three types of datasets are used: the first uses responses to a survey on performance and the situation during March 2020, when strict COVID-19 restrictions were first imposed in Manila and some urban provinces; the second is from August 2020, when some provinces, including Manila, briefly relaxed restrictions before reinstating them; with the third from March 2021, when similar restrictions were re-imposed. Each dataset includes provinces under strict COVID-19 restrictions at the time of the survey and those that were not. The provinces with restrictions serve as the treatment group, while the others act as the control group. We will explain more details about the treatment and control groups later. We apply the same empirical model to each dataset and propose the following DID model for firm *i*'s performance at time *t*, y_{it} :

$$y_{it} = \beta_0 + \beta_1 D_i + \beta_2 W_i + \beta_3 T_t + \beta_4 D_i W_i + \beta_5 D_i T_t + \beta_6 W_i T_t + \beta_7 D_i W_i T_t + \varepsilon_{it} , \qquad (1)$$

where W_i is the treatment indicator for whether firm *i* is in the treatment group (subject to COVID-19 restrictions), and T_t is a dummy variable indicating if time *t* is after the restrictions were imposed. D_i is a dummy variable indicating whether the firm uses the internet for sales and marketing. ε_{it} is the error term. Taking the first difference of Equation (1) for firm *i*'s performance before and after the restrictions gives

$$\Delta y_{it} = \beta_3 + \beta_5 D_i + \beta_6 W_i + \beta_7 D_i W_i + \Delta \varepsilon_{it}, \qquad (2)$$

where Δ is the first-difference operator. Equation (2) shows that β_7 estimates the effect of using the internet or e-commerce on mitigating the impact of COVID-19 restrictions on a firm's performance. Other coefficients represent the common time effect post-restrictions (β_3), the effect of internet/e-commerce use on business performance post-restrictions (β_5), and the effect of restrictions on the performance of the treatment group (β_6).

When estimating Equation (2), the potential endogeneity of D_i is crucial, as internet/e-commerce use for sales might correlate with unobserved variables that also affect performance, such as human capital and management practices. To address this, as mentioned above, IPW is used. IPW balances differences between firms using internet/e-commerce and those that do not by weighting observations with the inverse of the propensity score, which reflects the likelihood of a firm using the internet. The propensity score is estimated using a logit model with variables representing the firm's profile and situation, including province, industry, size (number of employees), female employee share, firm age, net asset value, funding capability, and primary business concerns.²

² As mentioned, we aim to control for covariates related to firms' capabilities to use the internet or ecommerce for business. However, the datasets do not directly include such covariates that measure these capabilities. When controlling for covariates, it is important to avoid using outcome variables influenced by the variable of interest. Instead, it is recommended to use variables that are predetermined, i.e., fixed before the variable of interest is determined (Angrist and Pischke, 2008). To address this limitation, we use

Three Cases of Comparable Groups

The Philippine response to the pandemic included a structured system of lockdowns, categorized primarily into strict and moderate restrictions, to manage the spread of the virus while balancing economic and social considerations. The most stringent of these measures was the ECQ, characterized by a curfew, a prohibition on gatherings, school closures, and business operations restricted to essential sectors. It was designed to significantly curtail movement and interaction among the population, thereby reducing transmission rates. As conditions evolved, a slightly relaxed Modified ECQ (MECQ) was introduced. It allowed some modification of restrictions based on regional pandemic conditions, serving as a transitional phase toward the less restrictive General Community Quarantine (GCQ).

The GCQ began to moderate restrictions, where those on mobility were relaxed, and a broader range of business operations were allowed. This aimed to revive economic activities while maintaining health protocols needed to prevent a resurgence of infections. The GCQ allowed increased social and economic interaction, albeit with caution and control measures remaining. In addition, a Modified GCQ (MGCQ) represented the least restrictive phase, modifying the conditions of the GCQ to allow for a gradual return to normalcy. This stage was intended to allow the full reopening of the economy while continuing to monitor and respond to any local outbreaks.

The timeline chart illustrates the implementation of quarantine classifications across various regions in the Philippines from March 2020 to May 2021 (Figure 2). It highlights the country's response to COVID-19 through three distinct waves of strict lockdown measures, specifically the ECQ and MECQ.

First Wave (March to June 2020): The initial wave began in mid-March 2020, when the National Capital Region (NCR) and several key regions entered ECQ, the strictest form of lockdown (yellow). This initial ECQ period lasted until the end of April, with extensions in some regions such as across Luzon and the Visayas. By early May, the quarantine measures shifted to a combination of MECQ (orange) and GCQ (General Community Quarantine, in light blue) as the government attempted to balance public health concerns with economic needs. By June, most regions transitioned to GCQ or Modified GCQ (MGCQ), easing restrictions after the initial outbreak control.

Second Wave (August to September 2020): The second wave of strict measures began in August 2020, when rising cases prompted a return to heightened restrictions. The NCR and other regions reverted to the MECQ in response to increasing COVID-19 cases. By September, the situation had stabilized enough to allow most areas to return to GCQ or MGCQ.

Third Wave (March to May 2021): The third wave began in late March 2021 as a surge in cases led to the re-imposition of strict ECQ in the NCR and nearby provinces. This period is notable for

proxy variables to represent these capabilities. These proxies include responses to survey questions about a firm's basic attributes, funding capability (e.g., whether the respondent can borrow a certain amount of money within a week if necessary), and main concerns for the longer term after COVID-19 (e.g., a prolonged decline in domestic demand, continued decline in foreign demand, disruption of production/supply chains/business networks, and loan repayment difficulties). We interpret the main concerns as indicative of general managerial capability rather than outcomes of internet or e-commerce use. This is because managing the assumed prolonged impact of COVID-19 is more closely related to fundamental management skills. These include maintaining or expanding customer and supplier relationships while securing financial resources, which are likely established prior to internet or ecommerce adoption.

the introduction of "Strict Home ECQ," a more stringent measure implemented in particularly affected areas. In April, MECQ was applied to regions like the Cagayan Valley, while other areas remained under varying levels of quarantine. This wave saw a mix of ECQ and MECQ classifications, reflecting the government's adaptive strategy to handle localized outbreaks.

Our empirical strategy involves comparing provinces under strict lockdown measures (ECQ or MECQ) with those experiencing no quarantine measures or moderate lockdowns (GCQ or MGCQ) during March 2020, August 2020, and March 2021. These periods coincide with our datasets on the business performance of Philippine MSMEs. For March 2020, the treatment group includes NCR, Cordillera Administrative Region, Mimaropa, Ilocos, Cagayan Valley, Central Luzon, Calabarzon, Bicol, and Central Visayas, while the control group comprises the remaining provinces. For August 2020 and March 2021, the treatment group is narrowed to the NCR, Central Luzon, and Calabarzon, with the control group consisting of the other provinces.

Essential vs Nonessential Sectors

The government's measures to control the spread of COVID-19 aimed to promote essential supplies for living while limiting personal contact to prevent infections. In fact, during the ECQ, essential industries were allowed to operate either at full or partial capacity to maintain critical services (Government of the Philippines, n.d.). Full operational capacity was granted to public and private hospitals, healthcare and emergency services (e.g., dialysis and chemotherapy centers), and manufacturers of medical supplies and equipment. Agriculture, forestry, and fishery—including related food value chain workers along with delivery and courier services for essential goods such as food, medicine, and veterinary products—were also allowed to operate fully. The government allowed 50% operational capacity to private establishments involved in the production and distribution of essential goods, including food, medicine, hygiene products, and disinfectants. It also included supermarkets, grocery stores, convenience stores, and establishments providing take-out food services, as well as media establishments accredited by the Department of Labor and Employment.

The granularity of industry classification in our dataset is limited, allowing us to identify a respondent's industry at a level between one and two digits of the 2017 North American Industry Classification System. Based on the expected proportion of firms within broader industry categories, we define the essential sector to include agriculture, forestry, and fisheries; power and energy (e.g., electricity and gas); wholesale and retail trade; ICT; water supply, sewerage, waste management, and remediation activities; accommodation and food service; and financial and insurance activities.

4 Data

ADB conducted surveys to evaluate the impact of COVID-19 on MSMEs one year into the pandemic in Indonesia, the Lao People's Democratic Republic (Lao PDR), the Philippines, and Thailand. They were done during three periods: March–April 2020, August–September 2020, and March–April 2021. Online surveys were used, given the need for timely assessments to help countries develop appropriate policies. Samples were gathered from networks of survey partners monitoring MSMEs across the countries. In the Philippines, partners included the Bureau of Small and Medium Enterprise Development of the Department of Trade and Industry and the Philippine Chamber of Commerce and Industry. In addition, ADB Facebook pages helped the four countries conduct the surveys.

Figure 2: Timeline of Quarantine Measures in the Philippines from March 2020 to May 2021

Region	Mar-20					Apr-20						May-20			-		Jun	-20				
	15		17	22	28	13	14	4	24	28	30	1	15		16	31		1	15	16	30	
National Capital Region (NCR)	ECQ							ECQ (ext	t.)			ECQ (ext.)		MEC	Q		GCQ					
Cordillera Administrative Region		ECQ					ECQ (ext.)					ECQ (ext.)		GCQ			MGCQ					
Region 1: Ilocos		ECQ					ECQ (ext.)					ECQ (ext.)		GCQ					M	GCQ		
Region 2: Cagayan Valley		ECQ					ECQ (ext.)					GCQ										
Region 3: Central Luzon		ECQ					ECQ (ext.)					ECQ (ext.)		MEC	Q		GCQ					
Region 4A: Calabarzon		ECQ					ECQ (ext.)					ECQ (ext.)		MEC	Q		GCQ					
MIMAROPA		ECQ					ECQ (ext.)					GCQ					MGCQ					
Region 5: Bicol		ECQ					ECQ (ext.)					GCQ					MGCQ					
Region 6: Western Visayas								ECQ				ECQ (ext.)		GCQ			MGCQ					
Region 7: Central Visayas			ECQ (C	Cebu)						ECQ (e	xt.)			ECQ	(ext.)		GCQ		ECO	Q/MECQ (on	ly Cebu); (GCQ (other cities)
Region 8: Eastern Visayas								GCQ									MGCQ					
Region 9: Zamboanga Peninsula								GCQ														
Region 10: Northern Mindanao								GCQ									MGCQ					
Region 11: Davao								ECQ					ECQ (ext.)	GCQ								
Region 12: SOCCSKSARGEN								GCQ									MGCQ					
Region 13: Caraga								GCQ									MGCQ					
BARMM (formerly ARMM)								GCQ									MGCQ					

Region	Jul-20				Aug-2	0						Sep-20		Oct-20		Nov-20		Dec-20		
	1	15	16	31		1	4	15	18	19	31	1	30	1	31	1	30	1	14	15
National Capital Region (NCR)	I					MECQ			GCQ											
Cordillera Administrative Region	GCQ	N	NGCQ												1					
Region 1: Ilocos															- 1					
Region 2: Cagayan Valley	MGCQ														1				GCC	2
Region 3: Central Luzon	MGCQ				GCQ	MECQ			GCQ					MGCQ						
Region 4A: Calabarzon						MECQ			GCQ											
MIMAROPA																				
Region 5: Bicol																				
Region 6: Western Visayas									GCQ											
Region 7: Central Visayas		N	AECQ (Cebu)	; GCQ (oth	GCQ				GCQ			MGCQ								
Region 8: Eastern Visayas	GCQ				MGCQ							GCQ								
Region 9: Zamboanga Peninsula	MGCQ	G	GCQ																	
Region 10: Northern Mindanao												MECQ		GCQ						
Region 11: Davao	MGCQ														1			GCQ		
Region 12: SOCCSKSARGEN															- 1					
Region 13: Caraga		G	GCQ		MGCQ															
BARMM (formerly ARMM)		G	GCQ		MGCQ									MECQ		GCQ				

Region		Jan-	-21	Feb-21		Mar-21				Apr-21							May-21	L			
	31		1 3	1 1	28	1	22	29	31	1	4	5	11		12	30	1	L	14	15	31
National Capital Region (NCR)							Strict home ECQ					ECQ (ext.)		MECQ			MGCQ				
Cordillera Administrative Region				GCQ										MECQ (A	Abra only);	GCQ	(others)				
Region 1: Ilocos																					
Region 2: Cagayan Valley		MGCQ								MECQ (part of Cagay	yan ۱	/alley); GCQ (oth	ers)	_							
Region 3: Central Luzon							Strict home ECQ					ECQ (ext.)		MECQ			l		MGC	Q	
Region 4A: Calabarzon							Strict home ECQ							MECQ					GCQ		
MIMAROPA																					
Region 5: Bicol																	l				
Region 6: Western Visayas				MGCQ																	
Region 7: Central Visayas																	1				
Region 8: Eastern Visayas										MGCQ				GCQ			1				
Region 9: Zamboanga Peninsula																					
Region 10: Northern Mindanao										MGCQ				GCQ							
Region 11: Davao									81	MGCQ				GCQ							
Region 12: SOCCSKSARGEN																					
Region 13: Caraga																	l				
BARMM (formerly ARMM)										MGCQ				GCQ							

Source: Authors. Information based on government announcements in the Philippines.

The surveys collected 1,804 responses in March–April 2020; 686 in August–September 2020; and 1,546 in March–April 2021. As these were online surveys, traditional national statistical frameworks were not followed, leading to nonstandard sampling methods. Online surveys can face self-selection and nonresponse biases. In the Philippines, microenterprises were underrepresented or slightly overrepresented at different times compared to the Philippine Statistics Authority (PSA) 2018 List of Establishments. Similarly, representation of small and medium-sized firms varied. Sectoral differences included overrepresentation in manufacturing and underrepresentation in trade. Regional disparities were around 5 percentage points across the surveys. Overall, when comparing ADB survey data with national statistics, the gaps in percentage shares were not very large, typically around +/-5 percentage points. For more details on the discrepancies with national statistics, refer to ADB 2022.

Tables 1–3 offer an overview of three datasets that examine the impact of internet or e-commerce usage on business performance during the pandemic in March 2020, August 2020, and March 2021.³ They report the number of samples for firms using and not using the internet or e-commerce. In the March 2020 dataset, there are 1,335 digitalized firms and 469 non-digitalized firms. The August 2020 dataset includes 313 digitalized firms and 373 non-digitalized firms, while the March 2021 dataset comprises 538 digitalized firms and 1,008 non-digitalized firms.

The breakdown of samples by digitalized and non-digitalized firms and by lockdown treatment and control groups is as follows. The March 2020 dataset includes 977 digitalized and 334 nondigitalized firms in the treatment group, and 358 digitalized and 135 non-digitalized firms in the control group. The August 2020 dataset contains 55 digitalized and 47 non-digitalized firms in the treatment group, and 258 digitalized and 326 non-digitalized firms in the control group. The March 2021 dataset consists of 112 digitalized and 207 non-digitalized firms in the treatment group, and 426 digitalized and 801 non-digitalized firms in the control group.

These tables compare fundamental firm characteristics, including size, age, and the proportion of female employees, by calculating and comparing the means between firms that utilize internet or e-commerce and those that do not. Across all groups, most sample firms are microenterprises with fewer than five employees, and nearly all firms have fewer than 20 employees. Young firms make up the majority within each group, and the share of female employees is not particularly high. Also, firms in non-essential sectors are relatively more prevalent than those in essential sectors.

When examining the differences between firms that use the internet or e-commerce and those that do not, digitalized firms generally report better business performance and operating environments than their non-digitalized counterparts. These differences are statistically significant, as indicated by simple tests of proportion or t-tests comparing mean differences. The following section discusses how the results of these simple mean comparisons change when estimating Equation (2), which controls for differences in social restrictions across provinces and potential endogeneity between business performance and use of the internet or e-commerce.

³ It is important to note that the August 2020 and March 2021 surveys assessed internet usage only in terms of selling products or services and purchasing materials.

	Internet	No internet	Diff	n-value
Size (employees)	internet		Dill	
	0 885	0.784	0 101	0.000
1-4 5 10	0.000	0.704	0.101	0.000
0-19 20.00	0.109	0.200	-0.091	0.000
20-99 Sector	0.006	0.016	-0.010	0.100
Sector	0.500	0.454	0.400	0.000
Essential sector	0.593	0.454	0.139	0.000
Nonessential sector	0.407	0.546	-0.139	0.000
Age (years)				
0-5	0.565	0.607	-0.042	0.107
6-10	0.192	0.187	0.005	0.825
11-15	0.104	0.078	0.027	0.076
16-30	0.102	0.094	0.008	0.615
31+	0.036	0.033	0.003	0.735
Female employees share				
0-10%	0.576	0.449	0.126	0.000
11-30%	0.062	0.100	-0.039	0.012
31-50%	0.107	0.145	-0.038	0.038
51-80%	0.113	0.141	-0.028	0.128
81-100%	0 143	0 165	-0.022	0 264
Business performance	0.110	0.100	0.022	0.201
Sales	-0 754	-0 799	0.045	0.005
Income	_0 749	-0.800	0.010	0.000
Salary naid	-0.745	-0.000	0.001	0.002
Employment	-0.0+3	-0.000	0.010	0.437
Business environment	0.005	0.017	0.040	0.077
Busiliess environment	0 1 5 1	0.170	0.017	0.409
	0.154	0.170	-0.017	0.400
ino change	0.023	0.017	0.000	0.394
vvorse	0.823	0.813	0.010	0.621
Observations	1335	469		

 Table 1: Mean Attributes and Business Performance of MSMEs Using or Not Using

 the Internet Based on March 2020 Samples

Note: The essential sector consists of agriculture, forestry and fisheries; power and energy (e.g., electricity and gas); wholesale and retail trade; information and communications technology; water supply, sewerage, waste management and remediation activities; accommodation and food service activities; and financial and insurance activities. The non-essential sector consists of the remaining industries. "Employment" is a binary variable that equals one when a respondent reports non-negative changes in employment. The column labeled "p-value" reports the p-values from proportion tests comparing firms using the internet with those not using it for binary variables (e.g., size, sector, age, female share, employment, and business environment) and from t-tests for continuous variables (e.g., sales, income, and salary paid).

	E-commerce	No e-commerce	Diff	p-value
Size (employees)				•
1-4	0.882	0.907	-0.025	0.284
5-19	0.102	0.083	0.019	0.399
20-99	0.016	0.010	0.007	0.456
Sector				
Essential sector	0.464	0.367	0.096	0.011
Nonessential sector	0.536	0.633	-0.096	0.011
Age (years)				
0-5	0.536	0.671	-0.135	0.000
6-10	0.223	0.192	0.031	0.322
11-15	0.123	0.067	0.056	0.013
16-30	0.088	0.045	0.044	0.024
31+	0.029	0.026	0.004	0.755
Female employees share				
0-10%	0.539	0.521	0.018	0.636
11-30%	0.054	0.058	-0.004	0.824
31-50%	0.123	0.128	-0.004	0.860
51-80%	0.115	0.112	0.003	0.887
81-100%	0.169	0.182	-0.013	0.650
Business performance				
Sales	-0.326	-0.390	0.065	0.036
Salary paid	-0.269	-0.286	0.017	0.587
Employment (permanent)	0.807	0.780	0.027	0.376
Employment (part-time)	0.879	0.866	0.014	0.596
Business environment				
Better	0.273	0.249	0.024	0.472
No change	0.129	0.064	0.065	0.005
Worse	0.598	0.687	-0.089	0.016
Observations	313	373		

Table 2: Mean Attributes and Business Performance of MSMEs Using or Not Usingthe Internet Based on August 2020 Samples

Note: The essential sector consists of agriculture, forestry and fisheries; power and energy (e.g., electricity and gas); wholesale and retail trade; information and communications technology; water supply, sewerage, waste management and remediation activities; accommodation and food service activities; and financial and insurance activities. The nonessential sector consists of the remaining industries. "Employment (permanent)" and "Employment (part-time)" are binary variables that equal one when a respondent reports non-negative changes in permanent employment and part-time employment, respectively. The column labeled "p-value" reports the p-values from proportion tests comparing firms using the internet with those not using it for binary variables (e.g., size, sector, age, female share, employment (permanent), employment (part-time), and business environment) and from t-tests for continuous variables (e.g., sales and salary paid).

	E-commerce	No e-commerce	Diff	p-value
Size (employees)				•
1-4	0.860	0.911	-0.051	0.004
5-19	0.122	0.086	0.037	0.028
20-99	0.018	0.004	0.014	0.019
Sector				
Essential sector	0.438	0.355	0.082	0.002
Nonessential sector	0.562	0.645	-0.082	0.002
Age (years)				
0-5	0.625	0.706	-0.081	0.001
6-10	0.197	0.143	0.054	0.008
11-15	0.083	0.080	0.003	0.816
16-30	0.075	0.050	0.025	0.058
31+	0.019	0.020	-0.002	0.828
Female employees share				
0-10%	0.506	0.535	-0.029	0.271
11-30%	0.064	0.033	0.031	0.010
31-50%	0.124	0.119	0.005	0.773
51-80%	0.101	0.119	-0.018	0.282
81-100%	0.204	0.193	0.011	0.605
Business performance				
Sales	-0.260	-0.314	0.054	0.010
Salary paid	-0.157	-0.253	0.096	0.000
Employment (permanent)	0.850	0.794	0.057	0.005
Employment (part-time)	0.904	0.857	0.047	0.005
Business environment				
Better	0.291	0.342	-0.051	0.037
No change	0.244	0.123	0.121	0.000
Worse	0.465	0.535	-0.070	0.009
Observations	538	1008		

Table 3: Mean Attributes and Business Performance of MSMEs Using or Not Using the Internet Based on March 2021 Samples

Note: The essential sector consists of agriculture, forestry and fisheries; power and energy (e.g., electricity and gas); wholesale and retail trade; information and communications technology; water supply, sewerage, waste management and remediation activities; accommodation and food service activities; and financial and insurance activities. The nonessential sector consists of the remaining industries. "Employment (permanent)" and "Employment (part-time)" are binary variables that equal one when a respondent reports non-negative changes in permanent employment and part-time employment, respectively. The column labeled "p-value" reports the p-values from proportion tests comparing firms using the internet with those not using it for binary variables (e.g., size, sector, age, female share, employment (permanent), employment (part-time), and business environment) and from t-tests for continuous variables (e.g., sales and salary paid).

5 Estimation Results

Results 1: ECQ in March 2020

Based on the March 2020 dataset, we found no positive impact of internet use under COVID-19 restrictions. In fact, it may have negatively influenced the MSME business environment. Table 4 shows the regression analysis results of Equation (2) for the March 2020 ECQ data, including all samples (top panel), essential sectors (middle panel), and non-essential sectors (bottom panel). Internet usage had no significant effect on sales growth, revenue growth, or employment stability between February and March 2020 (measured by a dummy variable indicating whether a firm maintained its employment level).

On changes in the business environment and overall firm evaluation during the survey period, the coefficient for the treatment group dummy ("Internet") was positively significant for both the total and essential sector samples. However, the interaction term between internet use and the treatment group dummy ("Internet X COVID") was negative across all samples and non-essential sector. While not statistically significant, the coefficient for the essential sector was also negative. One possible reason for the negative impact of using the internet under social restrictions was panic buying, where people rushed to buy essential supplies from local markets and retailers. In fact, news media reported that customers rushed into supermarkets to buy food and essential supplies in Metro Manila in response to the lockdown measures (e.g., ABS-CBN News, 2020). Panic buying was also observed in Indonesia, as reported by Oikawa et al. (2024a).

	Sales	Income	Wage	Employment	Business environment
All samples					
Internet	0.014	-0.003	-0.027	-0.049	0.914***
	(0.044)	(0.045)	(0.072)	(0.062)	(0.329)
COVID	-0.021 [´]	-0.019 [́]	-0.101 [´]	0.013 [´]	Ò.893* [*]
	(0.045)	(0.045)	(0.074)	(0.065)	(0.349)
Internet X COVID	-0.048	-0.030	0.029	-0.017	-0.934**
	(0.050)	(0.050)	(0.079)	(0.072)	(0.385)
N	1804	1804	1804	1804	1804
Essential sector					
Internet	0.088	0.072	-0.102	-0.111	0.518
	(0.064)	(0.063)	(0.129)	(0.085)	(0.468)
COVID	0.041	0.047	-0.215*	-0.080	0.779
	(0.064)	(0.062)	(0.130)	(0.093)	(0.521)
Internet X COVID	-0.120*	-0.107	0.119	0.058	-0.923
	(0.071)	(0.069)	(0.137)	(0.104)	(0.575)
N	884	884	884	884	884
Non-essential sector					
Internet	-0.066	-0.084	-0.034	-0.035	1.756***
	(0.074)	(0.074)	(0.093)	(0.095)	(0.601)
COVID	-0.077	-0.078	-0.064	0.050	1.483**
	(0.077)	(0.078)	(0.100)	(0.100)	(0.626)
Internet X COVID	0.032	0.052	0.030	-0.036	-1.467**
	(0.081)	(0.082)	(0.106)	(0.109)	(0.664)
Ν	920	920	920	920	920

Table 4: Regression Results of Effects of Using the Internet on Business Performance Based on the Samples from the March 2020 Dataset

Note: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Results 2: MECQ in August 2020

For the August 2020 dataset, although there were still no evident major positive impacts of ecommerce use under COVID-19 restrictions, the negative effects observed in the March 2020 dataset disappeared. Table 5 highlights the negative impacts of COVID-19 restrictions on all business performance and environment variables (coefficients of COVID) across all samples and non-essential sector samples. This indicates that the COVID-19 restrictions significantly harmed MSME performance and their business environment. Meanwhile, the interaction terms between e-commerce use and COVID-19 restrictions do not show any significantly negative impacts of ecommerce use under these conditions. For the nonessential sector samples, there is a positive impact of e-commerce on sales growth under COVID-19 restrictions, although this is only significant at the 10% level.

	Sales	Wage	Employment	Employment	Business
			(permanent)	(part-time)	environment
All samples					
E-commerce	0.008	0.026	0.014	-0.021	-0.292
	(0.039)	(0.041)	(0.038)	(0.027)	(0.196)
COVID	-Ò.249* ^{**}	-0.137*	-Ò.246***	-Ò.267***	-1.645***
	(0.062)	(0.071)	(0.083)	(0.076)	(0.473)
E-commerce X COVID	0.065	-0.034	-0.038	0.091	0.817
	(0.097)	(0.103)	(0.116)	(0.111)	(0.624)
N	686	686	686	686	686
Essential sector					
E-commerce	0.035	0.059	0.014	-0.039	-0.655**
	(0.056)	(0.055)	(0.064)	(0.054)	(0.321)
COVID	-0.259***	-0.111	-0.244*	-0.043	-1.963**
	(0.088)	(0.110)	(0.146)	(0.091)	(0.832)
E-commerce X COVID	-0.116	-0.213	-0.075	-0.150	1.278
	(0.121)	(0.151)	(0.189)	(0.151)	(1.065)
N	288	288	288	288	288
Non-essential sector					
E-commerce	0.006	0.011	0.035	0.013	-0.093
	(0.052)	(0.057)	(0.050)	(0.038)	(0.260)
COVID	-0.229***	-0.173*	-0.235**	-0.347***	-1.737***
	(0.082)	(0.093)	(0.102)	(0.099)	(0.564)
E-commerce X COVID	0.258*	0.181	-0.014	0.178	0.804
	(0.150)	(0.127)	(0.160 <u>)</u>	(0.161)	(0.773)
N	398	398	398	398	398
Nate: Debugt standard among	in nonenthe see 3	* = <0.40 ** = <0.0			

Table 5: Regression Results of Effects of Using the Internet on Business PerformanceBased on the Samples from the August 2020 Dataset

Note: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Results 3: ECQ in March 2021

Finally, for the March 2021 dataset, there were no significantly negative impacts of e-commerce use under COVID-19 restrictions, and in the case of the essential sector, there were significantly positive impacts. Table 6 shows that all the cross-term coefficients (E-com X COVID) are not significantly negative across all models and sample subsets. Notably, for essential sector samples, the cross-term coefficient in the business environment model (last column) is significantly positive.

•	Sales	Wage	Employment	Employment	Business
			(permanent)	(part-time)	environment
All samples					
E-commerce	-0.023	-0.056**	-0.066**	-0.060**	-0.036
	(0.027)	(0.027)	(0.029)	(0.025)	(0.142)
COVID	-0.087**	-0.064**	-0.080**	-0.029	-0.214
	(0.036)	(0.032)	(0.033)	(0.027)	(0.165)
E-commerce X COVID	-0.015	-0.036	0.020	0.016	0.464
	(0.065)	(0.058)	(0.062)	(0.053)	(0.285)
Ν	1546	1546	1546	1546	1546
Essential sector					
E-commerce	-0.017	-0.060	-0.036	-0.022	-0.090
	(0.047)	(0.041)	(0.043)	(0.038)	(0.210)
COVID	-0.148***	-0.080	-0.085	0.006	-0.266
	(0.056)	(0.053)	(0.061)	(0.047)	(0.265)
E-commerce X COVID	0.031	0.023	0.069	-0.096	1.467***
	(0.108)	(0.101)	(0.109)	(0.108)	(0.557)
Ν	632	632	632	632	632
Non-essential sector					
E-commerce	-0.035	-0.076**	-0.070*	-0.073**	0.110
	(0.036)	(0.037)	(0.037)	(0.032)	(0.197)
COVID	-0.054	-0.051	-0.075*	-0.038	-0.194
	(0.047)	(0.040)	(0.039)	(0.032)	(0.211)
E-commerce X COVID	-0.049	-0.053	-0.031	0.017	0.036
	(0.079)	(0.073)	(0.077)	(0.067)	(0.350)
N	914	914	914	914	914

Table 6: Regression Results of Effects of Using the Internet on Business Performance
Based on the Samples from the March 2021 Dataset

Note: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01 Source: Authors' calculations.

Discussion

The use of the internet and e-commerce did not initially enhance the MSME business resilience during the early phase of the COVID-19 pandemic. Many MSMEs struggled with the abrupt shift to digital platforms due to a lack of digital infrastructure, technological know-how, and workforce skills. The sudden imposition of strict lockdowns further complicated the transition online, as disruptions in logistics and delivery systems made efficient fulfillment of online orders difficult. For MSMEs, especially those in traditional sectors, this rapid digital shift posed considerable challenges, limiting their ability to capitalize on e-commerce and online services.

Approximately one year into the pandemic, however, signs of a positive impact on MSME resilience began to appear. This delayed improvement aligns with the Indonesian case presented in Oikawa et al. (2024a), suggesting that businesses needed time to build digital competence and

the adaptability required to effectively leverage online tools. As MSMEs became more familiar with digital platforms, such as e-payment systems, the potential benefits of e-commerce became increasingly evident. This is further supported by the findings of Acopiado et al. (2022), who reported that 67% of Philippine firms surveyed between July 2020 and January 2021 had adopted digital payment systems, with more than half using these technologies during the pandemic. This shift illustrates how businesses gradually embraced digital solutions, enhancing their ability to engage in e-commerce. However, it should be noted that our dataset consists of repeated cross-sectional data, and the results may be influenced by survivorship bias.

Equally important to the success of e-commerce is the availability of reliable physical infrastructure, particularly in logistics and stable supply chains. As UNIDO (2021) reported, despite being allowed to operate under government policies supporting the supply of essential goods during the ECQ, Philippine firms faced significant supply chain disruptions due to the shutdown of key suppliers and service providers, as well as logistical challenges from travel restrictions and checkpoints. As e-commerce depends heavily on the efficient movement of goods, robust infrastructure to support digital business is crucial.

Based on the findings of this paper and existing literature, there are five policy recommendations to enhance the resilience of MSMEs in the Philippines through digitalization to potential future shocks.

1. Strengthening human capital for digitalized business and advisory services: Research by Oikawa et al. (2024b), focusing on ASEAN firms (including the Philippines), highlights the significant internal barriers faced by firms at the early stages of digitalization. These businesses, which only partially access digital tools, struggled with limited IT expertise during the initial stages of gathering information, underscoring the lack of internal human resources able to apply digital technologies. Furthermore, once digital tools are adopted, employees often lack the skills needed to use them effectively. Thus, enhancing IT knowledge and skills training within firms is essential to support the successful integration of digital tools.

2. Encouraging the formalization (registration) of informal businesses: For the government to effectively support digitalizing MSMEs, it is crucial to have a clear understanding of which business needs appropriate assistance. Registering informal MSMEs as formal enterprises is a key step in this process, as a substantial number of MSMEs in the Philippines operate informally (Schneider, 2012). Shinozaki (2022) emphasizes the importance of expanding and improving business registration services, particularly through establishing one-stop service centers nationwide or strengthening online registration systems. These also help the government determine the best appropriate assistance to target MSMEs, including digitalized firms.

3. Enhancing ICT Infrastructure, particularly in rural areas, as well as physical infrastructure for robust logistics: The success of e-commerce is highly dependent on the availability of reliable ICT infrastructure, as well as the physical infrastructure required for robust logistics. In areas with insufficient digital connectivity, particularly in rural areas, MSMEs are unable to fully participate in digital markets. Improving access to competitive ICT infrastructure in these regions is critical for enabling broad participation in the digital economy.

4. Promoting e-commerce, e-payments, and digital finance solutions through enhanced business development services: Oikawa et al. (2024b) note that MSMEs with limited digital adoption, typically using basic tools such as mobile devices, have difficulty accessing relevant information in local languages during the digitalization process. Additionally, these firms often struggle to diagnose their internal issues that could be solved using digital tools. Strengthening

business development services and digital literacy training programs focused on e-commerce, epayments, and digital finance solutions is essential. These programs can help businesses navigate the complexities of digital adoption and better utilize digital tools to enhance operations.

5. Establishing a regulatory framework to ensure fair competition for MSMEs on digital platforms: The government should establish competition policies that both provide stability for MSMEs and encourage growth-oriented business strategies. It is essential to reduce entry barriers for digital platforms and promote fair competition, as these platforms both offer substantial opportunities for MSMEs and present challenges due to strong network effects and scale economies that favor a few dominant players. Ensuring that digital platforms are accessible for MSMEs in a fair competitive environment will allow them to thrive in the digital economy. Maintaining a fair and competitive market environment is crucial to ensure MSMEs do not face unfair competition.

6 Conclusion

The findings from both the Philippine study and the Indonesian case (Oikawa et al. 2024a) illustrate that simply using internet or e-commerce did not necessarily contribute to MSME resilience to the COVID-19 shock: MSMEs need a certain level of maturity to effectively harness digital tools. The delayed positive effect one year into the pandemic highlights the importance of gradual digital adoption, the development of supporting digital capacity across different segments of society, and the critical role played by logistics and physical infrastructure. These factors collectively shape the ability of MSMEs to navigate the challenges brought about by the pandemic and to capitalize on the opportunities presented by the digital transformation.

As mentioned in section 2, it is uncertain whether the Philippine economy will return to its prepandemic trajectory (see Figure 1). However, there are positive aspects for the future of the economy. After the COVID-19 pandemic, MSMEs increasingly adopted digitalization and innovation to enhance their growth and resilience (ADB 2024b). The government supports MSME digitalization through its Strengthening Private Enterprise for the Digital Economy (SPEED) program, which is a collaborative work with the United States Agency for International Development (Philippine News Agency 2024). The program focuses on helping MSMEs innovate and adopt digital technology solutions that are safe, reliable, and affordable, addressing areas such as innovation, e-payment systems, and e-commerce. It works with the Department of Trade and Industry to boost MSMEs and complements central bank initiatives to build an inclusive digital economy. The vision is to create a robust digital economy that empowers all, especially the most vulnerable. Through SPEED, digitalized MSMEs can operate more efficiently, reduce costs, reach wider markets, and earn higher profits, according to the ADB Asia SME Monitor 2024.

The broader society has also accelerated digitalization. E-commerce has taken over many traditional retail and cash-based transactions (ADB 2024b). Platforms like Lazada, Shopee, Facebook Marketplace, Zalora, Carousell, and eBay Philippines have reshaped consumer behavior, particularly during and since the pandemic. This shift includes online marketplaces, digital payment systems, and diverse e-commerce platforms. The surge is fueled by rising consumer demand, technological advancements, and the sheer convenience of online shopping and delivery systems. E-commerce is evolving as businesses and consumers increasingly use digital transactions, offering new opportunities for MSMEs, which are optimistic about the growth of e-commerce to "continue to boom" and become more vital to their business growth (Talavera 2022).

Looking ahead, the convergence of sustained government support and MSMEs adopting digital tools, along with the broader societal shift toward new business practices offers an opportunity to create a more resilient and dynamic economy. By investing in human capital, encouraging formalization, enhancing ICT and physical infrastructure for robust logistics, promoting e-commerce and digital payment systems through enhanced business development services, and ensuring fair competition, MSMEs in the Philippines can build long-term resilience and contribute to sustained economic recovery and growth.

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Unintended Consequences of Business Digitalization Among MSMEs During the COVID-19 Pandemic The Case of the Philippines

This paper investigates whether e-commerce use in the Philippines strengthened micro, small, and medium-sized enterprise (MSME) performance during the pandemic, based on a unique survey dataset from 2020 to 2021. The findings reveal that internet or e-commerce use did not lead to better MSME outcomes during the strict lockdown in March 2020. However, by August 2020, the negative effects had lessened, and by March 2021 a positive impact had emerged. The authors suggest establishing a regulatory framework to ensure fair competition for MSMEs on digital platforms.

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