Unintended Consequences of Business Digitalization among MSMEs during the COVID-19 Pandemic: the Case of the Philippines

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Motivation

- The negative impact of COVID-19 pandemic was significant on businesses, particularly MSMEs.
- Using digital technologies, such as e-commerce platforms, is often considered an effective tool for enhancing businesses resilience during the pandemic.
- However, digitally operated MSMEs were not always successful (ADB, 2022). An Indonesian case indicates that using e-commerce even had negative impacts on business performances at the beginning of the pandemic (Oikawa et al., 2024).
- This study explores the same research question as Oikawa et al. (2024) using a unique dataset about the COVID impact on Philippine businesses, conducted by ADB in 2020 and 2021.

Research Question

- Does digitalization make MSMEs resilient?
- Did using e-commerce (or internet for business) help MSMEs to keep or improve their business performance under the COVID-19 social restrictions?

Literature Reviews

- A variety of COVID-19 impacts on the resilience of MSMEs has been studied using surveys or transaction data:
  1. Productivity and other outcomes (Bloom et al., 2023 for the UK; Dai et al. 2021 for China; Kong et al. 2021 for China)
  2. Business expectations in the US (Bartik et al., 2020)
  3. Layoffs and closures in the US (de Vaan et al. 2021)
  4. Firm entry and the number of firms on a digital platform in China (Zhou, et al., 2024)
- To the best of our knowledge, limited existing studies have statistically examined the resilience of MSMEs to the COVID-19 shock in the Philippines, where the lockdown has been one of the longest in the world.

Method

- **What we want to know**: The significance of digitalization in enhancing the resilience of MSMEs to the COVID-19 shock, as measured by the effect of using internet (e-commerce) on their performance during the pandemic.
- **Data**: ADB's MSME surveys in the Philippines in 2020 and 2021
- **Identification strategy**: Difference-in-Differences (DID) with Inverse Probability Weighting (IPW), leveraging the difference in the timing of COVID social restrictions among provinces within the Philippines and the difference between companies using internet (e-commerce) for business and those that do not, while addressing the possible endogeneity between digitalization and business performances

Data

- **Asia Small and Medium-Sized Enterprise Monitor 2020 and 2021**: questionnaire collects information from MSMEs regarding their business performance ("changes" from the previous month or from pre-COVID), internet usage for business, firm attributes, financial conditions, and government support (only applicable for 2021) during the COVID-19 pandemic
- **Coverage**: MSMEs in the Philippines
- **Survey periods used (repeated cross-sectional data)**:
  1) Mar 2020 (collected in Apr): ECQ (1st COVID restrictions)
  2) Aug 2020 (collected in Sep): MECQ (2nd COVID restrictions)
  3) Mar 2021, (collected in Apr): ECQ (3rd COVID restrictions)

Lockdowns in the Philippines

Region	Mar-20				Apr-20					May-20				Jun-20			
	15	17	22	28	13	14	24	28	30	1	15	16	31	1	15	16	30
National Capital Region (NCR)	ECQ						ECQ (ext.)			ECQ (ext.)		MECQ		GCQ			
Cordillera Administrative Region		ECQ				ECQ (ext.)				ECQ (ext.)		GCQ		MGCQ			
Region 1: Ilocos		ECQ				ECQ (ext.)				ECQ (ext.)		GCQ			MGCQ		
Region 2: Cagayan Valley		ECQ				ECQ (ext.)				GCQ							
Region 3: Central Luzon		ECQ				ECQ (ext.)				ECQ (ext.)		MECQ		GCQ			
Region 4A: Calabarzon		ECQ				ECQ (ext.)				ECQ (ext.)		MECQ		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 (Cebu)						ECQ (ext.)			ECQ (ext.)		GCQ		ECQ/MECQ (only 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-20					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)						MECQ			GCQ										
Cordillera Administrative Region	GCQ		MGCQ																
Region 1: Ilocos																			
Region 2: Cagayan Valley	MGCQ																	GCQ	
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			MECQ (Cebu); GCQ (oth		GCQ				GCQ		MGCQ								
Region 8: Eastern Visayas	GCQ				MGCQ						GCQ								
Region 9: Zamboanga Peninsula	MGCQ		GCQ																
Region 10: Northern Mindanao											MECQ	GCQ							
Region 11: Davao	MGCQ															GCQ			
Region 12: SOCCSKSARGEN																			
Region 13: Caraga			GCQ		MGCQ														
BARMM (formerly ARMM)			GCQ		MGCQ							MECQ		GCQ					

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

ECQ = enhanced community quarantine, MECQ = modified ECQ, GCQ = general community quarantine.

Source: Authors' compilation from the government announcements.

Data – Questionnaire

“What is the status of your sales revenue/income/wage <u>as compared to the previous month</u>?”

-- Please select one –

☐ Zero (temporary closed) ☐ More than 50% decrease ☐ 31%-50% decrease ☐ 21%-30% decrease ☐ 11%-20% decrease ☐ 1%-10% decrease

☐ No change ☐ 1%-10% increase ☐ 11%-20% increase ☐ 21%-30% increase ☐ 31%-50% increase ☐ More than 50% increase

“Your business environment <u>after the COVID-19 outbreak</u>”

-- Please select all that apply --

☐ Better than before the COVID-19 outbreak ☐ No change ☐ Drop in domestic demand ☐ Drop in foreign demand ☐ Delayed delivery of products/services

☐ Disruption of production/supply chain ☐ Cancellation of contracts ☐ Temporary closed ☐ Others

Interpreted as a subjective evaluation of overall business performance

COVID-19 Restrictions in the Philippines

(1) Strict restrictions

- **Enhanced Community Quarantine (ECQ):** curfew, no gathering, school closure, limited business operations (essential sectors only), etc.
- **Modified ECQ (MECQ):** modified conditions of ECQ by area, given the pandemic conditions (some restrictions relaxed toward the shift to GCQ).

(2) Moderate restrictions

- **General Community Quarantine (GCQ):** eased mobility restriction, some business activities allowed to operate.
- **Modified GCQ (MGCQ)**: modified conditions of GCQ by area (toward the shift to the normal).

ECQ > MECQ >> GCQ > MGCQ > No restrictions

Treatment Group

Control Group

Empirical Model

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

$$\Rightarrow \quad \Delta y_i = \beta_3 + \beta_5 D_i + \beta_6 W_i + \beta_7 D_i W_i + \Delta\varepsilon_i .$$

- Δy_i: Business performance change (e.g., sales growth, employment change, business environment, etc.)
- D_i: Digitalization (using internet) heterogeneity dummy
- W_i: Treatment group dummy based on mobility restrictions
- T_i: Post COVID restriction (time) dummy
- $\Delta\varepsilon_i$: Error term

- $\boldsymbol{\beta_7}$ **= Average Treatment Effect on Treated (ATET) of Internet use under COVID restriction**
- **Since digitalization (*D*=1) is endogenous (due to missing variables, such as human capital and management practices), we use IPW-adjusted DID to handle this.**

Cases

- **Case 1 (ECQ, March 2020): 1st Wave of Social Restrictions**
  - **ECQ** started on 15 March 2020 in NCR and expanded to other regions, continued until May 2020, and transitioned to (M)GCQ in June 2020.
  - **Treatment group = 9 provinces under ECQ in March 2020: NCR, Cordillera Administrative Region, Mimaropa, Ilocos, Cagayan valley, Central Luzon, Calabarzon, Bicol,** and **Central Visayas**
  - **Control group = the other provinces**
- **Case 2 (MECQ, August 2020): 2nd Wave of Social Restrictions**
  - **MECQ** started on 4 August 2020 in NCR, Central Luzon, and Calabarzon, continued until 18 August 2020, and transitioned to GCQ.
  - **Treatment group = 3 provinces under MECQ in August 2020: NCR, Central Luzon,** and **Calabarzon**
  - **Control group = the other provinces**

Cases

- **Case 3 (ECQ, March 2020): 3rd Wave of Social Restrictions**
  - **ECQ** started on 22 March 2021 in Central Luzon, and Calabarzon.
  - **Treatment group = 3 provinces under MECQ in March 2021: NCR, Central Luzon,** and **Calabarzon**
  - **Control group = the other provinces**

Mean Attributes of Case 1 Samples (ECQ , Mar 2020)

	Internet	No internet	Diff	p-value
Size (employees)				
1-4	0.883	0.779	0.104	0.000
5-19	0.109	0.199	-0.090	0.000
20-99	0.006	0.016	-0.010	0.109
Sector				
Essential sector	0.253	0.410	-0.157	0.000
Nonessential sector	0.747	0.590	0.157	0.000
Age (years)				
0-5	0.564	0.605	-0.041	0.117
6-10	0.191	0.186	0.005	0.804
11-15	0.104	0.078	0.026	0.082
16-30	0.102	0.095	0.007	0.636
31+	0.038	0.036	0.003	0.801
Female employees share				
0-10%	0.574	0.448	0.127	0.000
11-30%	0.062	0.100	-0.038	0.013
31-50%	0.106	0.145	-0.039	0.034
51-80%	0.115	0.142	-0.027	0.134
81-100%	0.143	0.165	-0.022	0.259
Business performance				
Sales	-0.753	-0.796	0.043	0.009
Income	-0.749	-0.798	0.049	0.003
Salary paid	-0.649	-0.664	0.015	0.520
Employment	0.664	0.615	0.049	0.058
Better	0.153	0.171	-0.017	0.382
No Change	0.023	0.017	0.006	0.389
Worse	0.823	0.812	0.011	0.591
Observations	1442	470		

Mean Attributes of Case 2 Samples (MECQ , Aug 2020)

	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
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		

Mean Attributes of Case 3 Samples (ECQ , Mar 2021)

	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
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		

Estimation Results – Case 1 (ECQ, Mar 2020)

	Sales	Income	Wage	Employment	Business environment
All samples					
Internet	0.021	0.003	-0.026	-0.053	0.926***
	(0.045)	(0.045)	(0.073)	(0.063)	(0.330)
COVID	-0.020	-0.017	-0.102	0.012	0.908***
	(0.045)	(0.045)	(0.075)	(0.066)	(0.352)
Internet X COVID	-0.053	-0.036	0.030	-0.014	-0.952**
	(0.050)	(0.050)	(0.080)	(0.073)	(0.388)
N	1812	1812	1812	1812	1812
Essential sector					
Internet	-0.017	-0.050	0.031	-0.064	2.244***
	(0.112)	(0.113)	(0.139)	(0.144)	(0.815)
COVID	-0.094	-0.110	-0.082	0.025	1.615*
	(0.115)	(0.116)	(0.144)	(0.151)	(0.859)
Internet X COVID	0.005	0.058	0.008	0.043	-1.894**
	(0.119)	(0.120)	(0.150)	(0.159)	(0.894)
N	669	669	669	669	669
Non-essential sector					
Internet	0.031	0.021	0.036	-0.041	0.570
	(0.039)	(0.040)	(0.056)	(0.061)	(0.352)
COVID	0.003	0.017	-0.032	-0.009	0.930**
	(0.037)	(0.038)	(0.058)	(0.068)	(0.393)
Internet X COVID	-0.065	-0.071	-0.033	-0.039	-0.851*
	(0.046)	(0.047)	(0.067)	(0.079)	(0.447)
N	1143	1143	1143	1143	1143

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

Estimation Results – Case 1 (ECQ, Mar 2020)

	Sales	Income	Wage	Employment	Business environment
All samples					
Internet	0.021	0.003	-0.026	-0.053	0.926***
	(0.045)	(0.045)	(0.073)	(0.063)	(0.330)
COVID	-0.020	-0.017	-0.102	0.012	0.908***
	(0.045)	(0.045)	(0.075)	(0.066)	(0.352)
Internet X COVID	-0.053	-0.036	0.030	-0.014	-0.952**
	(0.050)	(0.050)	(0.080)	(0.073)	(0.388)
N	1812	1812	1812	1812	1812
Essential sector					
Internet	-0.017	-0.050	0.031	-0.064	2.244***
	(0.112)	(0.113)	(0.139)	(0.144)	(0.815)
COVID	-0.094	-0.110	-0.082	0.025	1.615*
	(0.115)	(0.116)	(0.144)	(0.151)	(0.859)
Internet X COVID	0.005	0.058	0.008	0.043	-1.894**
	(0.119)	(0.120)	(0.150)	(0.159)	(0.894)
				669	669
				-0.041	0.570
				(0.061)	(0.352)
				-0.009	0.930**
				(0.068)	(0.393)
				-0.039	-0.851*
				(0.079)	(0.447)
				1143	1143

Finding 1

During the first social restrictions, the impact of using internet in general was **positive**…

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

Estimation Results – Case 1 (ECQ, Mar 2020)

	Sales	Income	Wage	Employment	Business environment
All samples					
Internet	0.021	0.003	-0.026	-0.053	0.926***
	(0.045)	(0.045)	(0.073)	(0.063)	(0.330)
COVID	-0.020	-0.017	-0.102	0.012	0.908***
	(0.045)	(0.045)	(0.075)	(0.066)	(0.352)
Internet X COVID	-0.053	-0.036	0.030	-0.014	-0.952**
	(0.050)	(0.050)	(0.080)	(0.073)	(0.388)
N	1812	1812	1812	1812	1812
Essential sector					
Internet	-0.017	-0.050	0.031	-0.064	2.244***
	(0.112)	(0.113)	(0.139)	(0.144)	(0.815)
COVID	-0.094	-0.110	-0.082	0.025	1.615*
	(0.115)	(0.116)	(0.144)	(0.151)	(0.859)
Internet X COVID	0.005	0.058	0.008	0.043	-1.894**
	(0.119)	(0.120)	(0.150)	(0.159)	(0.894)
				669	669
				-0.041	0.570
				(0.061)	(0.352)
				-0.009	0.930**
				(0.068)	(0.393)
				-0.039	-0.851*
				(0.079)	(0.447)
				1143	1143

Finding 2

However, the impact of using the internet for business under the COVID restrictions was **negative**.

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

Estimation Results – Case 2 (MECQ, Aug 2020)

	Sales	Wage	Employment (permanent)	Employment (part-time)	Business 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	-0.249***	-0.137*	-0.246***	-0.267***	-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)	(0.161)	(0.773)
N	398	398	398	398	398

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

Finding 3

During 2nd wave of social restrictions, **no significant negative impacts** of using e-commerce under the COVID restrictions were observed.

(MECQ, Aug 2020)

			Employment (permanent)	Employment (part-time)	Business environment
			0.014	-0.021	-0.292
			(0.038)	(0.027)	(0.196)
			-0.246***	-0.267***	-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)	(0.161)	(0.773)
N	398	398	398	398	398

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

Estimation Results – Case 3 (ECQ, Mar 2021)

	Sales	Wage	Employment (permanent)	Employment (part-time)	Business 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)
N	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)
N	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

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

Finding 4

During 3rd wave of social restrictions, **no significant negative impacts** of using e-commerce under the COVID restrictions continued to be observed.

(ECQ, Mar 2021)

				Employment (part-time)	Business environment
				-0.060**	-0.036
				(0.025)	(0.142)
				-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)
N	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)
N	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

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

Estimation Results – Case 3 (ECQ, Mar 2021)

	Sales	Wage	Employment (permanent)	Employment (part-time)	Business environment
All samples					
E-commerce	-0.023				
	(0.027)				
COVID	-0.087**				
	(0.036)				
E-commerce X COVID	-0.015				
	(0.065)				
N	1546				
Essential sector					
E-commerce	-0.017				
	(0.047)				
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)
N	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

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

Finding 5

Moreover, the impact of using e-commerce on business environment under the COVID restrictions became **significantly positive** for essential sector

Summary of the Estimation Results

- **First wave of social restrictions (ECQ, March 2020):**
  - ✓ A **Negative** impact of using internet on business environment under the COVID restrictions was observed.
- **Second wave of social restrictions (MECQ, August 2020):**
  - ✓ **No significant negative** impacts of using e-commerce in various performance measures under the COVID restrictions were observed.
- **Third wave of social restrictions (ECQ, March 2021):**
  - ✓ A **Positive** impact of using e-commerce on business environment under the COVID restrictions was observed.

Discussion

- The use of internet for business and e-commerce did **not appear to have a direct positive effect** on MSMEs' business resilience **during the first wave of social restrictions** caused by COVID-19.
- Meanwhile, a **positive effect** on their resilience **may have started to emerge one year after the pandemic** started.
- Overall, these findings are consistent with the Indonesian case studied by Oikawa et al. (2024).

→ MSMEs **need a certain level of maturity** to effectively leverage digital tools and gain benefits.

→ The development of **digital capacity in the society (e.g., e-payment)** is essential to fully realize digital dividends (Acopiado et al., 2022).

→ **Physical infrastructure** (i.e., logistics) is necessary for fully utilizing e-commerce.

Policy Implications

- Strengthen **human capital** for digitalized business and advisory
- Encourage or incentivize registering informal businesses (**formalization**)
- Improve competitive **ICT infrastructure**, especially in rural areas
- Promote e-commerce, e-payments, and digital finance solutions through strengthened **business development services (BDS)/training programs**
- **Regulatory framework** to ensure fair competition for MSMEs as users of digital platforms

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Thank you!