

Analysis of the COVID-19 Shock, Technology and Trade

Regression Results for India and Indonesia

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1. Does Tech Adoption Affect Trade Outcomes?

These regressions aim to analyze the relationship between technology adoption and trade outcomes (such as the value of imports/exports or the propensity to import/export) for specific types of products (e.g., online tradeable products, durable/consumption goods, time sensitive goods, among others). The regression model used is as follows:

$$y_{ipt} = \alpha_0 + \alpha_1 tech_{i,t-l} \cdot category_p + \alpha_2 tech_{i,t-l} + FE_p + FE_i + FE_t + \epsilon_{ipt} \quad (1)$$

Where y_{ipt} represents the trade outcome for the firm i product p in the month t . Specifically, the outcomes variable can be the logarithm of number of exports/imports for a product p of a firm i in the month t (intensive margin), or a dummy indicating if the product p of firm i in the month t is imported/exported or not (extensive margin), we define these variables as the import/export propensity. The variable $tech_{i,t-l}$ is a dummy indicating whether the firm i in month $t-l$ (l is the number of lags taken) used an adopted E-commerce or E-payment technology. The variable $category_p$ is a dummy variable that describes the category of product p . We analyze 2 categories of products: a) Products traded online from eBay or from China e-commerce tax lists, b) BEC Classification of products to differentiate between durable and consumption goods.

The interaction term $tech_{i,t-l} \cdot category_p$ captures the relationship between technology adoption and trade outcomes for products of a specific category.

Time fixed-effects control for unobserved variables that are constant at the firm-product level but vary over time. Firm fixed-effects control for unobserved time-and-product-invariant heterogeneities across firms. Similarly, product fixed-effects control for unobserved time-and-firm-invariant heterogeneities across products.

For each product category, we present three tables, each of which is estimated with a specific lag in the technology variable (E-payment or E-commerce).

1.1 Intensive Margin Analysis

Table 1: India - Regression Results for Log. Imports and Log. Exports: e-Bay tradable, China e-commerce, Consumable and Durable products. 2-Lag in technology variable

	Dependent Variables									
	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports
E-payment or E-commerce (t-2)	0.016 (0.019)	-0.025 (0.021)	0.031 (0.021)	-0.005 (0.026)	0.025 (0.022)	-0.032 (0.030)	0.017 (0.019)	-0.035 (0.027)	0.012 (0.019)	-0.040* (0.022)
E-payment or E-commerce (t-2) \times eBay-tradable			-0.055 (0.054)	-0.070 (0.055)						
E-payment or E-commerce (t-2) \times China e-commerce					-0.028 (0.042)	0.018 (0.046)				
E-payment or E-commerce (t-2) \times Consumable							-0.012 (0.082)	0.045 (0.060)		
E-payment or E-commerce (t-2) \times Durable									0.312** (0.144)	0.405*** (0.117)
Num. Obs.	2,162,522	1,922,894	2,162,521	1,922,861	2,162,521	1,922,861	2,162,521	1,922,861	2,162,521	1,922,861
R-squared	0.444	0.47	0.444	0.47	0.444	0.47	0.444	0.47	0.444	0.47
Adj.R-squared	0.436	0.462	0.436	0.462	0.436	0.462	0.436	0.462	0.436	0.462
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

Clustered-standard errors at the firm-product level.

Table 2: Indonesia - Regression Results for Log. Imports and Log. Exports: e-Bay tradable, China e-commerce, Consumable and Durable products. 2-Lag in technology variable

	Dependent Variables									
	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports
E-payment or E-commerce (t-2)	0.029 (0.028)	0.029 (0.08)	-0.020 (0.039)	0.044 (0.08)	0.033 (0.030)	0.138 (0.089)	0.013 (0.031)	0.046 (0.083)	0.029 (0.028)	0.034 (0.081)
E-payment or E-commerce (t-2) \times eBay-tradable			0.196** (0.089)	-0.071 (0.28)						
E-payment or E-commerce (t-2) \times China e-commerce					-0.011 (0.069)	-0.389** (0.181)				
E-payment or E-commerce (t-2) \times Consumable							0.224 (0.160)	-0.210 (0.220)		
E-payment or E-commerce (t-2) \times Durable									0.097 (0.421)	-0.135 (0.280)
Num. Obs.	969,154	192,043	969,153	192,042	969,153	192,042	969,153	192,042	969,153	192,042
R-squared	0.393	0.588	0.393	0.588	0.393	0.588	0.393	0.588	0.393	0.588
Adj.R-squared	0.388	0.575	0.388	0.575	0.388	0.575	0.388	0.575	0.388	0.575
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

Clustered-standard errors at the firm-product level.

1.2 Extensive Margin Analysis

For the extensive margin analysis, we expand the dataset at the firm-month-HS6 level by using only feasible HS6 products, which we obtain through the HS4 codes. If a firm exports or imports an HS6 product, it is allowed the expansion of the firm in all months to all HS6 products in the HS4 code of the exported/imported HS6 product.

Table 3: India - Regression Results for Import Propensity and Export Propensity: e-Bay tradable, China e-commerce, Consumable and Durable products. 2-Lag in technology variable

	Dependent Variables									
	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity
E-payment or E-commerce (t-2)	-0.00006 (0.00064)	0.00007 (0.0005)	-0.0002 (0.00069)	0.00050 (0.00053)	-0.00056 (0.00065)	-0.00060 (0.00055)	0.00010 (0.00066)	-0.00019 (0.00055)	-0.00004 (0.00065)	-0.00013 (0.00052)
E-payment or E-commerce (t-2) \times eBay-tradable										
E-payment or E-commerce (t-2) \times China e-commerce					0.00226** (0.00102)	0.00231** (0.00102)				
E-payment or E-commerce (t-2) \times Consumable							-0.00183 (0.00168)	0.00153 (0.00137)		
E-payment or E-commerce (t-2) \times Durable									-0.00078 (0.00185)	0.00699** (0.00289)
Num. Obs.	86,846,928	69,771,954	86,846,928	69,771,870	86,846,928	69,771,870	86,846,928	69,771,870	86,846,928	69,771,870
R-squared	0.063	0.076	0.063	0.076	0.063	0.076	0.063	0.076	0.063	0.076
Adj.R-squared	0.063	0.075	0.063	0.075	0.063	0.075	0.063	0.075	0.063	0.075
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

Clustered-standard errors at the firm-product level.

Table 4: Indonesia - Regression Results for Import Propensity and Export Propensity: e-Bay tradable, China e-commerce, Consumable and Durable products. 2-Lag in technology variable

	Dependent Variables									
	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity
E-payment or E-commerce (t-2)	-0.00166 (0.00177)	-0.00211 (0.00665)	-0.00252 (0.00204)	-0.00155 (0.00589)	-0.00261 (0.00192)	0.00083 (0.00590)	-0.00227 (0.00207)	-0.00009 (0.00643)	-0.00163 (0.00179)	-0.00174 (0.00671)
E-payment or E-commerce (t-2) × eBay-tradable			0.00333 (0.00229)	-0.00235 (0.00496)						
E-payment or E-commerce (t-2) × China e-commerce					0.00470 (0.00410)	-0.01354*** (0.00506)				
E-payment or E-commerce (t-2) × Consumable							0.00916 (0.00951)	-0.02326*** (0.00677)		
E-payment or E-commerce (t-2) × Durable									-0.00148 (0.00353)	-0.01424 (0.00911)
Num. Obs.	20,804,600	4,176,480	20,804,600	4,176,480	20,804,600	4,176,480	20,804,600	4,176,480	20,804,600	4,176,480
R-squared	0.098	0.143	0.098	0.143	0.098	0.143	0.098	0.143	0.098	0.143
Adj.R-squared	0.098	0.141	0.098	0.141	0.098	0.141	0.098	0.141	0.098	0.141
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01
Clustered-standard errors at the firm-product level.

2. Does Existing Tech Use Mitigate COVID Impacts?

The aim of these regressions is to investigate whether companies that had adopted E-payment or E-commerce technology before 2019 were better equipped to mitigate the impacts of COVID on their product trade outcomes. The regression model is specified as follows:

$$y_{ipt} = \alpha_0 + \alpha_1 tech_i \cdot covid_t + \alpha_2 tech_i \cdot covid_t \cdot category_p + \alpha_3 covid_t \cdot category_p + FE_p + FE_i + FE_t + \epsilon_{ipt} \quad (2)$$

Trade outcomes y_{ipt} are the same as in equation (1). The variable $tech_i$ is a dummy variable indicating whether the company adopted an E-commerce or E-payment technology before 2019. $covid_t$ captures the impact of COVID using the monthly *Stringency Index*, and $category_p$ is a dummy variable describing the category of product p .

The triple interaction term $tech_i \cdot covid_t \cdot category_p$ captures the effect of the adoption of E-commerce or E-payment technology before 2019 on mitigating the impact of COVID on trade outcomes for products of a specific category. The interaction term $tech_i \cdot covid_t$ investigates whether the adoption of E-commerce or E-payment technology before 2019 mitigates the impact of COVID on trade outcomes, without distinguishing by product category. The term $covid_t \cdot category_p$ examines the effect of COVID on trade outcomes of a specific category, without distinguishing by firms' adoption of e-commerce or e-payment technologies before 2019. Finally, fixed-effects are included for product, firm, and month.

2.1 Intensive Margin Analysis

Table 5: India - Regression Results for Log. Exports and Log.Imports: e-Bay tradable, China e-commerce, Consumable and Durable products

	Dependent Variables							
	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index	0.000 (0.000)	0.000 (0.000)	-0.001*** (0.000)	0.000 (0.001)	-0.001** (0.000)	0.000 (0.000)	-0.001* (0.000)	0.000 (0.000)
Monthly Avg. Stringency Index \times eBay-Tradable	0.000 (0.000)	-0.002*** (0.000)						
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times eBay-Tradable	-0.001 (0.001)	0.000 (0.001)						
Monthly Avg. Stringency Index \times China e-commerce			0.000 (0.000)	-0.001*** (0.000)				
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times China e-commerce			0.002*** (0.001)	0.001 (0.001)				
Monthly Avg. Stringency Index \times Consumable					-0.002** (0.001)	-0.003*** (0.001)		
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times Consumable					0.006*** (0.002)	0.002** (0.001)		
Monthly Avg. Stringency Index \times Durable							-0.003* (0.001)	0.000 (0.001)
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times Durable							0.010*** (0.003)	0.006*** (0.002)
Num. Obs.	1,397,621	1,261,365	1,397,621	1,261,365	1,397,621	1,261,365	1,397,621	1,261,365
R-squared	0.445	0.486	0.445	0.486	0.445	0.486	0.445	0.486
Adj.R-squared	0.434	0.474	0.434	0.474	0.434	0.474	0.434	0.474
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

The variable E-payment or E-commerce 2019 means that the company adopted the E-payment or E-commerce technology before 2019.

Clustered-standard errors at the firm-product level.

Table 6: Indonesia - Regression Results for Log. Exports and Log.Imports: e-Bay tradable, China e-commerce, Consumable and Durable products

	Dependent Variables							
	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports	Log.Imports	Log.Exports
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index	0.000 (0.001)	-0.002 (0.002)	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)	-0.001 (0.002)	0.001 (0.001)	-0.001 (0.002)
Monthly Avg. Stringency Index \times eBay-Tradable	-0.002*** (0.001)	-0.002 (0.002)						
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times eBay-Tradable	0.006*** (0.002)	0.006* (0.003)						
Monthly Avg. Stringency Index \times China e-commerce			0.000 (0.000)	-0.001 (0.002)				
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times China e-commerce			0.001 (0.001)	-0.002 (0.003)				
Monthly Avg. Stringency Index \times Consumable					-0.002 (0.002)	-0.006*** (0.002)		
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times Consumable					0.007*** (0.003)	0.008** (0.004)		
Monthly Avg. Stringency Index \times Durable							-0.003 (0.002)	-0.007* (0.004)
E-payment or E-commerce 2019 \times Monthly Avg. Stringency Index \times Durable							0.005 (0.004)	0.013* (0.007)
Num. Obs.	737,377	160,028	737,377	160,028	737,377	160,028	737,377	160,028
R-squared	0.382	0.583	0.382	0.583	0.382	0.583	0.382	0.583
Adj.R-squared	0.375	0.567	0.374	0.566	0.375	0.567	0.374	0.567
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

The variable E-payment or E-commerce 2019 means that the company adopted the E-payment or E-commerce technology before 2019.

Clustered-standard errors at the firm-product level.

2.2 Extensive Margin Analysis

As in section 1.2, we expand the dataset at the firm-month-HS6 level by using only feasible HS6 products, which we obtain through the HS4 codes. If a firm exports or imports an HS6 product, it is allowed the expansion of the firm in all months to all HS6 products in the HS4 code of the exported/imported HS6 product.

Table 7: India - Regression Results for Export Propensity and Import Propensity: e-Bay tradable, China e-commerce, Consumable and Durable products

	Dependent Variables							
	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index	-0.000032*** (0.000010)	-0.000023** (0.000011)	-0.000049*** (0.000011)	-0.000026** (0.000011)	-0.000029*** (0.000009)	-0.000021** (0.000010)	-0.000026*** (0.000009)	-0.000017** (0.000009)
Monthly Avg. Stringency Index × eBay-Tradable	-0.000018* (0.000010)	-0.000058*** (0.000010)						
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × eBay-Tradable	0.000030 (0.000019)	0.000035** (0.000018)						
Monthly Avg. Stringency Index × China e-commerce			-0.000096*** (0.000014)	-0.000086*** (0.000011)				
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × China e-commerce			0.000121*** (0.000021)	0.000051*** (0.000016)				
Monthly Avg. Stringency Index × Consumable					-0.000060*** (0.000023)	-0.000098*** (0.000015)		
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × Consumable					0.000072** (0.000031)	0.000060** (0.000024)		
Monthly Avg. Stringency Index × Durable							-0.000010 (0.000016)	-0.000026 (0.000021)
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × Durable							0.000073** (0.000033)	0.000091** (0.000039)
Num. Obs.	57,142,584	45,382,080	57,142,584	45,382,080	57,142,584	45,382,080	57,142,584	45,382,080
R-squared	0.065	0.077	0.065	0.077	0.065	0.077	0.065	0.077
Adj. R-squared	0.065	0.077	0.065	0.077	0.065	0.077	0.065	0.077
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

The variable E-payment or E-commerce 2019 means that the company adopted the E-payment or E-commerce technology before 2019.

Clustered-standard errors at the firm-product level.

Table 8: Indonesia - Regression Results for Export Propensity and Import Propensity: e-Bay tradable, China e-commerce, Consumable and Durable products

	Dependent Variables							
	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity	Import Propensity	Export Propensity
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index	-0.000053* (0.000029)	-0.000113 (0.000116)	-0.000049* (0.000028)	-0.000086 (0.000109)	-0.000022 (0.000026)	-0.000087 (0.000121)	-0.000015 (0.000025)	-0.000105 (0.000133)
Monthly Avg. Stringency Index × eBay-Tradable	-0.000039*** (0.000014)	0.000020 (0.000078)						
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × eBay-Tradable	0.000149*** (0.000053)	0.000073 (0.000114)						
Monthly Avg. Stringency Index × China e-commerce			-0.000044** (0.000020)	0.000039 (0.000120)				
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × China e-commerce			0.000168*** (0.000048)	-0.000023 (0.000123)				
Monthly Avg. Stringency Index × Consumable					-0.000057 (0.000042)	0.000020 (0.000167)		
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × Consumable					0.000124 (0.000099)	-0.000042 (0.000169)		
Monthly Avg. Stringency Index × Durable							0.000028 (0.000022)	-0.000043 (0.000113)
E-payment or E-commerce 2019 × Monthly Avg. Stringency Index × Durable							0.000036 (0.000073)	0.000047* (0.000233)
Num. Obs.	15,259,464	3,293,892	15,259,464	3,293,892	15,259,464	3,293,892	15,259,464	3,293,892
R-squared	0.1	0.151	0.1	0.151	0.1	0.151	0.1	0.151
Adj. R-squared	0.099	0.149	0.099	0.149	0.099	0.149	0.099	0.149
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

The variable E-payment or E-commerce 2019 means that the company adopted the E-payment or E-commerce technology before 2019.

Clustered-standard errors at the firm-product level.