

Digitalization, Firm Performance, and Internationalization of Micro Firm in India

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Outline

- 1 Introduction
- 2 Data & Methodology
- 3 Empirical Findings
- 4 Conclusion

The Rise of Digitalization

- Digitalization has altered the business and production landscape
- Rapid strides in ICT has reduced distance and lowered coordination & entry costs for firms (Cassetta et al., 2020).
- Digitalization and investment in ICTs which leads to operational efficiency for firms, greater innovation impetus, and improved resource allocation (Yoo et al., 2010)
- Provides firms with a repository of real-time data that induce efficient inventory management practices and improved capacity planning (Wroblewski, 2018)
- Digitalization is key for both sustaining production activities, but also for leveraging digitalization for improved economic gains (Hoekman & Shepherd, 2015 ; Taglioni & Winkler, 2016).

Existing Evidence

- The literature on ICT from a firm perspective has largely focused on two aspects - Productivity & Trade
- Studies document a positive impact of digitalization on firm productivity and internationalization (Manyika et al., 2015 ; De Marchi et al., 2018 ; Gopalan et al., 2023)
- At the backdrop of Covid-19, literature also documents that digitalization enables greater resilience and robustness of firms (UNIDO, 2021 ; Miroudout, 2020)

What do we contribute ?

- Despite its importance, there remain significant gaps in the literature.
- First, digitalization is a complex measure, however the literature has largely focused on firm's investment in ICT as opposed to the adoption
- To overcome this, studies resort to measure of website adoption, or email usage as adoption metrics.
- These measures fail to capture multitude of different adoption parameters.
- Our study bridges this gap by looking at twelve parameters of digital adoption.
- Specifically, we focus on digital adoption from a financial perspective, which remains unexplored in the literature.

What do we contribute ?

- Second, the existing literature at the firm level is largely focused on the case of large firms with little emphasis on the case of MSMEs
- Within this limited evidence of MSMEs, most studies fail to factor in the role of micro firms
- We bridge this gap by focusing on 836 Indian micro firms
- By doing so, we also provide evidence from a developing economy perspective
- **Objective** : Examine the role of digital adoption on firm performance and internationalization of Indian micro enterprises.

Why India ?

- Rapid push towards digitalization
- Real-time payments transactions **48.6 billion** in 2021 compared to 18.5 billion transactions for China (IGPP, 2023)
- Businesses using computers have increased from 52 % in 2004 to nearly **77%** in 2018 (UNCTAD Stats, 2023).
- Over **95%** of large enterprises used computers compared to less than **50%** for micro firms (IGPP, 2023)
- Kaka et al. (2019) : McKinsey report - Highest and fastest growing digital consumer market
- Kaka et al. (2019) - productivity improvement unlocked by the digital economy can create up to 65 million jobs by 2025, with many requiring digital skills.

Why Indian Micro Firms ?

- India is home to 63 million MSMEs ; employs to 111 million workers and contributes 29 % of GVA to India's GDP, 40% in manufacturing GVA, and 45% in overall exports.
- However, of these 63 million MSMEs 99.83% of these firms are micro in nature (Raghuvanshi et al., 2019).
- MSMEs are the backbone of the Indian economy but the, focus of the existing studies is largely on SMEs rather than micro firms due to the data availability.

Data Source

- We use a unique survey-based database sourced from the World Bank Enterprise Survey on Micro Firms (ESM).
- The firms surveyed are formally registered businesses in non-agricultural sectors
- Survey provides key firm-level information on firm sales, exports, imports, finance, crime, ownership, business environment
- Our final sample consists of 836 micro firms spread across nine cities.
- Data is cross-sectional in nature and is for the time period 2022.

- ESM has some key advantages over other existing database covering Indian firms.
- First, ESM collects information on various facets of digital use in firms day-to-day business activities.
- Second, most of the existing databases on India are not representative of micro firms (Say CMIE-Prowess)
- On the other hand, databases such as National Sample Survey Organization (NSSO) and Fourth All-India Census of MSMEs 2006, do not have intricate detailed information on various use of digitalization by micro firms.
- Therefore, given these distinct advantages, we use the ESM survey database for our study.

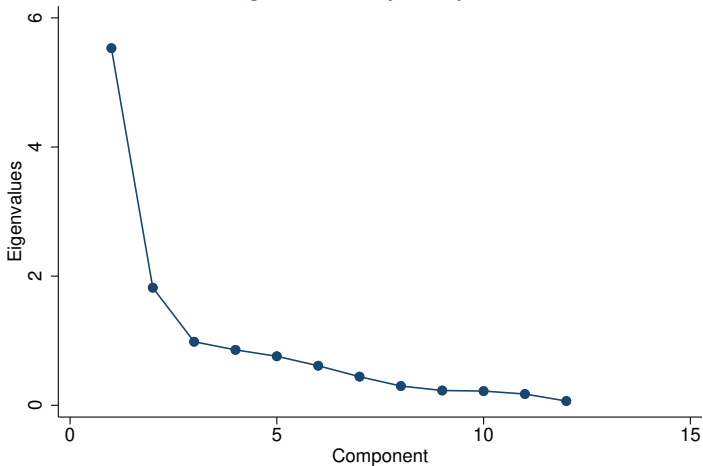
Digitalization Index

- Digitalization represents a complex phenomenon that encompasses a multitude of factors
- Haller & Siedschlag (2020) proxy firm digital adoption via their use of website services and acceptance of online payments.
- we create a multi-dimensional index that focuses on digital adoption of the firm.
- Higon & Bonvin (2023) also create a multidimensional index but their index focuses on ICT capital, ownership of domains, digital aspects related to human capital, and extent of automation.
- We focus on aspects of digitalization from payments, inventory and interaction perspective.

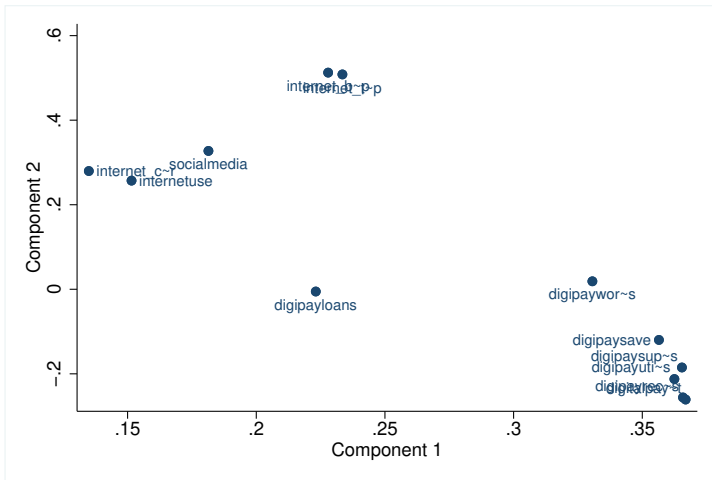
Table 1 – Summary Statistics - Digital Adoption

Variable	Description	Obs	Mean	Min	Max
Use Internet	=1 if firm uses internet	836	0.804	0	1
Buy Inputs	=1 if firm uses internet to buy inputs	836	0.628	0	1
Track Inputs	=1 if firm uses internet to track inputs	836	0.629	0	1
Customer Interaction	=1 if firm uses internet to interact with customers	836	0.877	0	1
Social media	=1 if firm uses social media	836	0.373	0	1
Digital payments	=1 if firm uses digital payments	836	0.688	0	1
Pay suppliers	=1 if firm uses digital payments to pay suppliers	836	0.58	0	1
To Save	=1 if firm uses digital payments to save	836	0.541	0	1
Pay Utility Bills	=1 if firm uses digital payments to pay utility bills	836	0.587	0	1
Receive Payment	=1 if firm uses digital payments to receive payments from customers	836	0.657	0	1
Pay Loans	=1 if firm uses digital payments to pay loans	836	0.213	0	1
Pay Workers	=1 if firm uses digital payments to pay workers and family	836	0.439	0	1

Eigenvalues by component



Variable loading to Component 1 & 2



Methodology

Firm Performance

$$Y_{ic} = Digitalization_{ic} + Z + \epsilon_{ic} \quad (1)$$

- Y represents firm performance
 - Firm Sales
 - Firm Productivity
- We estimation Equation 1 using OLS

Firm Exports

$$Pr(Export_{ic} = 1) = \phi(\alpha_1 + Digitalization_{ic} + Z + \epsilon_{ic}) \quad (2)$$

- Dependent Variable is firm Exports
- We estimation Equation 2 using Probit model

Table 2 – Summary Statistics - Other Variables

Variable	Description	Obs	Mean	Min	Max
Log Productivity	Ln of output per workers	723	13.179	10.021	17.034
Ln Sales	Log of Sales	814	13.892	10.463	17.728
Export	=1 if Firm Exports	836	0.164	0	1
Log Age	Log of number of years firm has been in operation	836	2.529	1.099	4.143
Sole	Sole proprietor firm	836	0.959	0	1
Female Owned	Female owned firm	836	0.055	0	1
Access to finance	=1 if day to day operations are financed from bank	836	0.337	0	1
Log SDP	Log of state domestic product	836	16.917	14.139	18.537
Log Tele	Log of telephones per 100 population	836	4.57	4.21	5.452

Table 3 – Baseline Estimates

	OLS (1)	OLS (2)	Probit (3)
	Ln Sales	Ln Productivity	Exports
Principal Component-1	0.089*** (.015)	0.048*** (.016)	0.0140** (0.00575)
Principal Component-2	0.139*** (.024)	0.076*** (.027)	0.0258*** (0.00955)
Ln Age	.211*** (.058)	.143** (.063)	0.0703*** (0.0225)
Sole	-.259 (.164)	-.349** (.176)	-0.00592 (0.0623)
Female Owned	-.219 (.147)	-.045 (.167)	0.0972* (0.0507)
Access to Finance	.174** (.074)	.166** (.082)	-0.0325 (0.0281)
Ln SGDP	.213*** (.028)	.207*** (.029)	-0.0331*** (0.00979)
Ln Tele	1.027*** (.099)	.745*** (.111)	0.0400 (0.0367)
Firm-Level Controls	Yes	Yes	Yes
State-Level Controls	Yes	Yes	Yes
Manufacturing FE	Yes	Yes	Yes
Observations	814	723	836

Table 4 – Digital Adoption and Firm Sales

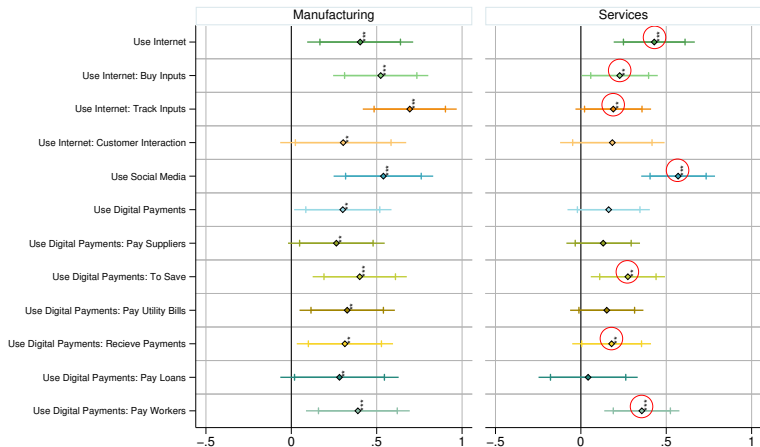
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales	Log sales
Internet Use	.528*** (.078)											
Buy Input		.352*** (.068)										
Track Input			.397*** (.068)									
Customer Interaction				.234** (.093)								
Social Media					.589*** (.07)							
Digital Payment						.21*** (.074)						
Payment to Suppliers							.175** (.07)					
Save								.334*** (.068)				
Utility Bills									.212*** (.069)			
Receive Payments										.23*** (.072)		
Pay Loans											.182** (.089)	
Pay Workers												.369*** (.072)
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manufacturing FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	.228	.214	.221	.195	.258	.198	.196	.213	.199	.2	.194	.217
Observations	814	814	814	814	814	814	814	814	814	814	814	814

Table 5 – Digital Adoption and Firm Productivity

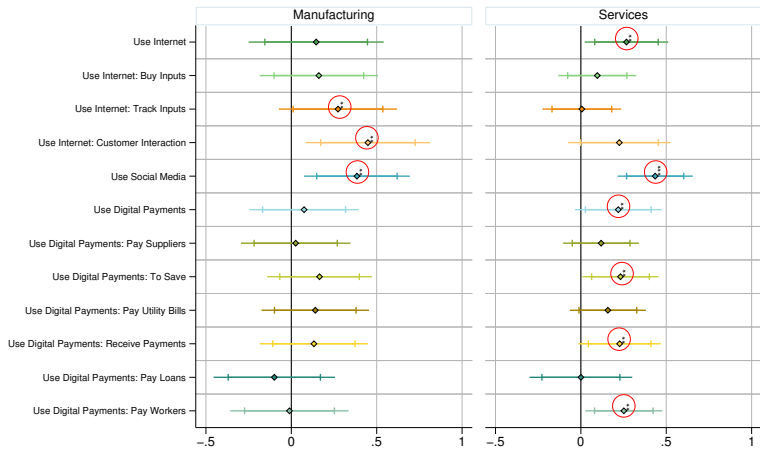
	(1) LP	(2) LP	(3) LP	(4) LP	(5) LP	(6) LP	(7) LP	(8) LP	(9) LP	(10) LP	(11) LP	(12) LP
Internet Use	.316*** (.091)											
Buy Input		.126* (.074)										
Track Input			.107 (.075)									
Customer Interaction				.305*** (.092)								
Social Media					.458*** (.073)							
Digital Payment						.115 (.079)						
Payment to Suppliers							.063 (.074)					
Save								.187*** (.072)				
Utility Bills									.122* (.073)			
Receive Payments										.157** (.077)		
Pay Loans											-.02 (.091)	
Pay Workers												.142* (.076)
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manufacturing FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	.136	.125	.124	.131	.168	.124	.123	.13	.125	.127	.122	.126
Observations	723	723	723	723	723	723	723	723	723	723	723	723

Table 6 – Digital Adoption and Export Participation

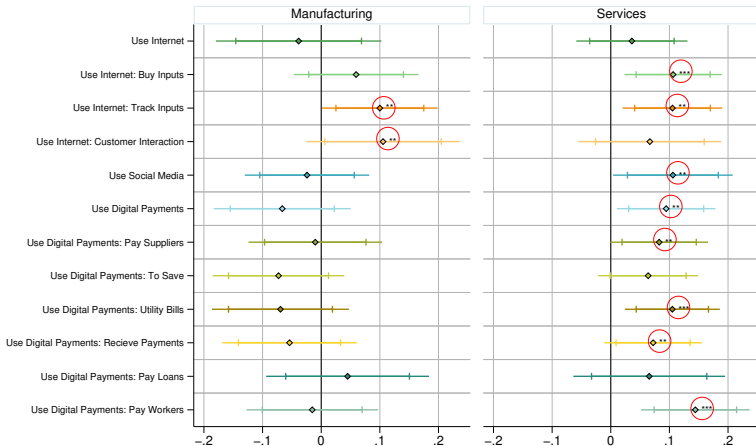
VARIABLES	(1) Export	(2) Export	(3) Export	(4) Export	(5) Export	(6) Export	(7) Export	(8) Export	(9) Export	(10) Export	(11) Export	(12) Export
Internet Use	0.0983 (0.143)											
Buy Input		0.360*** (0.119)										
Track Input			0.451*** (0.121)									
Customer Interaction				0.361** (0.183)								
Social Media					0.152 (0.115)							
Digital Payment						0.0705 (0.117)						
Payment to Suppliers							0.212* (0.114)					
Save								0.0131 (0.112)				
Utility Bills									0.133 (0.113)			
Receive Payments										0.0494 (0.114)		
Pay Loans											0.216 (0.138)	
Pay Workers												0.348*** (0.114)
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manufacturing FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	836	836	836	836	836	836	836	836	836	836	836	836



Impact of Digitalization on Firm Sales: Manufacturing vs Services

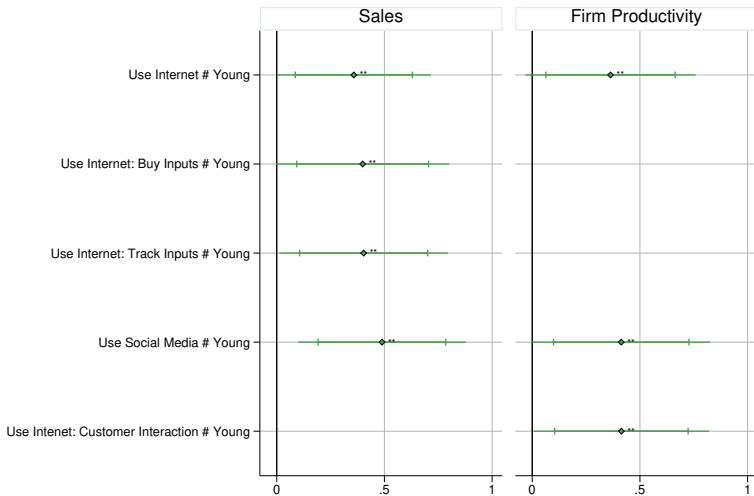


Impact of Digitalization on Firm Productivity: Manufacturing vs Services



Impact of Digitalization on Firm Exports: Manufacturing vs Services

Young Firms



Conclusion

- Examine the role of digital adoption on firm sales, productivity, and export performance of Micro firms
- Use survey data on 836 Micro firms for the year 2022
- We use 12 parameters of digital adoption, focusing on customer interaction, inventory management, and digital payments.
- we find that digital adoption is significantly associated with improvement in firm sales, output per worker, and increases the probability of firms export participation.
- Customer interaction, especially social media engagement is key for improving firm sales, and productivity.
- However, use of digitalization for efficiency in purchase of inputs, tracking of inputs and payment to suppliers results in higher exporting probability for a firm.

Thank You !