Do e-commerce impact small enterprises and employment in India?

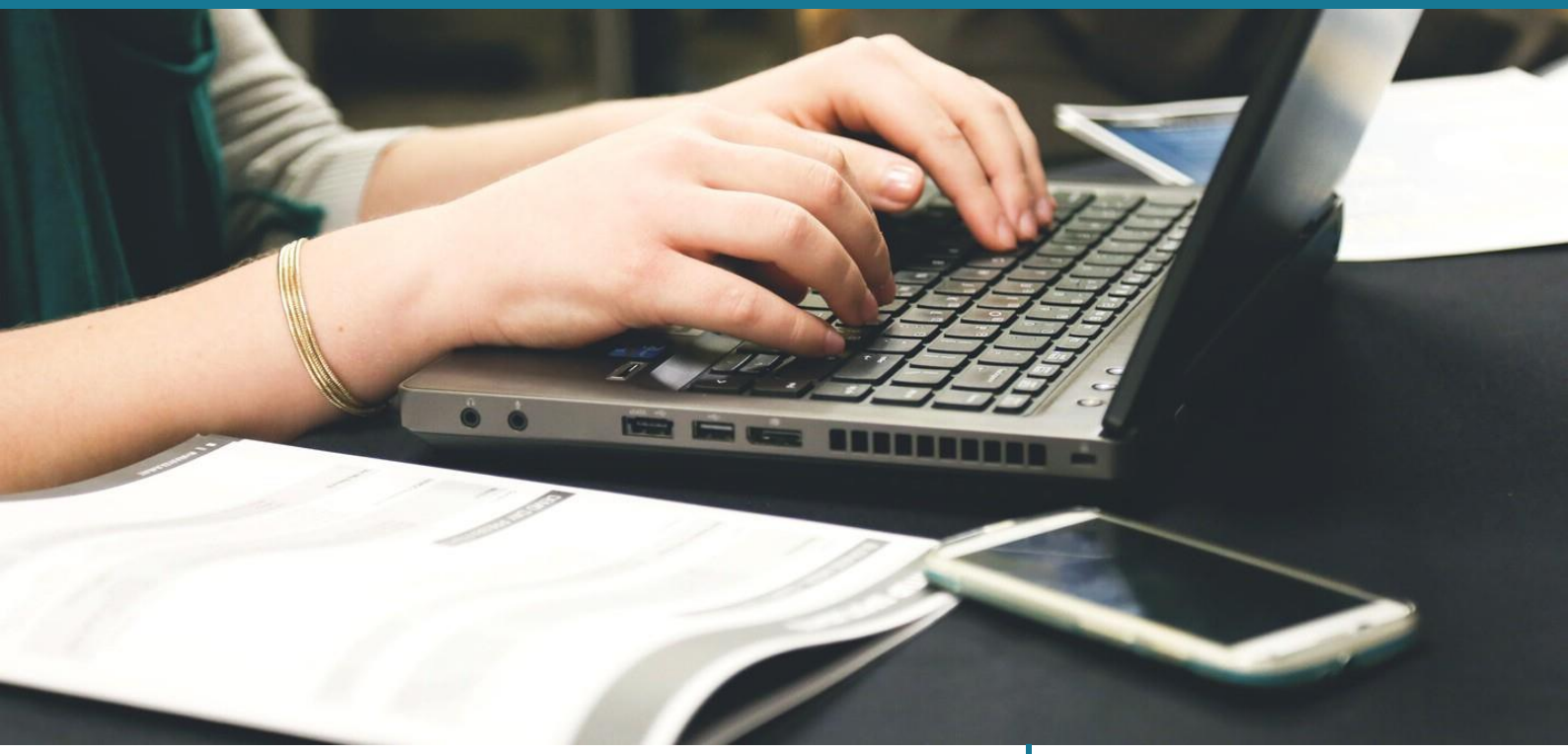

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Table of contents

List of Figures

List of Tables

Executive Summary

We present clear evidence for the impact of digital technologies on micro-enterprises and self-employment. It resonates with advantages to enterprises adopting digital technologies in value creation and last-mile delivery. Embracing technology is also crucial to generating jobs.

Since 2020, there have been far-reaching changes in the Indian economy. With the outbreak of Covid-19, e-commerce became pivotal to Indian retail across regions. While more consumers switch over to digital platforms for purchases, many micro and small enterprises participate in the emerging value chains. Moreover, it has transformed self-employment from a traditional location-dependent system to flexible virtual- social networks.

This report examines sizeable sample-based microdata, an all-India sample survey, and voices from the field. The objective is to assess if digitalization impacts value creation and employment. The findings from diverse sets of data provide evidence for the positive impact of the technologies. Moreover, the results remain valid across geographies. The report begins with the microdata analysis of unorganized enterprises from the National Sample Survey Seventy-Third round. It consists of data for approximately 0.3 million units. Internet use by enterprises acts as a measure of digitalization. There is an apparent gain for adopters of technology over non-adopters. The incremental benefits translate to increases in value-addition, employment, productivity and assets for the units.

The evidence is far from being serendipitous. We scrutinize evidence for its size induced bias. Figures A and B describe the story. The adoption of technology varies across India. Some big states have emerged as hot spots for technology adoption and value creation, especially Gujarat, Maharashtra, Uttar Pradesh and Tamil Nadu. However, the digital divide is a constraint to the transformation. North-Eastern states are an exceptional case of less adoption but moderate value creation. It is a silver lining. For users of digital technologies, value addition is 1.5 times higher than it is for non-users. Adopters of digital technologies for trade generate 40 percent more employment than non-adopters do.

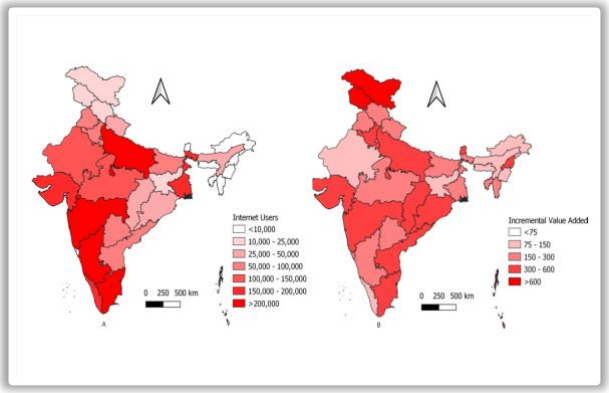

FIGURE A: NUMBER OF INTERNET USERS AND INCREMENTAL VALUE ADDED

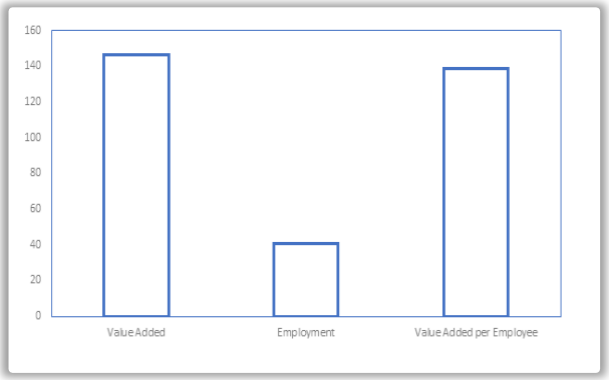

FIGURE B: INCREMENTAL CHANGE FOR INTERNET USERS OVER NON-USERS (%)

Again, productivity (value-added per employee) is 1.5 times higher for adopters. This story of incremental benefits for users is not nearly a chance. In terms of employment, value-added and asset, users form a distinct

cluster from non-users. It foretells what awaits microenterprises and livelihoods in India.

The distinction between users and non-users is manifestly clear from the interactive plots of these variables presented in figure C. The mixing up of these groups is rather exceptional. Instead, both look visibly different. Users concentrate in the quadrant of high-value addition and high employment.

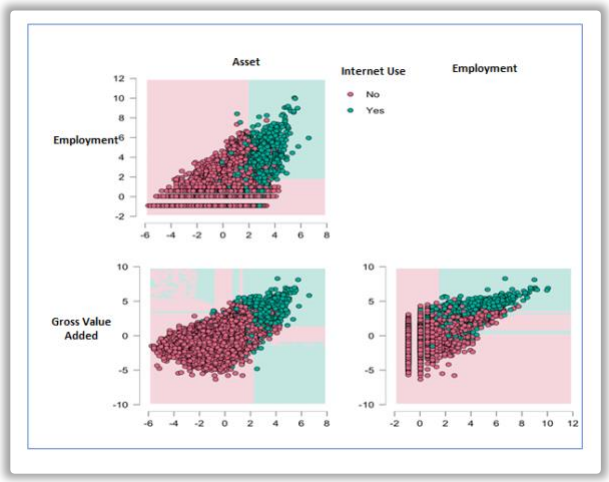

Figure C: Classification of Enterprises through Random Forest algorithm

The survey data draws up exciting patterns. We update the hypothesis of no difference between users and non-users with evidence from the field. From figure D it is observed that for the value of sales and employment, there is an edge for users. It's evident from the probability distribution presented in the figure. For the value of sales, there is a separation between users and non-users. However, for employment, there is a slight overlap. Tier 2 cities are ahead of tier 1 in the value of sales. For employment, there is no difference between these cities.

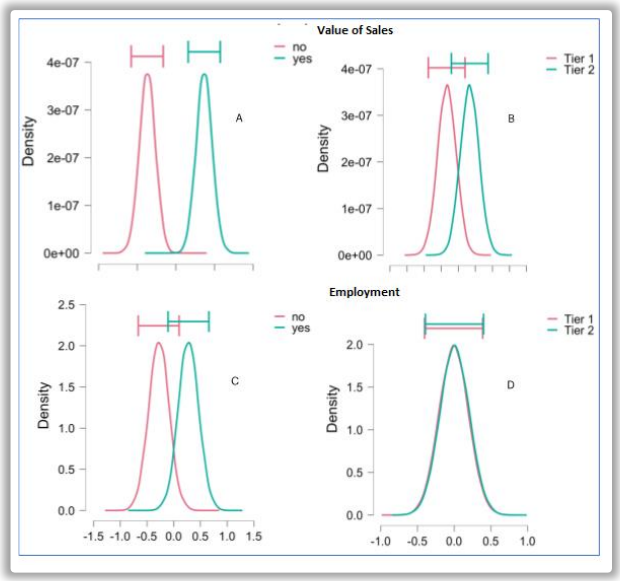

Figure D: Posterior density for the value of sales and employment across different categories

Coming to the actual figures of sales revenue obtained from the field, Table A, it supports the argument of positive impact of digitisation of the firms. It can be observed here that digitized firms are having more than double the revenue across regions and cities.

Table A: Median Difference in revenue across categories for region, tier 1 & tier 2 cities

Criteria	Median Revenue	
	Digitalized	***Non-digitalized***
Region		
North	2.00 M	0.75 M
South	1.50 M	0.95 M
East	1.50 M	0.75 M
West	5.00 M	0.80 M
City		
Tier 1	1.64 M	0.50 M
Tier 2	2.50 M	0.90 M

Note: values in Million ₹

The incremental value of sales remains higher for users over non-users of digital technologies across regions and cities. The premium enjoyed by the users is not a matter

of chance but a statistically validated difference across samples (figure E). Another crucial outcome is employment. Users generate more employment than non-users do. In contrast, users incur lesser costs than non-users. The same is also valid for productivity. The survey reveals that freely available digital technologies are visibly popular with enterprises. Covid-19 seems to be a game-changer. As evident from the survey, it brought more firms to use digital platforms.

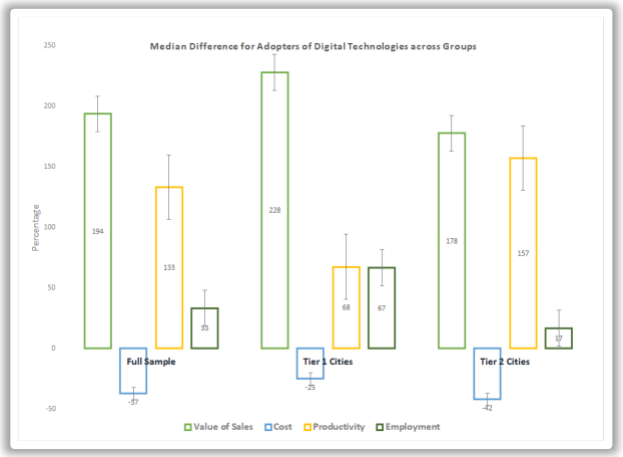

Figure E: Median Difference (%) across categories for full sample, tier 1 & tier 2 cities

Adopting digital technology contributes to business expansion, market coverage and modification of the workplace. Another crucial outcome is the development of new products. A few units began exporting after the adoption of new technologies. Across generations, the adoption of digital technologies yields better payoffs. Participation of women is higher for technology users. Field narratives throw some concerns. Primarily, it's about the digital divide. Lack of digital literacy is the primary reason for non-adoption. For instance, a 46-year-old male textile store owner from Patna states:

I've only had primary education, and I'm unaware of new technology. My sons are educated, and maybe in future, they will run the business in new ways and forms.

The narratives presented in the study allow us to conclude that e-commerce participation leads to enterprise prosperity. For instances, a 44-year-old women own account worker who runs an online tuition says:

> *Through e-commerce I can find an income sitting home without compromising my family needs…. Covid has increased my students base, and I even have students from UAE and Cairo*

A 25-year-old women jewellery maker views:

> *I use communication e-commerce mostly since it is free. I could easily manage it using my mobile…. I have a great fan following in Instagram, Facebook, and Snapchat, which has followers from abroad. I also ask my friends and families to share my post…*

Digital technologies positively impact microenterprises and self-employment. However, their potential remains unutilized in India. Making digital transformation an inclusive process is crucial to harness the potential. It involves skilling and re-skilling, especially for the workforce in the transition stage. Irrespective of the existing state of knowledge, digitalization will grow. It changes the scope of occupations. The digital processes are likely to complement some prevalent practices. It's crucial to align skilling and entrepreneurship with this transformation.

1. Introduction

Although the Indian economy has been steadily growing since the early millennium, job creation has been relatively slow. National Sample Survey Organisation reports that; in India, regular wage jobs form just one-fourth of employment. More than a half of the workforce is self-employed. Moreover, more than 90 percent are small and micro enterprises out of sixty million enterprises. Many of these enterprises are own-account units driven by the self-employed. This structure has been stable over the years. However, most self-employed are classified as vulnerable[1] and struggle to meet both ends. The precarity gets amplified with pandemics like Covid-19. In this context, digital technology is emerging as a crucial resource for running small and micro-enterprises. It is likely to be an indispensable factor for business performance in the future. Irrespective of the scale of operations, it will play a pivotal role in positioning the enterprise in an interdependent business system. These technologies are essential to attain diverse efficiencies, whether from the supply side or demand side. Like any technology, there are two classes here: adopters and non-adopters. Some in the business system subscribe to it. In contrast, the other group is still embracing it. It implies that the choice has some interesting outcomes. Is it beneficial for small, medium, and micro enterprises or self-employed to be a part of digital technologies?

An exciting characteristic of digital technology is its existence in a networked world. In this context, there is considerable overlap between society and business. A classic case is that networks like WhatsApp cater to both social and business requirements for the same set of users. However, businesses based on these technologies can be challenging for people who lack exposure to digital skills. And, it's important to note that the digital divide remains unresolved. Nevertheless, the silver lining is that the size of adopters is on exponential growth in economies like India. Users are from different socioeconomic strata and diverse geographies.

Unlike the developed economies, self-employment is substantially higher than the wage employment in India. The former is a bit more than half while the latter is just one-fourth. The drivers of most self-employed entities are single owners, called own account workers. However, a few of these entities employ workers or family members. Most of these units face multidimensional challenges like a lack of predictability in coordinating demand and supply. Instead, a conventional self-employment entity often resorts to informal social networks for coordinating the information. On the other hand, moderate to large-sized business units can afford to have more nuanced information systems that generate data on transactions and the market. With the advent of digital systems, small units[2] can have better access to markets and

[1] https://ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_631497.pdf
[2] The Ministry of Micro, Small & Medium Enterprises of Government of India has defined the Micro and Small enterprises under the provision of Micro, Small & Medium Enterprises Development (MSMED) Act.

transactions. Thus, it reduces uncertainty to an extent. Presumably, adopters are likely to have some edge over non-adopters regarding the value of business, employee, productivity, buyers and suppliers. If adoption grows significantly, there will be economy-wide benefits in terms of employment. Therefore, it's crucial to examine whether digital technologies benefit small enterprises.

Although self-employment remains the principal livelihood in India, it's far from being decent work. Instead, it's a repository of low-value addition, low wages, low productivity and precarious employment. It's a challenge to the social sustainability of India unless it goes through a structural change. It's crucial to think what brings prosperity to this segment. It's a theme for transformation. A major constraint that limits these entities is the space. Unlike in agglomerative metropolitan cities, the second-tier towns may rely more on regular customers. However, for the enterprise to grow, its crucial to have new customers also. Digital technologies are flexible enough to connect with new clients irrespective of the location. Furthermore, business units can assure more efficient last mile delivery through the adoption of digital systems. Since the concept of space and transactions become more flexible, it lets the enterprise to build a network of employees and affiliates. It will have profound implication on employment at a macro scale. In this context the research examines the following.

1) Analyse if the digital economies directly impact the outcome of small enterprises, self-employed persons, and wage labour. The outcomes in consideration are of three types: profit or surplus, value-added, and wages. It also captures if the measured impact of digitalization is substantially higher than that of scenario of non-digitalized.
2) Examine if digitalization generates efficiencies or economies in labour productivity and input usage. In doing so, the evidence for this effect will be compared with a situation of enterprises or entrepreneurs not subscribing to e-commerce.
3) Understand if digitalization fosters both domestic business and exports. Specifically, whether is it serendipity, or is it an explained variation observable from the data?
4) Finally, engage in a perspective building on the impact of major e-commerce players on digitalisation of small business in India.

The report is organized in five sections. Section two reviews the literature. The methodology is covered in section three. The fourth section analyses the microdata of enterprise's internet usage. The analysis of the survey data is presented in section five. Finally, the sixth section concludes the report.

2. Review of Literature

For micro and small enterprises and self-employed persons, its crucial to upgrade the business they are in, especially to generate a higher value added[3]. Digital technologies are indispensable for aligning these units with networked markets. Adopting digital technologies helps in two ways. First, it improves the internal processes, particularly the labour productivity. Second, it enables better co-ordination with suppliers and buyers. On the other hand, non-adoption may offer limited choices to cope with different sorts of transaction costs[4].

2.1 Introducing the Digital Economy

The emergence of the digital economy and Information and Communication Technologies (ICT) has been a breakthrough over the last two decades. Digitalization refers to the use of ICT in the production and consumption systems. The interplay is a phenomenon visible over the recent decade (Acemoğlu & Restrepo, 2019; Cariolle et al., 2019; Antonelli, 2009). Williams (2021) estimates that the digital economy accounts for three per cent of the international employment opportunities and five per cent of the international Gross Domestic Product (GDP). On the producer side, introducing digital technologies enhance productivity, reduces business costs and information asymmetry, cuts barriers to entry and improves the accessibility of international markets. The benefits on the consumer side are reduction in prices, accessibility to products from different producers, and convenience of the direct delivery of products reducing transactions cost.

Moreover, regional markets for a digitalized start-up within developing nations and digital firms in the global south provide an escape avenue from ineffective labour markets and corrupt markets. Many countries use ICTs to drive economic growth, innovation and employment. For developing economies, digital economies are advancing exponentially in the range of 15 - 25% per cent annually and offer much scope (Williams, 2021). Regardless of the opportunities, there also exist vital threats like exclusions from opportunities due to primitive digital technologies and skills, especially in developing nations. Further, issues also exist concerning resources constraints, institutional frameworks, marginalization of employees and vulnerabilities around digital privacy and security.

Over time various definitions of the digital economy have emerged in the extant literature depicting the trend prevalent during the preceding years. The early ones concentrate on the internet, portraying its percolation in the late 1990s and early 2000s as a significant stream of technological development within the economy. The later illustrations also introduce novel technologies like mobile networks, big data and

[3] Value Added = Revenue – Input Cost
[4] It includes cost due to co-ordination failures

cloud computing. The most recent definitions of a digital economy present it as an economy referenced by digital initiatives. For instance, Campbell (2021) reasons that the digital economy encompasses economic activities over two dimensions. The first is information-based, and consists of essential functions like placing data on websites. In essence, it relates to the capacity of the web to permit digital transactions (e-commerce, for example). The scope of the digital economy in this sense spreads over the following domains. It involves the digital delivery of goods and services like software sales, internet data services and online education. It is also associated with IT-intensive goods and services like engineering designs and accounting services, where telecommunications get bundled up with Information Technology (IT) goods and services.

One of the earliest definitions of a digital economy prevalent during the 1990s owes its origin to the Organization for Economic Cooperation and Development (OECD). It defines the digital economy as the interlinking of service and manufacturing industries, which display, transmit and capture data electronically (Williams, 2021). The digital economy as a term is supposed to have been coined by Lauscher (2019). The idea is to illustrate the connection between novel economies, novel businesses and novel technologies and how they support each other. Here the focus is not only on technology but also on humans using technology, thus connecting creativity, knowledge and intelligence for a breakthrough in social and wealth development (Williams, 2021; Lancaster, 2019). Mahmod (2017) views it as the convergence of ICT with computing, facilitation of technology and data and enhancing the business environment.

The term digital economy owes its origin to Salem and Purusheva (2018). They compare the foundations involved in a digital economy to one without it. The study identifies the drivers of a digital economy: (i) developing the web, (ii) electronic e-business among organizations, (iii) digital delivery of goods and services, and (iv) retailing of tangible products. Chouhan et al. (2018) view it from the digital dimensions of business change, labour, competition, and the overall economy. Szeto (2018) classifies digitalized economies in four sections: high-digital goods and services; mixed digital goods and services; IT-based intensive service of production; and the IT industry.

Similarly, Daoud (2000) explains the digital economy to comprise e-business and e-commerce components during the previous decade. It distinguishes between the two as e-commerce represents the value of services and products sold over computer-aided networks. At the same time, e-business is the organizational process over computer-based networks. Likewise, Ai (2005) conceptualises digitalized economies to encompass IT infrastructure quality and usage of IT capacity by governments, businesses and consumers. Therefore, the operationalization was broader, covering organizational environment, cultural and social environment, legal ecosystem, governmental policies and mission, and business and consumer adoption (Williams, 2021). The role of regulations and competition is emphasized by Schon (2019) while also bringing in the role of

open and closed platforms. The scope of the digital economy is broader in Kumar and Yadav (2015), where it refers to the international network of social and economic activities allowed by digital technologies. In this context, the major components of such a system are the environment, readiness and the concentration of policy approaches to develop a digitalized economy. On a similar note, Sharma and Jain (2016) concentrate on the concept of web economy, which includes international e-business but at the same time identify the role of finance, innovation and organizational frameworks. Weng and Mi (2006) recognize the accessibility of goods and services and the application of digital technologies for businesses. Here, the scope is more towards establishing protocols to support and regulate the digital economy.

2.2 Digital Technologies and Small Enterprises

The cross-border technology transfer and spillover of knowledge created as a result of globalization (Audretsch et al., 2014; Sun, 2010; Eden et al., 1997; Grossman & Helpman, 2015) have enabled the small enterprises of the developing countries to introduce innovation and achieve growth (Matthews, 2007; Barbero et al., 2011; Higon, 2012).

Digital uptake by small enterprises is intense (Haller & Siedschlag, 2011; Olise et al., 2014) and has introduced structural changes to how a traditional enterprise operates. The Economics of digitization is not causing scarcity but is opening abundance opportunities, especially since the the Covid-19 pandemic. Small enterprises' technology capacity-building process will spur the nation's growth rate. It already contributes to the bulk of India's exports and industrial base, almost 50% of the industrial output and 30-40% of employment in the private sector. Cull of all, the third industrial revolution is on the flow (Brynjolfsson & McAfee, 2011).

Digitalization simplified the venturing process, reducing the need for physical space and direct interaction of the parties involved, especially post the pandemic Covid 19 (Liagkou & Stylios, 2019; Viswanathan & Telukdarie, 2021). Internet and mobile phones being the focal points, the scope for entrepreneurship has gotten wider (Dholakia & Kshetri, 2004; Marmaridis, 2009; Prasarry et al., 2015). Digitalization has opened enormous entrepreneurial opportunities for individuals and helped existing ventures expand their reach (Acs & Ndikumwami, 1998; Acs & Sanders, 2012). Entrepreneurship has become a vital driving factor of economic growth. Promoting SMEs has become the synonym for promoting the nation's business environment (Rivza et al., 2019). The digital environment stimulates entrepreneurial intentions (Ben Youssef et al., 2021; Huđek et al., 2021) and helps SMEs innovate and expand operations.

Technology uptake positively impacts economic growth by facilitating efficient manufacturing, augmenting human capital, and research & development (Avgerou, 1998, 2003; Kuznetsova et al., 2019; Schneider, 2018).

Indian economy is characterized by its informal nature, and most of its jobs come from the Micro, Small and Medium enterprises (MSME) operating in it. Numerous studies show that small businesses' performance is vital to Indian economic development (Gupta & Nanda, 2015). According to Economic Census 2016[5], there are 58 million enterprises in India, and nearly 72 % of units are own account entities without any hired workers. Small enterprises in India profoundly benefit from ICT[6]. Its adoption creates an advantage over non-users, especially in surplus and value addition

MSMEs in developing countries, like India, often run their operations with the support of an information system (Kassim et al., 2012; Quaosar & Rahman, 2021). Small enterprises suffer from a capital shortage for expansion, and they bridge this gap by building from the knowledge spillover (Altenburg, 2000; Del Giudice et al., 2019; Dewan & Kraemer, 2000). The faster innovations in the technology industry and cutthroat competition have enabled Indian enterprises to digitalize their operations, including human resource management (Gera & Singh, 2019; Gulati, 2004; Nair & Prasad, 2002; Rishi & Saxena, 2004). Information systems have enabled firms to easily automate the routine activities of the human resource department and introduce a self-service function to employees. The prices of ERP solutions have reduced compared to the previous decade and are affordable to many well-performing small entrepreneurs. Digitalization has helped the Indian SMEs improve the quality of decision-making (Curraj, 2018), performance of the staff (Jeyalakshmi & Rani, 2019; Vuori et al., 2019) and improve quality of communication with external beneficiaries of the enterprise (Taiminen et al., 2015).

2.3 Digital Technologies, Economic Growth and Human Capital

The scope of a digital economy involves the application of digital data and knowledge as a significant factor of production. Modern data networks and efficient data and communication technologies are the drivers of the economic structure. Belowa (2021) describes it with a narrow focus as an economy that functions majorly through the digitalized economy, mostly electronic transactions using the web. However, Patterson (2018) introduces the role of networks and accordingly defines digitalization as economic activities resulting from massive online connections from processes, data, devices, businesses and people. Therefore, the digitalized economy denotes the connectedness of individuals, machines, and organizations based on the web, mobile technologies, and internet-of-things (IoT). Likewise, Baez and Brauner (2018) stressed the link between initiatives' socioeconomic outcomes. Notably, the thrust is on the capacity of the digital economy to deliver both sustainable and inclusive growth. Yang (1978) long recognized the improvement of micro and macroeconomic growth through an adequate digital economy foundation. In this sense, the

[5] https://msme.gov.in/sites/default/files/All%20India%20Report%20of%20Sixth%20Economic%20Census.pdf
[6] Paul (2016), Does information and communication technology (ICT) impact small business in India? emerging patterns, Tech Monitor, 33-4, p 19-25, https://apctt.org/sites/default/files/2020-05/16oct_dec_tm_final.pdf

digitalized economy represents the share of the overall economic output derived from international dimensions of digital input. These include digital competence, equipment (communication tools, software and hardware) and the intermediate digitalized services and goods utilized in production. These wide-range measures, therefore, denote the foundation of a digitalized economy.

The economic impact of digital technologies (ICT) on variables like output and productivity growth at any possible level of aggregation (firms, sectors, regions and countries) forms the point of investigation across many studies. Recent literature specifically examines the employment implications of the paradigmatic change brought about by the digital era (Cariolle et al., 2019). Theoretically, two hypotheses exist in the literature. First is the Skill-based technological change. Here digital technologies have differentiated effects on the marginal productivity of labour depending on the skill content and the level of qualification of the labour force (Cirillo et al., 2021; Cariolle et al., 2019). Here, the assumption is that productivity gains originate only if digital technologies like ICT complement qualified skills and competencies (Autor et al., 2003; Machin & Van Reenen, 1998). The gains initiate because skilled workers are more capable of learning how to use new technologies and are more flexible to their job assignments. The adoption of digital technologies requires organizational changes. Therefore, firms need skilled workers, in terms of technical education, for successful implementation. The second hypothesis is routine-based technological change. The approach distinguishes jobs according to the relative share of routine tasks characterizing each of these, deviating from the focus on generic skill endowment (Cirillo et al., 2021). Autor et al. (2003) argue that computerization enhances the possibility of automating tasks characterized by a high degree of routineness. Since routinized jobs can be more easily codified, automation through the introduction of digital technologies is possible. The routineness applies to low qualified labour processes and cognitive tasks (carried out mainly by managers and professional workers). While the non-routine cognitive tasks are likely to be linked to digital technologies by a complementary relationship, routine cognitive tasks (characterizing clerical and administrative professions) are potentially automated by introducing digital technologies (Autor et al., 2006).

The move toward digital economies through ICTs could result in incessant problems to human capital, the existence of telecommunications infrastructure and difficulties of regulating telecommunications markets (Avom et al., 2021). Advanced digitization of the economies also raises fear towards technological unemployment. The use of new production techniques, like fully digitalized banks, online services and the adoption of integrated management systems (GIS), induce significant disruptions in the job market (Avom et al., 2021; Cariolle et al., 2019). This market is evolving towards polarized skilled jobs (Acemoglu & Restrepo, 2020; Autor et al., 2006). Thus, the digital revolution favours capital over labour and skilled labour over unskilled labour (Baek et al., 2020; Nomaler & Verspagen, 2020; Jorgenson, 2001; Quah, 2001). Therefore, this could result in the loss of a few unskilled jobs (those unable to use ICT tools) and

strong demand for skilled jobs (IT specialists, engineers, system analysts, programmers, telecom engineers) (Avom et al., 2021). Evidence does exist for early job market disruptions in highly digitalized countries (Bartoloni & Baussola, 2020). Studies have also shown that since 1980 employment growth has been more robust in new occupations (Frey & Osborne, 2017). A positive correlation emerges between ICT usage and the skill levels of individuals, firms and countries (Avom et al., 2021; Freeman & Soete, 2009). Freeman and Soete (1997) argue that the information society demands knowledge, skills, training, education and learning as essential complementary assets. Drawing on the seminal paper of Nelson and Phelps (1966), numerous studies analyze the relationship between human capital and the adoption of new technologies across various levels. The consensus emerging from these is that a better level of human capital is necessary to adopt ICTs (Acemoglu and Restrepo, 2020 Bessen, 2019; Doms et al., 1997). A general conclusion emanating from these studies is that: apart from the professional qualification of the manager and employees, the firm's size and research and development predispositions are the main determinants of ICT adoption and move towards a digital economy.

Examining the effect of digitalization through ICT on employment studies shows mixed results. Both positive and negative impacts emerge across studies (Acemoglu & Restrepo, 2019; Cariolle, 2018; Asongu, 2015). As discussed above, the adoption of ICTs leads to polarization in the labour market. In contrast, the demand for skilled workers increases, and less-skilled workers decline (Avom et al., 2021). Cirera and Sabetti (2019), Crespi et al. (2011), Michaels et al. (2014) and Autor et al. (2006) test this hypothesis using data from Japan, the United States, and the European countries. The results show that firms with high growth in ICT capital have shifted from a demand for medium-skilled workers to highly skilled workers. Likewise, Akerman et al. (2015) examine the effect of broadband on productivity and employment in a wide range of developed and developing countries. The conclusion from both studies is that while high-speed internet enhances the productivity and employment of skilled workers, that for unskilled workers deteriorate. It is hence complementary to qualified work and participates in the performance of their tasks.

Conversely, it is a substitute for unskilled labour, replacing unskilled workers with specific tasks. Therefore, new technologies can destroy jobs if they aim to substitute capital for labour and increase productivity (Avom, 2011). Acemoğlu and Restrepo (2019) illustrate the net effects. The results indicate that adopting a new technology induces a two-headed innovation. The first is the automation of specific existing tasks, and the second is the creation of new ones. Automating some of the existing tasks would reduce the share, productivity, and wages of unskilled labour.

Similarly, creating new tasks would increase qualified labour share, productivity, and wages. Therefore, new technologies increase unemployment and increase economic inequalities in the short term. In the long run, adapting the workforce's skills to the needs of this new technology suggests a positive impact on

employment (Acemoğlu and Restrepo 2020, 2019, 2016). The skill-based technological change hypothesis explains long-term compositional changes in employment. In particular, the increasing share of the labour force's highly educated and high-skilled component (Cirillo et al., 2021; Autor & Dorn, 2009; Kemeny and Rigby 2012; Michaels et al., 2014).

3. Research Design

3.1 Hypotheses and Methodology

The premise of the research is that access to e-commerce directly impact the prosperity of the enterprise. At the same time, the scenario of not being digitalised is likely to constrain growth. We examine both evidence and counter-evidence. It means that an inference of positive impact of digitalisation (D) on performance (P) will be compared to the situation of combination of P and no digitalisation (~D). Thus, the research provides scope for updating prior hypotheses. Table 1 provides a schema of evidence and counter-evidence.

Table 1: Evidence and Counter Evidence

Evidence	Counter Evidence
Performance High, Digitalised (P, D)	Performance High, Not Digitalised (P, ~D)
Performance Low, Digitalised (~P,D)	Performance Low Digitalised (~P,~D)

Further, the thought is represented by following equation:

$$p(P/D) = \frac{p(D/P)p(P)}{p(D/P)p(P) + p(D/\sim P)p(\sim P)}$$

The above equation is a Bayesian updating. p(P/D) is the updated hypothesis. p () is the probability. The broader coding procedure used to analyse the stories by the respondents involve open coding, axial coding and selective coding (see Figure 1). The continuum data coding procedure help in data reduction and consolidation.

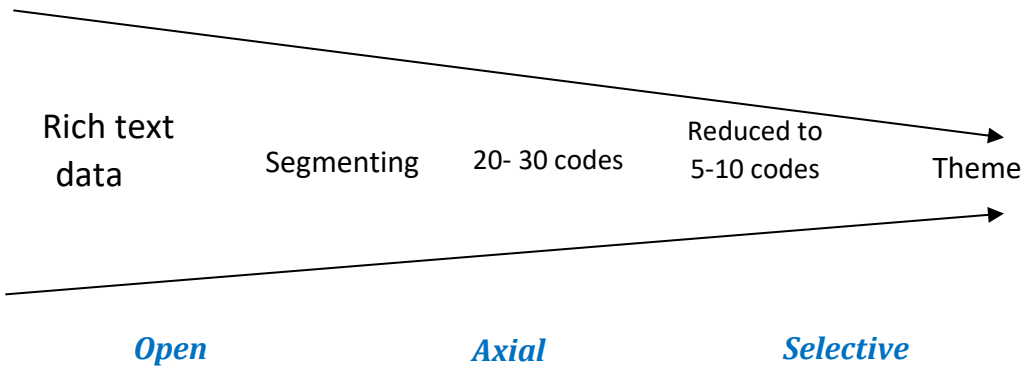

Figure 1: Coding procedure (Source: adapted from Strauss & Corbin)

Table 2 provides a tabular presentation of research design and analytics.

Table 2: Research Design and Analytics

Dimension	Hypothesis	Data	Analytics
Job Creation	E-commerce positively impacts small enterprises, self-employed persons, and wage labour)	• National sample Survey (NSS) 73rd Round (2016) on Unorganised Enterprises • In-depth/Semi-structured Interview of entrepreneurs and own account workers	• Visualisation and Predictive Analytics • Thematic Analysis • Descriptive Analytics
Digitisation of Small Businesses	Digitalisation of small business generates efficiencies in operation	• National sample Survey (NSS) 73rd Round (2016) on Unorganised Enterprises • In-depth/Semi-structured Interview of entrepreneurs and own account workers • Other published recent data	• Visualisation and Predictive Analytics • Thematic Analysis
Growth in Exports	E-commerce foster both domestic business and exports	• In-depth/Semi-structured Interview of entrepreneurs and own account workers • Other published recent data	• Thematic Analysis

3.2 Sampling

For semi-structured/in-depth interviews, multi-stage sampling is used. The inclusion criterion is if the respondent engages in self-employment (or own account work[7]), or she is a business owner who employs others. We delimit the sampling to the small and micro enterprises. Moreover, the sample is heterogenized with respect to gender, with women getting adequate representation in the sample.

First, the sample is drawn from four zones: North, South, East and West. There is one metropolitan city with at least 5 million population for each zone and three medium to big towns with less than 50 million. There are 12 urban spatial units in the sample. Second, for both self-employed and business owners, the sample is split into users and non-users of e-commerce. For every Tier 1 city in the list, we have included

[7] Own account workers do not employ others.

at least 5 sample units in every category. For every Tier 2 city in the list, we have included at least 2 sample units in every category. In aggregate, we have collected data from 361 small and micro-enterprises. The data was collected through face-to-face intervention following the Covid safety protocols. Table 3 provides the sampling frame in detail.

Table 3: Sampling Frame for Primary Data Collection

Region	**City**	**Own Account Workers (Self Employed)**		**Business Owners who employ others (up to 10 workers)**		**Total**	
		Users of Digital Platform	Non-Users of Digital Platform	Users of Digital Platform	Non-Users of Digital Platform		
North	New Delhi	5	5	5	5	20	75
	Lucknow	4	5	4	5	18	
	Indore	3	4	6	4	17	
	Patna	5	5	5	5	20	
South	Bengaluru	5	5	13	6	29	88
	Madurai	4	2	4	6	16	
	Visakhapatnam	5	5	5	10	25	
	Cochin	3	4	7	4	18	
East	Kolkata	10	10	10	10	40	97
	Ranchi	4	4	6	4	18	
	Guwahati	4	3	5	7	19	
	Bhubaneswar	5	2	5	8	20	
West	Mumbai	5	5	13	5	28	101
	Surat	5	5	3	5	18	
	Goa	6	3	6	5	20	
	Nagpur	5	2	21	7	35	
Total		78	69	118	96	361	

Note: We split the sample into Trading and Non-Trading entities.

3.3 Research Tool and Data Collection

A comprehensive questionnaire (Appendix 1) is used to collect data from small and micro-enterprises. The latter part of the tool contained an interview schedule that helped the field investigators to collect stories from the non-digitalized small and micro-enterprises. The fieldwork was administered from Dec 2021 to March 2022. Covid has posed certain data collection difficulties, yet the team fully managed to immerse into the field. Face-to-face interaction with the business owners was felt to be a necessary ingredient for the study. Covid safety protocol was completely followed, and the health & safety of all the field investigators and respondents were at every stage of fieldwork. The confidentiality of the data collected was assured at the beginning of the interview. A brief introduction to the research was given at the beginning of the session. It was promised that the data collected will be used only for research purposes. The respondents were encouraged to stop the investigator at any point of data recording and clarify for doubts.

4. Analysis of Micro data

Concerning the small businesses and microenterprises, National Sample Survey Organization (NSSO) 73rd round conducted in 2015-16 is the latest microdata available in India that captures approximately 0.3 million units. It provides data on socioeconomic characteristics, resources and performance of enterprises. The database covers all States and Union Territories of India. It's an outcome of sample survey spanning over a year. We primarily analyse the performance of enterprises based on three indicators: value-added, asset, and count of employees. These are mapped separately for adopters and non-adopters of digital technologies. From the microdata, we identify internet usage as a proxy for digital technology adoption. Value-added depicts performance, while the other two indicators measure the resources. Table 4 presents the descriptive statistics of these indices, segregated for both the categories.

Table 4: Descriptive Statistics of the sample

Details for the Sample	LNASSET		LNGVA		LNLABOUR	
	Using Internet		Using Internet		Using Internet	
	No	Yes	No	Yes	No	Yes
Number of Observations	264344	24646	263686	24503	263164	24685
Mean	11.9	13.9	9.3	10.8	0.6	1.5
Std. Deviation	1.6	1.5	1.2	1.3	0.6	1.0
Minimum	2.7	5.3	0.7	3.5	0.0	0.0
Maximum	19.5	22.8	16.0	19.7	6.3	8.0

Note: LNASSET = Logarithm of Asset Value; LNLABOUR = Logarithm of Employee Count; LNGVA = Logarithm of Value Added; Source: Computed from the Micro data of National Sample Survey, Government of India (2015-2016)

It is vividly clear that non-users form a huge cohort (0.26 million). In contrast, users are much smaller in size amounting to approximately 0.02 million. However, concerning the performance, average value-added is discernibly higher for the users than for non-users. Similar results emerge for the other indicators assets and employment. Figure 2 illustrates the incremental percentage change in these indicators for users over non-users. Concerning value-added, the premium is profoundly higher for users (150 percent). Moreover, we standardize value-added for the size by diving it with employee count. The emerging measure is productivity (value-added per employee). For this indicator also the premium is in favour users (higher by 140 percent). Likewise, employment is 40 percent more for users compared to non-users.

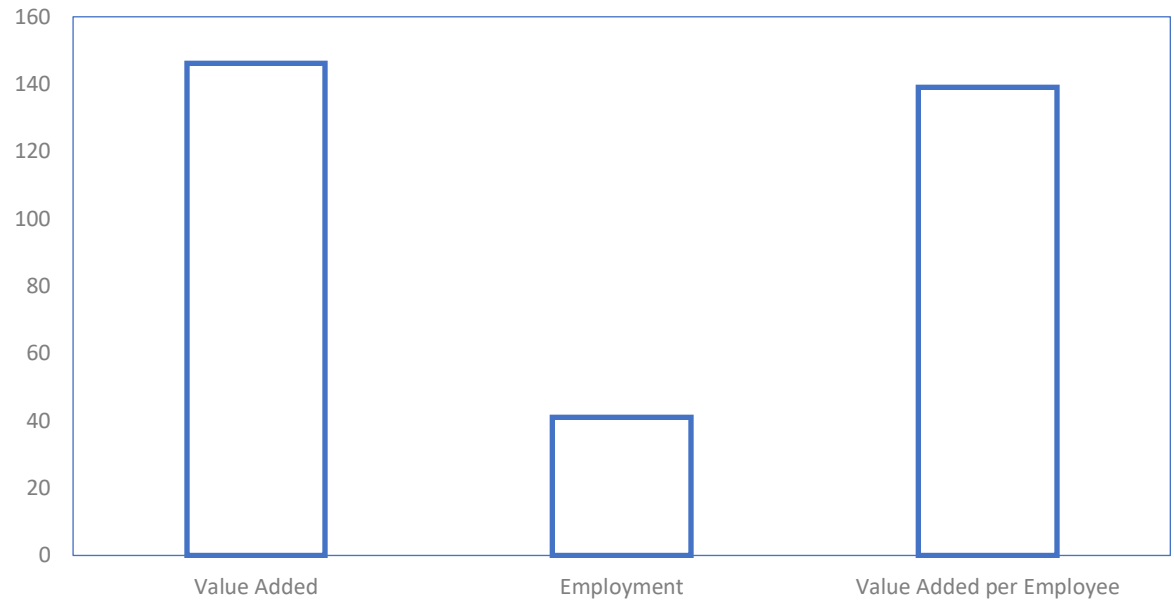

Figure 2: Incremental Change (%) for Internet users over non users
Source: Computed from the Micro data of National Sample Survey, Government of India (2015-2016)

As shown in figure 3, enterprises using internet vary across states. The count is quite high in bigger states especially in Western and Southern India. In contrast, the count in lower in Eastern and Northern India except the states Uttar Pradesh and West Bengal. It's crucial to plot the magnitude of incremental gain in value-addition that accrues to adopters over non-adopters. It's a mixed pattern. It appears that count of users and incremental value-added are not strongly correlated. Interestingly, in terms of count and value-added, states like Maharashtra, Tamil Nadu and Uttar Pradesh emerge as hot spots. It implies that, in these states, economies of scale translate to prosperity of the enterprises.

The count of users also varies across economic activities. Wholesale and retail trade reports the highest count (0.78 million). The activity Professional, Scientific and Technical comes second (0.29 million), followed by Education (0.28 million) and Manufacturing (0.26). It's crucial to note that the count of users for microenterprises in Finance and Insurance is just 0.04 million, even in the era of digital finance. Probably for this sector the scenario might change in future, especially post Covid-19.

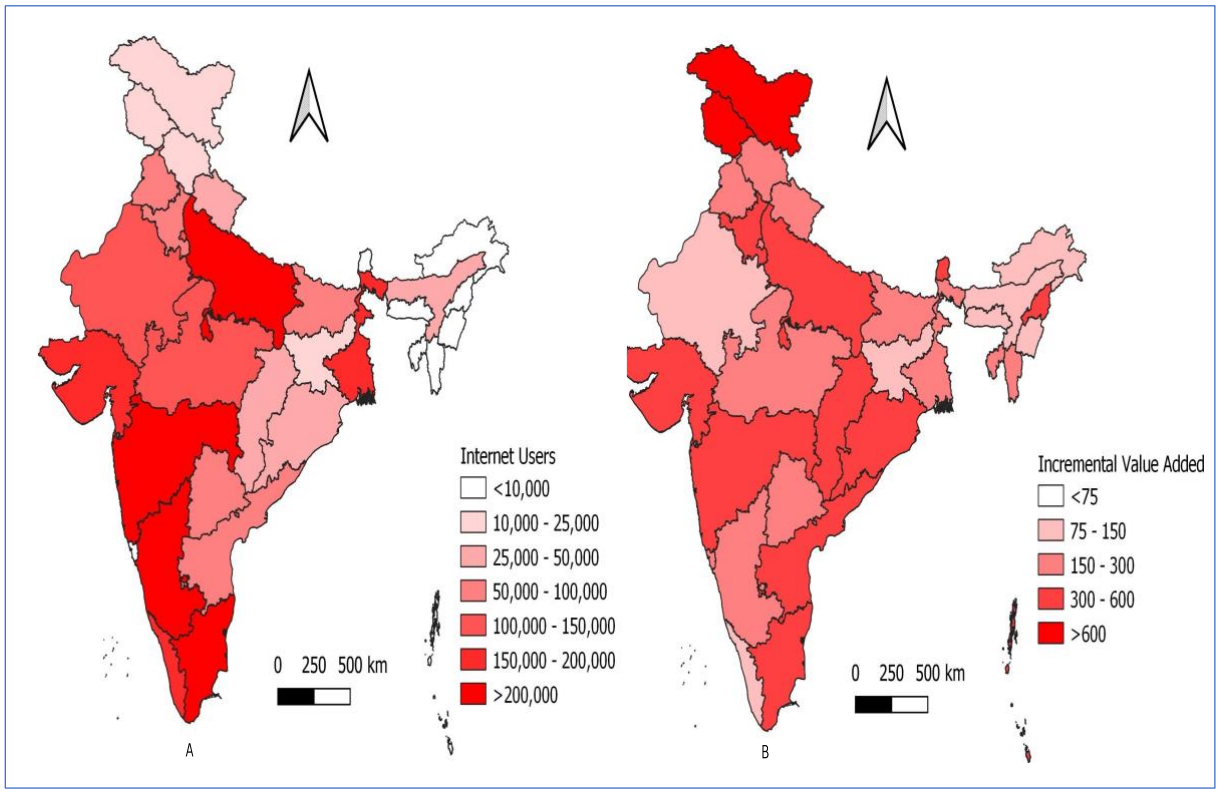

Figure 3: Number of internet users is depicted in panel A; Incremental percentage change in value-added is presented in panel B
Source: Computed from the Micro data of National Sample Survey, Government of India (2015-2016)

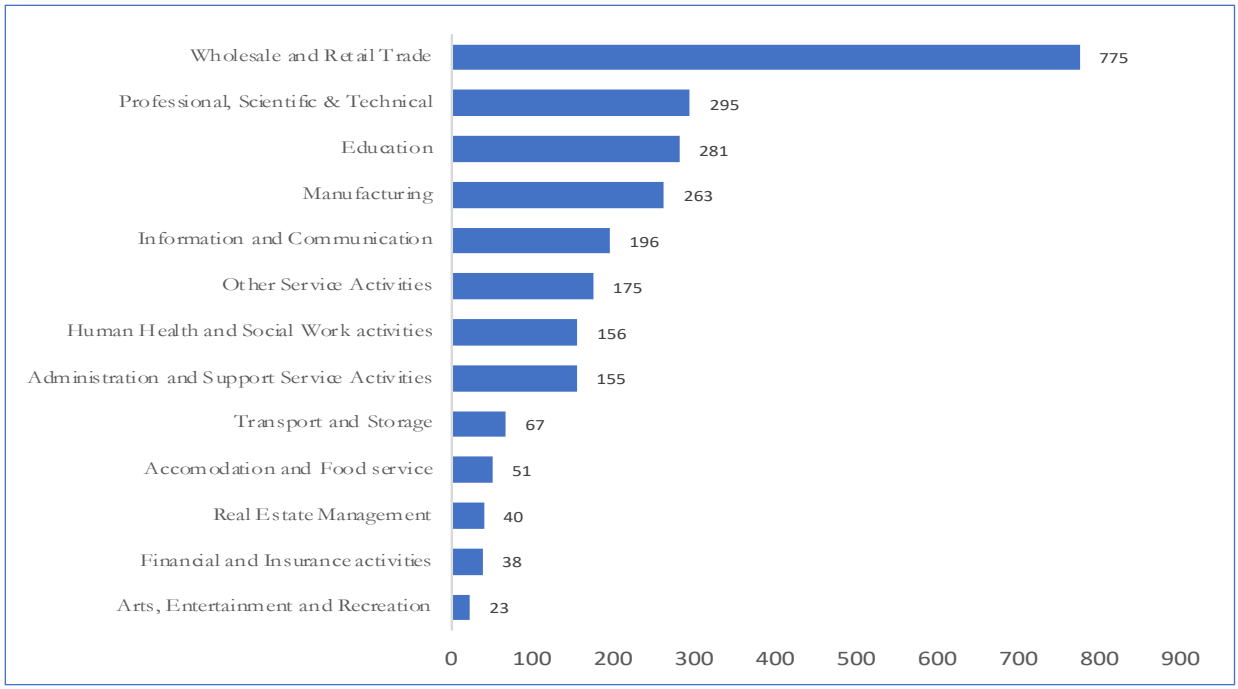

Figure 4: Count of Enterprises using internet for business purposes (in 000s)
Source: Computed from the Micro data of National Sample Survey, Government of India (2015-2016)

Figure 5 presents the density and correlation plot of value-added, employment and asset for users and non-users. Concerning the univariate distribution, density plots are relatively more symmetric for users than non-users. Any correlation plot is a mix of scattered points and patterns. Users demonstrate more or less unidirectional patterns with lesser spread, especially for the correlation between employment and value-added. In contrast, for non-users the plots display marked scatteredness. These graphs clearly demonstrate that enterprises that are subscribed to digital mode yield better outcomes in terms of value-added and employment.

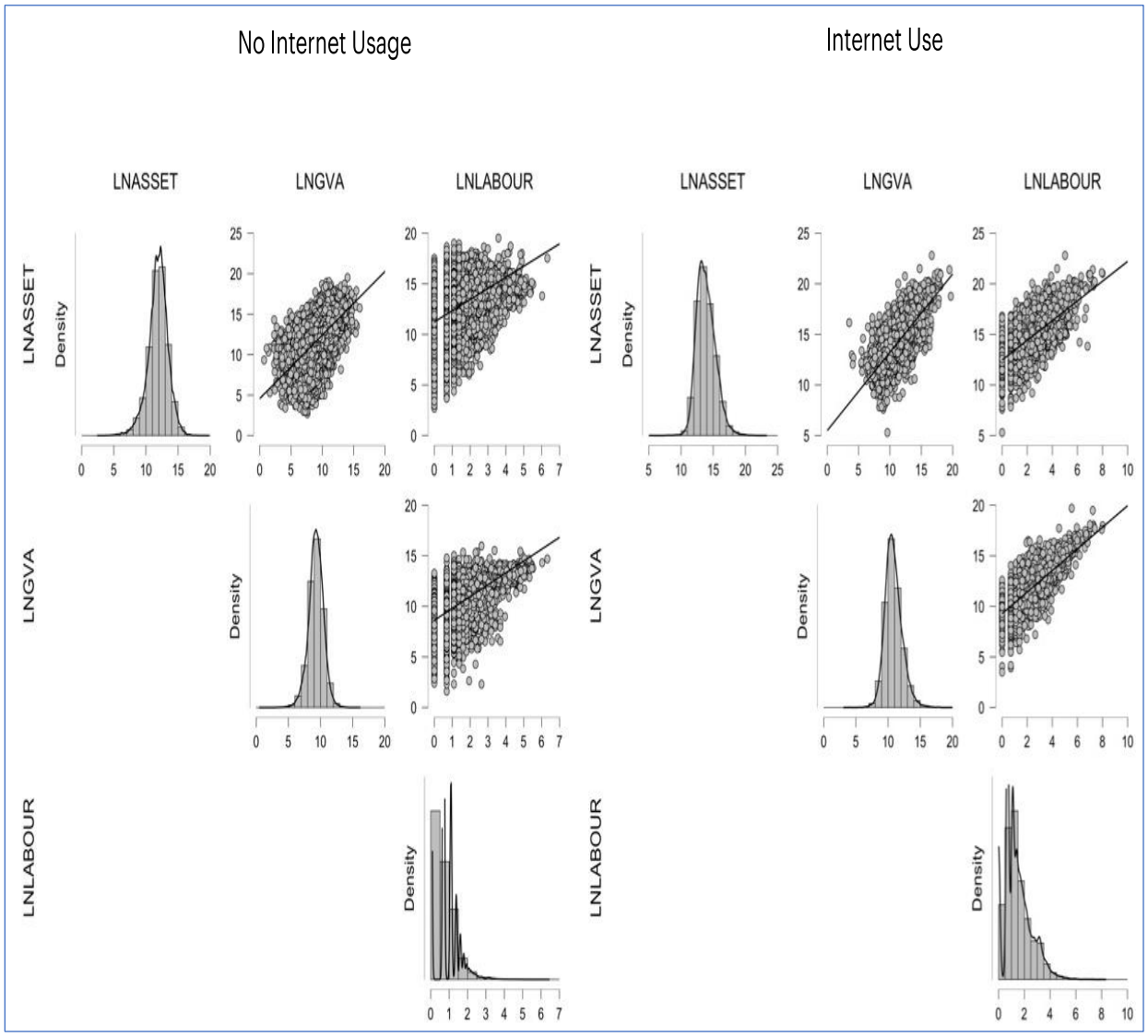

Figure 5: Density and Correlation Plot; N= 285502
Source: Computed from the Micro data of National Sample Survey, Government of India (2015-2016)

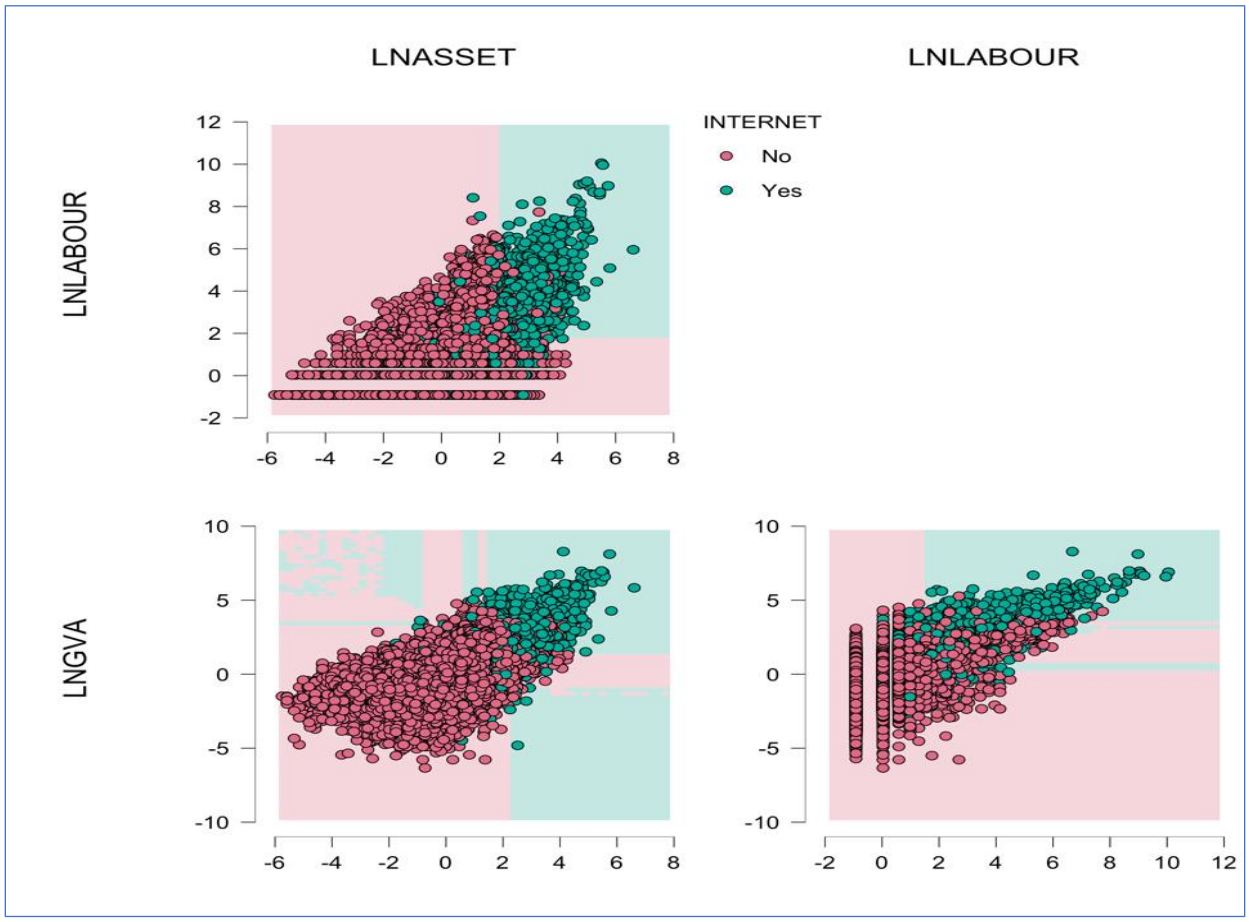

Figure 6: Classification of Enterprises through Random Forest algorithm; N = 285502
Source: Computed from the Micro data of National Sample Survey, Government of India (2015-2016)

We apply machine learning algorithm (Random Forest Classification) to the microdata. The objective is to visualize the grouping between users and non-users across correlation plots of value-added, employment and asset. Out of 0.28 million samples, 0.18 million units are in the training set, while 0.045 million and 0.057 million observations are in validation and test sets respectively. The fit is reasonably good with 78 percent area under curve that signifies the veracity of classification (curve depicts the relation between true positive and false positive rate). Across these plots, users (green coloured) tend to cluster. However, a few users are out of the cluster. There is also counter clustering by the non-users (red coloured). An interesting case in point is the plot of value-added and employment. Here, most of the users are located in the quadrant of high employment and high value-added. However, for non-users high in employment corresponds to low-moderate value-added.

5. Findings from Field Survey

5.1 Quantitative Analysis

Descriptive analysis revealed that the digitalized firm's revenue is higher than the non-digitalized enterprises, despite regional and town differences. Table 5 shows the median revenue of the digitalized to the non-digitalized in terms of the regional split. Table 6 shows the median revenue differences between the digitalized and non-digitalized in terms of the towns studied.

Table 5: Value of sales (region wise)

Region	***Digitalized***			***Non-digitalized***		
	Median	*Min*	*Max*	*Median*	*Min*	*Max*
North	2.00 M	-	70.00 M	0.75 M	0.12 M	6.50 M
South	1.50 M		70.00 M	0.95 M	-	120.00 M
East	1.50 M		36.00 M	0.75 M	-	7.50 M
West	5.00 M		250.00 M	0.80 M	-	9.00 M

Source: primary survey
Note: values in Million ₹

Table 6: Value of sales (town wise)

Town	***Digitalized***			***Non-digitalized***		
	Median	*Min*	*Max*	*Median*	*Min*	*Max*
New Delhi	5.20 M	0.00 M	8.00 M	0.63 M	0.12 M	6.50 M
Lucknow	1.10 M	0.00 M	8.00 M	0.63 M	0.12 M	6.50 M
Indore	3.50 M	1.00 M	70.00 M	0.90 M	0.60 M	1.60 M
Patna	3.20 M	0.50 M	30.00 M	0.80 M	0.50 M	1.40 M
Bengaluru	0.40 M	0.00 M	70.00 M	0.33 M	0.00 M	1.90 M
Madurai	1.35 M	0.70 M	5.00 M	1.00 M	0.50 M	8.00 M
Visakhapatnam	10.75 M	0.10 M	50.00 M	3.60 M	0.12 M	120.00 M
Cochin	0.90 M	0.50 M	2.00 M	0.75 M	0.06 M	1.50 M
Kolkata	0.85 M	0.05 M	4.00 M	0.55 M	0.06 M	8.00 M
Ranchi	1.75 M	0.80 M	20.00 M	0.50 M	0.33 M	2.20 M
Guwahati	2.50 M	0.40 M	36.00 M	1.83 M	0.00 M	6.00 M
Bhubaneswar	2.00 M	0.00 M	8.50 M	0.75 M	0.06 M	7.50 M
Mumbai	4.00 M	0.10 M	80.00 M	0.55 M	0.00 M	5.00 M
Surat	1.45 M	0.00 M	10.00 M	1.10 M	0.50 M	5.00 M
Goa	4.00 M	0.25 M	20.00 M	0.80 M	0.00 M	3.60 M
Nagpur	5.70 M	0.50 M	250.00 M	2.50 M	0.06 M	9.00 M

Source: primary survey
Note: values in Million ₹

The difference in revenue generation between the digitalized and non-digitalized businesses is found to be statistically significant. Digitalized firms enjoy 194% *(Mean difference =1.075***)* revenue than the non-digitalized counterpart, $t = 6.61^{***}$. The average revenue of a digitalized enterprise was 4,99,82,410₹ and of the non-digitalized enterprise was 26,76,000₹. There is a significant difference between the revenue from e-commerce and offline sales within the digitalized firms, $t = 2.75^{***}$. The average revenue from the platform trade was found to be less than the offline trade, 41,46,896₹ < 47,59,776₹. In percentage, we could

say that 56% of small businesses' revenue is from traditional selling methods and not via e-commerce. It signifies the future potential of platform trade in India.

Not limited to revenue differences, there is a statistically significant difference between the operational cost of digitalized firms and non-digitalized firms, and the difference is in favour of the digitalized enterprises. The overall trade cost of non-digitalized firms is 37 percent higher than that of digitalized. The average operational cost of a non-digitalized enterprise is 13,13,963₹, and the digitalized enterprise is 8,05,483₹. The survey had a section set apart for measuring trade-related costs of the enterprise related to shipping, storekeeping, platform commission charges etc.

Comparing Tier 1 and Tier 2 cities

The descriptive analysis in the prior section showed that enterprise prosperity is in favour of digitalized enterprises, and a similar trend emerges when we compare the Tier 1 (T1) cities to the Tier 2 (T2) cities. Table 7 prima facie reveals that digitalized firms enjoy higher median revenue than non-digitalized enterprises in both T1 and T2 settings. In T1 cities, the median revenue of digitalized enterprises is 16,40,000 ₹, and for non-digitized enterprises is 5,00,000₹. In T2 cities, the median revenue of digitalized enterprise is 25,00,000 and for the non-digitized enterprise is 9,00,000₹. Whereas the costs are concerned, it is higher for non-digitalized firms in both T1 and T2 cities. In T1 cities, the costs of the digitalized enterprise are 3,00,000 and the non-digitized enterprise is 4,00,000₹. In T2 cities median cost of the digitalized enterprise is 2,75,000 and of the non-digitized enterprise is 4,75,000₹

Table 7: Value of sales and cost; T1 and T2 cities

	Value of sales					
		Digitalized			***Non-digitalized***	
	Median	*Min*	*Max*	*Median*	*Min*	*Max*
T1	1.64 M	-	80.00 M	0.50 M	-	8.00 M
T2	2.50 M	-	250.00 M	0.90 M	-	120.00 M
	Cost					
		Digitalized			***Non-digitalized***	
	Median	*Min*	*Max*	*Median*	*Min*	*Max*
T1	0.30 M	-	5.69 M	0.40 M	-	7.20 M
T2	0.28 M	-	19.80 M	0.48 M	-	30.00 M

Source: primary survey
Note: a. T1 & T2 – Tier 1 and Tier 2 cities
b. values in Million ₹

To analyze the extent of the difference, we have obtained the rate of change using the available data. It ideally explains the percentage difference between the variables. It is obtained by applying the equation;

$$Rate\ of\ change = \frac{(digitalized - nondigitalized)}{nondigitalized} * 100$$

In T2 cities, the revenue of digitalized businesses is 178% greater than that of non-digitalized enterprises. In the T1 cities, the difference in revenue is found to be 228 %. Irrespective of the city classification, the costs involved in running a non-digitalized business are high. In T1 cities, it is 25 percent higher than the digitalized business, and in tier 2 cities, it is 42 percent higher. The operational costs of T2 cities are higher than T1 cities (42%>25%). To statistically support the argument, we have conducted an independent sample t-test[8] bootstrapping the results for 10,000 sample units (in table 8). Technically, the bootstrap resample allows deriving more quality standard errors and confidence intervals that help better infer the data obtained. The test results were significant for both the T1 cities and T2 cities. The revenue of digitalized small and micro enterprises in T1 cities is 184 percent higher than the non-digitized businesses, $t = 3.12^{***}$. The revenue of digitalized small and micro enterprises in T2 cities is 199 percent higher than the non-digitized businesses, $t = 6.12^{***}$. In T1 cities, the operational costs of the non-digitised enterprise are 54 percent higher than the digitized, $t = -2.17^{**}$. In T2 cities, the operating costs of the non-digitized enterprises are 56 percent higher than the digitized, $t = -3.74^{***}$.

Table 8: Test of significance between T1 and T2 cities

City	Variable	Mean diff	Impact%	95% Confidence Interval	
				Lower	*Upper*
T1	Value of sales	1.044***	228	0.420	1.67
	Cost	-0.777**	25	-1.55	-0.07
T2	Value of sales	1.095***	178	0.754	1.44
	Cost	-0.804***	42	-1.25	-0.39

Source: primary survey
Note: a. T1 & T2 – Tier 1 and Tier 2 cities
b. results are bootstrapped for 10,000 samples

When only digitalized enterprises are considered (Table 9), in T1 cities, 89 percent of small and micro enterprises' revenue comes from offline trading than online sales, $t = 4.07^{***}$. The median sales revenue from online trade is 2,50,000₹, whereas the median sales revenue from offline trade is 7,00,000₹. In T2 cities, 45 percent of small and micro enterprises revenue comes offline, $t = 2.19^{**}$. The median sales revenue from online trade is 7,20,000₹, whereas the median sales revenue from offline trade is 8,80,000₹.

[8] *t* -test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different.

Table 9: E-commerce vs traditional selling in digitalized enterprises

City	Mean diff	P value	Impact %	95% Confidence Interval	
				Lower	*Upper*
T1	-2.223***	0.00	89%	-3.23	-1.25
T2	-0.609**	0.03	45%	-0.41	0.82

Source: primary survey
Note: a. T1 & T2 – Tier 1 and Tier 2 cities
b. results are bootstrapped for 10,000 samples

Employment

The digitization factor influences the employment rates of the country. The country's digitalized small and micro-enterprises provide 33 percent more jobs than non-digitized enterprises, $t = 2.17^{**}$(results are bootstrapped for 10,000 samples). Breaking the employment figures in to T1 and T2 cities, as shown in figure 7, in T1 cities, the digitalized enterprises provide 67 percent jobs than the digitalized enterprises. In T2 cities, non-digitized enterprises offer 17 percent more jobs than the digitized.

Figure 7: Employment generation
Source: primary survey

Productivity differences

Figure 8 shows that the labour productivity in digitalized firms is 133 percent higher than the labour in non-digitalized enterprises, t = 7.27***. In T1 cities, the labour productivity in digitalized firms is 68 percent higher than the non-digitized, t= 2.68***. In T2 cities, the labour productivity in digitalized firms is 157 percent higher than the non-digitized, t= 7.25***. The variable for productivity was obtained by dividing the revenue figure by the labour from the obtained survey data.

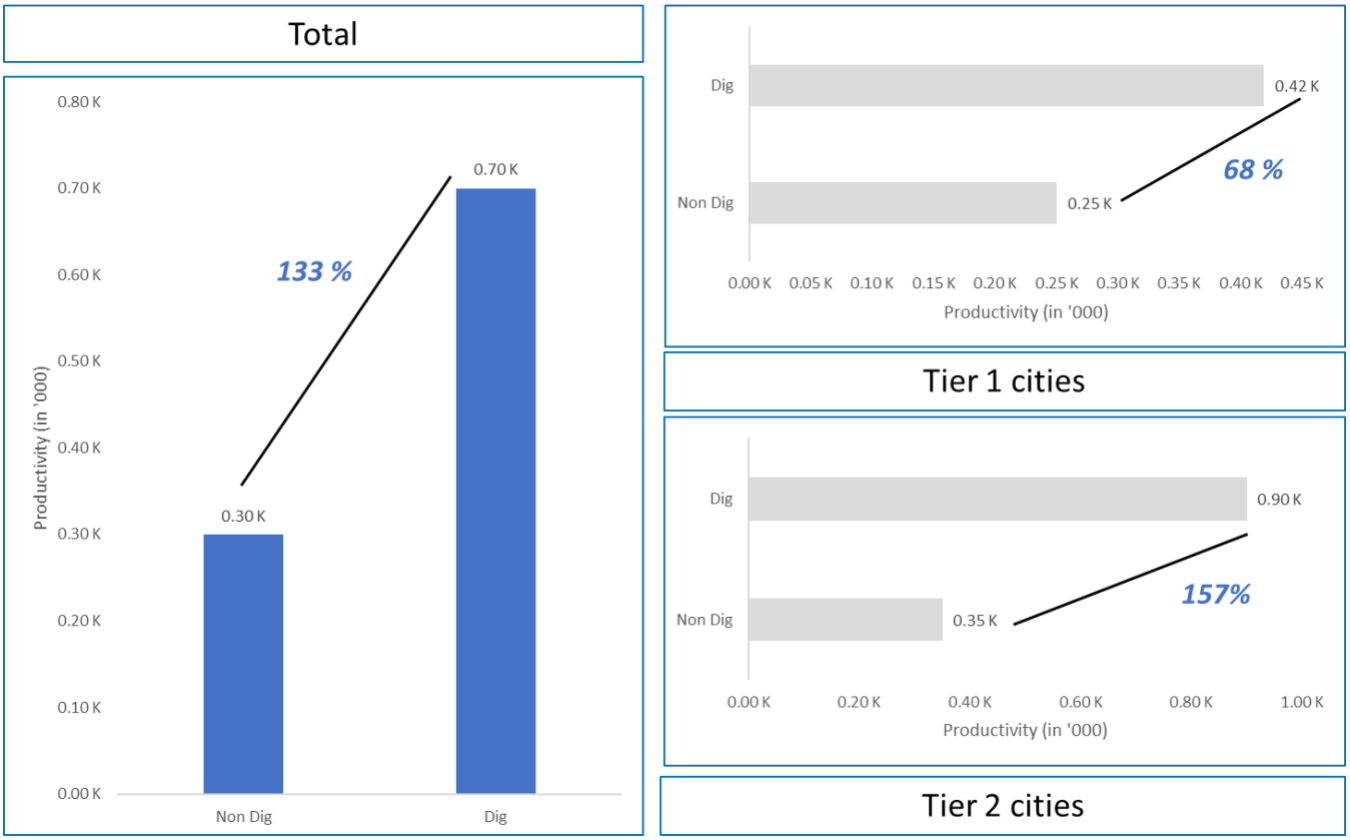

Figure 8: Labour productivity
Source: primary survey
Note: a. T1 & T2 – Tier 1 and Tier 2 cities

Leading e-commerce platforms in the market.

Figure 9 shows the list of major e-commerce platforms and their market share in percentage. The use of communication-based e-commerce platforms for value creation is higher than the paid e-commerce platforms. Nearly 20 percent used WhatsApp for business, and nearly 15 percent used WhatsApp, Instagram, and Facebook. Amazon, Flipkart, and Myntra are the market leaders among the paid and subscribe e-commerce models. There is a good number of entrepreneurs who uses own websites to find sales. Among digitalized firms' 7.4 percent had their websites. We also notice many local innovations that capture a good amount of business in the *others* category. Fraazo of Mumbai, OnlineKochi of Kerala,

Onlinekaka of Lucknow, etc., are good examples. We could see these local innovators capture a certain percentage of customers who otherwise would be captured by the market leaders.

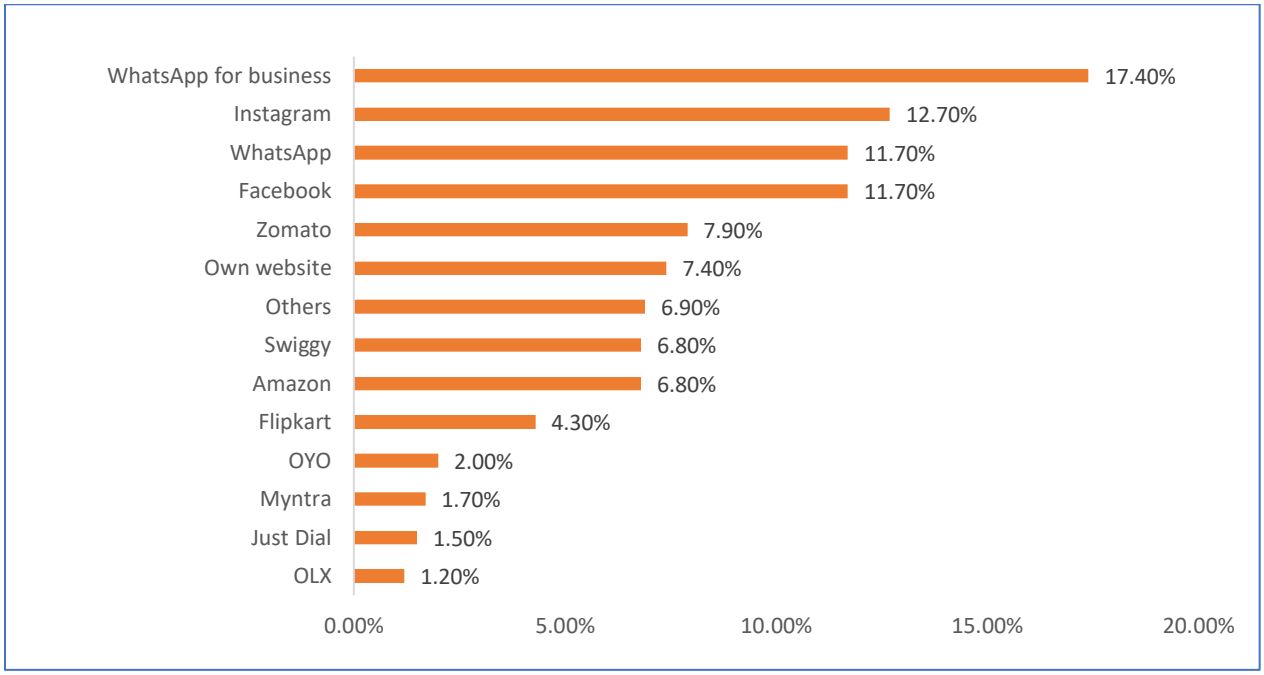

Figure 9: Major e-commerce platforms in the market
Source: primary survey

Platform uptake, expansion and foreign trade

Figure 10 shows that participating in e-commerce has helped small and micro-entrepreneurs achieve prosperity and expand their business. Nearly 15 percent of enterprises have introduced new products, 5 percent have started new shops, 6 percent have started new storage units, nearly 20 percent have modified their workplace environment, 23 percent have improved their intrastate reach, 16 percent have improved their inter-state reach, nearly 5 percent have found customers abroad, and 15 percent have hired new employees through their e-commerce participation.

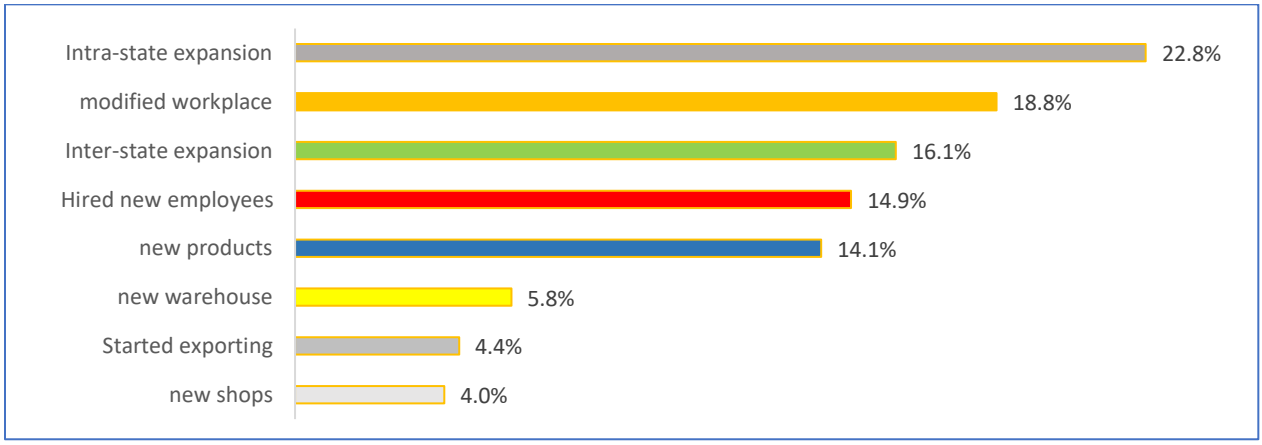

Figure 10: E-commerce usage and business expansion

Source: primary survey

Among the observed expansion criteria, 28 small enterprises had customers abroad. We have made special interventions with entrepreneurs who had customers abroad. They all used online marketplaces to sell abroad. None of their major income sources was from foreign trade, but they were optimistic about finding more foreign customers in the future. A 25-year-old self-employed women jewellery maker from Cochin states;

> *I use communication e-commerce mostly since it is free. I could easily manage it using my mobile itself. I have a great fan following in Instagram, Facebook, and Snapchat, which has followers from abroad. I also ask my friends and families to share my post…Most of my orders are from locals, but I expect increased orders from abroad because jewelry is our part of the culture and Indian women cherish it wherever they go.*

A 23-year-old women business owner who found e-learning app states;

> *Pandemic has spurted high demand for online teaching, and students get in contact through classmates, peer group, and families. Recently, we have been promoting our website through Insta, Fb, etc. I have students from abroad too. My cousin's (staying abroad) friends joined, and thereby I got a few more students. I need to explore new ways of teaching online methods and hopefully expand our app…. hopefully in the coming year."*

A 50-year-old male business owner who runs a crockery shop states;

> *I'm old school and unaware of digitalizing. We target tourists and other local and nearby city dealers. We sell ceramic, porcelain utensils and earthenware. My son is helping me in business for last 2 years. He is a graduate and knows about technology. So, we have decided to extend the business through e-commerce. Very recently, only we have registered on Amazon and Flipkart.*
>
> *Online sales volume is less, still, my son tells me to continue online and says sales will increase coming years. We encourage our tourist customers to gift their families our products. We will collect payments from them and ship it on their behalf.*

44-year-old female own account worker who runs an online tuition state;

> *Through e-commerce I can find an income sitting home without compromising my family needs…. Covid has increased my students base, and I even have students from UAE and Cairo.'*

A close observation of the narratives indicates that the time factor, years passing, has influenced small and micro businesses' entrepreneurial behaviour and digital uptake decision. To understand this, we have categorized the respondents into different age groups, following the generational theory, and observed their sales volume. Table 10 shows that the average revenue of entrepreneurs aged 56 and above is higher than the rest of the age groups (6,26,36,364₹). Their entrepreneurial expertise, brand value, hold & trust in the

local market, networking depth, etc., are the reasons for this. Even though this category of entrepreneurs participates in e-commerce, none of them had reported it as their major revenue source. All the age groups, except those entrepreneurs born before 1964, enjoy higher revenue through their platform operations. It indicates that the younger generation is more receptive to digital technologies. Considering the digital exposure and technical education, we could say that the entrepreneurial engagement of the country aided by digital technologies is going to achieve phenomenal growth in the years to come.

Table 10: Volume of sales and age groups

Age group	***Volume of sales***	***SD***	***Minimum***	***Maximum***
12 *to* 24	1.48 M	3.10 M	0.00 M	15.00 M
25 *to* 44	9.00 M	19.31 M	0.00 M	105.00 M
45 *to 55*	6.02 M	11.95 M	0.00 M	50.00 M
56 and above	62.64 M	66.78 M	4.00 M	250.00 M

Source: primary survey
Note: values in Million ₹

Gender and E-commerce

In the data collection process, we have given due representation to women to know how digitization has improved their business participation through e-commerce platforms. Approximately 30 percent of the sample was women-owned small and micro-enterprises. Nationwide, the gender difference in revenue generation favours male entrepreneurs, $t= 2.62^{***}$. Figures 11 show that male entrepreneurs predominantly enjoyed 67 percent (*mean difference* 0.493^{***}) of the revenue than female counterparts in e-commerce. The average revenue of the male entrepreneur is 15,00,000₹, and the average revenue of the female entrepreneur is 9,00,000₹. The disparity in revenue is higher in tier 1 cities than in tier 2 cities. In tier cities, male entrepreneurs enjoy 278 percent more revenue than female entrepreneurs, $t= 2.89^{***}$. While in tier 2 cities, male entrepreneurs enjoy 25 percent more revenue than the female entrepreneurs The factors contributing to the low women participation rates include social biases, limited networks and access to credit, family and peer support, safety concerns, motherhood and childcare, lack of confidence, low skill and education, etc. Proper training, guidance, and policy assistance can mitigate these social taboos and other hurdles.

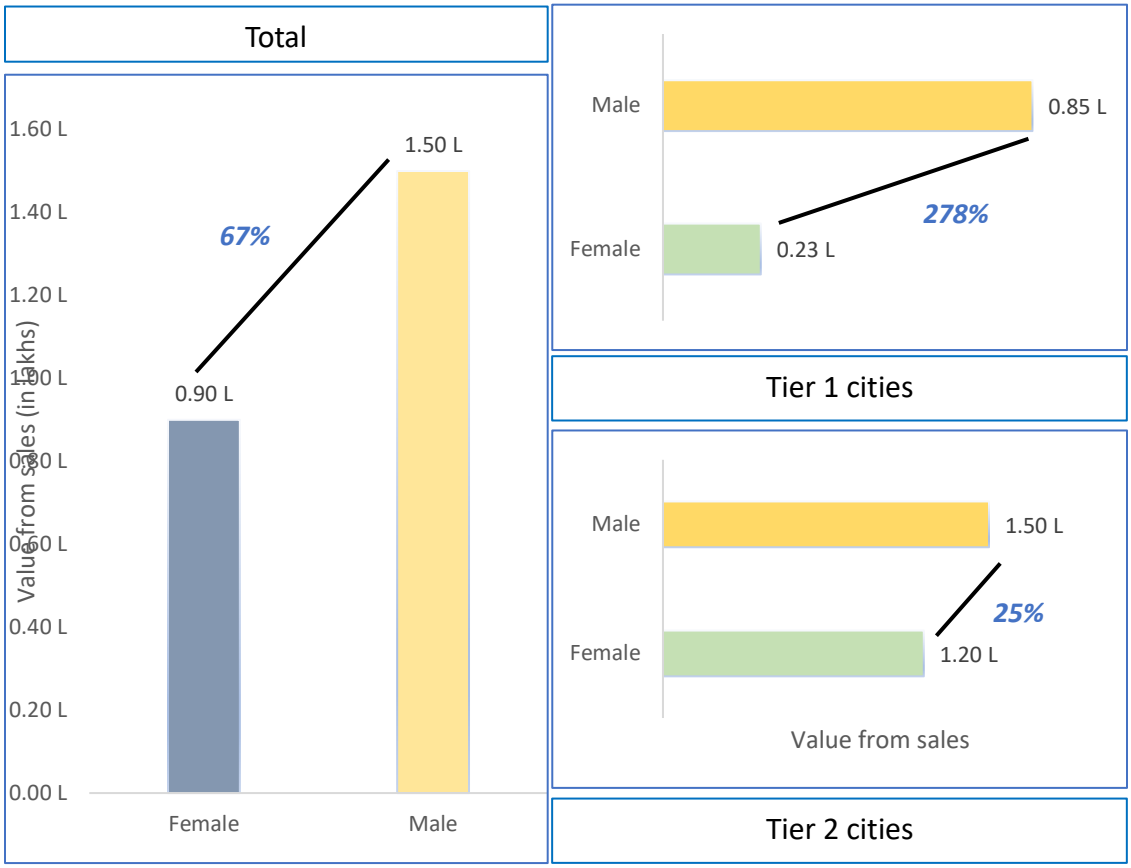

Figure 11: Gender and prosperity in Tier 1 and Tier 2 cities
Source: primary survey

A close observation of the frequency of women's participation in enterprises, shown in table 11, depicts that the e-commerce platforms have increased women's employment, especially in the self-employed category. Women's entrepreneurial intentions are positively influenced by time and digitalization. To analyze how time and digitalization have favored women in business activity, we plotted the data descriptive in a line graph. Figure 12 shows that women's participation in self-employment has increased by 59 percent, and business owners have increased by nearly 91 percent. The data also had a few women entrepreneurs in their early 20s who formed the age group of 18 to 24. It implies that the societal outlook towards women's participation in the employment generation is changing. Their increased participation in entrepreneurship is expected in the future in light of the growing digitalization.

Table 11: Women's participation in enterprises

Use e-commerce		Type of business		
		self employed	business owner	Total
yes	male	40	91	131
	female	38	27	65
no	male	52	70	122
	female	17	26	43

Source: primary survey

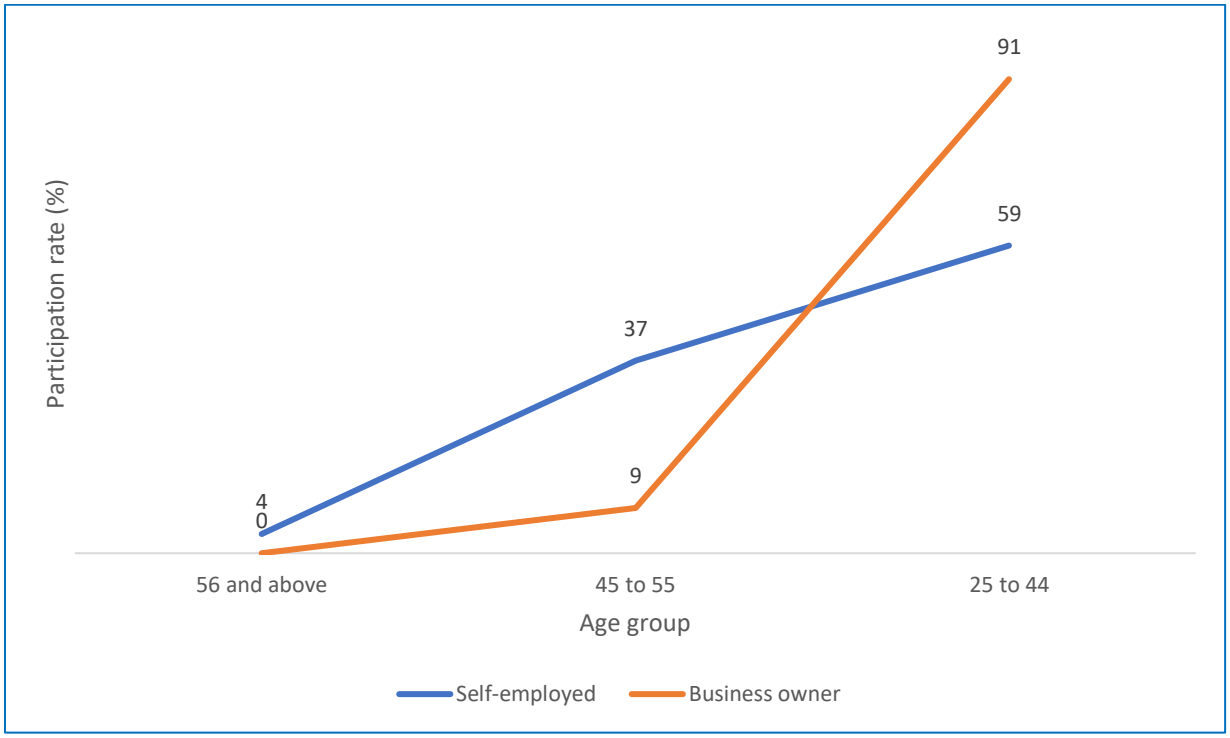

Figure 12: Women's participation in enterprises
Source: primary survey

We conducted in-depth interviews with multiple women entrepreneurs to explore more in this area. The results of the analysis revealed influences of literacy and social pressure. Compared to the early 60s, the women's literacy rate has improved, and the negative effects of social pressure have decreased. As a result, they started getting due representation in formal employment and all social spheres. This positive change in the societal outlook has resulted in their participation in entrepreneurial activities. A 73-year-old self-employed woman from Nagpur states:

> *A woman starting a business in my youth was considered a bad thing, I had to fight a war with my family to make my family agree finally. I had almost zero support and had to receive hate from*

many. Whereas for kids now, it is relatively easy to start a business. Society is changing so does business. It is good to see many women-owned shops in the neighborhood.

35-year-old women textiles owner from Mumbai says:

Rather than a 9-5 job starting a business is easier. My husband is a great support and helps me in his free time. Using the internet, we could co-ordinate the majority of the related activities and remain a good home-maker.

20-year-old women jewelry maker from Kolkata views:

I started my business during my graduation, and I found a decent income. Post to graduation, I fully concentrated on the business and have done courses on digital content marketing and am planning to expand soon.

Covid 19 and E-commerce

Figure 13 shows that more than 40 percent of the enterprises had digitalized their business amid the covid pandemic. They are likely to continue the practice for the rest of their business tenure. Among the new platform adopted by small and micro enterprises, in T1 cities, their sales increased by 42 percent (revenue increased by 11 percent). In T2 cities, their sales increased close to 40 percent (revenue increased by 13.4 percent).

A 31-year-old male Grocery shop owner from Indore states:

I always thought that receiving orders and payments digitally is not for me; hence my business volume was less. Covid has forced me to experiment in e-commerce, and now I have majority of sales happening through it, and the whole process has become a lot easier.

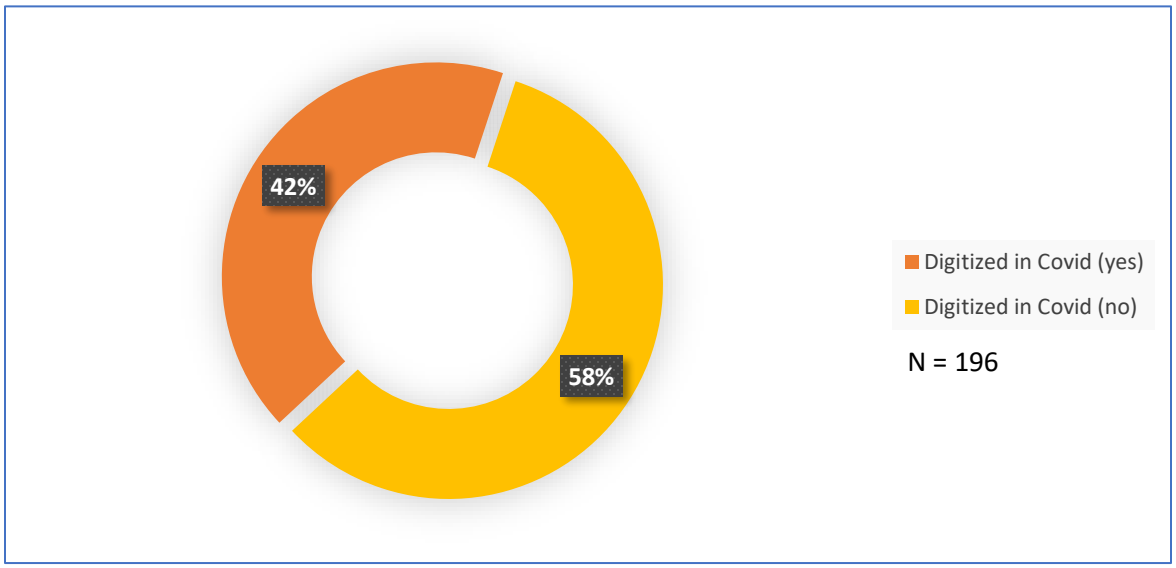

Figure 13. Covid-19 and e commerce participation
Source: primary survey

5.2 Why Small and Micro Enterprises Says No to E-commerce?

The majority of small and micro enterprises in the country are in technological backwater and do not participate in e-commerce. We have interviewed 165 small and micro-entrepreneurs (69 own account workers and 96 business owners) to find reasons for their non-participation in e-commerce. The significant reasons are summarised in Table 12

a. Literacy rate and Age

The education status of the entrepreneur is a critical factor that influences the technology uptake decision. A glance at the educational status of the participants, shown in figure 14, reveals that the education status of the non-users of e-commerce is less compared to those who integrate e-commerce into their business. The e-commerce non-users highlight their difficulty understanding the English language and confusing options in the e-commerce platforms and net-banking applications. We also need to consider the age distribution of the non-users of e-commerce here. The average non-user of e-commerce is 45 years (Std Deviation 10 years). Nearly 70 percent of the sample was eithers Boomers or Gen Xers. The majority of them accept that digitizing is not their generation's deal. A 58-year-old male hardware store owner from Madurai views:

> *my younger son is good with computers and the internet. He tells me the importance of connecting with buyers online. Let their time come and do it, I am comfortable and used to the way it is.*

A 46-year-old male textile store owner from Patna says:

> *I've only had primary education, and I'm unaware of new technology. My sons are educated, and maybe in future, they will run the business in new ways and forms.*

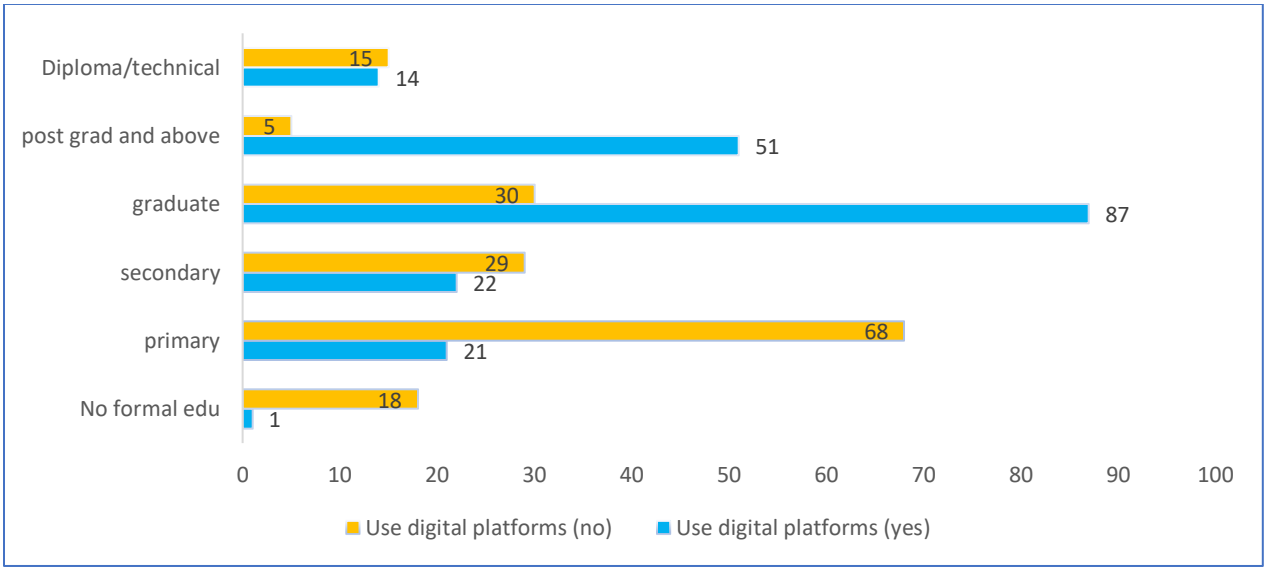

Figure 14. Education of respondents
Source: primary survey

The digital literacy rate of the small and medium entrepreneurs is difficult to measure, especially in T2 cities. As a threshold, we have observed their smartphone usage rate. Despite the generational differences

and age, nearly 80 percent of the non-users of e-commerce were using a smartphone. Their internet usage was limited to entertainment purposes and personal UPI transactions. They were skeptical regarding e-commerce adoption. Nearly 20 percent of the sample had never used a smartphone in their life.

b. Low digital literacy of the stakeholders

The literacy rate and technology exploration of stakeholders also influence the degree of digital uptake by enterprises. Customers prefer visiting the store (especially Gen-Xers) and like to make payments in hard cash. This forces enterprises to stay traditional or choose to lose their business. Digitizing the business is pointless if its customers and other stakeholders stick to conventional means.

c. Convenience with traditional business model.

The nature of the product/ service sometimes forces enterprises to limit their e-commerce participation. Automobile workshops, flower shops, vegetable vendors, etc., come in this category. Since their service area is limited to very closed geography, they prefer to concentrate on direct sales. There were also incidents where entrepreneurs chose to stay traditional as a strategy.

A male bicycle shop owner in Guwahati says:

> *Customers need to pedal and feel the ride; it is something that cannot give online.*

A 45-year-old male textile vendor from Surat states:

> *In my 15 years of business life, I've not thought about any other method of selling other than what I am used to. I like to speak to my customers face to face to understand their taste. I think that will be lacking in e-commerce.*

d. Financial constraints and Fear of unknown

The cost of electronics, recruiting skilled labour, packing and shipping charges, advisory charges, etc., is a burden to enterprises considering their total business volume compared to its realization period. Also, few entrepreneurs believe that technology uptake will result in financial burden and profit erosion. They perceive their knowledge level is too low for e-commerce participation and are too old for upskilling. The average age of the non-digitized enterprise studied was 15 years. It seems that they are well rooted in their routine business behaviour and find it challenging to accept the e-commerce model.

A 56-year-old restaurant owner from Kerala states: I *am too old for digital business.*

e. Lack of institutional support

Small entrepreneurs receive very little institutional support (monetary or non-monetary) in digitizing or formalizing their business. Credit and developments schemes of the Government and banks seem to be more suitable for manufacturing medium enterprises (whose capital investment doesn't exceed 50 crores). These small firms are far from the target of professional tech advisory firms. The paper works and waiting period for these schemes usually are high and require visiting authorities multiple times. The educational background of the entrepreneur is a disadvantage in this scenario.

f. Risk of fraud

Few entrepreneurs cited incidents of the digital security breach. These entrepreneurs further have not tried digitizing. A 48-year-old female medical shop owner from Kerala says:

> *Once I exhibited QR code in my shop, a fraud pasted another QR code above it, and I lost business. Since then, I have not thought of digitizing by business*

g. Age and profession of the customer

The age range and profession of the customer have a certain influence on enterprises' digital uptake. Businesses that target children are a good example. Book stores, ice cream stores, etc., for instance. Most of their customers are kids, and not legal to access online banking. They agree to the fact that they have access to smart devices through their parents and influence the purchase decision of their parents. A 35-year-old female bookstall owner from Lucknow views:

> *Most of my customers are school students they visit our shop daily and do cash transactions. Even if I digitalise it won't benefit my young customers.*

Table 12: Open coding and Axial coding [9]

Sl No	Open coding	Axial coding
1	Difficult to use mobile and computer devices	Low digital literacy of entrepreneur
2	E-commerce is difficult to use	
3	Using online payments/ UPI payments are not easy	
4	Customers and other stakeholders like cash payments and receipts	
5	Functions in payment apps and e-commerce are confusing	
1	Customers prefer/ only knows traditional model	Low digital literacy of the stakeholders
2	Suppliers and middlemen prefer/ only knows traditional model	
3	Customers and other stakeholders like cash payments and receipts	
1	Customers and other stakeholders have language limitations	Low literacy rate of the participants
2	Language limitations of the entrepreneur	
3	Functions in payment apps and e-commerce are confusing	
1	Customers prefer coming to shop	Comfortability with offline sale
2	Customers do not use/ hesitant to use e-commerce	

[9] Open coding is the initial coding procedure in grounded theory. Here we break the interview transcriptions into discrete parts and create codes to label thems. In axial coding, we draw connections between codes.

3	I am comfortable with present business status	
4	There is no requirement of bringing technology as we have enough sales	
1	Unaffordable financial commissions	Financial constrains
2	High cost of supporting electronics	
3	Cost of packing (selling online requires high quality packing)	
4	Cost of shipping	
5	Cost of recruiting tech skilled labour	
6	High advisory cost	
1	Return processing will be hectic and costly	Fear of the unknown
2	Going digital will require heavy investment in electronics	
3	Don't have enough technical knowledge	
4	Online fraud will happen in platform businesses	
5	Maintenance charge will eat profits	
6	Using e-commerce require English knowledge	
7	Use of digital payments is risky	
1	Employees with major data access cheating entrepreneurs	Previous fraud experience
2	Paytm fake app fraud	
1	No govt support for digitizing (monetary/non-monetary)	Lack of institutional support
2	Lack of bank credit facilities (collateral and guarantee is an issue)	
3	Project plan preparations/ loan paper formalities is hectic, we don't know it	
1	Customers are school students. They come shop and very rarely does online dealing (books, school accessories etc)	Age and profession of the customer

Source: primary survey

5.3 Bayesian Analysis

To examine the difference between e-commerce users and non-users, its crucial to update the belief that these groups are not probably different from each other. We use the primary data as a base for the updating. It generates more refined evidence called Bayesian posterior. In essence, by doing it, we ascertain if these two groups differently in value creation and employment. As shown in the figure 15 we assess if value and employment vary across users and non-users as well as across tier 1 and tier 2 cities. It emerges that users

are clearly ahead of non-users in both value creation and employment. Concerning cities, the evidence is tier 2 is ahead of tier 1 in value creation. However, there is no difference across these groups of cities in employment.

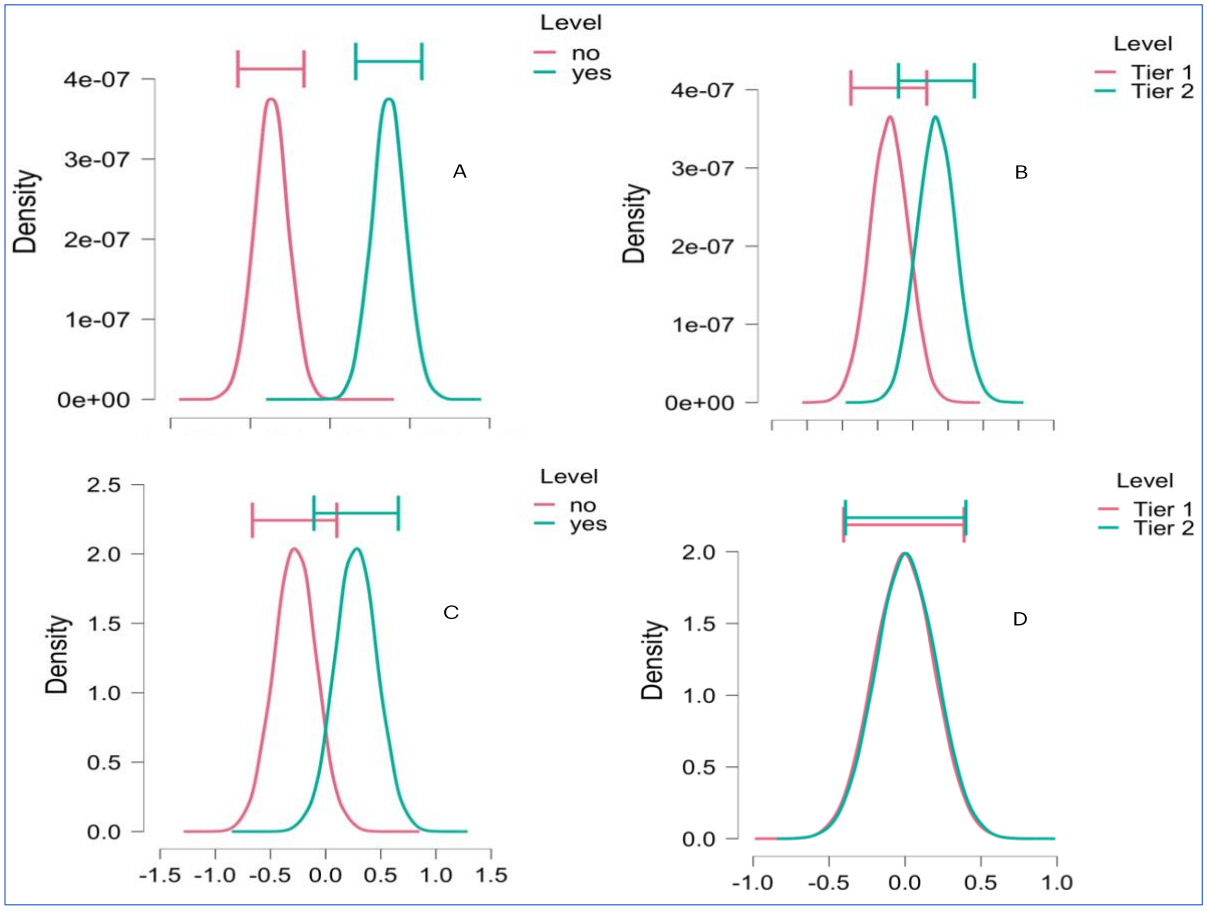

Figure 15: 15A depicts posterior density of Value of Sales (z value) for user (green) and non-users (red); 15B depicts posterior density of Value of Sales for Tier 1 cities (green) and Tier 2 cities (red); 15C depicts posterior density of Employment (z value) for user (green) and non-users (red); 15D depicts posterior density of Employment for Tier 1 cities (green) and Tier 2 cities (red)

Source: primary survey

6. Conclusion

There exists substantial difference between enterprises that use digital technologies / e-commerce and non-users in terms of value creation and employment. It not only emerges from the primary data but also from the micro data of unorganized enterprises. Concerning the primary data, it emerges that users are clearly ahead of non-users in diverse outcomes that include value creation, employment, productivity, exports and women in employment. Another interesting dimension is that the finding is sensitive to the nature of the city. Tier 2 cities are ahead of tier 1 cities in value creation. There are interesting stories emerging from the field. For instance, there are anecdotes pointing to a marked shift from non-digital to digital in micro and small businesses across both tier 1 and tier 2 cities. However, the pace of change is higher in tier 2 cities. What accounts for this pattern? Drawing cues from the field, adopting digital technology help the small enterprise or self-employed to mitigate the transactions cost, to coordinate demand and supply better and to overcome the challenge of the space and time. Moreover, we heard stories from users that signify how the adoption of technology improved the efficiency especially the last mile delivery. The impact of technology also resonates with better relationship with stakeholders.

How the adoption of technology generates innovation is an interesting episode, especially in the context of tier 2 cities. We observe that some users collaborate with local technologies to make affordable apps for their needs. This is an instance of combining adoption with customization. As emerged from the field, compared to non-users, users attract relatively more new customers especially the youth. Considering that these findings are in sync with inferences from micro data, the advantages for users over non-users is a major game changer in a country like India. While it makes the seller more prosperous, it also generates jobs. The digital technology may also reduce regional imbalances provided there are public policies to overcome the digital divide. The research establishes the correlation between adoption of digital technologies by the micro-enterprises and its benefits to the owner, workers, other stakeholders, regions and the economy. However, to make these opportunities sustainable, policy can play a pivotal role. For a structural change, there is a pressing need for integrating digital inclusion and its adoption for diverse entrepreneurial pursuits. A major constraint to this change is concerns about the cyber security. The instances of breaching cyber security are on a rise. Unless this concern is addressed, expected exponential growth in adoption will be hard to achieve.

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Annexure

1. Questionnaire and interview schedule

SIDE **A**

Question	Location particulars									No of Employees		Scale of business												Platform using																								
	Region #a	State/UT #b	Town #c	Type of Business #d	**Nature of product #e**	**Age of the firm**	**Age of entrepreneur**	**Gender of entrepreneur 1. male 2. female**	**Education 1. No formal edu 2. primary 3. secondary 4. graduate 5. Post. Grad& higher**	Male	female	No of product lines	No of suppliers	No of customers	Have you expanded your product line after PE ? (1. yes 2. No)	If yes, by what %	Has your suppliers increased after PE? (1. yes 2. No)	If yes, by what %	Has your customers increased after PE? (1. yes 2. No)	If yes, by what %	**Do you have a physical office space 1. yes 2. No**	**Where do you manufacture/ stock 1. factory 2. in home 3. only facilitating sales***	**Since how many years using PE**	Amazon seller (1. yes 2. No)	If yes, sales %	Flipkart seller hub (1. yes 2. No)	If yes, sales %	Myntra (1. yes 2. No)	If yes, sales %	OLX (1. yes 2. No)	If yes, sales %	Zomato (1. yes 2. No)	If yes, sales %	Swiggy (1. yes 2. No)	If yes, sales %	OYO (1. yes 2. No)	If yes, sales %	Facebook (1. yes 2. No)	If yes, sales %	Instagram (1. yes 2. No)	If yes, sales %	WhatsApp (1. yes 2. No)	If yes, sales %	WhatsApp Business (1. yes 2. No)	If yes, sales %	Own website (1. yes 2. No)	If yes, sales %	Others (specify)
S No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1																																																
2																																																
3																																																
4																																																

Question						Customer base %			Majority revenue from			Have you expanded your business after participating in platform-based business?									Complementary investments made in the last year					Trade costs (annual average)				Platform security				
	Which platform captures the most orders? 1.Amazon2.Flipkart 3. Myntra 4.OLX 5.Zomato 6.Swiggy 7.OYO 8.Fb 9.Instagram 10.Whatsapp 11.Whatsapp for business 12.Own website 13.Others	**Do you seek professional tech advisory service? 1. yes* 2. No**	**average annual revenue**	**Annual revenue generated through platforms?**	**annual revenue increase after platform business in %**	Local	Regional	Foreign	Local (1. yes 2. No)	Regional (1. yes 2. No)	Foreign (1. yes 2. No)	new products (1. yes 2. No)	new shops (1. yes 2. No)	new warehouse (1. yes 2. No)	modified workplace (1. yes 2. No)	Expanded regional coverage (intra-state) (1. yes 2. No)	Expanded regional coverage (inter-state) (1. yes 2. No)	Started exporting. (1. yes 2. No)	Hired new employees?. (1. yes 2. No)	other *	Hired digitally skilled staff (1. yes 2. No)	training for staff (1. yes 2. No)	upgraded supporting hardware (1. yes 2. No)	others *	**Who bear the additional cost of returns processing? 1.firm 2. Platform.3. mutual**	shipping costs	storekeeping costs	PE commission charges	Other:	Cyber attacks? 1. yes 2. no	Data loss (1. yes 2. No)	hacking (1. yes 2. No)	payment related issues (1. yes* 2. No)	other: 1. Phishing 2. malware 3. ransomware 4.weak passwords 5. Insider threats
S. No	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
1																																		

#a
1.North 2. South 3. East 4. West

#b
1.Delhi 2. Uttar Pradesh 3. Madhya Pradesh 4. Bihar 5. Karnataka 6. Tamil Nadu 7. Andhra Pradesh 8. Kerala 9. West Bengal 10. Jharkhand 11. Assam 12. Odisha 13. Maharashtra 14. Gujarat 15. Goa

#c
1.New Delhi 2. Lucknow 3. Indore 4. Patna 5. Bengaluru 6.Madurai 7.Visakhapatnam 8.Cochin 9.Kolkata 10.Ranchi 11.Guwahati 12.Bhubaneswar 13.Mumbai 14.Surat 15.Goa 16.Nagpur

#d
1.self-employed 2. Business Owners

e
1.Kitchen & Dining accessories 2. Bedding, Furniture & Room Décor 3. Grocery & Gourmet Foods 4. Baby Care 5. Household Supplies 6. Office Products 7. Lodging 8. Health & Personal Care 9. Garden& Outdoors 10. Electronics & Accessories 11. Toys& Games 12. Textiles & Accessories 13. Jewelry 14.Luggage, Bags and footwear15.Food retail 16. Others

2																																		
3																																		
4																																		

22* if 3, explain the modus operandi
50* if yes, what kind of advice is sought, from whom, cost?
68* how?
81* explain

SIDE **B**

Question	**Govt support**		**Foreign trade**					**Covid 19**													
	Have you received any govt support to digitalize your business ?1. yes 2.No	Type of support* 1. Monetary 2. Non-monetary	Do you trade to customers abroad? 1. Yes 2. No	How much revenue is earned from ft? %	Have you started ft after PE? 1. yes 2. No	Have you received any govt support sell abroad?1. yes 2. No	Type of support* 1. Monetary 2. Non-monetary	Have you digitalized business amid	If yes, by what %	Has your customer base increased amid covid? 1. Yes 2. No	If yes, by what %	Have your sales increased amid covid? 1. Yes 2. No	If yes, by what %	Has your overall operation cost increased amid covid? 1. Yes 2. No	If yes, by what %	Has your revenue increased amid covid? 1. Yes 2. No	If yes, by what %	Have you received any govt support amid covid?1. yes 2.No	Type of support* 1. Monetary 2. Non-monetary		
S.No	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
1																					
2																					
3																					
4																					

84* explain
89* explain
101*explain

1. How product returns are processed? / How product return in a foreign sale is processed?
2. What are your supply sources and selection strategy?
3. What kind of support you expect from govt in future to protect trade in platforms?
4. What kind of support you expect from govt in future to find foreign trade?

Interview schedule for the non-users of e-commerce

1. Gender
2. Age (of entrepreneur and age of firm)
3. Annual income and expenses
4. Number of employees (male and female)
5. Why are you not digitizing your business activity? (List the limitations)
6. If not digitizing by choice, why? Benefits?
7. Are you ready to digitalize if you receive help? What kind of help are you expecting, From whom?
8. Foreign Trade? Income? Modus operandi?
9. Migrant? Migration history?
10. Do you use smartphone? Why don’t you use mobile phone to find sales?

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