

Rajeev, Meenakshi; Bhandarkar, Supriya

Working Paper

Women online: A study of common service centers in India using a capability approach

ADB Working Paper, No. 1327

Provided in Cooperation with:

Asian Development Bank Institute (ADBI), Tokyo

Suggested Citation: Rajeev, Meenakshi; Bhandarkar, Supriya (2022) : Women online: A study of common service centers in India using a capability approach, ADB Working Paper, No. 1327, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/267760>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by-nc-nd/3.0/igo/>



ADB Working Paper Series

**WOMEN ONLINE: A STUDY OF
COMMON SERVICE CENTERS IN INDIA
USING A CAPABILITY APPROACH**

Meenakshi Rajeev and Supriya Bhandarkar

No. 1327
June 2022

Asian Development Bank Institute

Meenakshi Rajeev is a professor and Supriya Bhandarkar is a PhD scholar at the Institute for Social and Economic Change, Bangalore, India.

The views expressed in this paper are the views of the author and do not necessarily reflect the views or policies of ADBI, ADB, its Board of Directors, or the governments they represent. ADBI does not guarantee the accuracy of the data included in this paper and accepts no responsibility for any consequences of their use. Terminology used may not necessarily be consistent with ADB official terms.

Working papers are subject to formal revision and correction before they are finalized and considered published.

The Working Paper series is a continuation of the formerly named Discussion Paper series; the numbering of the papers continued without interruption or change. ADBI's working papers reflect initial ideas on a topic and are posted online for discussion. Some working papers may develop into other forms of publication.

The Asian Development Bank recognizes "China" as the People's Republic of China.

Suggested citation:

Rajeev, M. and S. Bhandarkar. 2022. Women Online: A Study of Common Service Centers in India Using a Capability Approach. ADBI Working Paper 1327. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/women-online-a-study-of-common-service-centers-in-india-using-a-capability-approach>

Please contact the authors for information about this paper.

Email: meenakshi@isec.ac.in

We are immensely grateful to ADBI for its support in carrying out this work. We also thank Gayathri Devi, Sabyasachi Tripathi, Jayasimha K Rao, and Pranav Nagendran for their valuable support, without which this paper would not have been completed. Meenakshi Rajeev thanks the ICSSR and the RBI for their support for ISEC. The usual disclaimer applies.

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

© 2022 Asian Development Bank Institute

Abstract

Income-generating activities performed by women are an effective way to reduce gender deprivations and disparities. In the constrained familial and community settings of developing economies, the online platform can be an appropriate means for women to carry out economic activities. In this context, certain important initiatives taken by the government of India such as the creation of Common Service Centers are worth studying. This paper critically evaluates such revolutionary online platform-based entrepreneurial initiatives using the capability approach developed by Amartya Sen. We examine how women-run businesses use the online platform and what determines their success, inputs, capabilities, and conversion factors through a case study method. Further, enterprise-level National Sample Survey Organization data at the all-India level are analyzed to show that the states that have a higher level of gender inequality are also the regions with a lower level of information and communications technology usage by women-run enterprises.

Keywords: common service centers (CSCs), village-level entrepreneurs (VLEs), capabilities, online platform, women-run enterprises

JEL Classification: L26

Contents

1.	MOTIVATION AND THE COUNTRY CONTEXT	1
2.	VILLAGE-LEVEL ENTREPRENEURSHIP (VLE): SCHEMES OF RELEVANCE	3
2.1	Common Services Center–Village-Level Entrepreneur (CSC-VLE) Scheme ..	3
2.2	<i>Stree Swabhiman</i> : An Initiative under the VLE Program	3
3.	DATA AND METHODOLOGY	3
3.1	Methodological Approach	3
3.2	Primary Data Collection	4
3.3	Survey Instruments	4
4.	THEORETICAL FRAMEWORK.....	5
5.	MACRO-SCENARIO: AN ANALYSIS OF NSSO DATA	5
5.1	Determinants of Internet Usage by Women-Owned Enterprises.....	6
6.	SUMMARY STATISTICS FROM FIELD-LEVEL DATA	8
6.1	Economic Activities and Impacts	8
6.2	Social Impacts.....	10
7.	ENTREPRENEURSHIP AND TECHNOLOGY THROUGH A CAPABILITY LENS: SELECTED CASE STUDIES	10
7.1	Taxonomic Partition	11
8.	CONCLUDING REMARKS AND POLICY SUGGESTIONS	15
	REFERENCES	17

1. MOTIVATION AND THE COUNTRY CONTEXT

Income-generating activities performed by women are an effective way to reduce gender deprivation and disparities (ADB 2013). Encouraging women's entrepreneurship has several benefits for an economy, such as improving livelihood opportunities and closing the gender gap in the labor market, thereby alleviating poverty and enabling sustainable economic development (ESCAP 2015). Women entrepreneurs, however, are still a minority in developing countries and face several work-family constraints (ADB 2018; Panda 2018). In India, women entrepreneurs are usually engaged in small businesses, and many of these activities are coordinated through self-help groups (SHGs), where certain product development training programs are usually organized by the government. However, these programs frequently overlook the important aspect of product marketing, which remains a major concern for enterprises (Rajeev et al. 2015). Further, due to patriarchy and other gender-based taboos, women's movement in countries like India, particularly in rural areas, is often restricted, confining them to their homes (see Gaitan 2018). Extra responsibilities like caring for children and the elderly (Duflo 2012; Yu and Cui 2019) create a further hurdle for them to overcome in taking up income-generating activities.

In such a constrained familial and community setting, the online platform has proved to be advantageous as it enables production and marketing to be done from home. Furthermore, Covid-19 has heightened the importance of this avenue as it offers opportunities for contactless business. In addition, the online platform provides marketing opportunities at a lower cost to entrepreneurs wishing to scale up their businesses. This is important for women entrepreneurs, who are often unable to acquire large capital for investment.

As has been well accepted, finance is one of the crucial requirements for starting and expanding a business, which small entrepreneurs lack. The usage of ICT-based tools helps these entrepreneurs to gain information on different modes of financing to improve their access. It can also help them acquire information on business development techniques and marketing opportunities (Webster and Zhang 2020; Güney-Frahm 2018), which can improve their return and thereby reduce poverty (ADB 2018; Liu, Zhou, and Wu 2015). More importantly, even micro- and small-enterprise-based women from interior rural and tribal parts can successfully establish business contacts without the interference of, or exploitation by, middlemen or fixers.

However, women wishing to operate on the online platform face several challenges as well, the most prominent being a lack of infrastructure access and operational knowledge. Because of this, they are not able to use ICT efficiently to their advantage (Martinez and Nguyen 2014; UNCTAD 2014). India, in particular, has a significant digital gender gap in Internet usage, with men accounting for 71% of Internet users and women accounting for only 29%. Compared to urban India, this gap is significantly higher in rural India, where the male-to-female internet user ratio is 88:12 (IMAI 2019). Furthermore, the (general) Gender Gap Index developed by the World Economic Forum (2020) ranks India as low as 112th among 153 countries based on indicators such as economic participation and opportunity. Literature also highlights how women in India are discouraged from using mobile phones and the internet, which essentially results in digital exclusion (Mukherjee et al. 2016). Thus, it is felt that empowering women through e-business requires governmental interventions. Researchers, however, argue that most state interventions for e-business development are gender-blind and, as a result, they benefit male entrepreneurs while excluding women unintentionally (Orser, Riding, and Li 2019). Therefore, it is required that gender-

sensitive incentives be provided to women entrepreneurs (Orser, Elliott, and Findlay-Thompson 2012) for them to get the benefits of the state programs.

One such transformative initiative undertaken by the government of India is the establishment of Common Service Centers (CSCs). CSCs are launched to serve as local access points for electronic services for various state welfare schemes, including financial inclusion programs. At the village level, entrepreneurs (VLEs) can establish these centers for the online enrollment of local citizens for various government welfare programs, charging a fee. This business, by its nature, is online as it requires accessing a government-created portal and uploading biometrics, etc. of the service seekers. These activities have now spread to every corner of the country, assisting in the expansion of digital literacy, livelihood opportunities, and smooth transfer of state benefits to citizens. Another revolutionary VLE program initiated by the state is the *Stree Swabhiman* (self-respect of women) scheme where women entrepreneurs manufacture and sell sanitary pads under local brand names while also educating women about menstrual hygiene. This is a program that does not necessarily require online operations. But there is immense potential to use the online platform for this business for marketing as well as information dissemination. Whether rural women are able to take advantage of ICT for these two significant VLE programs is an important question to consider.

This paper looks at the functioning of these programs in the rural regions, examining how the otherwise deprived rural women use the digital platform for livelihood generation through the VLE schemes, as well as their achievements and challenges. Despite the CSC VLE scheme being a revolutionary development under the digital India program, there have not been many rigorous studies on the subject. The few studies that do exist focus essentially on the terms of the scheme and the challenges of CSC rollouts (Dass and Bhattacharjee 2011; Dwivedi et al. 2016; Sharma et al. 2021) as well as the service qualities (Uthaman and Vasanthagopal 2017). Further, a study conducted at the Indian Business School attempts to highlight the factors that drive the entrepreneurial performance of VLEs and assess the financial viability and social impact of CSCs (Indian School of Business 2018). As CSCs also deal with banking services, the impact of these centers on financial inclusion has also been examined in the literature (National Insurance Academy 2021). To the best of our knowledge, there is no systematic study that looks at such transformational government initiatives in the context of digital literacy and entrepreneurship development in rural areas based on ground-level experiences. More importantly, the role of the scheme in transforming the capabilities of *women* VLEs and the conversion factors at work have not been analysed in the existing literature. The current study, therefore, fills this significant research gap by bringing in the gender dimension while taking up Sen's capability approach (Sen 1979, 1985) as a framework for analysis.

The study reveals several interesting aspects by employing both qualitative and quantitative methods. An important contribution of the paper is to analyze National Sample Survey Office (NSSO) enterprise-level data at the all-India level to demonstrate, using cross-sectional regression, that states with higher levels of gender inequality are also regions with lower levels of ICT usage by women-owned enterprises. A case study method is used to discuss how women engaged in the CSC-VLE and *Stree Swabhiman* programs use online services in business and what factors influence their success and failure. These cases were gathered during our field visits, and Sen's capability theory (Sen 1979, 1985, 1993) served as our conceptual framework for analyzing these cases in terms of capabilities and conversion factors, which is novel in this context.

2. VILLAGE-LEVEL ENTREPRENEURSHIP (VLE): SCHEMES OF RELEVANCE

When we consider women's entrepreneurship and usage of the online platform at the village level, as mentioned above, two state schemes appear to be of immense importance. A few of their details are discussed below.

2.1 Common Services Center–Village-Level Entrepreneur (CSC-VLE) Scheme

One of the noteworthy initiatives by the Ministry of Electronics and Information Technology, Government of India is the Common Service Center (CSC) scheme that was conceptualized to successfully implement e-governance in the country. These service centers were initially established to act as access points at the local level for electronic services for various state welfare schemes, including those for financial inclusion. For better monitoring and accountability as well as for reducing corruption, beneficiaries of state welfare programs need to enroll through government portals. Common citizens are usually unable to do these activities. CSCs act as a mediator by charging a small fee towards getting the work done with ease and efficiency. There are 360,873 functional CSCs across India as of 2020 (<https://www.csc.gov.in>). Thus, this is a large-scale livelihood program creating village-level entrepreneurs.

A potential entrepreneur wanting to become a CSC-VLE needs to enroll through a government portal. A certificate is also required for opening a digital Seva Kendra, i.e., a CSC outlet, which can be obtained by passing an online test, with the test varying depending on the kind of services the VLE decides to provide. Once the candidate enrolls after passing a qualifying test and is registered, s/he will be provided with an ID, which can be used to log on to the CSC portal and provide services. There is no rationing based on the number of VLEs in a location. Some of these services are also provided by public agencies, but the advantages of dealing through the CSCs include their easy access, less travel, better communication, and so on. However, as the number of CSCs is large, there is competition and the entrepreneurs need to maintain good services to capture a better share of the market.

2.2 Stree Swabhiman: An Initiative under the VLE Program

Another important drive under the VLE scheme is the *Stree Swabhiman* (self-respect of women) initiative under which women entrepreneurs make sanitary napkins and compete with multinationals selling similar products. In some cases, they receive state support in terms of marketing their products. Further, they provide an important service by educating village women and girls about menstrual hygiene and thus the importance of using sanitary napkins. Products are sold by local VLEs under local brand names (www.stree Swabhiman/Project Overview).

3. DATA AND METHODOLOGY

3.1 Methodological Approach

A multiple-method strategy, using both qualitative and quantitative methodologies, is adopted in this paper. To provide a background for the study, at a macroeconomic level we analyze secondary data provided by the NSSO at the enterprise level (NSSO

2016). The survey consisted of a sample of 2,90,113 enterprises, 51% of which were located in rural areas from which data have been extracted for women-headed proprietary enterprises that use Internet facilities in their business. Though NSSO data offer information on women-run enterprises, no data are provided on CSCs, and to fill this gap, we conducted a field survey.

The field-level findings are presented through a case study method where important cases from our primary survey are elaborated upon. The case study method offers a means of investigating complex social units such as women entrepreneurs, who are influenced by multiple variables of potential importance. Within the case study approach, multiple cases are considered to understand the differences and the similarities in the perspectives of various participants and analyze contrasting impacts of the same program on different participants, which in turn helps decipher the role of external factors in the outcomes (Yin 2003).

3.2 Primary Data Collection

Two states, one developed¹ and the other relatively less developed, viz., Karnataka and Assam, are considered for our study. We selected five districts purposively from each state comprising both developed and less developed districts, namely Kamrup, Golaghat, Nagaon, Darrang, and Bongaigaon from Assam and Tumkur, Dharwad, Bellary, Belgaum, and Uttara Kannada from Karnataka. In collating the list of women-run CSCs in these two states, we collected data for 120 CSCs, 75 from Karnataka and 45 from Assam, belonging to the above-mentioned districts. According to our pilot survey, the CSC scheme in Assam is in the nascent stage, with limited activities compared to Karnataka, where the program has made significant progress. As information was limited in Assam, we chose a larger sample from Karnataka. The sample size is constrained due to difficulty in conducting a large-scale survey because of the devastating effects of the pandemic and the resulting lockdown. For comparison purposes, we selected 50 women entrepreneurs, 15 from Assam and 35 from Karnataka, engaged in small offline businesses such as trading, baking, jewelry making, etc. Interviews were conducted both over the phone and in person.

The enterprises under the Stree Swabhiman scheme are limited and many of them are now defunct. Hence, we collected information from four such entrepreneurs, two each in Assam and Karnataka, and presented their cases in Section 7. Information about these operative entrepreneurs is obtained from government offices.

3.3 Survey Instruments

A structured questionnaire was formulated for the field survey. First, a pilot survey was conducted, based on which some revisions to the questionnaire were made. Questionnaires used for this case study were developed following the review of existing literature, news reports, reading government documents, and based on our research questions. The questionnaire contained both quantitative and qualitative questions on the following areas of interest: motivation to start the business, problems faced, familial and government support, level of income and expenditure, etc. All the participants were provided with information outlining the research aims and were informed that their experiences would be documented and subsequently available in the public domain. Informed verbal consent about recording the interview was obtained prior to

¹ Karnataka has an HDI score of 0.706 and Assam has an HDI score of 0.651 (National Statistical Office 2018).

commencement. Complete anonymity was ensured to help the respondents answer our queries candidly and the names of respondents have been changed in this paper to maintain anonymity. Each interview session lasted around 30 minutes. In addition, discussions were also held with government officials.

4. THEORETICAL FRAMEWORK

The theoretical framework utilized for the study is based on Sen's (1979, 1985, 1993) well-established capability approach. According to this approach, while indicators of economic prosperity are important, they are inadequate as measures of quality of life and well-being (Sen 2003). An individual's true well-being includes the freedom to choose opportunities and function accordingly. The capability approach, therefore, considers freedom in terms of expanding capabilities to help achieve functionings. Functioning is what an individual succeeds in "doing or being" (Basu and Lopez-Calva 2011); in other words, while capabilities are a vector of all conceivable functions in a given area, a functioning is a single observed outcome (Strenio 2020).

According to the capability literature, inputs/resources and their characteristics determine various capabilities. Inputs or resources can refer to both tangible and intangible assets and services that people have at their disposal—income, material objects, skills, rights, etc. (Robertson 2015). Technology has emerged as a key input that enhances capabilities. However, the capability approach recognizes that inputs do not necessarily transform into the same capabilities for every individual (Strenio 2020). Conversion factors are conditions that can either help or hinder a person in terms of transforming their capabilities into functionings. Following Robeyns (2005), conversion factors can be classified into individual (gender, physical health, literacy, IQ), social (laws and regulations, government policies/programs, societal hierarchies, or power relations based on class, caste, or gender, and spousal and familial support), and environmental (geographical environment including climate, infrastructure) factors.

Importantly, certain authors have made a distinction between the generative dimension and the transformative dimension of inputs. While technical objects such as mobile phones and computers can be used for their innate characteristics of processing and communicating digital data, and thus be considered an input, they can also "alter the characteristics (e.g., nutritional content) of other inputs (e.g., food) by modifying them directly (e.g., through a cooking stove) or through their combination (e.g., through a recipe)" (Haenssger and Ariana 2018: 103). In other words, they act as conversion factors toward other inputs in the attainment of valued capabilities (Haenssger and Ariana 2018).

The final concept in the capability approach that we refer to is agency. Agency is defined as "what a person is free to do and achieve in pursuit of whatever goals or values he or she regards as important" (Sen 1985). Sen further draws a distinction between realized agency success, which refers to situations when the realization of an individual's objective is through someone else, and instrumental agency success, where the individual plays an active part in the achievement of their objectives (Crocker and Robeyns 2010).

5. MACRO-SCENARIO: AN ANALYSIS OF NSSO DATA

Using the 73rd round of NSSO data to examine the macroeconomic backdrop surrounding women's use of the Internet for business, it is observed that only 2.1 and 6.1% of rural and urban women-owned businesses utilize the Internet, respectively.

Specifically, 70% of these enterprises primarily use ICT to send emails for business communication, followed by Internet banking (45%), with very few utilizing the Internet for marketing purposes (only 4.73% of enterprises deliver products online). Ironically, when we looked at the major problems that they face while running their business it turned out to be marketing. In addition to marketing being a major bottleneck, 9.57% of women stated that they faced difficulties in accessing credit to invest in better equipment such as computers and high-speed internet, with 6.47% of women also stating that a major challenge they face in using the online platform is an erratic power supply due to frequent power cuts, which hinders their ability to use the Internet consistently for business purposes.

5.1 Determinants of Internet Usage by Women-Owned Enterprises

One of the major contributions of capability theory to applied welfare economics is the development of indicators such as the Human Development Index (HDI) for measuring well-being, which represents capabilities more aptly than simple per capita income. A society concerned with the well-being of women needs to pay attention to the Gender Development Index (GDI) or Gender Inequality Index (GII) (UNDP 2010). We ask here whether having a better GDI, measured in terms of income, health, and education level, leads to a higher capability and functioning, ensuring the use of advanced technology and the development of entrepreneurship capabilities amongst women. This is relevant since most of these variables act as conversion factors as per capability theory. This question is addressed through our regression model, which considers a female proprietor's Internet usage and examines whether a region/state with a higher GDI shows a higher level of ICT-based women's entrepreneurship. The outcome (response) variable, therefore, is binary (1/0) and we thus use a probit model. Our regression models report comparable estimates with a parsimonious set of controls. Parsimonious models are used as they are simple models with great explanatory predictive power (Daganzo et al. 2012) and consideration given to just the right number of predictors needed to explain the best regression models.

Our regression results (Table 1) show that states with higher GDI² values have a positive impact on Internet usage by a female proprietor. Similarly, higher GII³ values display a lower level of usage of ICT for business by women. Internet usage is assessed by considering the number of Internet subscriptions, broadband subscriptions, and wireless Internet subscriptions, all of which have a positive and statistically significant effect on the increasing use of the Internet by a female proprietor. Greater availability of Internet infrastructure such as per person availability of base transceiver stations, and telecom tower count, also facilitates a female proprietor's use of the Internet.

² The GDI measures gender inequalities in achievement in three basic dimensions of human development for males and females: health (life expectancy at birth); education (expected years of schooling for children and mean years of schooling for adults aged 25 and older); and command over economic resources (estimated earned income).

³ The GII measures gender inequalities in three aspects of human development: reproductive health measured by the maternal mortality ratio (MMR) and adolescent birth rate (ABR); empowerment measured by the proportion of parliamentary seats occupied by females and the proportion of adult females and males aged 25 and older with at least some secondary education; and economic status expressed as labor market participation and measured by the labor force participation rate (LFPR) of female and male populations aged 15 and older. For detailed steps on the construction of the GDI and GII, see National Statistical Office (2018).

Table 1: Determinants of Internet Usage for Business by Women-Owned Enterprises

Independent Variable	Dependent Variable			
	If a Female Proprietor Uses Internet = 1 or Otherwise = 0			
	(1)	(2)	(3)	(4)
State dummy (if state's per capita constant NSDP is higher than national level = 1; otherwise = 0)	0.209*** (0.0304) {0.015569}			
If it is located in urban area = 1; otherwise = 0	0.402*** (0.0297) {0.0299572}	0.474*** (0.033) {0.0352878}	0.507*** (0.031) {0.040494}	
Location: if within household premises = 1; outside household premises = 0	-0.863*** (0.0297) {-0.0642314}			
Whether the enterprise maintains any bank account/post office savings bank account (yes = 1, no = 0)	0.766*** (0.0340) {0.0570446}	0.894*** 0.038 {0.0665498}		0.905*** (0.0337) {0.0744802}
Whether pursuing mixed activity (yes = 1, no = 0)	0.106* (0.0618) {0.0078609}		0.145* (0.0741) {0.0115866}	0.234*** (0.0629) {0.0192957}
Whether nonprofit institution (yes = 1, no = 0)	0.305** (0.143) {0.0227148}	0.436*** (0.152) {0.0324757}	0.572*** (0.147) {0.0456287}	
GII				-0.264* (0.147) {-0.0217617}
GDI		0.273*** (0.269) {0.0203204}		
HDI			1.149*** (0.33) {0.091781}	
Number of Internet subscriptions		0.005*** (0.001) {0.0003776}		
Number of broadband subscriptions			0.01* (0.002) {0.0008029}	
Number of wireless Internet subscriptions				0.00286** (0.00123) {0.0002354}
Base transceiver stations count (per capita)		82.949*** (21.75) {6.178098}		
Telecom tower count (per person)			307.08*** (91.29) {24.51229}	
Constant	-2.273*** (0.0443)		-3.149*** (0.195)	-2.289*** (0.0876)
LR chi ²	2,430.99***	1,178.36***	461.18***	998.22***
Pseudo R ²	0.1962	0.1237	0.0484	0.0912
Log likelihood	-4,981.2089	-4,173.2149	-4,531.8445	-4,971.811
Observations	35,462	29,260	31,521	31,520

Standard errors in parentheses (); Marginal effects of the overall expected value of estimated probit coefficients in { }.

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

Amongst the other control variables, our models show that female proprietaries who belong to a richer state use the Internet more than those who belong to a relatively poorer state. Compared to rural proprietaries, urban female proprietaries use the Internet more, perhaps due to a better business environment. Further, female proprietaries situated outside the household premises or maintaining bank accounts are more prone to using the Internet facility for business (these are also enterprises that are larger in size and hence we have not utilized size as a variable to avoid multicollinearity)⁴.

While this analysis provides us with interesting insights at the macroeconomic level, as previously mentioned, to understand how CSCs have impacted the lives of rural women, we have conducted a field survey. A few cases of significance from the survey are discussed to highlight the struggles of women, the challenges they face, and the facilitating environment they require. However, before moving to the cases, we present some of the summary statistics from our field survey.

6. SUMMARY STATISTICS FROM FIELD-LEVEL DATA

As previously mentioned, our sample consists of 170 respondents, of whom 110 are from Karnataka and 60 are from Assam.

6.1 Economic Activities and Impacts

Undertaking online activities has created reasonably good income for the women entrepreneurs, especially in Karnataka. In Karnataka, on average, online income is more than 150% higher than offline income (Table 2). The test of difference in mean (t-test) with the null hypothesis that there is no significant difference in the mean income of online vs. offline activities shows rejection of the null at a 99% confidence level. In Assam, however, our result shows no significant difference in income between online and offline businesses (the t-statistic is not significant).

Table 2: Profits from Business—Online vs. Offline

		Karnataka			Assam		
		Offline Business (Control)	Online Business (Treatment)	Statistical Result	Offline Business (Control)	Online Business (Treatment)	Statistical Result
Profit (in Rs)	Mean	3,800	9,646.66	$T = -6.637$ (0.000)*	3,466.66	2,850	$T = 1.068$ (0.289)

p-values in parenthesis; * significance at 1% level; statistical result using independent t-test.

Source: Analysis of primary data.

A simple t-test, however, does not account for the differences in the profile of women who take up online businesses vis-à-vis those who engage in offline activities. Several characteristics (equivalently covariates) such as age, education, caste, family income, and marital status may influence a woman entrepreneur's propensity to use an online platform for her business, and thereby influence her profits as well. This will introduce a self-selection bias in the estimation of the effect of online facilities on business profits unless we take into account the impacts of these covariates. To account for this

⁴ As the GDI incorporates state income, to avoid multicollinearity we have not considered income separately, but we have introduced a state income-based dummy.

discrepancy, we next estimate the average treatment effects (viz., usage of the Internet for business) on the target variable (profit). In an ideal situation, one should compare the profits earned by the same woman when she uses an online platform to her offline usage. However, such a counterfactual cannot be derived from observational data since each woman is only observed as either having used the Internet or not, and not having done both. Under such circumstances the assumption is made that it is possible to partition the population in such a way that we can obtain a group of demographically similar individuals, among whom some are treated (have an online business) and others are not (offline entrepreneurs), where their likelihood of being treated is identical, and compare their outcomes to obtain average treatment effects.

Several such methods exist, including regression, inverse probability weighting, and nearest neighbor matching, that can be used to examine the impact of a treatment on a target variable considering the influence of covariates on the propensity to get treatment. However, one useful method that is easier to implement and overcomes some of the shortcomings of the other methods is that of propensity score matching (PSM), where a logit or probit regression is used to estimate the probability of a particular unit receiving treatment, conditional on a vector of covariates. Following this, each treated unit is compared to a nontreated one that has the closest propensity score, i.e., which are nearly equally likely to have been included in the treatment (details of this method can be found in Rosenbaum and Rubin (1983)).

We utilize the PSM method for our analysis and the logic for considering the covariates mentioned above is as follows. Women's age and education are taken since it is expected that younger and more educated women are more likely to adapt to new technologies, and are more digitally literate and aware of ICT usage. We also consider caste, since it is expected that those from the general category have better informed and more affluent networks. Further, household income, which provides resources for capital investment, and marital status (presumably receiving support from spouse or children) were also considered covariates. The results from this analysis are presented in Table 3.

Table 3: Profits from Business—Online vs. Offline Using Propensity Score Matching

	Assam	Karnataka
Average treatment effect on the treated (online vs. offline business)	–116.66 (0.876) {747.65}	3,480 (0.000)* {667.85}

p-values in parenthesis (); All robust standard errors in { }; * significance at 1% level; statistical result using propensity score matching.

Source: Analysis of primary data.

Looking at Table 3, we can see that selecting an online business earns, on average, Rs3840 more than an offline one for women in Karnataka. This is primarily because the CSC-VLE program has been running well for a considerable time in the state and several women have been able to take advantage of it. There is also a considerable amount of learning by doing, as can be seen from our case studies. In Assam, however, our result shows no significant difference in income between the online and offline businesses. This is because CSC activities are at a nascent stage in the state and they are engaged in enrolling for only a few selected government schemes. Thus, income from these activities is currently modest. Some of the conversion factors, such as education and exposure, may also be responsible for this. From our secondary data,

we observe that the GDI and GII values, which incorporate some of these factors, are lower for Assam than for Karnataka⁵.

6.2 Social Impacts

In addition to the economic benefits, which undoubtedly contribute to women's empowerment, several social benefits accrue, which are listed in Table 4. Gaining respect within the family and being more independent are two of the major benefits recognized by these women. But the most noteworthy benefit stated by them is being able to fight for their own and their *girl child's rights*. Entrepreneurial activities, particularly CSC-based ones in which they help fellow citizens avail themselves of certain benefits, have also aided their socialization and empowered them to participate in conflict resolution within the village and local governance system (Table 4).

Table 4: Social Impacts of Online Business Activities

	Percentage of Respondents		
	Yes	Only to Some Extent	Not at All
Helped in getting more respect in the family	57.8	36.3	5.9
Helped in making decisions in the family	47.3	14.7	38.0
Increased income through online business helped to fight for the right of the daughter	60.7	–	39.3
Helped to fight for your right	44.1	1.8	54.1
Helped to go on outing with your friends	24.7	7.6	67.6
Helped to participate in conflict resolution within the village	13.0	11.3	75.7
Helped to participate in village governance	17.8	10.5	84.3
Helped to change bad habits of your husband like drinking	6.5	1.9	91.7

Note: Karnataka and Assam combined.

Source: Field survey.

7. ENTREPRENEURSHIP AND TECHNOLOGY THROUGH A CAPABILITY LENS: SELECTED CASE STUDIES

Technological devices have the potential to significantly impact human lives in general, and capabilities in particular, in many ways. Oosterlaken (2013) highlights how lamps not only provide light but also contribute to the overall quality of life by allowing individuals to use the outdoor toilet at night without being afraid, or to study in the dark. Technology, therefore, as seen through these cases, has the potential to contribute to the quality of life by expanding what people can do or be, i.e., their capabilities (Oosterlaken 2013).

Through the course of our primary survey, we highlight cases of individual women who have taken advantage of technology to adopt the government schemes mentioned above and reflect on their capabilities, conversion factors, and agency.

⁵ The GII score for Karnataka is 0.464 and that of Assam is 0.594 for 2017–18.

7.1 Taxonomic Partition

Building on our field observations, we put forth a taxonomic partition based on the capabilities and functioning of the women entrepreneurs into three broad groups. The partitioning done in terms of conversion factors and agency considers: (1) *“Active entrepreneurs: ICT acting as conversion factor” comprising women undertaking their business with tremendous interest and zeal; the (2) “Passive group: Hindrance of social conversion factors,” who are running the business primarily with the assistance of their relatives as resigned entrepreneurs; and the (3) “Withdrawn entrepreneurs: Lack of conversion factors leading to functioning failure,” which comprise unsuccessful CSC business ventures.* (We have presented a schematic representation of these cases in Figure 1.)

7.1.1 Active Entrepreneurs—ICT Acting as a Conversion Factor

In addition to achieving financial freedom, starting a CSC or a sanitary pad-making unit under the Stree Swabhiman scheme held immense value for this group of *active* entrepreneurs.

CSC Activities

The most important resources that operating a CSC requires are a mobile phone, a laptop, and Internet facilities. Depending on the extent of the business, many use mobile phones (costing INR4,000–12,000) for enrollment, while others utilize a desktop or a laptop (costing INR35,000–60,000). The biometric device costs an additional INR2,500–3,000. Technology is therefore used as an input that is vital to starting a CSC business. However, the mere presence of inputs does not lead to the same capability expansion and functioning for all individuals since individual conversion factors such as gender, literacy, skill, and agency play an important role.

Take, for example, the case of Ms. Nibha from Dharwad district of Karnataka, who actively spreads the message of CSCs across the state through a WhatsApp group. She is representative of an opportunity entrepreneur⁶, who, despite having the option to take up wage employment, saw the business potential in her village and decided to open a CSC. According to Ms. Nibha, the government has around 1,000 schemes, and because all the schemes require online enrollment, the business potential is enormous. As a result of the volume of transactions, even charging a small fee can result in significant earnings. However, she observes that, due to this potential economic gain, competition has intensified.

Ms. Nibha started her business in 2017 on the premises of her husband’s photocopying shop. Encouraged by her husband to undertake computer training rather than a traditional job such as tailoring, she was driven to take up CSC work. Self-learning the presence and handling of the various CSC schemes through YouTube videos increased her earnings from INR7,000 in 2017 to INR30,000 in 2019. Even during the pandemic, she was selected for Covid-data entry work and earned INR24,000. The recovery of her business in 2021 is expected to earn her INR30,000 per month. However, apart from this monetary gain, she has accrued the distinct social benefits of gaining significant respect within her community since all the people in her village approach her for various welfare schemes. She also proudly announces that she has

⁶ The Global Entrepreneurship Monitor differentiates between opportunity and necessity entrepreneurs. Opportunity entrepreneurs are those individuals who are motivated by the prospect of success and are pulled into self-employment, while necessity entrepreneurs are pushed into self-employment because there are few or no other alternatives to earn a living.

full rights over her earnings. Today, in addition to managing her own business, she trains other women in CSC work, empowering them to start their businesses. Thus, from an entrepreneur, she has also become an entrepreneur trainer. Ms. Nibha is not a singular case; there are other women working actively in this field.

Thus, while ICT is the basic input for CSC work, it also plays a transformative role by enhancing the role of other inputs such as knowledge and skill. These women are constantly interacting and learning from one another using ICT-based platforms such as WhatsApp and YouTube. Technology has created an enabling and transforming environment where knowledge is continuously enhanced. Thus, ICT has become a conversion factor, rather than only input for enrollment in various schemes. As previously mentioned, a recent paper by Haenssger and Ariana (2018) is a significant contribution in this regard. They wrote, “[T]echnical objects do not only have a ‘generative dimension’ that makes them an input like other objects in the CA. Technical objects also have a ‘transformative dimension’ through which other inputs are affected in the attainment of valued capabilities. In this transformative capacity, technical objects behave like other conversion factors.” In our case, for these active CSC members, we argue that ICT played a dual role: first, as an input in terms of a device that helps the enrollment process; and second, as a conversion factor, since online platforms like WhatsApp, Facebook, and Instagram help with the continuous skill formation required to carry out business.

In Assam, where the CSC activities have just begun, Ms. Rita from Jagiroad in Naogaon district began her activities as the head (pratinidhi) of a self-help group (SHG). She then became a banking correspondent (Bank Mitra), helping people carry out banking activities on their doorstep using the e-platform. She has recently got permission to carry out CSC activities and her business has just begun. But she uses her already existing network of SHGs in different villages through the WhatsApp platform to carry out her banking work in several villages and inform them about the CSC scheme (using ICT as a conversion factor). She enjoys not only the income, but also the respect she gets from the villagers as well as banks. Such social benefits have empowered her to fight for her rights. Her in-laws were initially unhappy about her working outside the house, but her confidence and success have helped her to establish herself and overcome these barriers.

Thus, all these women enjoy their *instrumental agency success*, with the entrepreneur herself playing an active part in achieving her objective. They acquired the ability to set goals and realize them.

However, there are some distinctions between the successful cases of Assam and Karnataka. As the country’s information technology capital, Karnataka citizens are far more Internet-savvy. This knowledge has spillover effects, and as a result, we see that a good percentage of women in Karnataka have relatively better digital literacy and learning-by-doing experiences. Furthermore, the level of difficulty of the enrollment process of CSC-based schemes varies depending on the schemes. The successful women of Karnataka are engaged in enrolling in schemes that have considerably more difficult procedures, whilst those in Assam are limited to schemes with simple procedures.

Stree Swabhimana Entrepreneurs: Technology Acting as a Conversion Factor

Unlike the CSC-based business model where only local, small entrepreneurs operate, under the Stree Swabhimana scheme, small, unknown, untrained entrepreneurs compete with established corporates, particularly MNCs making the same product. So the struggle to find a niche for themselves is more intense.

This is a segment close to a woman's heart as she experiences the menstruation phase. Thousands of such women, especially in the poorer segment and in rural areas of developing nations, use unhygienic methods to protect themselves during this phase and subsequently face health hazards. Therefore, initially, when the government declared that it would provide free sanitary napkins to young girls in schools, it was considered a welcome move. Several women came forward to make use of this opportunity and indigenously produce such products to be subsequently procured by the government. These women can therefore be considered opportunity entrepreneurs. They also served a very important purpose of spreading the message of menstrual hygiene amongst the girls in villages.

There are certain examples of success stories of active entrepreneurs in this program. In the Koppal district of Karnataka state, Ms. Revathi emerged as an entrepreneur who produced sanitary napkins for her village using an ingenious and effective method, and today she is popularly known as the "pad woman of Karnataka." She tracks all young women through a record book to ensure that menstrual hygiene becomes a part of their daily life, due to which the percentage of women using her pads has increased from 7 to 60.

Personal and social factors such as a lack of personal funds for investment and subsequent refusal by public banks to finance the new business led Ms. Revathi to pledge her gold for an informal loan at an exorbitant 24% interest rate to purchase a handheld machine and start her business. She went to villages to educate the young women and so far has conducted more than 2,000 sessions single-handedly. To differentiate her business from other similar ventures, she learned a technology that helps produce a completely biodegradable pad without the use of chemicals like chlorine. Using natural products like banana fiber for its manufacturing and sourcing the required raw materials online, the pad woman of Karnataka has created a niche for herself in this sector.

A slew of factors contributed to the success of these unique biodegradable pads. Inefficient garbage collection in rural areas has led to these pads becoming a preferred option. Additionally, rural women who are involved in manual construction work and sweat more found her pads more comfortable and body-friendly. The success of these pads got publicized on social media platforms and she attracted the attention of both print and electronic media. Subsequently, she was able to obtain a loan under the government credit scheme (a social and environmental conversion factor), enabling a move to a semi-automatic machine in 2019 and a fully automatic machine costing INR2 million in 2020, all through repaying her past loans. Ms. Revathi has grown increasingly active on Facebook and Instagram in seeking crowdfunding and corporate funding. A young girl can be supported for a year for as little as INR500, and Ms. Revathi is seeking to provide this to slum girls. A girl who receives this support then becomes a leader in the community, spreading the message of hygiene to other girls using WhatsApp or offline meetings. She has now formed a large number of SHGs and sells her product to them via WhatsApp. There are a few other women who can also be categorized as active entrepreneurs in this segment.

But a more significant development was yet to come for Ms. Revathi. From her online presence, she attracted the attention of a gynecologist from Hyderabad who now markets her products, highlighting the fact that she uses fully natural products.

While computer technology has aided these active entrepreneurs as a generative input in terms of helping them surf the web to source raw materials, etc., the online platform has also played a transformative role in these cases. As discussed above, the *technology has played the role of a conversion factor* (Haenssger and Ariana 2018)

by having an impact on other inputs such as funding agencies and donors in addition to other institutions that have helped with the distribution of the product.

Further, looking from the perspective of an “agent-oriented view” as described by Sen (1985), these active entrepreneurs took it upon themselves to help the community and “effectively shape their own destiny and help each other” (Sen 1999).

7.1.2 Passive Group: Hindrance of Conversion Factors

The second type of women VLEs are those who have a CSC in their name but the business is managed primarily by a man, often her husband or son. The case of Smt. Ratnamma Kadlimath is an atypical one in this category. Ratnamma, 55, from Bagalkot district in Karnataka, is a middle school dropout and has been involved in CSC work for the last six to seven years. This interview was partly given by her son Janamantha. Despite the CSC being started in her name to take advantage of the government assistance being given to women, she is not involved or trained in this work.

A similar situation can be observed in Assam, where Ms. Saisbali has opened a CSC in her name but the work is managed by her relative Mr. Sujay, who has passed the necessary examination for doing CSC work.

In terms of the capability approach, these cases face constraints owing to individual conversion factors such as gender and skill as they lack the required knowledge for operating online and are not encouraged to participate in the training programs by their families. Entrepreneurs in Assam are hindered by conversion factors such as unstable internet connectivity and power supply. Karnataka entrepreneurs face issues such as the server failing to function properly due to overload. Most of these entrepreneurs face another problem too, which can be referred to as an environmental conversion factor. Due to certain instances of anomalies in the Aadhaar card-making process (which is the primary identity card in India), as a precautionary measure, this facility has been withdrawn from many entrepreneurs, leading to the closure of some businesses. As far as “agency” is concerned, failure of the instrumental agency is observed as these passive entrepreneurs are not playing an active role in the achievement of their business success. Realized agency success is also limited as their relative has not empowered them either.

7.1.3 Withdrawn Entrepreneurs: Constraints Posed by Individual and Environmental Conversion Factors

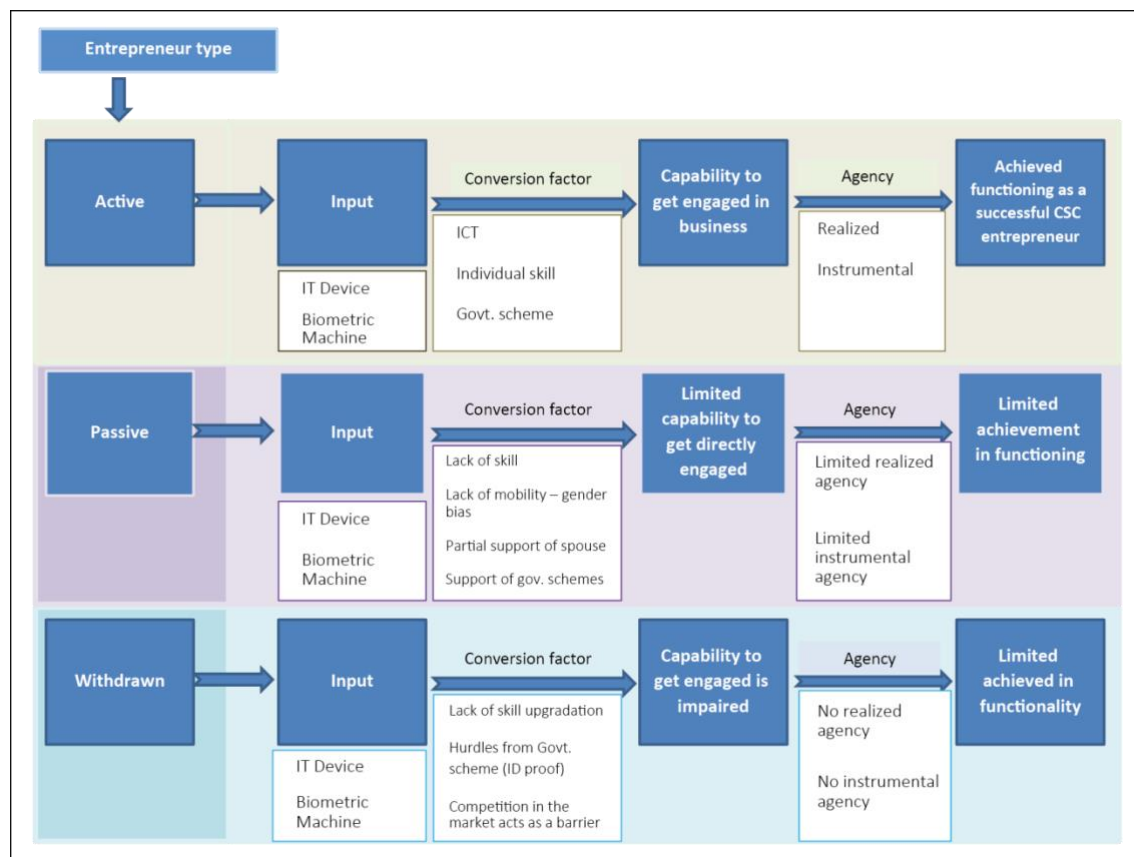
Besides the success stories that we have delineated, there are several failed cases, both in CSC and in Stree Swabhimana businesses.

Punusuya Bai (aged 37) from Karnataka is a case where the inability to get an identity (ID), which is required to operate, has created problems in undertaking CSC work. There are several cases in this category. Widowed 15 years previously, Punusuya returned to her natal home and started her business with the support of her father. Initially, they invested around INR100,000 for two laptops, and around INR2,200 for renting premises along with the recurrent monthly cost of the Internet. The kiosk, however, was defunct after a year because she realized that she lacked the skills to deal with such enrollment procedures. More importantly, their ID and password became inoperable as a result of the government’s revamping of operations, and their attempts to obtain a new ID were futile. Their computers had also become outdated and slow, making it difficult to compete with new entrepreneurs. Several such cases with ID and skilling issues and an inability to compete were observed during our survey. Our findings point to a lack of training and computer literacy as critical

conversion factors that hampered women's business success. Continuous learning is required in this industry because each new scheme has its own enrollment procedure.

Under the Stree Swabhiman program, initially, a large number of entrepreneurs came forward in the hope that there would be government procurement for schools. Subsequent nonprocurement and intense competition from MNCs forced these micro-entrepreneurs to shut down operations (observed both realized and instrumental agency failure). Here too we observe the environmental conversion factor posing constraints in realizing functioning.

Figure 1: Schematic Representation of CSC Entrepreneurship through the Capability Lens



Source: Author's Representation.

8. CONCLUDING REMARKS AND POLICY SUGGESTIONS

ICT has brought widespread changes to how our economy works. It has transformed how people access services and utilities and how they conduct business. Most importantly, technology has made information cheaper and available to all. Despite these promising changes in the economy, a large majority of people in India remain untouched by digital transformation. To remedy this, the government has strengthened the CSC scheme as part of the Digital India Program. The government particularly encourages women to take up the role of a CSC-VLE to improve their social and economic status.

Even though this is a transformational development, only a few studies have looked into the challenges and benefits that rural women entrepreneurs face while undertaking such online businesses. This paper adopts a case study approach to study such entrepreneurs in two Indian states: Assam and Karnataka. The cases are analyzed using the capability framework developed by Sen (1979, 1983, 1995). We see that in certain cases, ICT has played a transformational role and has acted as a conversion factor; however, in some other cases, ICT has acted only as an input. With the development of the CSCs, another set of unique activities took place under the Stree Swabhiman program where women entrepreneurs manufactured sanitary pads in their villages and made young girls aware of intimate hygiene. Through our cases, we show how these entrepreneurs face a tough battle in the face of multinationals operating in this field and how, through village SHGs and online platforms such as WhatsApp, they are serving the rural society.

Based on our study, a few major policy suggestions can be put forth for improving women's participation in online business in general and CSC activities in particular. One of the major bottlenecks many face, especially in Assam, is that their functioning is dependent on conversion factors such as uninterrupted Internet and electricity supply. CSC entrepreneurship needs investments in online devices, printers, and biometric machines, for which women entrepreneurs require adequate provisioning and access to credit facilities through a formal banking system. Training and awareness building for various online business opportunities are also necessary as different schemes have different enrollment procedures. Though the Covid-19 pandemic and the resulting lockdown impacted businesses negatively, the situation has improved over time. The pandemic also created certain new opportunities as more and more consumers are now opting to shop and transact online. Further, the government has also introduced new schemes to aid citizens during the pandemic, for which enrollment needs to be done through CSCs. Thus, in the long run, skilling appears to be a more daunting challenge. While more educated and computer-trained women from Karnataka can pick up these procedures through WhatsApp and YouTube videos, not all women are equally tech-savvy and they need more hands-on training. It is our observation that concerned government officials often try to highlight the successful cases and neglect the ones that struggled and failed. It is time they concentrate on the failed cases. Thus, women with lower levels of education and in remote areas need special attention. Women belonging to socially backward classes (such as scheduled castes and tribes) are not well educated and the state should focus on such classes in terms of their involvement in online business. Successful and active entrepreneurs also face problems with server capacity, which makes the process of enrollment highly time-consuming. As a result, only a few enrollments are undertaken per day, leading to lower income. Further, women entrepreneurs engaged in traditional manufacturing often get manufacturing training but lack training regarding the enrollment of one's business on online platforms like Amazon and Flipkart. To undertake online businesses, many of these women need basic computer training as well. In light of the pandemic, the online platform has great potential if some of the hindrances faced by these women can be adequately addressed.

Data Availability Statement

The data that support the findings of this study are openly available on the Ministry of Statistics and Program Implementation, Government of India website at <https://www.mospi.gov.in/>.

Data from the limited field survey can be shared on request.

REFERENCES

- ADB. (2013). *India: Gender Equality Diagnostics of Selected Sectors*.
<https://www.adb.org/sites/default/files/institutional-document/33970/files/india-gender-equality-diagnostic.pdf>.
- . (2018). *Emerging Lessons on Women's Entrepreneurship in Asia and the Pacific: Case Studies from the Asian Development Bank and the Asian Foundation*. <https://www.adb.org/sites/default/files/publication/459551/women-entrepreneurship-lessons-asia-pacific.pdf>.
- Basu, Kaushik., and L. Lopez-Calva,. 2011. Chapter Sixteen: Functionings and Capabilities. In *Handbook of Social Choice and Welfare Vol 2*, edited by K. Basu and L. Lopez-Calva. Elsevier.
- Crocker, D. A., and I. Robeyns, 2010. Capability and Agency. In *Amartya Sen* edited by C. W. Morris. Cambridge: Cambridge University Press.
- Daganzo, C. F., V.V. Gayah, and E. J. Gonzales. 2012. The Potential of Parsimonious Models for Understanding Large-Scale Transportation Systems and Answering Big Picture Questions. *European Journal of Transportation and Logistics* 1: 47–65. <https://doi.org/10.1007/s13676-012-0003-z>.
- Dass, R., and A. Bhattacharjee 2011. Status of Common Service Center Program in India: Issues, Challenges and Emerging Practices for Rollout. Indian Institute of Management, WP No. 2011-02, 3.
- Duflo, E. 2012. Women Empowerment and Economic Development. *Journal of Economic Literature* 50(4): 1051–1079.
- Dwivedi, Y. K., G. P. Sahu, N. P. Rana, M. Singh, and R. K. Chandwani. 2016. Common Services Centres (CSCs) as an Approach to Bridge the Digital Divide. *Transforming Government: People, Process and Policy* 10(4): 511–525.
- ESCAP. 2015. *Unlocking the Potential of Women's Entrepreneurship in South Asia*. ESCAP-SSWA Policy Brief. [https://www.unescap.org/sites/default/files/Session 1 Harnessing e commerce for – Rajan Sudesh Ratna.pdf](https://www.unescap.org/sites/default/files/Session%201%20Harnessing%20e-commerce%20for%20Rajasthan.pdf).
- Gaitan G., L A 2018. *Overcoming Gender Challenges in E-Commerce: What Is Being Done to Support Women-Owned MSMEs?* Geneva: CUTS International, Geneva.
- Güney-Frahm, I. (2018). A New Era for Women? Some Reflections on Blind Spots of ICT-Based Development Projects for Women's Entrepreneurship and Empowerment. *Gender, Technology and Development* 22(2): 130–144.
- Haenssger, M. J., and P. Ariana. (2018). The Place of Technology in the Capability Approach. *Oxford Development Studies* 46(1): 98–112. <https://doi.org/10.1080/13600818.2017.1325456>.
- Indian School of Business. (2018). Impact Assessment of Common Service Centres (CSC 2.0) Scheme. Srinji Raju Centre for IT and the Networked Economy.
- Internet and Mobile Association of India. (2019). *Digital in India 2019 – Round 2 Report*. IMAI.
- Liu, Y., Y. Zhou, and W. Wu. 2015. Assessing the Impact of Population, Income and Technology on Energy Consumption and Industrial Pollutant Emissions in China. *Applied Energy* 155: 904–917.

- Martinez, I., and T. Nguyen. 2014. *Using Information and Communication Technology to Support Women's Entrepreneurship in Central and West Asia*. Asian Development Bank. <https://www.adb.org/publications/information-and-communication-technology-support-womens-entrepreneurship-central-west-asia>.
- Mukherjee, E., Mazar, O., Aggarwal, R., and R. Kumar. 2016. *Exclusion from Digital Infrastructure and Access*. Digital Empowerment Foundation. https://defindia.org/wp-content/uploads/2017/09/India-Exclusive-Report_DEF-Chapter.pdf (accessed on 10 October, 2021).
- National Insurance Academy. 2021. *Role of Common Service Centres (CSCs) in Inclusive Growth of Insurance*. NIA, Pune.
- National Statistical Office. 2018. Gendering Human Development. A Working Paper for Computing HDI, GDI and GII for States of India. Ministry of Statistics and Programme Implementation, Government of India.
- Oosterlaken, I. 2013. *Taking a Capability Approach to Technology and Its Design: A Philosophical Exploration* (Doctoral dissertation TU Delft). TU Delft Institutional Repository. <https://doi.org/10.4233/uuid:df91501f-655f-4c92-803a-4e1340bcd29f>.
- Orser, B., C. Elliott, and S. Findlay-Thompson. 2012. Women-Focused Small Business Programming: Client Motives and Perspectives. *International Journal of Gender and Entrepreneurship* 4(3): 236–265.
- Orser, B., A. Riding, and Y. Li. (2019). Technology Adoption and Gender-Inclusive Entrepreneurship Education and Training. *International Journal of Gender and Entrepreneurship* 11(3): 273–298.
- Panda, S. 2018. Constraints Faced by Women Entrepreneurs in Developing Countries: Review and Ranking. *Gender in Management: An International Journal* 33(4): 315–331. doi: 10.1108/GM-01-2017-0003.
- Rajeev, M., Vani, B. P., and Veerashekharappa. 2015. *Financial Inclusion through SHGs: Understanding Quality and Sustainability of SHGs in Karnataka State*. Monograph No. 40, ISEC, Bengaluru, India.
- Robertson, P. 2015. Towards a Capability Approach to Careers: Applying Amartya Sen's Thinking to Career Guidance and Development. *International Journal of Educational and Vocational Guidance* 15: 75–88.
- Robeyns, I. 2005. Selecting Capabilities for Quality of Life Measurement. *Social Indicators Research* 74: 191–215.
- Rosenbaum, P. D., and D. R. Rubin. 1983. The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika* 70(1): 41–55.
- Sen, A. 1979. Equality of What? In *Tanner Lectures on Human Values*, edited by McMurrin. Cambridge: Cambridge University Press, pp. 197–220.
- . 1985. *Commodities and Capabilities*. Oxford: Oxford University Press.
- . 1993. *Capability and Well-Being*. In *The Quality of Life*, edited by Nussbaum and A. Sen. Oxford: Clarendon Press, pp. 30–53.
- . (1999). *Development as Freedom*. New York: Knopf.
- . (2003). *Development as Capability Expansion*. In *Readings in Human Development* edited by S. Fukuda-Parr S et al. New Delhi and New York: Oxford University Press.

- Sharma, S. K., B. Metri, Y. K. Dwivedi, N. P. Rana, 2021. Challenges Common Service Centers (CSCs) Face in Delivering e-Government Services in Rural India. *Government Information Quarterly* 101573. doi:10.1016/j.giq.2021.101573.
- Strenio., J. 2020. Time Heals all Wounds? A Capabilities Approach for Analyzing Intimate Partner Violence. *Feminist Economics* 26(4): 31–55. doi: 10.1080/13545701.2020.1756375.
- UNCTAD. 2014. Empowering Women Entrepreneurs through Information and Communications Technologies: A Practical Guide. UNCTAD Current Studies on Science, Technology and Innovation, No. 9. <https://unctad.org/webflyer/empowering-women-entrepreneurs-through-information-and-communications-technologies>.
- United Nations Development Programme (UNDP). 2010. Human Development Report 2010: 20th Anniversary Edition: The Real Wealth of Nations: Pathways to Human Development. New York: Palgrave Macmillan.
- Uthaman, V. S., and R. Vasanthagopal. 2017. A Comprehensive Multidimensional Conceptual Model to Assess the e-Governance Service Quality at Common Service Centers in India. In *Proceedings of the Special Collection on eGovernment Innovations in India* (pp. 99–106).
- Webster, N. A., and Q. Zhang. 2020. Careers Delivered from the Kitchen? Immigrant Women Small-Scale Entrepreneurs Working in the Growing Nordic Platform Economy. *NORA – Nordic Journal of Feminist and Gender Research* 28(2):113–125. doi: 10.1080/08038740.2020.1714725.
- World Economic Forum. 2020. *Global Gender Gap Report 2020*. www.weforum.org.
- Yin, R. K. 2003. *Case Study Research: Design and Methods*. SAGE.
- Yu, H., and Cui, L. (2019). China's e-Commerce: Empowering Rural Women? *The China Quarterly* 238: 418–437. doi: 10.1017/S0305741018001819.
- [data set] National Sample Survey Organization. (2016). Operational Characteristics of Unincorporated Non-Agricultural Enterprises (Excluding construction) in India, NSS 73rd round: July 2015 – June 2016. New Delhi: Government of India.