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HOW WELL DO AGENCY AND TECHNOLOGY WORK FOR WOMEN ENTREPRENEURS? INSIGHTS FROM A PANEL DATA MODEL USING CAPABILITY APPROACH

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Abstract

The role of technology in Amartya Sen's (1993) capability approach framework to development is a subject of academic debate, with recent research highlighting that it can play a dual role as an input as well as a conversion factor. One area in which technology plays a key role is in the field of entrepreneurship, especially in spring-boarding small businesses. The important question that arises in this context is whether the dual role of technology is prominent in facilitating entrepreneurial success. This paper looks at a prominent and socially valuable micro-entrepreneurship programme in India – the Common Services Centres (CSCs), which bridges the digital divide and provides entrepreneurship opportunities to the poor, in terms of its ability to facilitate women empowerment in a developing country. A primary data set gathered from a region with relatively developed internet infrastructure is considered – the southern Indian state of Karnataka, including Bangalore city and two other surrounding towns. A two-period panel data regression with random effects is utilized to isolate the impacts that inputs, conversion factors, and agency have on enterprise success – measured in terms of profits. The results reveal that while the transformative dimension of technology in acting as a conversion factor is observable, women are currently more reliant on interactive rather than static platforms. Consequently, the study recommends the development of bespoke technology platforms that are aimed at catering to women entrepreneurs, as well as focusing on expanding CSC networks among poorer communities.

Keywords: Common Services Centres, micro-entrepreneurship, capability theory, agency, conversion factors

JEL Codes: M2, D22

Introduction

The development and use of information and communication technology (ICT) has changed the way people work and run businesses. It has also expanded the work opportunities for women, especially in less developed nations, where women often face a number of socio-cultural constraints on their movement, and cannot work effectively outside their homes for long hours (Rajeev and Bhandarkar, 2022). In addition to the burden of household duties, they may face other cultural constraints that limit their activities. In this regard, digital entrepreneurship emerges as an important avenue for women's empowerment. ICT has also changed the way the government governs, whereby e-governance has become an important tool for improving transparency and accountability.

In this regard, an important initiative of the Government of India becomes relevant. With a view to improve service delivery and accountability, many Indian government services are being digitized. Registration for several welfare schemes and important documents/certificates have been moved online, which individuals can undertake themselves. However, a large percentage of Indian citizens are unfamiliar

with the use of computers and the internet. Judging by recent nationally representative survey data (conducted by the Indian National Sample Survey Office in 2018), only around 45% of people in urban areas aged 15-59 years reported being able to use the internet[3], which leaves a sizeable proportion of this population without the requisite skills. In order to provide a point of access and support to such sections of the population, and simultaneously provide an avenue for entrepreneurship and income generation, the Common Services Centres (CSCs) were introduced in 2006. This programme has now been popularised under the Digital India programme and a large number of micro-entrepreneurs, especially women, have initiated CSC activities. By passing a certification, getting an identity card from the government, and establishing a centre, individuals can become CSC entrepreneurs and facilitate registrations for government services on behalf of citizens for a small fee. Given the digital and community-oriented nature of this activity, there are a number of benefits for women taking up this kind of work, prominently including economic and social empowerment.

This paper takes up Sen's (1993) capability approach as a framework for the study and examines how such technology-based micro-entrepreneurship has changed women's ability to become economically empowered. The case of women is of relevance for India as their low labour force participation is a matter of intense debate[4]. The capability approach discusses a number of concepts including capability and functioning, inputs and conversion factors, as well as agency. Developing this theory further, Haenssgen & Ariana (2018) discuss how technology differs from other inputs in that it has generative and transformative dimensions. Due to the transformative dimension, they highlight that information and communication technology (ICT) can become a conversion factor and may not merely remain an input. This research collects primary data on CSC entrepreneurship from a prominent state of India, viz., Karnataka, which has well-developed ICT infrastructure, to analyse how women's functioning as micro entrepreneurs has been impacted by inputs, conversion factors, and agency. In particular, we examine whether ICT plays a dual role as an input as well as a conversion factor in impacting their economic outcomes. There is limited literature that evaluates the role of digital technology on women's livelihood and economic empowerment formally using the capability approach. Given the increasing importance of digital technology in less developed nations, this research therefore fills a significant research gap.

Thus, there are a number of contributions made by this paper. First, it looks at the employment of women in the online platform using data generated through a primary survey. Second, it evaluates the performance of such entrepreneurial endeavours of women using the capability approach. Third, it looks at the role of technology both as an input as well as a conversion factor using a rigorous empirical analysis based on field survey data where the same entrepreneurs are interviewed at two time periods. More importantly, the paper highlights how businesses affected by the Covid pandemic have subsequently recovered, wherein women show better resilience.

Against this backdrop, the paper unfolds as follows. The next section provides a brief review of the literature on female entrepreneurship and digital platforms. Section 3 presents the basics of the

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[3] https://www.mospi.gov.in/sites/default/files/publication_reports/Report_585_75th_round_Education_final_1507_0.pdf

[4] https://dge.gov.in/dge/sites/default/files/2023-05/Female_Labour_Utilization_in_India_April_2023_final__1_-pages-1-2-merged__1_.pdf

government's CSC scheme. The next section (4) presents the capability approach framework that is applied in this paper. Section 5 provides an overview of the data set and the survey methodology. Section 6 undertakes an econometric analysis to identify the role of inputs and conversion factors in determining entrepreneurial success, measured in terms of profits. The last section (7) presents concluding remarks and policy suggestions.

A Brief Review of Literature

Given our interest in gender, entrepreneurship, and the use of online platforms, our review of literature is confined to the interface of these three aspects.

Online Platforms for Female Entrepreneurship

In recent years, Information and Communication Technology (ICT) has emerged as an important factor in promoting entrepreneurship (Afawubo and Noglo, 2022), especially among women (Martin & Tiu Wright, 2005; Mathew, 2010). Digital entrepreneurship, "where digital products or services are sold across electronic networks" (Guthrie, 2014), and "where some or all of what would be physical in a traditional organization has been digitized" (Hull et. al. 2007), has brought a considerable change in the ways in entrepreneurs conduct business and has even given rise to new forms of business (Kraus et. al., 2018). Online platforms have been a significant innovation, by allowing entrepreneurs to develop new products and commercialize them (Hsieh and Wu, 2019). These platforms can reduce search and matching costs, and their shared infrastructure reduces barriers to entry for small and micro-entrepreneurs (Tae, Luo and Lin, 2020). Peer-to-peer selling platforms also allow entrepreneurs to establish enterprises with relative ease (Chandna and Salimath, 2018).

Although ICT is a powerful tool in facilitating entrepreneurial activity, certain challenges exist. Women often have lower access to such technologies than men, even though the gap is reducing (Montagnier and van Welsum, 2006; Dutta and Bilbao-Osorio, 2012; Michota, 2013). An older study from Tamil Nadu indicated that the use of internet kiosks by women was more likely to be impeded by structural factors such as time, location, and illiteracy rather than personal factors such as prohibition by relatives (Best and Maier, 2007). However, this is region-specific as another study in rural Bihar found that the village administration levied a monetary fine on unmarried girls who used a mobile phone (Mukherjee et. al., 2016). Such a lack of access not only impedes women from accessing beneficial online platforms for business but also hinders existing women's businesses as the Indian economy moves towards a cashless paradigm (Singh-Nagpal and Sebastian, 2021). Government services and activities are also increasingly based on online infrastructure. One criticism regarding ICT-enabled government interventions to promote entrepreneurship is that they are gender-blind (Orser, Riding and Li, 2019), and require a component of gender-sensitive training that addresses the various gender-specific constraints that they face (Orser, Elliot, and Findlay-Thompson, 2012). It could be expected that the CSC scheme might face some of these issues. Observing that a consistent theme underlying findings regarding women and access to technology refers to their freedom and capabilities, Amartya Sen's capability theory becomes relevant.

Although the literature on female entrepreneurship and digital platforms exists, research is still sparse in the context of India, and there has been little focus on state-led initiatives which satisfy a

number of objectives, including the fostering of employment and improving the reach of government services to citizens. A rigorous investigation of the performance of these enterprises will, therefore, be an insightful contribution to the literature.

Basic Concept of CSCs

Governments across the world are beginning to incorporate ICT to improve governance. Aiming to enhance monitoring, accountability, and transparency, registration for several welfare schemes in India has been moved online, and beneficiaries are now required to enrol themselves through government portals. However, many citizens face issues in accessing these vital welfare services owing to their unfamiliarity with using the internet, especially in rural areas. Even as of the most recent available NSSO survey (in 2018), it was estimated that only 14.9% of rural households had an internet connection, and only 10.9% of rural women aged 15-59 years reported being able to use the internet[5]. With a view to address this issue, the Ministry of Electronics and Information Technology initiated the Common Services Centres (CSCs) in September 2006, as access points for the delivery of government-to-citizen e-services[6]. As of March 2024, there are 5,70,493 functional CSCs across the country, of which 4,48,338 are located in rural areas and 1,22,155 in urban zones. CSCs are opened by village-level entrepreneurs (VLEs) by enrolling themselves through the appropriate government website. In order to start providing services to others, they have to undergo a tele centre entrepreneur course and acquire a certificate. Upon obtaining this certificate, they will be able to open a Digital Seva Kendra, and commence operations. An identification (ID)is provided, which is used to log on to the government portal, and which allows them to register clients for government services.

Framework for the Study

Sen's Capability Theory

Building upon and criticising existing metrics of development, which were overwhelmingly reliant on physical or monetary outcomes, Amartya Sen proposed that individual welfare should not only depend on the life that individuals are currently leading but also upon the freedom they have to pursue their goals, which he conceived as capability. Functioning is the actual state of being or doing that individuals are embodying, such as being nourished or succeeding in business. In this discussion, two other concepts of capability are important, namely inputs and conversion factors. Inputs can refer to both tangible and intangible assets and services that an individual possesses or can access, such as income, material objects, skills, rights, etc. (Robertson, 2015) which help achieve the desired capability. Conversion factors, on the other hand, are conditions that aid an agent to realize his/her capability in terms of functioning. Infrastructure is a classic example of a conversion factor.

However, certain authors have made a distinction between the generative dimension and the transformative dimension of inputs (Haenssgen and Ariana, 2018). While technical objects such as mobile

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[5] https://www.mospi.gov.in/sites/default/files/publication_reports/Report_585_75th_round_Education_final_1507_0.pdf

[6] https://csc.gov.in

phones and computers can be used for their innate characteristics of processing and communicating digital data (Heeks and Molla, 2009) and therefore 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)" highlighting the transformative dimension (Haenssgen and Ariana, 2018). In other words, they "act as conversion factors towards other inputs in the attainment of valued capabilities" (Haenssgen and Ariana, 2018). Therefore, the role technology plays in the context of our study also needs to be analysed.

A final concept in the capability approach that we refer to is agency, which 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, 1993), or as Oosterlaken (2015) defines it, as "the ability that humans have to reflect on what they value, to set goals and to pursue the realization of those goals". Sen further puts forth a distinction between realized agency success and instrumental agency success. Realized agency success refers to situations when the realization of an individual's objective is through someone else, as opposed to instrumental agency success where the individual plays an active part in the achievement of their objectives (Crocker and Robeyns, 2009).

The question of interest is: which are the important inputs and conversion factors for enabling women to achieve success in digital businesses in urban India? And do entrepreneurs, especially women, experience instrumental agency or only realized agency? To do this, we take up an investigation based on a field survey, whose details are given in the next section.

Dataset and Survey Methodology

Data

In order to undertake a careful analysis of the status of CSCs, especially with respect to the performance of women-led enterprises and the digitization of different aspects of such businesses, a field study was carried out in three urban districts of the state of Karnataka. The state is selected owing to its well-developed ICT infrastructure. The study regions include a more urban locale viz., Bangalore (including both the urban and rural districts), which had a high impact of COVID-19 with severe lockdowns, and Ramanagara and Mandya, which are adjacent but much lower developed districts than Bangalore. These two towns were selected for the survey owing to the comparatively lower impact of the COVID-19 pandemic on them. From these districts, entrepreneurs were selected through random sampling without replacement with the help of officials from district CSC offices. From Bangalore, 102 CSCs were canvassed, and another 98 from Ramnagara and Mandya. To provide context for this sample size, we can estimate the district-level number of CSCs using data from the Ministry of Electronics & Information Technology (MeitY) for the year 2017 and extrapolate[7]. In this way, we can estimate that as of March 2024, there are

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[7]   In the district-wise report from 2017 on the number of CSCs[7], there are a total of 3,00,774 CSCs registered, including at the Gram Panchayat level across all states and union territories, of which 2,61,071 (86.80%) are functional. From the Common Services Centre website[7], it can be found that there are 5,70,493 functional CSCs as of March 2024, which is a growth of 118.52%. Taking district-wise figures from the 2017 report, Bangalore and Bangalore Rural together have 978 CSCs (both functional and non-functional), and Ramnagara and Mandya have 288 CSCs. Adjusting for the fact that this includes non-functional CSCs as well (by multiplying by 86.80%) and then assuming that the growth in the number of CSCs was even across the country, and correspondingly adjusting (by multiplying by 118.56%)

approximately 1,855 functional CSCs across Bangalore (rural – 250, and urban – 1,605), and 546 CSCs across Ramanagara and Mandya (258 in Ramanagara and 288 in Mandya). While the selected sample sizes are not proportional to the populations, equivalently sized samples were drawn from both types of regions to provide a more reliable estimate of CSCs' operation and dynamics within each region.

Interviews with entrepreneurs were conducted by field investigators, who enumerated a structured questionnaire. This questionnaire ascertained important information regarding entrepreneur demographics (such as age, gender, religion, marital status, and location), details of business operations, profits and expenditure, issues faced in running the CSC centre, a picture of the daily time-use of the entrepreneur and their family, and investments made in the business. The survey was conducted in two rounds, with the first taking place in 2022 and a follow up ascertaining important changes in 2023.

Basic Characteristics of the Sample Observations

Of the CSCs surveyed, 136 were owned by women and 64 by men. 179 were Hindus, and the most of the rest (20) were Muslims, with one Christian CSC owner. The average age of CSC owners was 35, with a standard deviation of 5.9 years. On average, women owners were two years younger (34.3 years) than their male counterparts (36.5 years). Around 12% of surveyed entrepreneurs belonged to socially vulnerable communities (including scheduled castes and tribes), as opposed to the 24% share that these groups have in the total state population.

Understanding the performance of CSCs using Capability Theory

Following the discussion of capability theory, we extend the framework to our analysis by conceptualizing business success as dependent on inputs, which are mediated by conversion factors. In our context, inputs refer to financial capital (i.e., the level of investment in the enterprise) and human capital (such as skills and education). On the other hand, conversion factors include social networks and family support, which have been highlighted as important factors determining business success (Aidis et. al., 2008; Estrin and Mickiewicz, 2011). The combination of inputs and conversion factors that are available to an entrepreneur determines their level of agency. In this context, it is postulated that agency can take two forms – instrumental agency and realized agency. In the former case (instrumental agency), the entrepreneur has the requisite combination of inputs and conversion factors to achieve business success themselves. For women, they would learn through WhatsApp and other online resources and carry out their businesses on their own. In the latter case (realized agency), some of these factors are lacking and entrepreneurs do not have sufficient agency to realize success independently, and would instead rely on family help and support.

To study the particular combination of inputs and conversion factors that are essential, we turn to a regression exercise. Enterprise success is measured using the log of monthly profits. The regression model and the different factors hypothesized to affect this are discussed below.

Regression Model

To obtain stable estimates of the influence of the dependent variables on the outcome of interest viz., earnings measured through profits, we estimate a panel data model using survey information from two periods – 2022 and 2023. In this case, the general model specification is given by:

$$y_{it} = \alpha + x_{it}\beta + v_i + \epsilon_{it} \dots (1)$$

In equation (1), y_{it} is the monthly profit earned by CSC enterprise 'i' at time 't'. The vector of covariates that determine profits is given by x_{it}, and β is the vector of coefficients to be estimated. The error term is divided into two components – a time invariant error that differs only between units v_i, and an error that occurs both across time and cross sectionally ϵ_{it}.

From equation (1), taking the average across time provides the relationship:

$$\bar{y}_i = \alpha + \bar{x}_i\beta + v_i + \bar{\epsilon}_i \dots (2)$$

Then (2) can be subtracted from (1) to provide:

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)\beta + (\epsilon_{it} - \bar{\epsilon}_i) \dots (3)$$

Equation (3) is known as the fixed effects estimator and provides estimates of β, but it does not capture the effect of time invariant effects. In our case, there are certain regressors of interest that are time invariant, and thus, the fixed effects model is inappropriate. Ordinary least squares can also be used to estimate (2), which is known as the between effects estimator. However, in this case, information about time would be lost in the averaging. The random effects estimator is a matrix weighted average of the two estimators, and is equivalent to estimating:

$$(y_{it} - \theta\bar{y}_i) = (1-\theta)\alpha + (x_{it} - \theta\bar{x}_i)\beta + (\epsilon_{it} - \theta\bar{\epsilon}_i) \dots (4)$$

Where θ is a function of the variances of the two error terms σ_v^2 and σ_ϵ^2. This model requires the assumption that there is no correlation between the independent regressors x_{it} and the time invariant error v_i, and provides more efficient estimates of β as it does not discard temporal information. To ensure that this condition has been met, a hausman test has been conducted to test for the equivalence of coefficients from the between and random effects estimators. Robust standard errors have been computed in order to correct for the heteroscedasticity inherent in cross sectional models. The regression has also been computed by excluding groups of variables for robustness to ensure that the results are invariant to changes in functional specification.

Dependent Variable

For this regression, we are interested in identifying the factors that are responsible for CSC enterprise success, measured in terms of profits earned. To measure enterprise success and sustainability, we use the log of the typical reported monthly income generated by the business. The incomes for the years 2022 and 2023 were considered, corresponding to the first and second rounds of the surveys.

Independent Variables

We postulate that there are four types of factors that determine the success of a CSC business. From the realm of capability theory, we introduce inputs and conversion factors. Inputs refer to those elements that are direct tangible and intangible assets possessed by the entrepreneurs, whereas conversion factors refer to those elements that allow the transformation of assets into outcomes or functionings, such as business success. Finally, these inputs and conversion factors together make up the observed entrepreneur agency, which has also been incorporated. Additionally, we include strategy variables of business choice that the entrepreneur makes to investigate which combination of business strategies have the greatest success. Finally, demographic variables provide controls for demographic differences between entrepreneurs. The variables used under each category are discussed in detail next.

Inputs

Tangible assets are some of the most important inputs allowing individuals to succeed, and in the realm of business, the total investment made is a good indicator of such assets. In particular for internet-based businesses, the ICT capital used for enrolment is a vital input. Thereby, we have considered the logarithm of the total investment in technological devices including computers, printers, photocopiers, mobile phones and biometric machines up to the year 2022. The amounts have been inflated up to 2022 levels using the wholesale price index for computer, electronic and optical products in order to provide parity between the investments made in different years. In addition to tangible assets, intangible assets also play a critical role in enterprise functioning and success. One of the most prominent intangible assets is that of human capital, and formal education is notable in this regard. To test for the importance of education, a binary variable is included that takes the value of 1 if a CSC owner has completed a degree in a business-related course, such as business administration, and 0 otherwise. In addition to formal education, there are also numerous critical skills that are not usually imparted through college courses, and for a digital business, one of the most important skills is that of computer literacy. During the survey, respondents were asked to assess their proficiency with computers, and while all indicated some basic level of familiarity, some expressed more advanced skills. We test for the impact of these enhanced skills on business performance by including it as a binary variable, with 0 including only basic knowledge, and 1 indicating advanced proficiency with computers.

Conversion Factors

At the society level, the general level of literacy could impact the ability that individuals have to take up digital activities, since an ability to work with computer interfaces is required. Thus, greater literacy could allow for individuals to better navigate digital systems, and earn better profits. On the other hand, since the literacy rate is a society-wide variable, it could also have the impact that most citizens in highly literate areas are individually proficient in accessing online facilities, and do not need the help of CSCs to access services. Thus, the actual effect is an empirical question, and the district-level literacy rate has been included to test for this. Individuals from different financial strata also often form a network, and thus CSC owners belonging to poorer groups may be expected to cater to poorer communities. We ask whether such individuals earn more owing to greater need for such services in poorer areas. To test, we include a

binary variable that takes the value of 1 if an entrepreneur possesses a BPL ration card, which is issued to people that are below the poverty line, and 0 otherwise. Social networks also form an important conversion factor in providing individuals with opportunities to transform their inputs into functionings, and in India, these are often arranged along the lines of caste and religion. To measure their effect on CSC performance, we have included a binary variable for individuals belonging to SC/ST communities[8], and another for families that belong to the majority religious group – Hindus.

Family support is another conversion factor that could potentially aid individuals. Some respondents reported receiving some partial help such as their spouse taking printouts or watching the store temporarily, while others indicated that their spouse runs the business entirely, and binary variables for this have been included. However, in the context of CSCs, support of the family has to be differentially interpreted according to the gender of the person receiving help. This is because the need for help is an indicator of the entrepreneur's agency, with those dependent completely on their spouses (especially women) having only realized agency. Men who receive help from their spouses could be expected to have the requisite computer and business skills and only require additional manpower for business. Women receiving help, on the other hand, may require help from their families owing to a lack of skills with digital technologies or business (lack of instrumental agency), as evidenced by an earlier study by Rajeev and Bhandarkar (2022). Thus, in addition to the binary variables indicating whether an individual received help from a family member, we have also included an interaction term between family help and gender that will separate the differential effects.

ICT Inputs taking the Role of Conversion Factors

We examine whether ICT technology is used not only for the enrolment process but also to improve knowledge or improve marketing possibilities. This is observed through the use of ICT to access other online platforms such as WhatsApp, Facebook, or YouTube. Women have been observed exchanging knowledge about the enrolment process for different government services or for popularising schemes by accessing these platforms. For example, enrolment for an identity card (Aadhaar card) is quite different from enrolment for crop insurance or opening a bank account. New schemes entail new processes of enrolment. Hence, a constant learning process is necessary. ICT provides that vehicle through these other platforms and thus takes on the role of a conversion factor. Further, the platform for learning also creates differences in the content – with WhatsApp and Facebook providing an interactive form of learning by allowing members to guide each other and address doubts together. On the other hand, YouTube is a more static type of learning whereby individuals have to garner insights from pre-made video lessons. Absorption of knowledge through YouTube requires better skill as these videos are in the mode of lectures by a third party. On the other hand, women can actively engage with familiar persons to clarify doubts and ask questions through WhatsApp and Facebook groups. Thus, people with lower skill may find the latter platforms more effective. In the survey, all respondents reported using WhatsApp for learning. In addition, some used Facebook as well, and a smaller subset used WhatsApp, Facebook and YouTube

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[8] Communities that suffered from extreme social, educational, and economic deprivation on account of the caste system, geographical isolation, lack of infrastructural facilities etc., and which have been accorded special protection through the Indian constitution.

together. While interactive group learning can be helpful, it is unstructured and may not have all the required information. For example, registration processes for lesser-known schemes could only be learned through sources such as YouTube videos, as other group members do not have the requisite knowledge. We make an attempt to examine the effect of learning sources by considering the variable use of YouTube (in addition to other sources) to improve business knowledge. Respondents that reported using YouTube are given the value of 1, and 0 otherwise. We ask whether this additional source of learning is a valuable input, or whether it does not help entrepreneurs generate additional profits over and above their WhatsApp and Facebook learning. Furthermore, given the format of YouTube, its value would be augmented by the characteristics of the person using it. In this regard, there could potentially be an intertwined effect of digital literacy as well as gender. Does computer knowledge affect the value that a resource such as YouTube (which can provide unique new information and knowledge) has on incomes? Moreover, is there a difference between men and women in terms of converting such a resource into improved profitability? We test for this using interaction terms between computer proficiency, YouTube use, and gender.

Other Controls

Conduct

In addition to inputs to entrepreneurs and the conversion factors transforming these inputs, the entrepreneurs can themselves influence business success through the strategies they follow, which can be termed as conduct following the framework of Structure-Conduct-Performance (Bain, 1986).When running the enterprise, entrepreneurs can also choose their work timings, and to generate visibility, they can employ various advertising strategies. These include traditional strategies such as putting up banners or hoardings in public spaces, social network-based strategies such as word-of-mouth, and digital strategies such as promoting their business on social media platforms. Binary variables have been included for each strategy to analyse which strategies bring the greatest improvements in profit.

Demographic Variables

In order to capture the effect of demographic differences between entrepreneurs, binary variables capturing their gender (male or female) and the location (Bangalore metropolitan or others) have been included in the regression. The location parameter will help ascertain the benefits to operation in a large urban centre, but one which was heavily impacted by the COVID-19 pandemic.

Regression Results

Table 1 displays the results of a two-period panel data regression with random effects. Regressions have also been run on subgroups of variables excluded by category for robustness testing as well. A hausman test for the coefficients of the between effects and the random effects estimator provided a Chi squared value of 14.46 with a corresponding p value of 0.9131, leaving insufficient evidence to reject the null hypothesis that the coefficients of the two estimators are significantly different. Therefore, the random effects estimator has been used. The basic statistics of the variables used are presented in the appendix in Table A1.

Table 1: Regression Results

	(All)	(1)	(2)
Demographic Indicators			
Location (Bangalore = 1)	0.0835 [0.110]	0.0871 [0.129]	-0.0211 [0.257]
Owner Gender (Female = 1)	0.113*** [0.001]	0.104** [0.003]	0.0448* [0.019]
Inputs			
Ln (Tech Investments up to 2022)	-0.0233 [0.705]	0.0026 [0.970]	
Business Education	-0.00306 [0.840]	-0.0012 [0.938]	
Computer Proficiency	0.101*** [0.000]	0.105*** [0.000]	
Conversion Factors			
District Literacy Rate	-0.00655* [0.043]	-0.0066 [0.060]	
Has BPL Ration Card	0.0911*** [0.001]	0.0815** [0.002]	
Belongs to SC/ST Community	-0.0319 [0.162]	-0.0318 [0.176]	
Hindu	0.03 [0.219]	0.0334 [0.171]	
Family Help Extent (Partial)	0.0822* [0.037]	0.107** [0.005]	
Family Help Extent (Full)	0.032 [0.328]	0.0627* [0.050]	
Gender (Female) x Family Help (Partial)	0.0107 [0.824]	0.00179 [0.969]	
Gender (Female) x Family Help (Full)	-0.00166 [0.966]	-0.0175 [0.659]	
Inputs Acting as Conversion Factors			
Uses YouTube	0.125* [0.021]	0.0926 [0.075]	
Gender (Female) x Uses YouTube	-0.134* [0.041]	-0.0962 [0.136]	
Gender (Female) x Computer Proficiency	-0.0649 [0.101]	-0.0614 [0.133]	
Computer Proficiency x Uses YouTube	-0.102 [0.104]	-0.0804 [0.184]	
Gender x Computer Proficiency x YouTube	0.109 [0.161]	0.082 [0.286]	
Business Choices			
Starting Time	-0.0264** [0.008]		-0.0354*** [0.001]
Ending Time	0.0141* [0.014]		0.0183** [0.002]
Advertisement (Banners)	0.0118 [0.562]		-0.0042 [0.834]
Advertisement (Word of Mouth)	0.0577* [0.022]		0.0680** [0.003]
Advertisement (Social Media)	0.00108 [0.948]		0.00698 [0.690]
Constant	10.25*** [0.000]	10.01*** [0.000]	9.740*** [0.000]
Observations	400	400	400
Wald χ^2	123.37	124.70	34.16
Within R^2	0.3195	0.2662	0.1614
Between R^2	0.0910	0.0758	0.0261
Overall R^2	0.1890	0.1469	0.0787

Source: Calculated by Authors from Field Survey Data

Note: Figures in parentheses are p values. *, **, and *** indicate significance at the 10%, 5% and 1% levels respectively.

Inputs and Success

Out of the inputs, tangible assets are not correlated with profits, which perhaps indicates excess capacity. While general education (such as having a business degree) did not impact earnings either, the level of proficiency with computers did have an effect on profits, and this did not vary by gender, as evidenced by the interaction term between gender and computer proficiency.

Instrumental or Realized Agency?

Among the conversion factors allowing inputs to be transformed into functionings, family help can improve profits, but primarily for those who need only partial help from spouses. This kind of help includes taking print-outs, temporarily managing the store, or supervising registrations for a particular activity such as for the national identity cards (Aadhaar cards). On the other hand, there were no differences in income between those independently operating the business and those that were fully dependent on their spouse for operation, indicating that the latter category of entrepreneurs seek help owing to a lack of skills. Moreover, there was no difference between men and women in this regard. Thus, women on the whole had as much instrumental agency as men. Further, it is observed that profits were higher in districts with lower literacy rates, perhaps because this is correlated with a lower digital literacy and greater need for CSC services in these areas. While social and religious networks did not have an impact on profits, the economic profile of entrepreneurs did, with those possessing a BPL card being more likely to earn more. Such entrepreneurs, belonging to poorer communities, would thus be servicing more individuals requiring CSC assistance for registrations than entrepreneurs operating among richer demographics.

Inputs as Conversion Factors – the Role of Informal Online Learning Through YouTube

The regression reveals that ceteris paribus, women-run CSCs were more profitable than ones operated by men. In this context, we ask whether it is because of the ability to use digital technology as a conversion factor for a wider array of internet resources, rather than just as an input, and further augment profits. Based on experiences from our field survey, it has been observed that ICT functions as a conversion factor as all entrepreneurs use WhatsApp, and many use Facebook for their business to learn new techniques as well as get information regarding new businesses. However, the use of YouTube is less common and hence we tested for whether that further enhances earnings or not. While learning about business management and improvement through YouTube did improve profits for men, this effect was cancelled out in the case of women, who did not earn significantly more (looking at the interaction between gender and YouTube use). Given the fact that, overall, women earn more than men, this observation points towards an interesting finding that women remain comfortable in learning through one-to-one networks with friends and family. Such an opportunity is provided by WhatsApp and Facebook but not YouTube, where videos are created by a third person and there is reduced opportunity for bilateral interaction. However, by adhering to interactive group-based learning, women might miss out on discovering novel and innovative opportunities for business which are not known within the group.

Thus, intangible inputs play an important role in enterprise functioning, and are mediated by conversion factors such as family support. Entrepreneurs also have agency in improving business performance through business conduct strategies.

Conduct

Business timings were found to impact profits significantly, with those units that opened earlier and closed later in the day earning significantly more profits than others. However, given that women often perform multiple other domestic roles such as cooking, cleaning and childcare in addition to CSC work, these roles may place additional difficulties on them in ensuring that their CSC timings capture all available demand. The choice of advertising methods also has an impact, and social network-based advertising (in the form of word of mouth) is correlated with higher profits. However, digital advertising (social media) did not have any significant impact on profits, indicating that even such digital businesses have considerable reliance on traditional business development paradigms. This is perhaps because the clientele for these units often lack digital literacy and perhaps do not use social media.

Conclusions and Policy Suggestions

From this analysis, it is clear that the Common Services Centres scheme of the Indian government is an important programme that serves the dual purposes of generating self-employment as well as improving access to e-government services together, and is thus a powerful tool to improve the status of women in the country. This paper examines the success of micro entrepreneurs through the lens of Amartya Sen's (1993) capability theory. Our survey-based study that interviews the same entrepreneur at two points in time highlights a number of interesting results. The most important of these is that it finds that women entrepreneurs demonstrated resilience during the post-COVID period and earn more than men.

Looking more rigorously into the determinants of enterprise success, measured by monthly incomes, underscored by capability theory, we find that intangible inputs such as computer skills increase earnings. Conversion factors play an important role in mediating this effect, and family help is a significant conversion factor in helping CSCs succeed – either by increasing incomes for those seeking partial help, or by bringing incomes of individually self-sufficient entrepreneurs and those fully dependent on spouses for help on par. Entrepreneurs from poorer economic communities also saw better profits, perhaps owing to greater demand for such services that bridge the digital divide.

The analysis also examined the role that technology can play as a conversion factor in translating business ownership into profits, namely through the use of digital platforms for learning such as WhatsApp, Facebook and YouTube. Universal usage of these platforms shows that they have been an important source of gathering knowledge and marketing avenues for both men and women. Amongst these avenues however, YouTube tends to benefit men more than women. Interactive and group-based learning platforms such as WhatsApp and Facebook, however, may not expose members entrepreneurs to novel and innovative entrepreneurial opportunities, causing stagnation.

In addition to inputs and conversion factors, it was also found that entrepreneurs can improve their earnings through their conduct of business, especially with the choice to use more traditional advertising methods such as word of mouth. Thus, even though the internet plays an important role in

bringing people into this business and allowing it to operate, traditional, offline advertising methods work better in generating visibility.

In empowering this business model and other similar ones, the study also identified some important bottlenecks that need to be addressed. Formal credit for such units is an important input that none of the surveyed entrepreneurs reported receiving. Even under the MUDRA scheme of the government, it can be seen that most loans are under the smallest category (Shishu), where the amounts disbursed are under Rs 50,000 (approx. US$ 600). This is insufficient for purchasing the computers, printers, and other equipment required (which amount to, on average, Rs 1,20,000 or US$ 1,450) for internet businesses such as this one.

Furthermore, there is a lack of formal and structured training which could possibly also limit the functioning of CSC entrepreneurs. Establishment of a dedicated and comprehensive online resource, especially with a focus on interactive learning facilitating entrepreneurship education for women, can be particularly valuable. One possible method would be to establish a government-operated interactive social-media group staffed by experts in the topics of women's entrepreneurship, CSCs, business, and digital technologies, to disseminate information about newer business opportunities and resolve queries.

Discussions with government officials revealed that CSC entrepreneurs need not necessarily confine themselves to government schemes, but also can expand their business by servicing the private sector. There are several options in the private business sphere for online bookings. A new business to business (B-to-B) model is also emerging for micro service units. This includes inventory-free outlet services which can earn remunerative commissions for orders. Information dissemination and training are necessary, especially for women entrepreneurs, so that they can take advantage of such avenues.

Moreover, seeing that entrepreneurs from poorer communities see greater success, it is possible that there is more unmet demand among this group. Thus, efforts to expand the CSC network should focus on economically deprived communities to ensure greatest benefits. These measures are necessary for providing strength to an important internet-based entrepreneurship scheme of the government, and can also be useful in bolstering the performance of other internet-based microenterprises in the country.

References

Afawubo, K. and Noglo, Y. A. (2022). ICT and Entrepreneurship: A Comparative Analysis of Developing, Emerging and Developed Countries. *Technological Forecasting and Social Change*,175: 121312.

Aidis, R., Estrin, S. and Mickiewicz, T. (2010). Institutions, Finance and the Level of Development: The Impact on Entrepreneurship in Transition. *Review of Economics and Institutions*, 1 (1): 1-26.

Bain, J. S. (1986). Structure Versus Conduct as Indicators of Market Performance: The Chicago-school Attempts Revisited. *Antitrust Law & Economics Review*, 18: 17.

Best, M. L. and Maier, S. (2007). Gender, Culture and ICT Use in Rural South India. *Gender, Technology and Development*, 11 (2): 137-155.

Chandna, V. and Salimath, M. S. (2018). Peer-to-Peer Selling in Online Platforms: A Salient Business Model for Virtual Entrepreneurship. *Journal of Business Research*, 84: 162-174.

Crocker, D. and Robeyns, I. (2010). Capability and Agency in Morris, Christopher (ed.) *Amartya Sen*. New York: Cambridge University.

Dutta, S. and Bilbao-Osorio, B. (Eds.) (2012). *Global Information Technology Report 2012: Living in a Hyperconnected World*. Geneva: World Economic Forum and INSEAD, Retrieved from http://www3.weforum.org/docs/Global_IT_Report_2012.pdf.

Estrin, S. and Mickiewicz, T. (2011). Entrepreneurship in Transition Economies: The Role of Institutions and Generational Change. In Minniti, M (ed), *The Dynamics of Entrepreneurship: Evidence from the Global Entrepreneurship Monitor Data.* Oxford: Oxford University Press. Pp 181–208.

Guthrie, C. (2014). The Digital Factory: A Hands-on Learning Project Digital Entrepreneurship. *Journal of Entrepreneurship Education*, 17 (1): 115-133.

Haenssgen, M. J. and Ariana, P. (2018). The Place of Technology in the Capability Approach. *Oxford Development Studies*, 46 (1): 98-112.

Heeks, R. and Molla, A. (2009). Compendium on Impact Assessment of ICT-for-Development Projects.

Hsieh, Y. J. and Wu, Y. J. (2019). Entrepreneurship through the Platform Strategy in the Digital Era: Insights and Research Opportunities. *Computers in Human Behavior*, 95: 315-323.

Hull, C.E., Hung, Y.-T.C., Hair, N., Perotti, V. and DeMartino, R. (2007). Taking Advantage of Digital Opportunities: A Typology of Digital Entrepreneurship. *International Journal of Networking and Virtual Organizations*, 4 (3): 290-303.

Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L. and Spitzer, J. (2019). Digital Entrepreneurship: A Research Agenda on New Business Models for the Twenty-first Century. *International Journal of Entrepreneurial Behavior & Research*, 25 (2): 353-375.

Martin, L. M. and Tiu Wright, L. (2005). No Gender in Cyberspace? Empowering Entrepreneurship and Innovation in Female-run ICT Small Firms. *International Journal of Entrepreneurial Behavior & Research*, 11 (2): 162-178.

Mathew, V. (2010). Women Entrepreneurship in Middle East: Understanding Barriers and Use of ICT for Entrepreneurship Development. *International Entrepreneurship and Management Journal*, 6 (2): 163-181.

Michota, A. (2013). Digital Security Concerns and Threat Facing Women Entrepreneurs. *Journal of Innovation and Entrepreneurship*, 2 (7): 1-11. https://doi.org/10.1186/2192-5372-2-7

Montagnier, P. and van Welsum D. (2006). ICTs and Gender-Evidence from OECD and Non-OECD Countries. UNCTAD Expert Meeting. December 4-5, 2006. Retrieved from http://unctad.org/sections/wcmu/docs/c3em29p025_en.pdf.

Mukherjee, Eshita., Osama, Mazar., Raina, Aggarwal and Rajat, Kumar (2016). Exclusion from Digital Infrastructure and Access. Retrieved from:https://defindia.org/wp-content/uploads/2017/09/India-Exclusive-Report_DEF-Chapter.pdf

Oosterlaken, I. (2015). *Technology and Human Development*. London: Routledge.

Orser, B., Elliott, C. and Findlay-Thompson, S. (2012). Women-focused Small Business Programming: Client Motives and Perspectives. *International Journal of Gender and Entrepreneurship*, 4 (3): 236-265.

Orser, B., Riding, A. and Li, Y. (2019). Technology Adoption and Gender-Inclusive Entrepreneurship Education and Training. *International Journal of Gender and Entrepreneurship*, 11 (3): 273-298.

Rajeev, M. and Bhandarkar, S. (2022). Women Online: A Study of Common Service Centres in India Using a Capability Approach. *Asia & the Pacific Policy Studies*, 9 (3): 268-287.

Robertson, P. J. (2015). Towards a Capability Approach to Careers: Applying Amartya Sen's thinking to Career Guidance and Development. *International Journal for Educational and Vocational Guidance*, 15: 75-88.

Sen, A. (1993). Capability and Well-Being. In Nussbaum, M. C. and Sen, A. (eds), *The Quality of Life*, 30: 270-293.

Singh-Nagpal, R. and Sebastian, T. (2021). Challenges and Readiness in Cashless Economy: Women Entrepreneurs in Gujarat. In Kaur, H. (ed), *Women and Entrepreneurship in India.* New York: Routledge. Pp 108-128.

Tae, C. J., Luo, X. and Lin, Z. (2020). Capacity-constrained Entrepreneurs and their Product Portfolio Size: The Response to a Platform Design Change on a Chinese Sharing Economy Platform. *Strategic Entrepreneurship Journal*, 14 (3): 302-328.

Appendix

Table A1: Basic Statistics of Variables Used for Regression

	2022	2023
Dependent Variable		
Ln (Monthly Profit)	9.7432 (0.1173)	9.9004 (0.1575)
Demographic Indicators		
Location (Bangalore = 1)	0.51 (0.5012)	0.51 (0.5012)
Owner Gender (Female = 1)	0.68 (0.4676)	0.68 (0.4676)
Inputs		
Ln (Tech Investments up to 2022)	11.7645 (0.1191)	11.7645 (0.1191)
Business Education	0.205 (0.4047)	0.205 (0.4047)
Computer Proficiency	0.58 (0.4948)	0.955 (0.2078)
Conversion Factors		
District Literacy Rate	78.5953 (8.4919)	78.5953 (8.4919)
Has BPL Ration Card	0.90 (0.3008)	0.90 (0.3008)
Belongs to SC/ST Community	0.115 (0.3198)	0.115 (0.3198)
Hindu	0.895 (0.3073)	0.895 (0.3073)
Family Help Extent (0 – None; 1 – Partial; 2 – Full)	0.54 (0.8556)	0.865 (0.8062)
Uses YouTube	0.34 (0.4749)	0.455 (0.4992)
Business Choices		
Starting Time	9.2675 (0.6834)	0.855 (0.8351)
Ending Time	19.89 (1.5685)	20.565 (1.0590)
Advertisement (Banners)	0.275 (0.4476)	0.415 (0.4940)
Advertisement (Word of Mouth)	0.125 (0.3315)	0.22 (0.4153)
Advertisement (Social Media)	0.32 (0.4676)	0.305 (0.4616)

Source: Authors' Analysis of Primary Survey Data

Figures in parentheses are standard errors

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