Women-led Firms, Digital Technology Adoption, and Access to Finance in India

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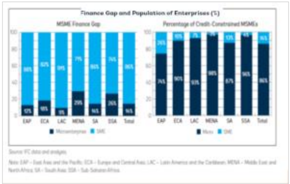
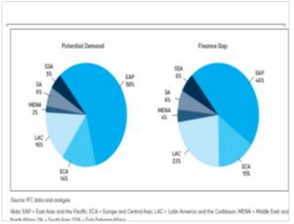
INTRODUCTION

- Small and medium-sized enterprises (SMEs) are one of the key contributors to growth and jobs in most economies (IFC, 2021).

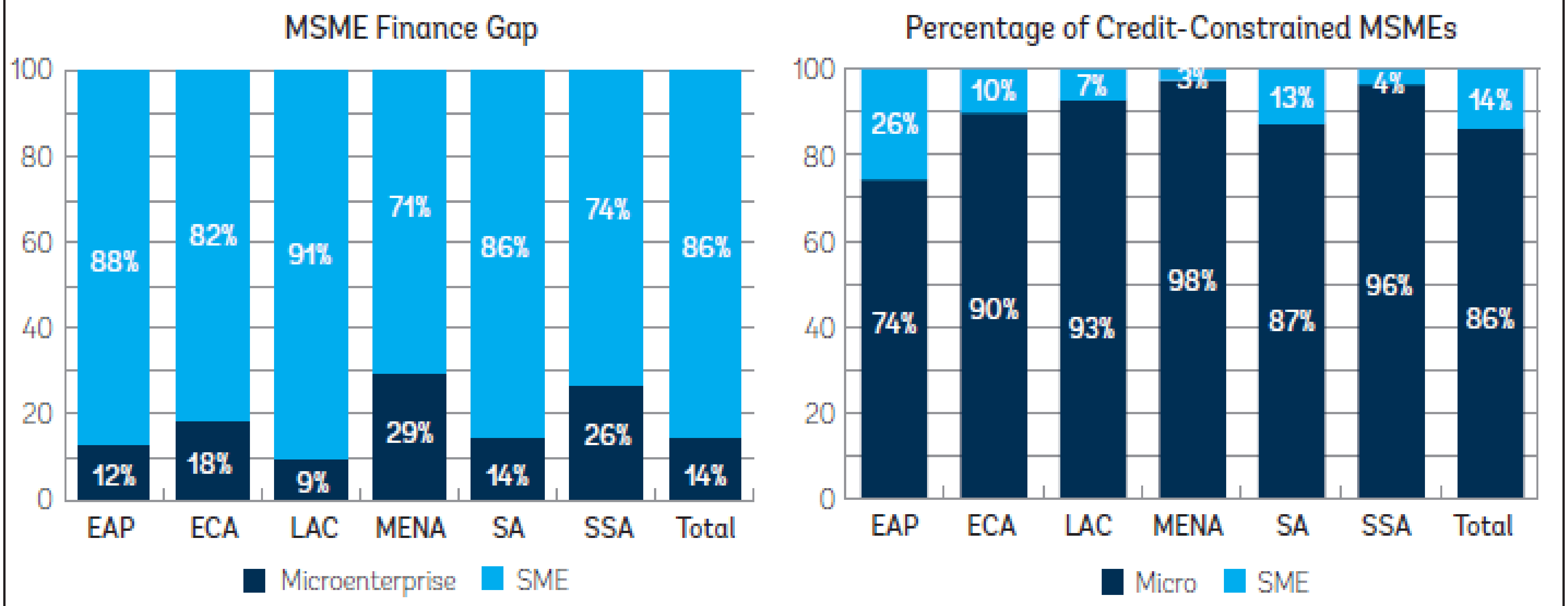
- However, their growth is constrained by a number of factors – limited access to credit is one of them (IFC, 2021; 2017; 2011). [Fig 1 and 2]

- Mitigating information asymmetry can play a significant role in reducing the gap in access to credit.



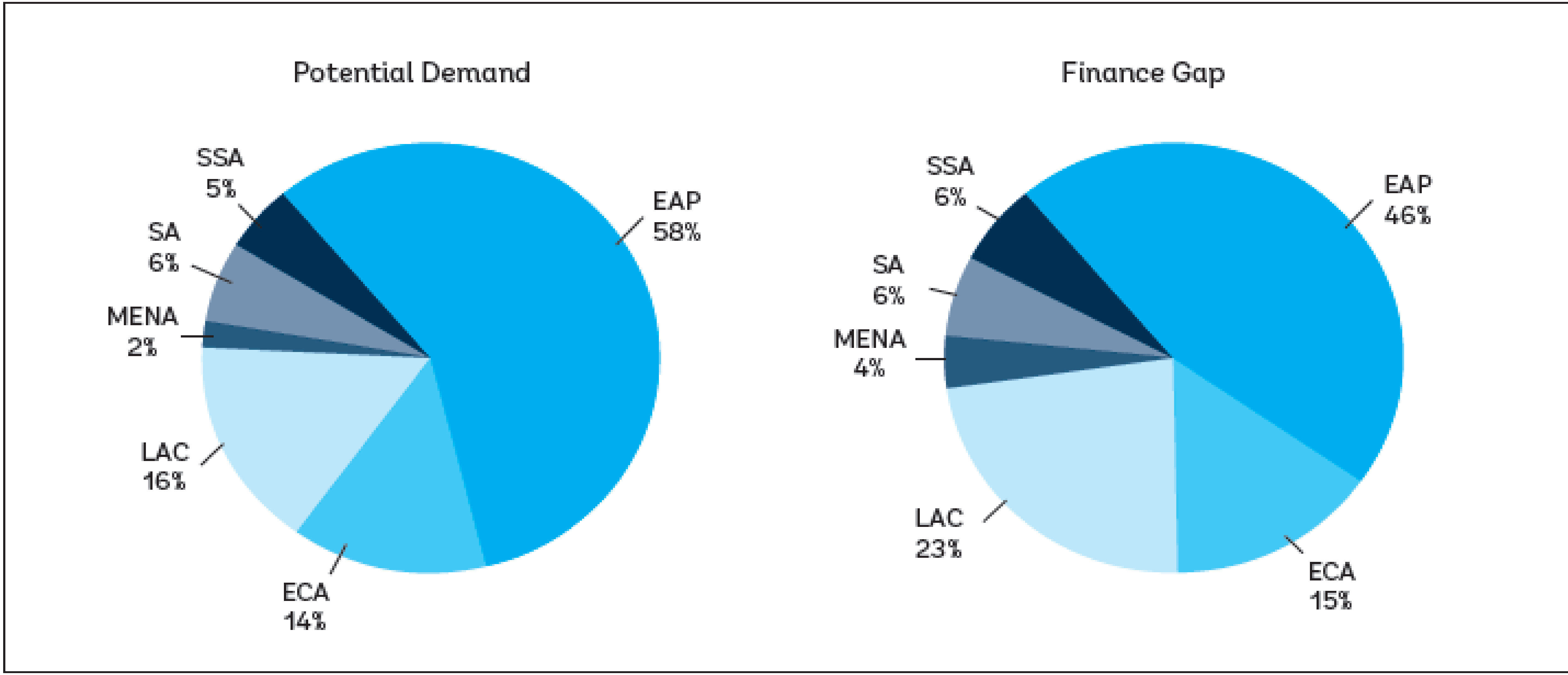


Finance Gap and Population of Enterprises (%)



Source: IFC data and analysis.

Note: EAP = East Asia and the Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.



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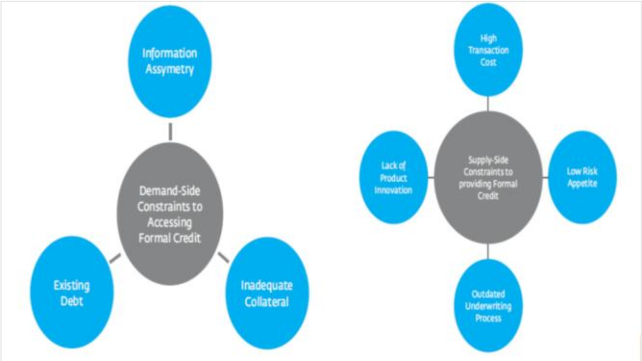
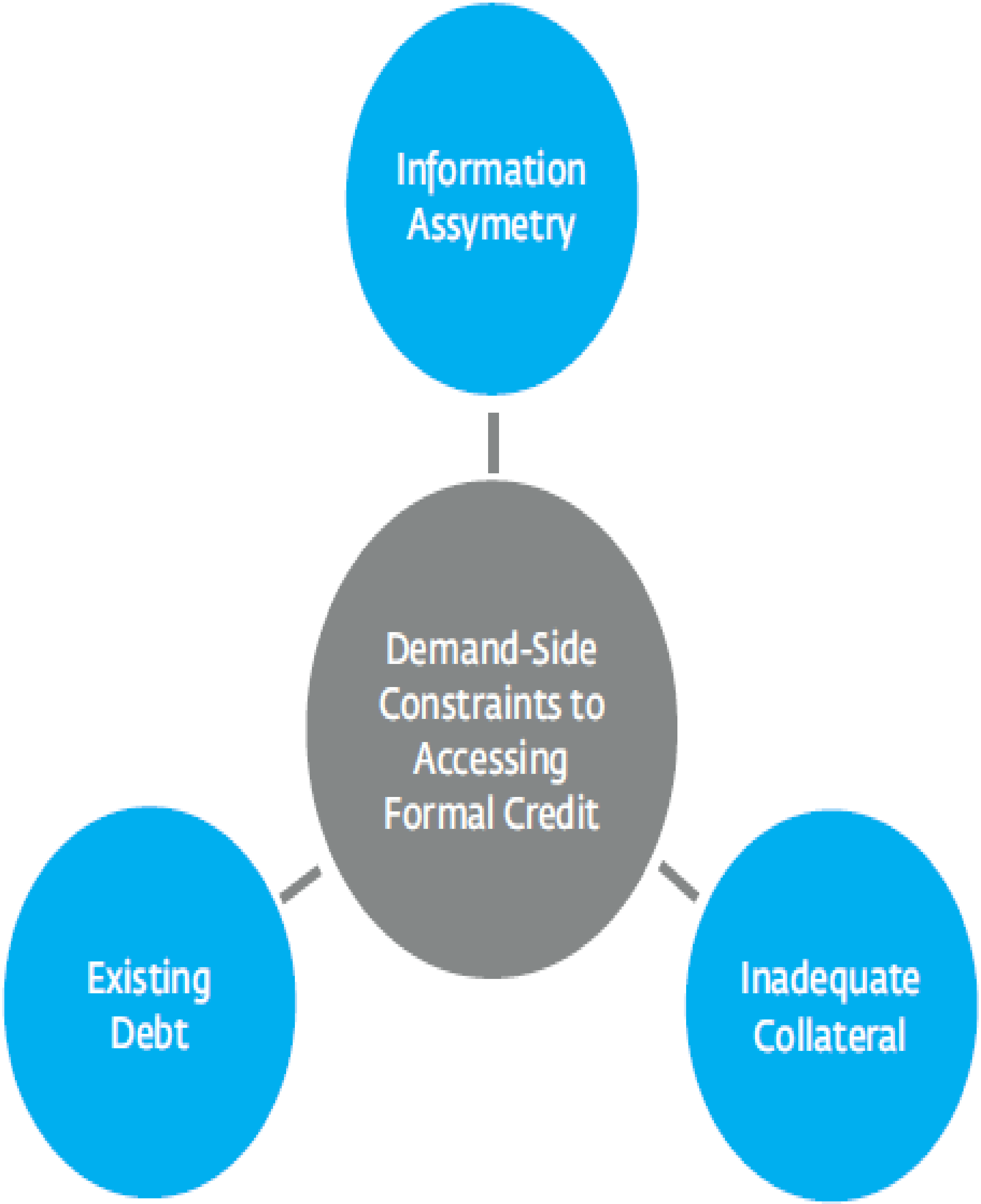
INTRODUCTION

Factors that affect credit flow to firms : Demand and supply side

- Information asymmetry: small firms are often unaware of the credit facilities while banks may not have sufficient information about them.
- Size (Beck & Demirguc-Kunt, 2006); age (Beck et al., 2006; Chakravarty Xiang 2013) [Fig 2]
- Financially unaware, averse to high monitoring costs and regulations, and need collateral (Dutta & Mallick, 2022)
- Risky borrowers small size (Chaudhuri et al. 2018), low productivity, underperformance (Bardasi et al., 2011; Aterido et al., 2011), lack of collateral and not opaque (IFC, 2019).
- Bank restraints: pay more for overdraft facilities than men (Alesina et al., 2008), rejection fear (Muravyev et al., 2009) and discouraged (Ghosh, 2023)



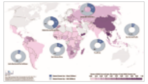

Information
Assymetry
Demand-Side
Constraints to
Accessing
Formal Credit
Existing
Debt
Inadequate
Collateral


High
Transaction
Cost
Lack of
Product
Innovation
Supply-Side
Constraints to
providing Formal
Credit
Low Risk
Appetite
Outdated
Underwriting
Process

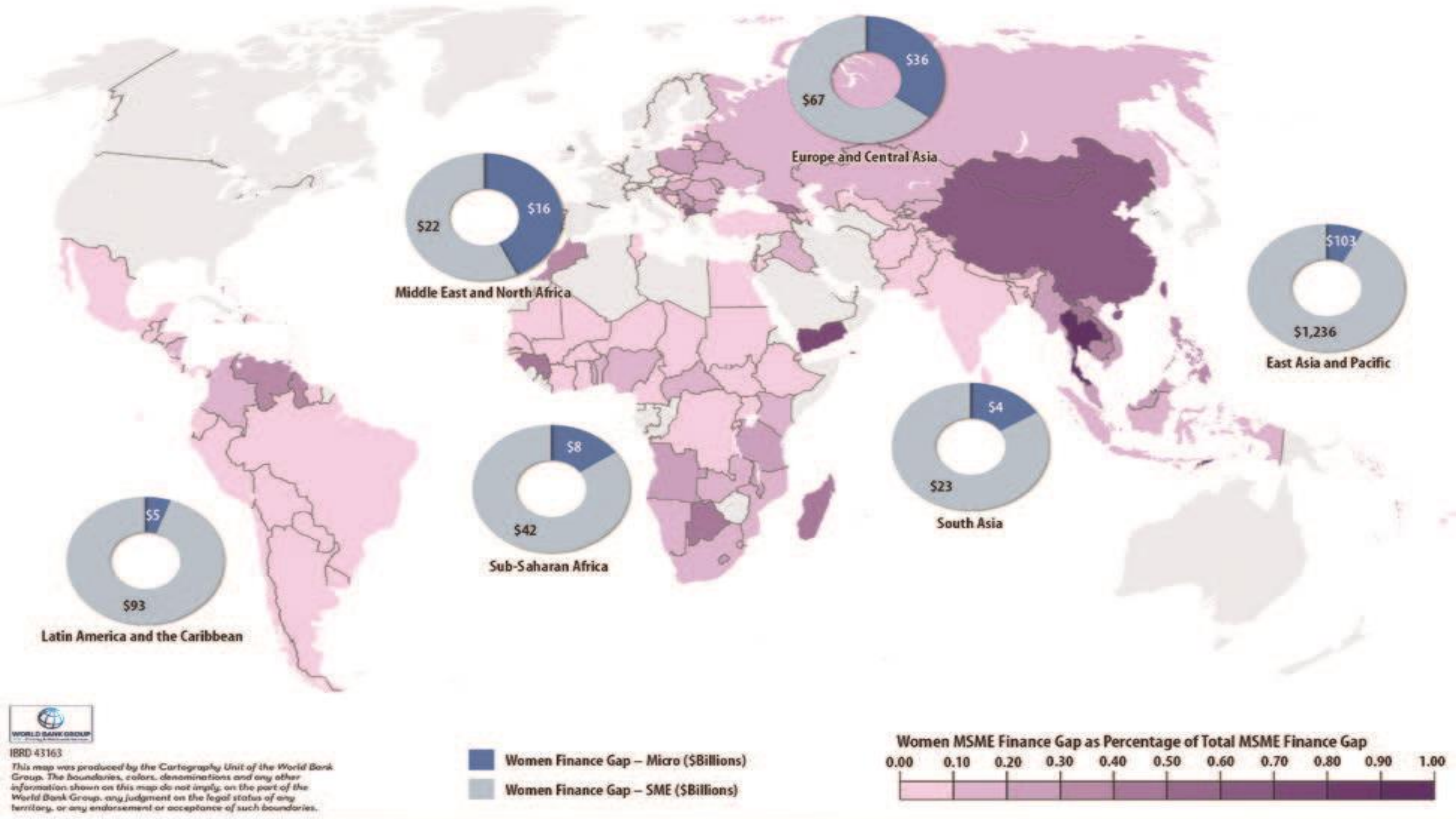
BACKGROUND

Discrimination in credit theories

- Perception about women entrepreneurs- is negative which can lead to lower access to credit. [Fig 3]
- Taste based discrimination (Becker, 1957) and Statistical discrimination (Phelps, 1972; Arrow, 1998)
- Credit constraints faced more by women (Stefani & Vacca, 2013; Asiedu et al., 2013, Watson & Robinson, 2003)



Signalling theory :Reduces information asymmetry (Spence, 2002)


$36
$67
Europe and Central Asia
$16
$22
Middle East and North Africa
$103
$1,236
East Asia and Pacific
$4
$23
South Asia
$8
$42
Sub-Saharan Africa
$5
$93
Latin America and the Caribbean
WORLD BANK GROUP
IBRD 43163
This map was produced by the Cartography Unit of the World Bank Group. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.
Women Finance Gap – Micro ($Billions)
Women Finance Gap – SME ($Billions)
Women MSME Finance Gap as Percentage of Total MSME Finance Gap
0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00

BACKGROUND

Role of financial intermediaries: Smooth flow of credit (Allen & Santomero, 1997; Sharpe, 1990; Hannig & Jansen, 2010)

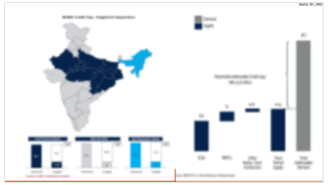
Technology and small firms

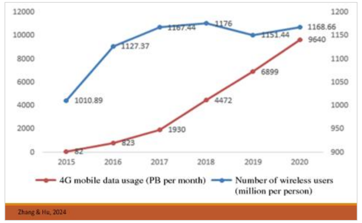
- Producitivity increases with the use of technology (Manaresi & Pierri, 2018);
- Innovative firms face lower constraints in credit (Pellegrina et al., 2017), (Agyekum et al., 2021), (Cuaon & Hau, 2021) (Mushtaq et al. 2022)
- Underutilization of technology by small firms (Yoshino & Taghizadeh-Hesary, 2016)

BACKGROUND

Credit access problems: India

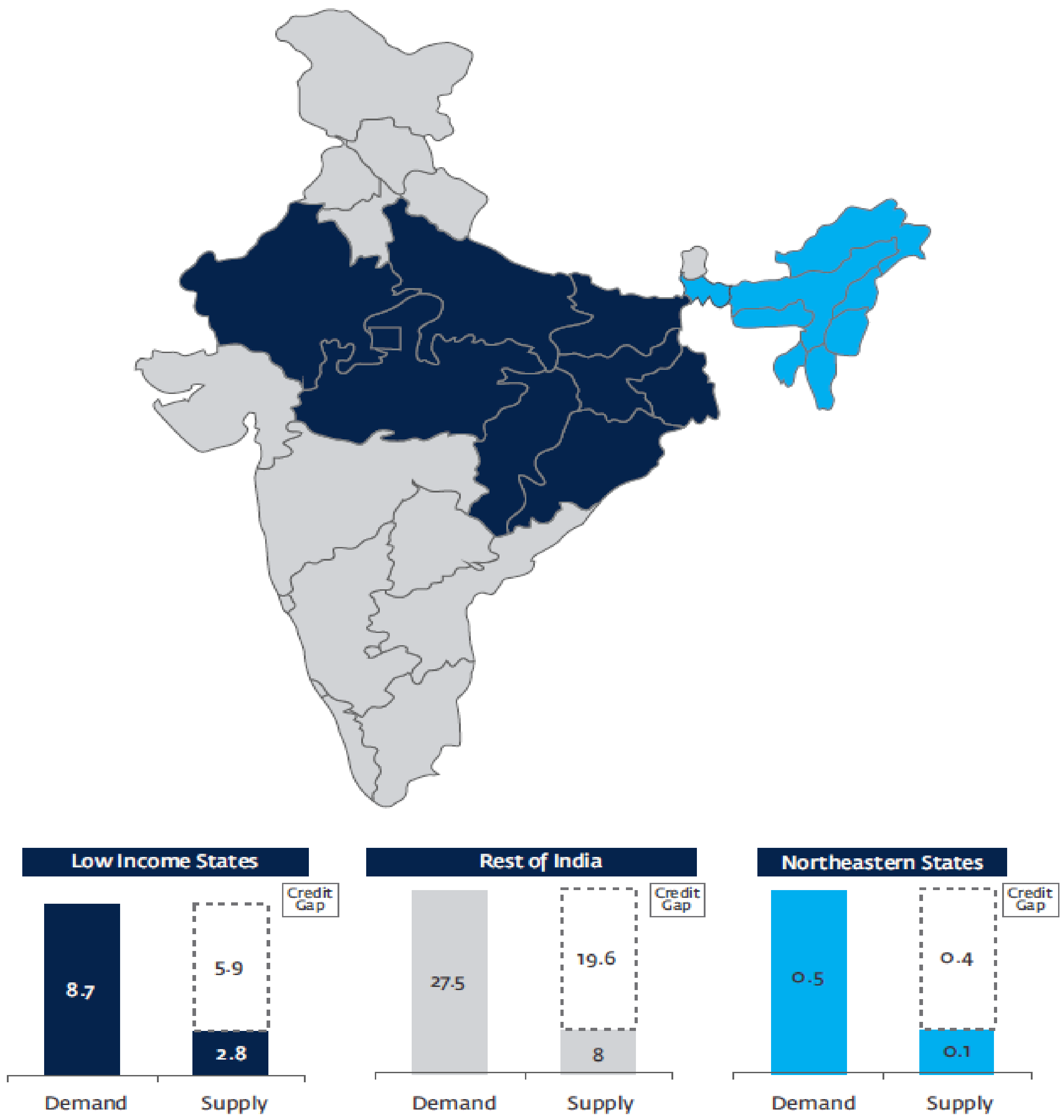
- In India, only 20% of women entrepreneurs opted for external finance, among which 96% preferred formal credit (public sector banks) (IFC, 2019) [Fig 4]
- Structural changes (example digital technology) can lower the information asymmetry which in turn can reduce financial market frictions, narrowing the gap in credit access.[Fig 5]
- Rapid growth in digitalization in India in the last few decades (Zhang & Hu, 2024) [Fig 6]
- Internet and mobile density along with other factors have positive impacts on the per capita GDP (Sahoo et.al., 2021)



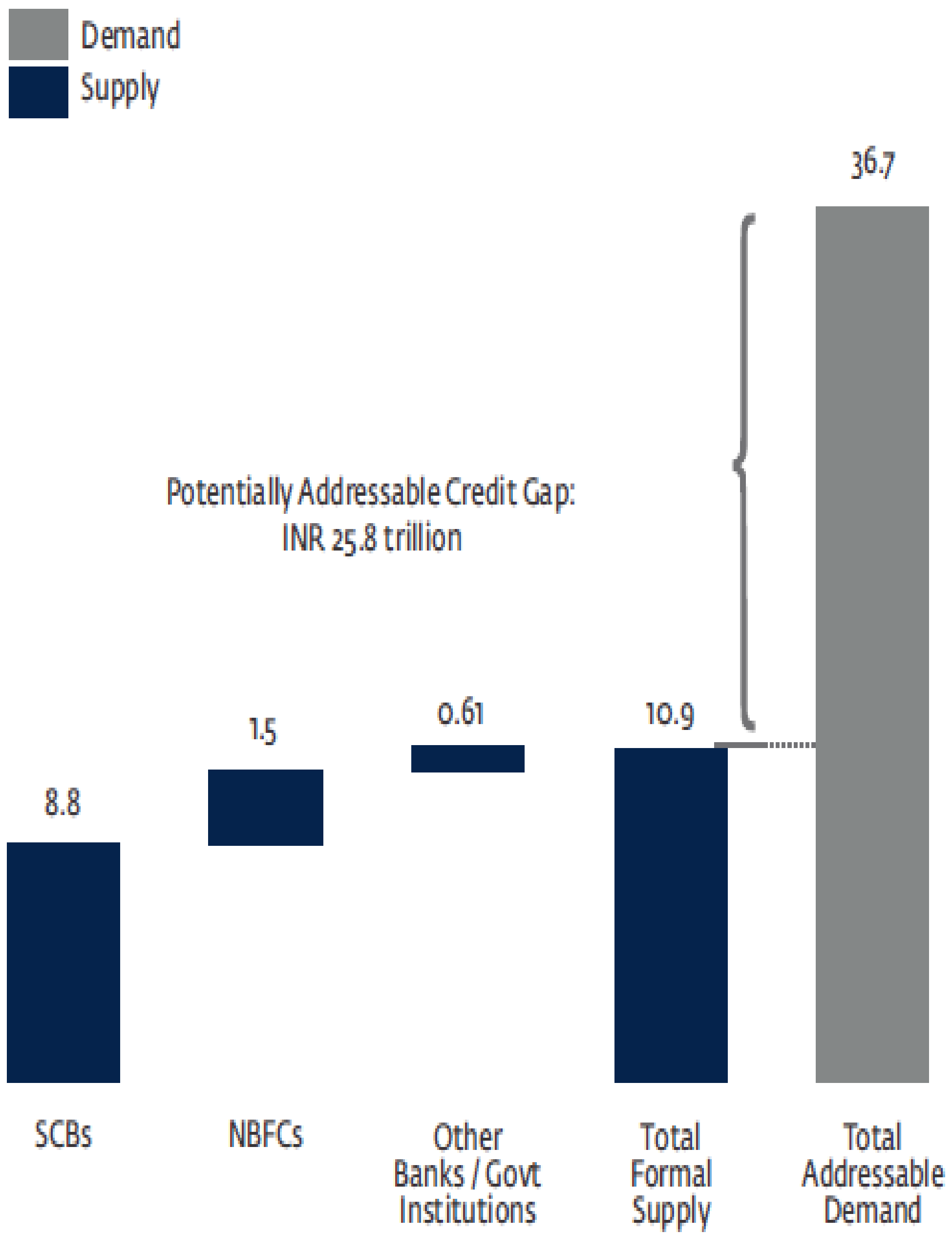


Source: IFC, 2019

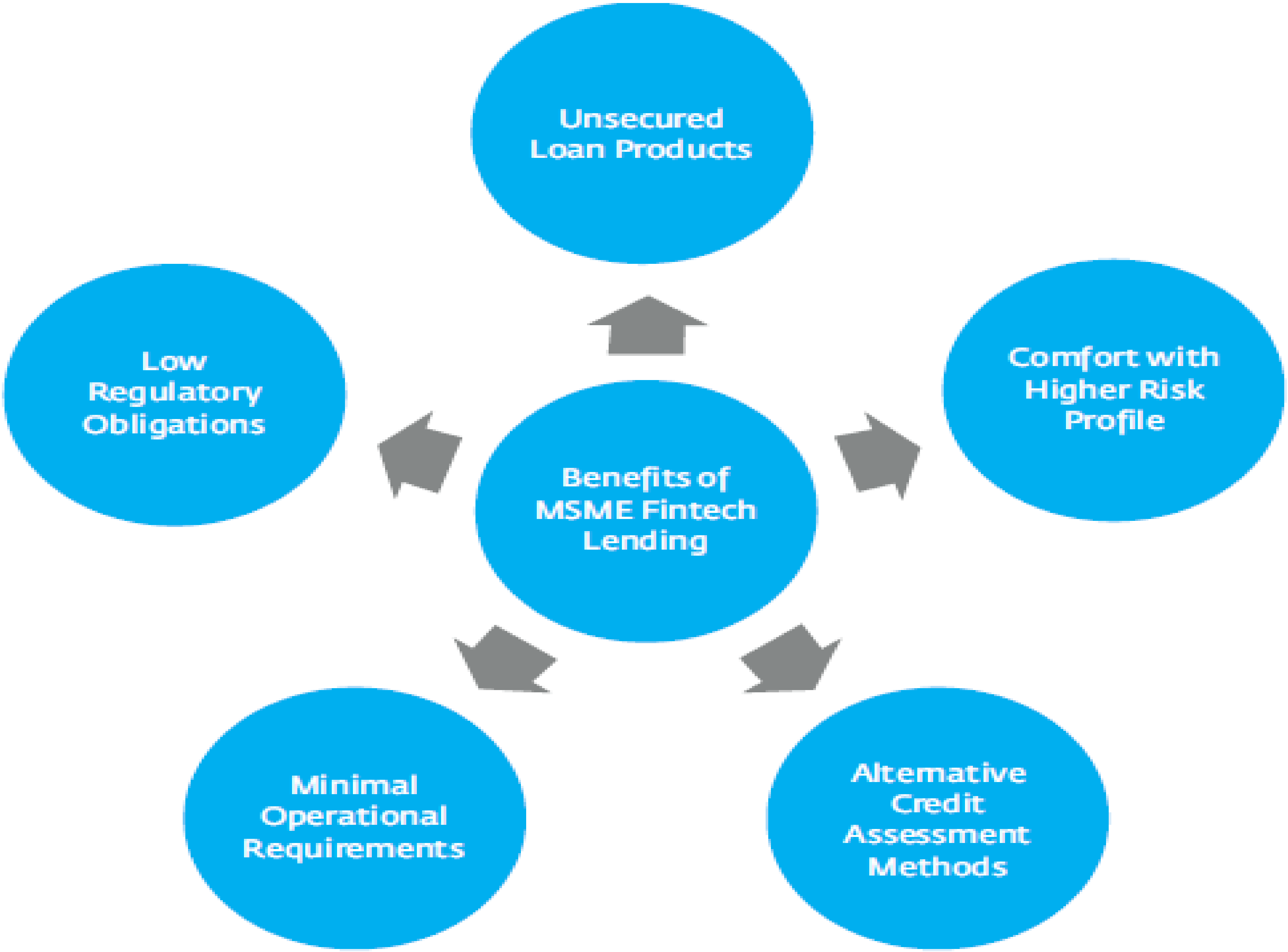
MSME Credit Gap - Regional Comparison



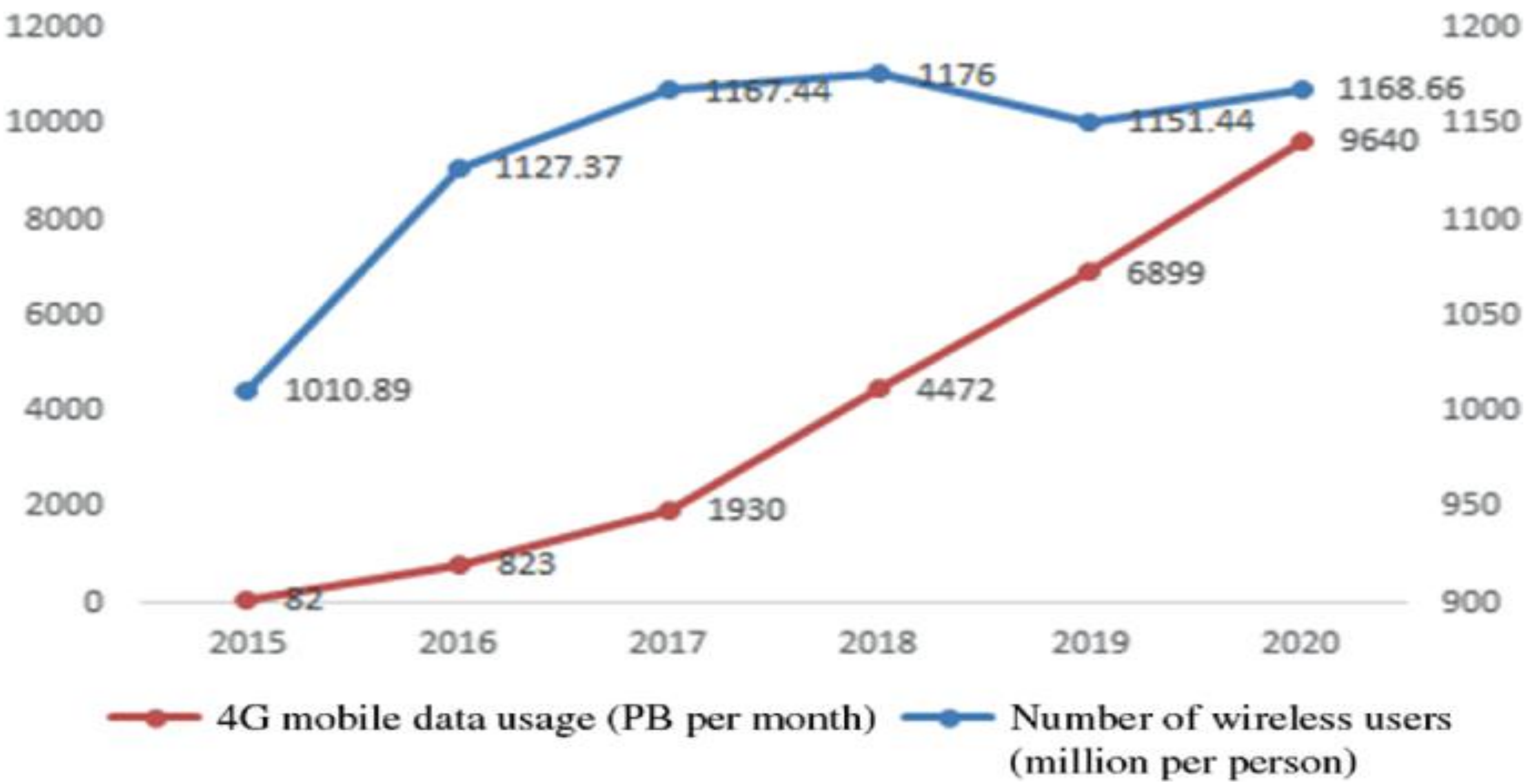
Source: WBG-Intellecap Analysis



Source: MSME AR16-17, Primary Research, Intellecap Analysis



Source: WEF (2015), WBG-Intellecap Analysis



Zhang & Hu, 2024

RESEARCH QUESTIONS

- Discrimination in credit : There has been rapid changes in the technological scenario in India since 2014, but does gender discrimination in access to credit still persist? Do credit access problems persist in 2022?
- Technological advancements: How does the introduction of ICT (proxy website) lead to better access to credit for enterprises? Additionally, does female-led enterprises benefit from ICT adoption in terms of better access to credit?

Our Contribution

- The pooled dataset definitely shows the discrimination faced by female entrepreneurs in India in new light.
- We use the website to see the technological advancements made in the last decade with pooled data over two points in time : 2014 and 2022.
- There is very limited research on the scope of website being an instrument reduce information asymmetry.

Why is WEBSITE important?

Firth et al. (2019) enterprises with good performance like to disclose more, to reduce information opacity

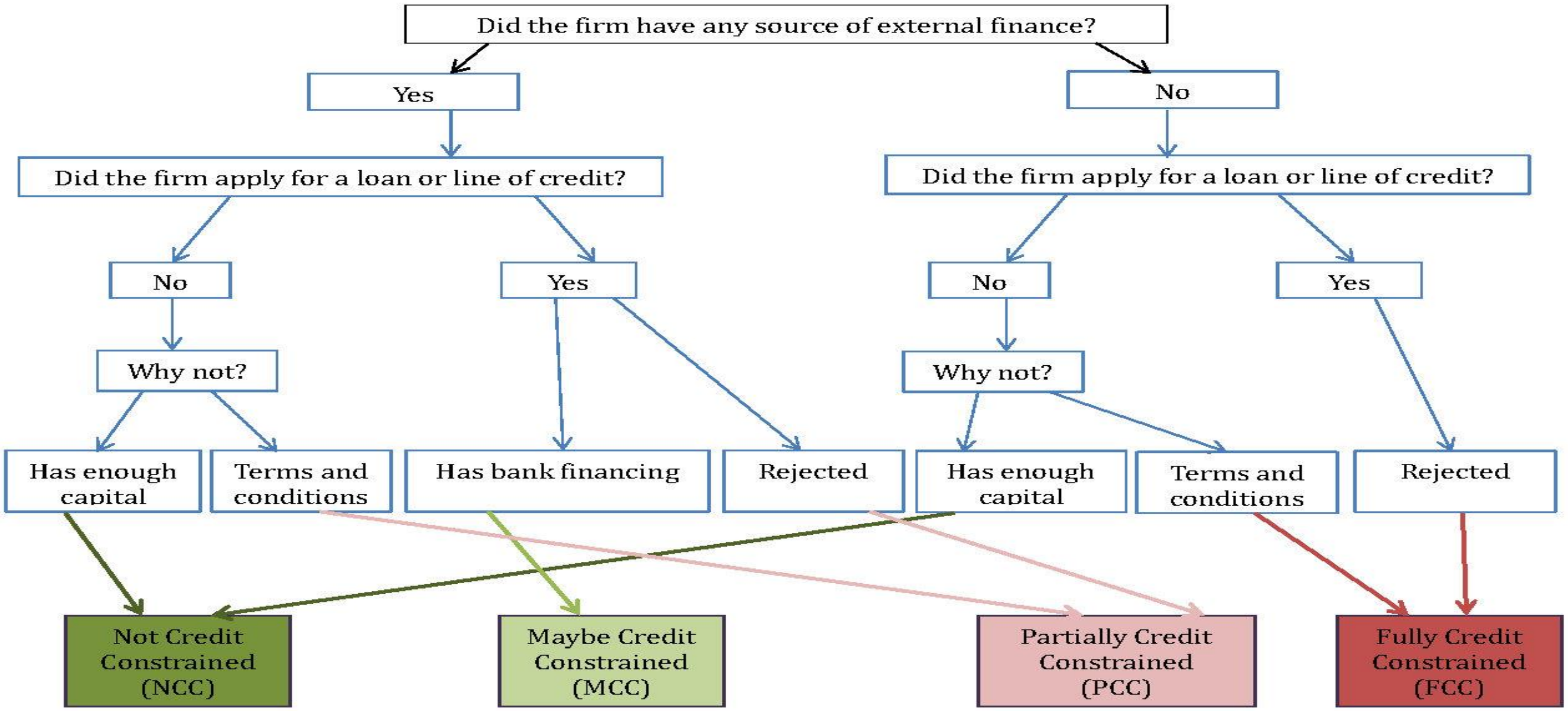
Hung et al., 2014 SME posts positive information and presents its competitiveness to site visitors by introducing itself, presenting its products and/or services, releasing news

Jiang et al. (2023) SMEs’ official website information can help financial institutions reduce their financial losses due to loan defaults

DATA

- World Bank Enterprise survey data for 2014 and 2022 for India.
- The survey consists of more than 9000 firms for two years respectively.
- Pooled cleaned dataset includes 7869 firms with around 3336 and 4533 firms for 2014 and 2022, respectively.
- Female-led firms were 7.94% and 7.52% in 2014 and 2022 respectively.

Correspondence between Credit-Constrained Groups and Questions in Enterprise Surveys

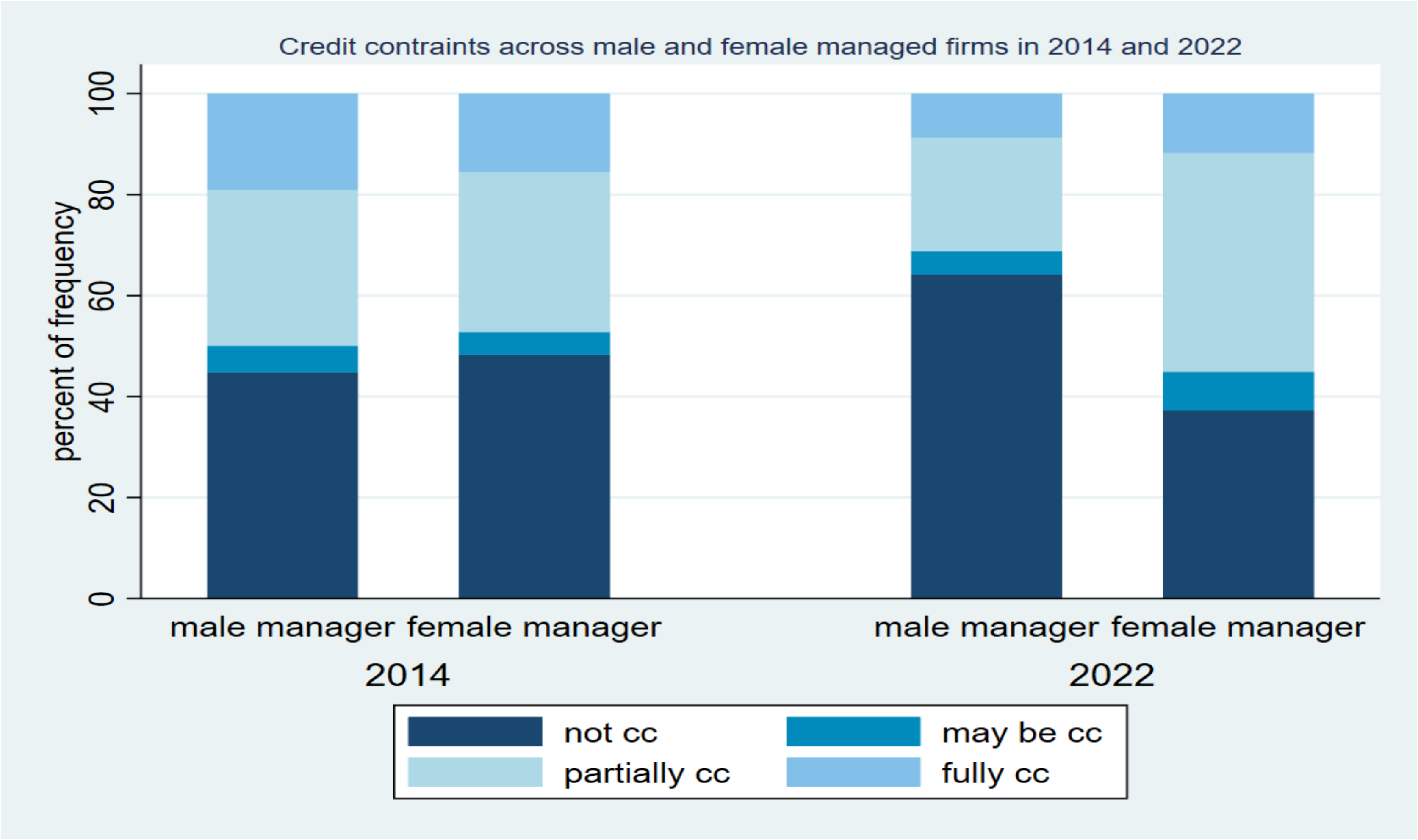


Conditions	NCC=1	MCC=2	PCC=3	FCC=4
APPLICATION FOR LOAN	Did not apply for a loan during the previous fiscal year	Had applied for a loan during the previous fiscal year.	1.Did not apply for a loan during the previous fiscal year (reasons below) or; 2. Applied for a loan but was rejected.	1. Loan applications were rejected or 2. The firm did not apply for loan, although there was a capital requirement or;
REASON FOR APPLYING OR NOT APPLYING LOAN	Having enough capital for the firm's needs.		The reason for not applying for a loan was other than having enough capital for the firm’s needs	The reason for not applying for a loan was, like collateral issues or interest too high, the loan criteria did not match and;
LOAN OUTSTANDING		Loan outstanding at the time of the survey And/Or;	Loan outstanding during the survey and/or	Do not have an outstanding loan during the survey and;
TYPE OF FINANCING FOR WORKING CAPITAL	May use external finance and internal finance.	external sources of finance for working capital during the previous fiscal year	External sources of finance for working capital during the previous fiscal year	No external finances only internal sources of finance for working capital during the previous fiscal year

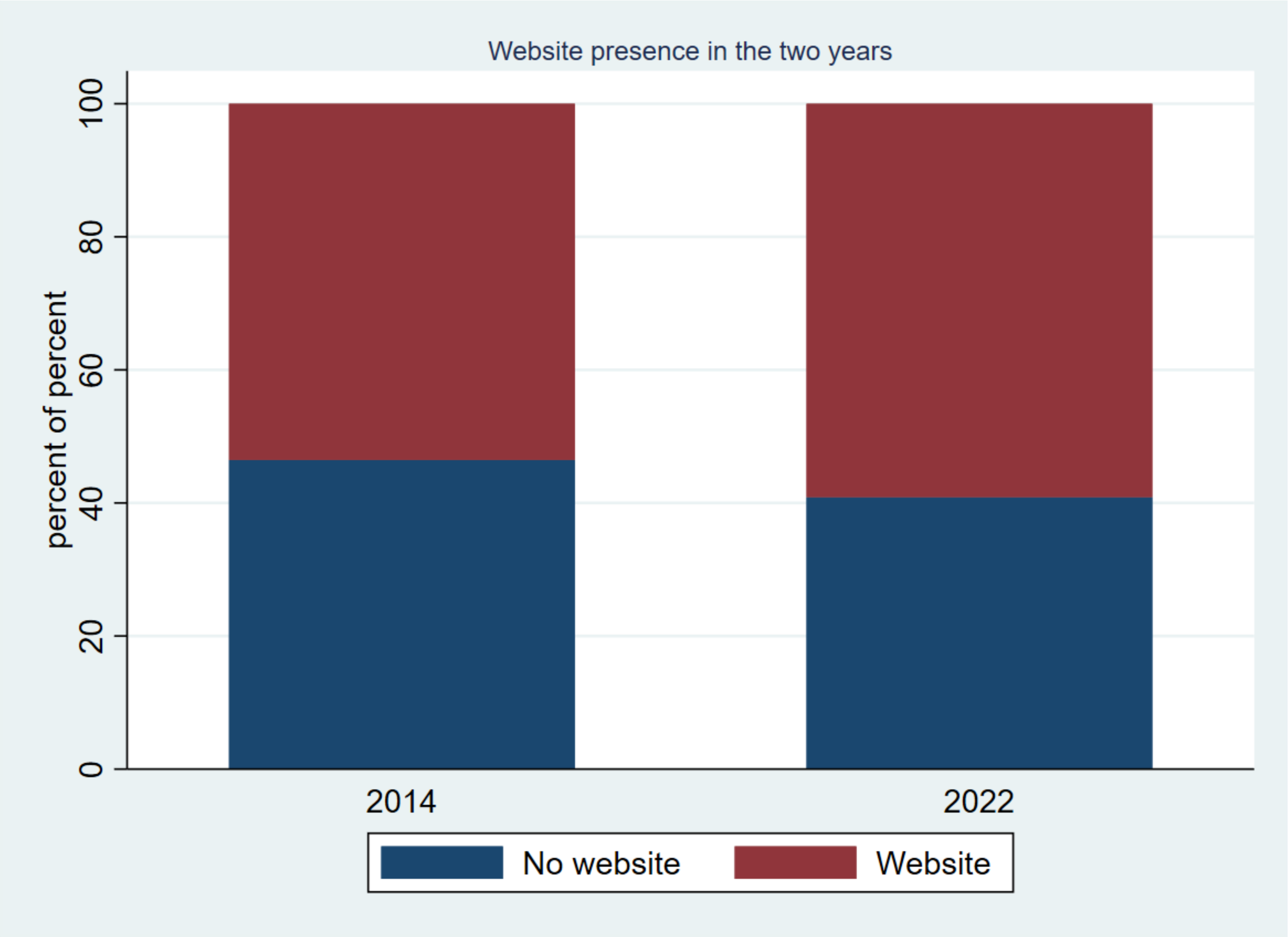
VARIABLE DESCRIPTION OF PERCEPTION OF CREDIT CONSTRAINT

VALUE ASSIGNED	PERCEIVED CREDIT CONSTRAINT
0	NO OBSTACLE
1	MINOR OBSTACLE
2	MODERATE OBSTACLE
3	MAJOR OBSTACLE
4	VERY SEVERE OBSTACLE

Credit constraints in 2014 and 2022 across managers



Percentage of firms with technology (website)



METHODOLOGY :Ordered Probit Regression

Relationship between credit constraints and whether gender and year pooled data analysis and, we estimate the following regression:

$$Y_{ij} = \beta_1 + \beta_2 *Manager_{ij} + \beta_3 *Year_{ij} + \beta 4*Manager_{ij} *Year_{ij} + \gamma_1 *X_{ij} + \gamma_2 *Z_{ij} + \mu_{ij} \qquad (1)$$

To understand the relationship between credit constraints and how technology plays a role, we estimate the following regression

$$Y_{ij} = \beta_1 + \beta_2 *Manager_{ij} + \beta_3 *Year_{ij} + \beta_4 *Manager_{ij} *Year_{ij} + \beta_5 *ICT_{ij} + \beta_6 *ICT_{ij} *Manager_{ij} *Year_{ij} + \gamma_1 *X_{ij} + \gamma_2 *Z_{ij} + \mu_{ij} \qquad (2)$$

METHODOLOGY :Ordered Probit Regression

In (1) and (2), i refers to firm and j state.

Y_{ij} is an ordered variable of credit constraint (1 = NCC, 2=MCC, 3=PCC, 4=FCC)

X_{ij} is a vector of all firm-specific characteristics, log of age, export dummy, firm size and location if in the main city

Z_{ij} is a vector of state and industry-level effects

ICT_{ij} is a dummy variable indicating 1 if the firm has a website or not

We also use Perception of credit constraint (Y_{ij}) as a dependent variable

RESULTS: MODEL 1: Ordered Probit Regression

- We see, female managers face more credit constraints than their male counterparts.
- We see, female managers in 2022 are more credit-constrained, and in 2022, the overall firms are still credit-constrained.
- The interaction term with 2022, compared to 2014 female managers are in no better position to access credit.
- Micro firms, are more credit-constrained than small-sized firms.

RESULTS: MODEL 2 : Ordered Probit Regression

- We use credit constraint definition as the dependent variable..
- The interaction term in 2022 of female managers with websites, compared to 2014, is in a better position to access credit.
- Female managers with websites face credit constraints, but in the year 2022, the constraints are lower.
- Firms with websites face or perceive lesser obstacles- indicate that technology introduction can have an easing effect on credit availability.
- With the changes in technology adoption, female managers with website also perceive to be less constrained.
- Similar results are observed with perceived credit constraint as the dependent variable

Endogeneity: IV Probit

Endogeneity in the models

- Endogeneity may arise from unobserved variables in the error term. It may also be due to reverse causality.
- Firms access to finance changes if they have access to ICT. Contrarily, firms may have increased access to ICT if their finances change.
- We estimate this model using the two-step IVprobit; the estimated value of ICTij is replaced in equation 2 from equation 3.

IV PROBIT ANALYSIS

$$ICT_{ij} = \alpha_1 + \alpha_2 Manager_{ij} + \alpha_3 Year_{ij} + \alpha_4 X_{ij} + \alpha_5 Z_{ij} + \alpha_6 IV_{ij1} + \alpha\mu_{ij} \quad (3)$$

- Estimate the equation using the IVprobit where our main dependent variable is a credit constraint dummy.
- Binary dependent variable: Assigning the value 0 to not credit constrained (NCC) and may be credit constrained (MCC) as ’no constraints’ and, the value 1 to the category ’facing constraints’, which is a pooled category of partially credit constrained (PCC) and fully credit constrained (FCC).
- Although the interaction term is not available in the IVprobit model, the endogeneity issue is addressed.

IV Probit Analysis

- To address the endogeneity issue of the ICT variable, we use the instrument "Percentage of electricity from generator shared or owned". This variable indicates if the firm has a stable electricity connection, which is necessary for website adoption.

- For the endogenous variable website proxy for ICT: One instrument from the literature is power availability as followed by Agyekum et al 2021, and others. Hence, we use the percentage of electricity from a generator. The availability of steady electricity would imply lesser usage of generators.

- Website adoption would be a hindrance when steady electricity connection is unreliable, and firms have to depend on external sources like generators.

IV Probit Analysis

Our results are consistent with the previous results that :

- Females face higher credit constraints. Credit constraints are dependent on website adoption.
- Credit constraints might be reduced by website adoption (a proxy for ICT) and IVprobit analysis. Considering the possible endogeneity issues, the website is an important determinant of credit constraints.
- For the endogenous variable website, which is a proxy for ICT, the percentage of electricity from generators is negatively significant. Hence, following our hypothesis that a stable electric connection would imply less usage of generators .

Conclusion

- The impact of Covid 19 cannot be denied- rapid use of technology – hence it is time for MSMEs to make advances in technology usage in their daily functioning.
- We conclude that technology in enterprises has some form of association towards financial inclusion- small-sized firms are still credit-constrained; technology might help the enterprises to be less constrained in terms of credit.
- Technological advancements might positively affect the functioning of firms as they help reduce the credit frictions that exist in the credit market.
- Step towards mitigating statistical discrimination as information asymmetry reduces, leading to better functioning of firms with the help of easy access to credit.

THANK YOU!
QUESTIONS AND COMMENTS

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