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The Role of E-Commerce in Promoting Digital Financial Inclusion: Empirical Evidence from Pakistan

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ABSTRACT

Digital financial inclusion remains uneven across developing economies despite rapid digitalization. This study investigates whether and how participation in e-commerce promotes financial inclusion in Pakistan a cash dominant, low-trust context characterized by expanding digital markets alongside persistent gender and rural disparities. Drawing on a mixed-methods design that combines national payment systems data with original survey evidence from 450 merchants and consumers, we show that participation in formal e-commerce platforms is strongly associated with improved financial inclusion outcomes. Specifically, formal platform participation is linked to a 34-percentage-point increase in digital payment acceptance and a 28-percentage-point increase in access to formal credit (average marginal effects from logistic regression, controlling for key covariates). However, these gains are highly uneven. Women merchants exhibit significantly lower adoption rates (approximately 27 percentage points lower), while the persistent dominance of Cash on Delivery (61% of transactions) limits the digitization of financial activity and constrains inclusion outcomes. Combining quantitative analysis with qualitative evidence, the study identifies three underlying mechanisms: transaction digitization, embedded finance integration, and network effects. Yet, these mechanisms operate imperfectly in cash-dominant environments. The paper makes three key contributions. First, it conceptualizes e-commerce platforms as data-generating financial infrastructures that reshape access to financial services. Second, it identifies payment modality as a binding constraint, showing that digital commerce does not automatically translate into financial inclusion where cash remains dominant. Third, it introduces and empirically substantiates the concept of conditional inclusion, whereby digital participation yields uneven financial access across social groups. The findings have important policy implications, highlighting the need for targeted interventions to accelerate digital payment adoption, address gender gaps, and expand rural digital infrastructure. Without such measures, the benefits of digital commerce risk reinforcing existing inequalities rather than alleviating them.

Keywords: *e-commerce; digital financial inclusion; embedded finance; Pakistan; conditional inclusion*

INTRODUCTION

The convergence of digital commerce and financial technology has reshaped pathways to financial inclusion in low- and middle-income countries. E-commerce platforms generate rich transactional data, integrate payment systems, and create new opportunities for previously unbanked populations to access formal financial services. Pakistan provides a compelling case: the e-commerce market was estimated by industry sources at approximately US$10–11 billion in 2025 (Research and Markets, 2026; State Bank of Pakistan, 2025), digital retail payments account for 88% of transaction volume within digital channels (i.e., not total retail transactions; State Bank of Pakistan, 2025), yet approximately 40% of adults remain financially excluded (World Bank, 2024), and only 13–15% of women have bank accounts depending on the definition and dataset (World Bank, 2024; Karandaaz Pakistan, 2025). This paradox rapid digitization alongside deep exclusion raises critical questions about whether e-commerce genuinely drives financial inclusion or primarily benefits those already connected.

Prior research has examined digital finance and e-commerce separately, but empirical work on their intersection in South Asia is limited. Studies from China show that digital inclusive finance significantly enhances e-commerce penetration (Jiang et al., 2025), but the mechanisms differ in contexts with weaker infrastructure and lower trust. In Pakistan, small businesses constitute over 90% of enterprises (Government of Pakistan, 2021; World Bank, 2022), yet barriers such as poor logistics, limited digital skills, and a strong preference for Cash on Delivery (COD) persist (Jamil & Khan, 2024). This study addresses three questions: (1) To what extent is e-commerce participation associated with digital financial inclusion among merchants and consumers? (2) Through what mechanisms does e-commerce facilitate financial access? (3) How do inclusion effects vary by gender and geography?

We employ a mixed-methods design, analyzing survey data from 280 e-commerce merchants and 170 consumers, complemented by key informant interviews. The findings reveal that formal platform participation strongly predicts financial inclusion, but COD dominance and gender disparities substantially moderate this relationship. The study contributes to the literature by providing empirical evidence from an under-researched context, identifying specific mechanisms, and highlighting equity-relevant heterogeneity.

LITERATURE REVIEW

Digital Financial Inclusion in Developing Economies

Digital financial inclusion refers to access to and use of formal financial services delivered through digital channels, including mobile money, digital payments, and online credit (World Bank, 2024). Cross-country studies find that fintech variables have a predominantly positive effect on economic growth, particularly through improved payment systems, although the effect varies significantly by institutional quality (Azmeh et al., 2024). In countries with low digital literacy and weak regulatory frameworks, the benefits may be concentrated among urban, educated populations.

In Pakistan, financial inclusion has improved, with 69% of adults now having some form of financial access (including mobile wallets and informal channels), up from 21% a decade ago (Karandaaz Pakistan, 2025). Yet gender gaps remain extreme: only 14% of women are financially included compared to 56% of men. Estimates suggest that closing the digital gender gap could generate up to $17 billion in potential GDP gains annually (GSMA, 2024). Rural areas also lag, with approximately 30–35 percentage points lower internet penetration rates than urban centers (Pakistan Telecommunication Authority, 2025). These disparities underscore the need to understand whether e-commerce can help bridge, or instead widen, existing divides.

E-commerce Development and Payment Preferences

E-commerce in Pakistan has grown at an industry-estimated compound annual rate of 22.2% from 2020 to 2024 (Research and Markets, 2026). Mobile commerce accounts for over 60% of transactions, and the number of digital banking accounts/users (as defined by the State Bank of Pakistan) reached 123 million in 2025 (State Bank of Pakistan, 2025). However, consumer payment behavior lags: Gallup & Gilani (2025) found that approximately 60% of online shoppers prefer Cash on Delivery, citing trust concerns and unfamiliarity with digital payments. This preference creates a chicken-and-egg problem: merchants are reluctant to invest in digital payment systems when customers demand COD, and customers continue using COD because merchants do not offer reliable digital alternatives.

The COVID-19 pandemic accelerated digital adoption: mobile banking transaction volume grew 106.8% between 2020 and 2024, and the share of digital retail transactions rose from 17% to 88% (State Bank of Pakistan, 2025). However, COD remains the single most used method, indicating that the shift is still incomplete.

Critical Gaps in the Existing Literature

The theoretical literature proposes several channels through which e-commerce can promote financial inclusion. First, transaction digitization creates verifiable financial histories that enable credit assessment for previously unbanked individuals (World Bank, 2025). Second, embedded finance integrates lending and insurance directly into platform workflows, reducing transaction costs. Third, network effects normalize digital payment behavior as more users join the ecosystem (CGAP, 2024).

However, prior studies suffer from several limitations. First, most assume that digital adoption automatically translates into financial integration. This assumption overlooks behavioral and institutional barriers such as persistent reliance on Cash on Delivery which may decouple digital commerce from financial inclusion outcomes, particularly in low-trust environments. Second, the empirical evidence is heavily skewed towards China and high-income Asian economies; South Asian contexts with weaker institutional frameworks remain under-studied. Third, and most critically, existing literature implicitly treats digital platforms as neutral conduits of inclusion. This overlooks how platform architectures, data visibility, and algorithmic processes selectively enable access (Berg et al., 2020; Jagtiani & Lemieux, 2019), raising fundamental questions about the distributional consequences of platform-led financial inclusion. Who gains access, who is left behind, and on what basis are these decisions made? These questions remain largely unanswered.

This study addresses these gaps by focusing on Pakistan, a low-trust, cash-dominant economy, and by explicitly examining the conditional nature of platform-driven inclusion.

Theoretical Framework

This study integrates the Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990) with insights from embedded finance literature. The TOE framework posits that technology adoption is shaped by technological readiness (e.g., digital infrastructure), organizational capabilities (e.g., digital literacy), and environmental factors (e.g., consumer preferences, regulation). We extend this by introducing payment modality as a critical environmental constraint that conditions digital transformation outcomes. Specifically, when COD dominates, the transaction digitization pathway is disrupted, limiting the conversion of digital commerce into financial inclusion.

Thus, our analytical framework proposes that e-commerce promotes digital financial inclusion through three mechanisms: (M1) transaction digitization (creating verifiable financial footprints); (M2) embedded finance integration (platform-linked credit and payments); and (M3) network effects and behavioral normalization. These mechanisms are moderated by gender, geography, and digital literacy. Critically, we conceptualize e-commerce platforms as data-generating financial infrastructures that substitute for traditional credit histories in emerging markets.

METHODOLOGY

Research Design and Data Sources

We employed a mixed-methods design consisting of (a) secondary analysis of State Bank of Pakistan Payment Systems Review reports (2020–2025) and Global Findex data; (b) a cross-sectional survey of e-commerce merchants and consumers; and (c) semi-structured interviews with 15 key informants from e-commerce platforms, financial institutions, and regulatory agencies. The mixed approach enables triangulation and provides both breadth and depth.

Survey Sampling and Administration

The target population was e-commerce merchants and consumers in Pakistan's five largest urban centers: Karachi, Lahore, Islamabad, Rawalpindi, and Faisalabad. A stratified sampling approach was used with elements of convenience sampling due to platform access constraints. For merchants, strata were business size (micro, small, and medium), gender of owner, and primary platform (Daraz, Telemart, social commerce via Facebook/Instagram). For consumers, strata were age, gender, income quintile, and online shopping frequency.

The sample size was set at 500 to allow subgroup analyses. The achieved sample of 450 exceeds the minimum required for logistic regression with multiple predictors (approximately 10 events per variable; Peduzzi et al., 1996), ensuring sufficient statistical power for subgroup analyses by gender and platform type. Data collection occurred from October to December 2025 using online distribution (through platform seller portals and consumer panels) and in-person administration at e-commerce seller meetups. The final valid sample comprised 450 respondents (280 merchants, 170 consumers), a 72% response rate. Informed consent was obtained, and the study was conducted in accordance with ethical guidelines for survey research (institutional review board approval was obtained; details available from the corresponding author).

Measures

Dependent variables (digital financial inclusion): For merchants: bank account ownership (yes/no), mobile wallet ownership (yes/no), formal credit access (yes/no, including bank loans, microfinance, or platform-provided credit). For consumers: same plus frequency of digital payment use.

Independent variables (e-commerce participation): For merchants: platform type (formal platform vs. social commerce), duration of e-commerce activity, monthly transaction volume, share of transactions settled digitally. For consumers: frequency of online purchases, platform used, preferred payment method.

Control variables: Age, gender, education (secondary, bachelor's, postgraduate), location (city), business size (number of employees) for merchants, and household income for consumers.

All survey instruments were pilot-tested on 30 respondents and refined for clarity. Urdu and English versions were offered. Quotations from interviews were translated into English where necessary.

Key Informant Interviews

Fifteen semi-structured interviews (45–60 minutes each) were conducted with platform managers (n=5), financial institution representatives (n=5), and regulatory officials (n=5). Interviews explored perceived mechanisms, barriers, and policy priorities. Recordings were transcribed and analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework.

Analytical Approach

Quantitative data were analyzed using Stata. Descriptive statistics and bivariate comparisons (t-tests, chi-square) were computed. Multivariate logistic regression was used to estimate associations between e-commerce participation and financial inclusion, controlling for covariates. Variance inflation factors (VIF) were examined to assess multicollinearity; all values were below the threshold of 5, indicating no concerning collinearity. Robust standard errors clustered at the merchant level (for the merchant subsample) were used to account for potential heteroscedasticity and intra-group correlation. The main specification was:

$$\log\left(\frac{1 - P(Y_i = 1)}{P(Y_i = 1)}\right) = \alpha + \beta_1 FormalPlatform_i + \beta_2 X_i + \varepsilon_i$$

Where Y_i is the inclusion indicator, Formal Platform is a dummy for operating on a formal e-commerce platform (vs. social commerce), and X_i is the vector of controls.

Proxy test for transaction digitization mechanism: To provide partial empirical support for Mechanism 1, we estimated an additional logistic regression where formal credit access was regressed on the merchant's share of digital transactions (percentage of sales settled digitally), controlling for the same covariates. This tests whether greater digitization of transactions is associated with higher credit access, as the mechanism would predict.

Given the cross-sectional design, we report associations, not causal effects. The mechanisms are supported by qualitative evidence and consistent patterns in the data, but they are not directly estimated in the regression models. Future research should formally test these pathways using mediation or structural equation models.

Limitations

The study has several limitations. First, the cross-sectional design precludes causal inference; potential endogeneity cannot be fully ruled out. Unobserved factors such as entrepreneurial ability, risk tolerance, or prior financial literacy may influence both platform participation and financial inclusion outcomes, potentially biasing estimates. Instrumental variable or quasi-experimental approaches (e.g., platform rollout shocks) would strengthen causal identification. Second, the sample is urban-centric, limiting generalizability to rural areas. Third, self-reported measures may be subject to recall bias. Fourth, the study does not capture platform-level algorithmic decision-making, which may influence credit allocation and introduce biases not observable in survey data (Berg et al., 2020). Fifth, potential negative consequences of platform-driven inclusion (e.g., data privacy, over-indebtedness) were not examined.

RESULTS

Sample Characteristics

Among merchants, 62% were male, 38% female; 52% operated on Daraz, 28% on social commerce. Among consumers, 58% were male, 42% female; 48% used Daraz, 32% social commerce. The sample was relatively educated (42% of merchants and 48% of consumers held bachelor's degrees), reflecting the digital economy demographic.

Digital Payment Adoption and COD Persistence

Among merchants, 56% accepted digital payments, but this varied sharply by platform: 72% of formal platform merchants vs. 34% of social commerce merchants accepted digital payments ($\chi^2(1) = 38.2$, $p < .001$). The most common payment method offered was COD (74%), followed by JazzCash / Easypaisa (48%). Among consumers, 61% used COD for their most recent online purchase, 28% used mobile wallets, and only 4% used credit/debit cards. The primary reasons for using COD were trust concerns (72%), lack of familiarity (48%), and fees (35%). This persistent COD dominance suggests that the transaction digitization mechanism a key pathway from e-commerce to financial inclusion is substantially weakened in the Pakistani context.

Association between E-commerce and Financial Inclusion

Table 1 shows financial inclusion indicators by platform type. Formal platform merchants had significantly higher bank account ownership (82% vs. 44%, $p < .001$), mobile wallet ownership (63% vs. 35%, $p < .001$), and formal credit access (34% vs. 12%, $p < .001$) compared to social commerce merchants.

Table-1
Financial Inclusion by Platform Type (Merchants)

Indicator	Formal Platform (n=170)	Social Commerce (n=78)	Difference
Bank account ownership	82%	44%	38%***
Mobile wallet ownership	63%	35%	28%***
Formal credit access	34%	12%	22%***
Digital payment acceptance	72%	34%	38%***

*** P < 0.001 (chi-square test)

Multivariate logistic regression (Table 2) confirms that formal platform participation is associated with a 34-percentage-point increase in digital payment acceptance (average marginal effect, OR = 4.82, $p < .001$) and a 28-percentage-point increase in formal credit access (average marginal effect, OR = 3.65, $p < .001$), holding constant business size, education, age, gender, and location. An odds ratio of 4.82 indicates that formal platform merchants have approximately 4.8 times higher odds of accepting digital payments compared to social-commerce merchants, corresponding to a 34-percentage-point increase in predicted probability. This association suggests that platform participation is linked to changes in financial behavior, with formal platforms embedding users within data-driven financial ecosystems where transaction histories may substitute for traditional collateral.

These results should not be interpreted causally; rather, they indicate strong conditional associations consistent with the proposed mechanisms.

Table-2
Logistic Regression: Formal Platform vs. Financial Inclusion (Merchants, N=280)

Dependent variable	**Odds ratio**	**95% CI**	**Pseudo R^2**
Bank account ownership	4.21***	[2.45, 7.24]	0.18
Mobile wallet ownership	3.48***	[2.08, 5.82]	0.15
Formal credit access	3.65***	[2.01, 6.63]	0.21
Digital payment acceptance	4.82***	[2.76, 8.42]	0.24

Note: Controls include business size, education, age, gender, location. Robust standard errors clustered at merchant level. *** $P < 0.001$.

Proxy test for the transaction digitization mechanism (M1)**:** Regressing formal credit access on the merchant's share of digital transactions (percentage of sales settled digitally) yielded a positive and significant log-odds coefficient ($\beta = 0.31$, $p < .01$), which corresponds to approximately a 36% increase in the odds of formal credit access for each 10-percentage-point increase in digital transaction share. This provides partial empirical support for Mechanism 1: merchants who digitize a larger share of their transactions are more likely to access formal credit, consistent with the idea that digital transaction records facilitate credit assessment. While not a formal mediation test, the consistency between regression patterns and qualitative evidence provides indicative support for the proposed mechanisms.

For consumers, those who shopped online at least monthly had significantly higher mobile wallet ownership (78% vs. 48%, $p < .001$) and bank account ownership (82% vs. 63%, $p < .01$) than less frequent shoppers. However, causality cannot be determined from cross-sectional data, and reverse causality is possible (financially included individuals may be more likely to shop online).

Heterogeneity: Gender and Geography

Gender disparities were pronounced. Among merchants, women-owned businesses were less likely to operate on formal platforms (32% vs. 58% for men, $p < 0.001$). Even on formal platforms, women had lower digital payment acceptance (58% vs. 78%, $p < 0.05$) and lower formal credit access (24% vs. 38%, $p < 0.05$). Regression with an interaction term (Gender × Platform) showed a negative interaction coefficient of -0.16 (log-odds, SE = 0.07, $p < 0.05$), indicating that the association between formal platform participation and credit access is significantly weaker for women than for men. This coefficient, while in log-odds units, reflects a smaller marginal effect; it is not directly interpretable as a 16-percentage-point difference in probability. This indicates that platform-driven inclusion is structurally uneven, shaped by gendered access to technology and socio-cultural constraints such as SIM ownership and restricted financial autonomy (GSMA, 2024).

Geographic disparities were evident from secondary data: rural areas have approximately 30–35 percentage points lower internet penetration and significantly lower e-commerce participation. However, targeted programs like the Ufone Ba-Ikhtiyar Women initiative, which provides smartphones, digital training, and

mobile wallets to rural women, have shown promise in reducing the gap (PTCL Group, 2025). (Note: PTCL Group is an industry source; academic evaluation of this initiative is pending.)

Qualitative Evidence on Mechanisms

Mechanism 1: Transaction digitization. A platform manager explained: "When a seller processes 100 transactions through our platform, we have data on sales volume, return rates, customer satisfaction. This data is gold for lenders. According to our internal estimates, we've disbursed millions in loans to sellers who never borrowed from a bank before" (Platform Manager #1). This illustrates how digital transaction records substitute for traditional credit histories.

Mechanism 2: Embedded finance integration. A Mobilink Bank representative described the partnership with Daraz: "It's about creating a seamless experience where sellers can access financing, sell, receive payments, and manage cash flow within an integrated ecosystem. This makes financial services accessible to sellers otherwise excluded" (Financial Institution Representative #2).

Mechanism 3: Network effects and normalization. A regulatory official noted: "As more people use digital payments for e-commerce, utilities, person-to-person transfers it becomes normal. People start to trust the system. COVID accelerated this dramatically" (Regulatory Official #1).

However, barriers remain. One woman merchant said: "I don't own the mobile phone registered in my name. My husband does. So I cannot open a mobile wallet. I sell on Facebook, and customers pay by cash on delivery. That's the only way" (Merchant #34, female). This highlights structural constraints that platforms alone cannot solve.

DISCUSSION

Summary of Findings

This study provides empirical evidence that e-commerce participation, particularly on formal platforms, is strongly associated with digital financial inclusion in Pakistan. Merchants on formal platforms have an odds ratio of 4.8 for digital payment acceptance (substantially higher likelihood) and an odds ratio of 3.65 for formal credit access compared to social-commerce merchants. However, the persistence of Cash on Delivery (61% of consumers) substantially weakens the transaction digitization mechanism. Moreover, gender disparities persist even among formal platform users, and rural areas remain underserved. Unlike evidence from China, where digital payments are near-universal, our findings show that payment modality remains a binding constraint in cash-dominant economies.

Theoretical Contributions

This study advances theory in three ways. First, it identifies payment modality as a binding constraint, demonstrating that digital infrastructure alone is insufficient for financial inclusion. By introducing payment modality into the TOE framework as an environmental variable, we show that the COD preference disrupts the transaction digitization pathway. In low-trust environments, the mere presence of digital infrastructure does not guarantee financial integration; payment culture must be addressed as a distinct constraint.

Second, the study re-conceptualizes e-commerce platforms as financial infrastructures that produce alternative creditworthiness, rather than passive intermediaries. Unlike prior studies that treat platforms as neutral conduits, our findings demonstrate that platform-generated transaction data substitute for traditional

credit histories. This contributes to the embedded finance literature by empirically showing how platform data reduce information asymmetries. In this sense, e-commerce platforms do not merely reduce exclusion they redefine the criteria of inclusion, privileging those who are digitally visible and data-rich.

Third, we introduce and empirically ground the concept of conditional inclusion building on emerging debates in digital finance and platform governance (Berg et al., 2020; Schou & Bucher, 2024) showing that digital participation does not uniformly translate into financial access but is mediated by structural inequalities (gender, geography, payment modality). This challenges the implicit assumption in much of the digital finance literature that digital adoption automatically equals inclusion. The conditional inclusion concept has broad applicability beyond Pakistan, as many cash-dominant, low-trust economies face similar dynamics.

Policy Implications

E-commerce platforms increasingly function as gatekeepers of financial inclusion, determining who gains access based on participation, data visibility, and digital capability. This gatekeeping role carries several policy implications.

Accelerate digital payment adoption. The COD barrier must be addressed through targeted behavioral nudges (e.g., default digital payment incentives, cashback mechanisms, and escrow-based trust systems) (Benartzi et al., 2017; Jack & Suri, 2016). The State Bank of Pakistan's Raast instant payment system (State Bank of Pakistan, 2025) and QR Code subsidies are steps in the right direction.

Gender-targeted platform interventions. Platforms should partner with women's organizations to provide digital literacy training, facilitate SIM registration in women's names, and design credit products that do not require collateral. The Ba-Ikhtiyar Women initiative is a replicable model.

Rural connectivity and logistics. Investment in rural internet infrastructure and last-mile delivery networks is essential. Regulatory policies should encourage platform expansion beyond major cities.

Youth financial inclusion. The State Bank of Pakistan's new teen banking framework (State Bank of Pakistan, 2025; circular BPRD-05-2025) allowing 13- to 18-year-olds to open accounts should be integrated with e-commerce platforms to build early digital financial habits.

Data governance. As platforms accumulate transactional data, robust data protection and privacy regulations are needed to prevent exploitation and ensure that consumers retain control over their financial information (Berg et al., 2020).

Among these, accelerating digital payment adoption is likely the most immediate lever, as it directly activates the transaction digitization mechanism underpinning financial inclusion.

Generalizability beyond Pakistan

While grounded in the Pakistani context, the findings have broader relevance for other cash dominant, low-trust economies, where digital adoption does not automatically translate into financial inclusion. Countries in South Asia (e.g., Bangladesh, Nepal), Sub-Saharan Africa (e.g., Nigeria, Tanzania), and parts of Latin America share similar characteristics: high cash preference, gender gaps in digital access, and rapidly growing but uneven e-commerce markets. The concept of conditional inclusion and the identification of payment modality as a binding constraint are likely to travel to these contexts, though local institutional and cultural factors will shape precise manifestations.

Limitations and Future Research

The cross-sectional design prevents causal claims. Potential endogeneity (reverse causality) remains a key concern: financially included individuals may be more likely to adopt formal platforms. Unobserved factors such as entrepreneurial ability, risk tolerance, or prior financial literacy may bias estimates. Future research using panel data or natural experiments (e.g., platform rollouts in previously unserved areas) could establish causality. The urban focus limits generalizability; a dedicated rural survey is needed. Additionally, the study did not examine platform-level algorithmic decision-making or potential downsides such as algorithmic bias and over-indebtedness. These warrant investigation. Finally, the rapid pace of digital change means longitudinal monitoring is essential.

CONCLUSION

E-commerce has the potential to be a powerful engine of digital financial inclusion in Pakistan, but its impact is conditional on payment digitization, platform design, and structural equity. This study shows that formal platform participation is associated with significantly higher digital payment acceptance and credit access (odds ratios of 4.8 and 3.7 respectively), yet COD dominance and gender disparities severely constrain these benefits. Theoretically, we extend the TOE framework by introducing payment modality as a binding constraint, re-conceptualize platforms as financial infrastructures, and propose the concept of *conditional inclusion*. For e-commerce to fulfil its inclusive promise, policymakers and platforms must move beyond a purely technological approach and address the social, cultural, and infrastructural barriers that perpetuate exclusion. Targeted behavioral nudges for digital payments, gender-targeted interventions, investment in rural connectivity, and robust data governance are essential. Without such measures, the digital divide will persist, and the benefits of e-commerce will flow mainly to those already connected.

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