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Does ICT Investment Affect Market Share and Customer Acquisition Cost? A Comparative Analysis of Domestic and Foreign Banks Operating in India

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Abstract: Competitive banks aggressively invest in information and communication technologies (ICT) to enhance their market share and reduce Customer Acquisition Costs (CAC). This study examines the impact of *cumulative stock* of ICT investment on (a) deposit and loan market share and (b) CAC of banks operating in India. The analysis uses a longitudinal dataset of 84 domestic and 70 foreign banks from 2000 to 2020, employing a two-step system Generalized Method of Moment (GMM). It is found that ICT investment adversely affects the market share of domestic banks, indicating a need for these banks to strategically invest more in CAC. Conversely, foreign banks are able to increase their market share through ICT investment and reduced CAC, thereby demonstrating greater efficiency in utilizing ICT. The study underscores the strategic importance of cumulative stock of ICT investment for banks. Nonetheless, it is emphasized that ICT investment must be complemented with innovative marketing strategies to enhance customer experience, reduce CAC, and increase market share. Overall, while foreign banks are able to leverage ICT to boost efficiency, domestic banks must leverage ICT to implement targeted marketing strategies and strive to enhance their customer service.

Keywords: ICT investment; deposit and loan market share; banks; customer acquisition cost

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1. Introduction

In the context of emerging economies, competitive interaction between domestic and foreign banks can have important ramifications. Overall, such competition is expected to enhance the efficiency of the banks in terms of providing financial services. Nevertheless, foreign banks might also engage in poaching the relatively safe borrowers and depositors away from domestic banks (Giannetti and Ongena 2012). Thus, the foreign banks would essentially be competing with the domestic banks in terms of deposit and loan market shares. It is expected that the entry of foreign banks would lead to increased competition in a given market. This would create opportunities and incentives for the domestic banks to introduce cost efficiency. Such cost reduction might occur through the assimilation of superior banking technologies and practices of the foreign banks (Claessens et al. 2001).

It is also well known that the banking sector in emerging markets is characterized by large asymmetric information (Dell'Ariccia 2001). In such markets, information and communication technology (ICT) is expected to play an instrumental role, both for domestic and foreign banks, in the game of acquiring market share. Technological changes have indeed led to enhanced competition in the banking sector.

In an emerging economy like India, the knowledge-intensive service sector plays a crucial role. Not surprisingly, ICT has become indispensable for the service sector. As a general-purpose technology, it complements innovative activities and augments firms' productive capacity. The Internet revolution and Industry 4.0 regime have made ICT indispensable for the growth of the financial services sector. Such events have facilitated

unprecedented innovations in financial services. Consequently, the financial services sector has emerged as one of the most intensive users of ICT (Scott et al. 2017). Essentially, ICT leads to *information acquisition*, which has important practical implications for the banking sector (Arabyat and Aziz 2022).

In recent years, ICT has brought about a paradigm shift in banking services. It determines the effectiveness of a bank's core banking system. Unlike brick-and-mortar banking, technology-enabled banking follows a multi-channel approach, such as internet banking, automated teller machines (ATM), and mobile banking. This transformation has led the world into a different spectrum of banking by making modern banking time- and place-independent. Empowered with ICT, banks are technically able to collect, process, analyze, and optimally use information obtained from their customers to design customized products and services for them. For instance, customized loans, pre-approved credit and debit cards, incentive offers, and privileges (e.g., airport lounge access, flight vouchers, and exclusive memberships) are provided on the basis of the observable credit history of the customers. Banks are able to verify the credentials of their customers by using technology-enabled electronic know-your-customer (KYC) systems. Much of the erstwhile labor-intensive, time-consuming operations are being automated. All of these factors have supposedly led to a favorable impact on the cost of providing banking services. In order to further enrich the customer experience, banks have made significant advances in Artificial Intelligence (AI), machine learning, business analytics, cloud computing, and blockchain technology. The diffusion of these technologies in banking has enabled round-the-clock access to core banking services.

Banks have implemented technology to provide a one-stop solution for most of the customer needs. The radical transformation in banking has eliminated the need to visit banks to avail themselves of relevant services. Customers can open accounts from their homes, apply for digital loans in real-time, and make cardless withdrawals from multiple digital platforms. Digital transformation has helped banks build, sustain, and expand customer relationships, leading to a persistent market share. Banks today resort to user-friendly interfaces like websites, mobile interfaces, and social media to render many services. Unified Payment Interface (UPI), banking applications, contactless lending platforms, WhatsApp banking, voice know-your-customer (VKYC), and other technology-enabled services have added new dimensions to modern banking. For customers' convenience, Indian banks have made their websites available in multiple languages. Indian banks incorporated UPI Lite in January 2022, following the Reserve Bank of India's (RBI) offline transaction framework. This interface uses Near-Field Communication (NFC) technology to facilitate real-time small-value transactions. The interface also ensures successful payments irrespective of low or no Internet connectivity. UPI thus accounts for the largest share of transactions in terms of volume in India. The success of UPI Lite has paved the way for RBI to launch UPI Lite X, Tap & Pay, and conversational payment interfaces in 2023. These innovations are further expected to enable banks to render hassle-free services to the customers.

Notwithstanding such ICT innovations being introduced, very little is known about the relevance of ICT on market shares and customer acquisition efforts of competing banks operating in emerging markets. This paper seeks to address such important, understudied issues in the context of domestic and foreign banks operating in India.

There is a strand of the literature that emphasizes the impact of ICT on financial indicators, especially profitability, return on assets (ROA), and return on equity (ROE) (Ghose and Maji 2022; Sharma 2023). Nonetheless, the extant studies indicate that the effect of ICT investment on the profitability of banks is, at best, equivocal. For instance, some studies have found a *positive* impact of ICT on a bank's profitability, efficiency, and productivity (Ghose and Maji 2022). Yet another branch of the literature demonstrated an *ambiguous* effect of ICT on the performance indicators of Indian banks (Sharma 2023). Such inconsistent and mixed findings preclude a clear understanding of the impact of ICT on bank performance as measured by the usual financial indicators. Given such an

inconclusive verdict on the impact of ICT on the typical financial metrics of banks, this paper contributes to the literature along the following four aspects.

First, it is evident that the outcome of ICT investment is not likely to be instantaneous (Beccalli 2007; Hernando and Nieto 2007; Scott et al. 2017). The authors have postulated that the benefits of ICT investment accrue over an extended period. To realize positive outcomes, it becomes imperative for banks to invest consistently in the latest technologies. Consequently, it is imperative to measure the effect of *cumulative* ICT investment on appropriately chosen metrics of bank performance. Cumulative ICT investment is a bank's total expenditure over a specific period to acquire and maintain ICT assets and capabilities. Consistent investment in ICT equips a bank with a resilient technological infrastructure. It facilitates cost minimization and improves operational efficiency. The literature lacks empirical studies examining the impact of cumulative ICT investment on the performance of banks in India. This study contributes to the literature by examining the possible link between cumulative ICT investment, bank market share, and customer acquisition cost (CAC).

Second, the impact of ICT has been analyzed mostly within the context of profitability and ROA and ROE metrics. The volume of deposits and loans reflects a bank's efficiency in attracting deposits and utilizing loanable funds to produce additional profits (Baker et al. 2023; Nguyen et al. 2021). This process improves its financial position. A bank's market share also indicates its reputation and trustworthiness among retail customers and firms. For this reason, the market share of deposits and loans are important indicators of bank performance and resilience.

It is important to justify the *economic rationale* behind focusing on market share in this study. Deposit market share (DMS) is defined as the ratio of each bank's deposits to total deposits of all banks in a given year. Similarly, loan market share (LMS) is defined as the ratio of each bank's loans to the total loans of all banks in a given year. Attracting deposits is one of the most important goals and a competitive tool for a bank. Enhanced market share is expected to lead to higher market power. There is a strong association between market share and profitability indices. Thus, the second novelty of this study comes from the analysis of how cumulative ICT investment affects alternative performance metrics, specifically market share and CAC.

Third, this study performs a comparative examination of how ICT investment affects the performance of domestic and foreign banks operating in an emerging market like India. The rationale for this approach stems from the fundamental premises of the *home field advantage hypothesis* vis-à-vis the *global advantage hypothesis*. Berger et al. (2000) proposed these hypotheses while examining the effect of foreign ownership on bank performance. According to the home field advantage hypothesis, domestic banks tend to demonstrate greater efficiency in providing financial services. Foreign banks would have to incur higher costs of rendering financial services due to cross-border disadvantages emanating from distance, language, and cultural barriers. In contrast, the global advantage hypothesis holds that foreign banks tend to possess higher efficiency. Superior managerial skills and the use of advanced technologies would give a comparative advantage to the foreign banks. Consequently, foreign banks might be able to perform better in comparison to domestic banks. The extant literature supports both of these competing theories (Berger et al. 2000; Lensink and Naaborg 2007). In the context of domestic and foreign banks operating in India, the applicability of these theories has not been tested. This is the third differentiator of the current paper.

Fourth, unlike most of the extant literature, the analysis is conducted for the years 2000–2020. It is important to note that prior to 2000, the level of ICT investment in the banking sector was quite low. Although automation of some of the banking activities had started during the 1990s, even computerization of basic banking operations did not occur until the end of the decade. Essentially, these two decades capture the most important phases of ICT evolution in the Indian banking sector. The major technological and policy initiatives that occurred during this period are Internet banking (2000), the IT Act (2000),

and the launch of centralized payment systems (CPS) in 2004–2005. These events were followed by the promotion of mobile banking (2011) and the launch of UPI (2016). Such significant events have altered the dynamics of banking in India. Hence, the 2000–2020 time period helps us to capture the learning and adjustment effects associated with the adoption of new technologies in emerging markets. Moreover, the Indian economy started to liberalize during 1991–1992. Due to liberalized Foreign Direct Investment (FDI) norms, entry of foreign banks became relatively easier during the late 1990s. Thus, the chosen time period, 2000–2020, also enables us to analyze the competition between the domestic and foreign banks.

Based on the gaps identified in the extant literature, there are three specific research questions of this study:

1. What has been the impact of ICT investment on the deposit and loan market share of banks operating in India?
2. What is the effect of ICT investment on Customer Acquisition Costs of banks operating in India?
3. Is there any differential impact of ICT investment on the market share and Customer Acquisition Costs of domestic and foreign banks?

This paper is structured as follows. Section 2 builds a theoretical framework, followed by a review of the literature and hypotheses formulation in Section 3. The methodology adopted in the study is discussed in Section 4. Econometric results are reported in Section 5, followed by a discussion of major findings in Section 6. Section 7 provides the managerial implications and Section 8 concludes.

2. Conceptual Framework

The relationship between ICT investment and market share of banks is conceptualized as a sequential process described below.

Stage 1: Both domestic and foreign banks invest in ICT. Such investment increases the *stock* of ICT capital of each of the banks.

Stage 2: The *stock* of ICT increases the efficiency of banking operations by reducing transaction costs for both customers and bank employees.

Stage 3: Notwithstanding the investment in ICT, only a subset of the banks can provide improved services to their customers. Such improved services may be attributed to various non-ICT factors (like foreign or domestic bank status, interest rates, the governance of banks).

Stage 4: Both existing and new customers would respond favorably to the signals provided by their preferred banks. This, in turn, would have a favorable impact on market shares of a subset of banks. The other set of banks, whose customer service has not improved, would experience an adverse impact on their market share.

Stage 5: As a response to declining market share, a subset of banks would optimally respond by increasing their marketing and Customer Acquisition Costs. In contrast, the other subset of banks with increasing market share would have the ability to reduce marketing and Customer Acquisition Costs.

With the conceptual background described above, the testable hypotheses of this study are formulated as follows.

3. Literature Review and Hypotheses Formulation

In the context of this paper, a survey of prior studies pertaining to the relevance of ICT on banks and their customers is warranted. These are summarized as follows.

3.1. Impact of ICT on Banks

The usage of ICT helps to improve competitive advantage by increasing the customer base (Kim and Davidson 2004). Technology-intensive banks experience larger economies of scale (DeYoung 2005), which gives them a cost advantage. According to Chen (2020),

Claessens et al. (2001), DeYoung (2001), and DeYoung (2005), banks can shift their cost advantage to customers by either lowering interest on loans or increasing deposit interest. The authors have identified the effectiveness of this approach in attracting customers without affecting bank earnings. ICT has made banking operations more cost-efficient and enabled banks to maintain stability in their financial performance (DeYoung et al. 2007; Ho and Mallick 2010). Thus, investment in ICT has become a strategic necessity and an operational requirement for banks (Beccalli 2007; DeYoung et al. 2007; Ho and Mallick 2010).

Banking has become increasingly agile, secure, and convenient, fostering more robust customer relationships as a result of its inclination towards technology (Banker and Kauffman 1988; DeYoung et al. 2007). Customers demonstrate an increased willingness to purchase additional deposit services (DeYoung et al. 2007). Banks using technology also fare better in advancing loans (Kim and Davidson 2004; Sheng 2021). Technology assists banks in monitoring borrowers' credit history, thereby reducing *information asymmetry*. The digital lending channel quickens loan advancement, lowers lending rates, and increases bank lending.

Market share plays an important role in determining a bank's profit. Banks' core functions of deposit acceptance and lending are significantly affected by their market share. Banks are able to influence their market share through the acquisition and retention of customers. In one of the earlier studies, authors have identified the strategic contribution of ICT. By investing in ATM, banks were found to improve the deposit market share of their branches (Banker and Kauffman 1988). Arabyat and Aziz (2022) analyzed how profits are affected by IT investment in the context of Jordanian banks. They found that IT investment affected the market share of Jordanian banks, which moved the banking system away from an efficient equilibrium.

3.2. Impact of ICT on Customers

ICT has also favorably affected bank customers in various tangible ways. For instance, by accessing ATMs, customers are able to reduce the opportunity costs of standing in long queues. Most of the banking services can now be conducted by using a computer or smartphone. This is particularly important for business owners whose opportunity cost of time of visiting a bank used to be quite high. In a competitive environment, banks are aggressively using ICT to offer pre-approved, instant loans to businesses. Such innovative products and services are expected to affect businesses in a favorable way. This, in turn, is expected to have important effects on the market shares of domestic and foreign banks operating in India.

3.3. Hypotheses of the Study

3.3.1. Foreign vs. Domestic Banks

In a competitive market, banks ought to differentiate themselves from their peers in terms of service provision. Therefore, they need to *continuously* innovate in terms of the service they provide. In other words, competition fosters financial innovation among banks to attract new and retain existing customers. In the context of banking services, it may be argued that a sustained ICT investment can foster the introduction of innovative products and services. ICT has proved to be an important tool to introduce such innovations. For instance, ICT has facilitated the development of electronic banking services. Market share has also been recognized as the cause of innovation and ICT investment by banks. The application of ICT tools by banks is likely to improve their banking services.

Nevertheless, the relationship between ICT and the market share of banks need not be straightforward. It is possible that in spite of investing in ICT, some banks do not experience any improvement or even reduction in their market share. This is plausible when such banks consistently fail to enhance their services, which dissuades customers away from them. Which of the above theories holds well in the context of the banks operating in India? This is an empirical question that is addressed in this paper.

Prashad (2020) found evidence of regulatory arbitrage, which explains the presence of foreign banks in India. Foreign banks operating in India were among the early adopters of technology (Sensarma 2006). These banks introduced modern banking technologies and innovative banking practices in India. Foreign banks are also highly specialized in offering banking products like derivatives, advisory services, and trade finance. Hence, technological leadership and product innovation would have provided a long-term competitive advantage to the foreign banks. In contrast, the old private and public sector banks emerged as late bloomers in technology adoption (Rishi and Saxena 2004). The technological gap has been instrumental in augmenting the operational efficiency of foreign banks. Moreover, it is the quality of banking services that determines the market share of domestic and foreign banks. Although both the categories of banks would have invested in ICT, ceteris paribus, it is the quality and persistence of customer service that would ultimately determine their market shares. This is one important aspect where the foreign banks seem to have fared better in comparison to the domestic banks. Thus, it is expected that foreign banks would experience a favorable impact of ICT on their market share. This argument leads us to the following hypotheses.

H1a: *Cumulative ICT investment is expected to have an adverse impact on the deposit and loan market share of the domestic banks.*

H1b: *Cumulative ICT investment is likely to have a favorable impact on the deposit and loan market share of foreign banks.*

3.3.2. ICT and Customer Acquisition Cost

CAC is a key metric of advertising and marketing strategies adopted by the banks. Targeted marketing by the banks can attract more customers at lower costs, which boosts their competitiveness (Cao and Gruca 2005). ICT has given a stimulus to banks' customer outreach programs through various digital platforms. Integrating technology into banking operations is more likely to make banks efficient in customer acquisition. For instance, DeYoung (2001) examined the financial performance of "Internet banks" in the US. He found that by adopting Internet banking, it is possible to address the problem of high marketing costs for banks. Subsequent studies by Hernando and Nieto (2007) and Mithas et al. (2012) also support this finding. Modern banking is, therefore, expected to be more cost-efficient in acquiring new customers than traditional brick-and-mortar banking. Banks' technology-enabled systems have effectively automated various facets of customer acquisition. CRM (customer relationship management) systems, for instance, through emails and phone calls, automate the tracking of customer interactions. This process has a crucial implication for targeted marketing by banks, consequently reducing unnecessary marketing expenses. Banks' multi-channel approach offers a multitude of banking services that are time- and place-independent. This approach becomes an effective conduit for more robust marketing. Mithas et al. (2012) observed that using multiple channels allows banks to connect to a more extensive customer base at a lower cost.

Technological advancements and product and process innovations are expected to empower foreign banks to expand their customer base in India. Foreign banks typically enter host market(s) with enhanced operational competencies and superior customer services. Such technological advantages and differentiated services are likely to lead to cost-effective customer acquisition for foreign banks. Domestic banks, on the other hand, due to slower technology diffusion may exhibit highly inefficient customer acquisition practices. Thus, the following hypotheses are formulated.

H2a: *The domestic banks are not able to enhance their market share through cumulative ICT investment. Consequently, the domestic banks would strategically respond to such reduced market share by increasing their Customer Acquisition Costs.*

H2b: *Cumulative ICT investment will lead to enhanced market share of foreign banks. Consequently, the foreign banks are expected to have reduced Customer Acquisition Costs.*

To address the issue of omitted variable bias, it is important to control for the effect of bank-specific factors like age, size, interest on loans, interest on deposits, and deposits. This would allow us to analyze the impact of such non-ICT factors that might also affect the deposit and advance market share of a bank.

3.3.3. Bank Size

The log of total assets is taken as a proxy for bank size in the literature (Świtała et al. 2020; Ünvan and Yakubu 2020). The relatively large-sized banks would be able to undertake technological advancements to minimize operating costs and render better services. Larger banks may offer diversified services to customers that can attract a larger customer base and enhance market share (Kim and Davidson 2004; Ünvan and Yakubu 2020). Bank size also influences its efficiency in mobilizing loanable funds. Larger banks are willing to endure the potential risks associated with lending. Hence, large banks demonstrate higher ability to increase lending (Sheng 2021; Świtała et al. 2020). Customers might also consider governance related factors while determining with which bank they would prefer to conduct their financial transactions. In the context of India, customers seem to prefer the relatively larger (and older) banks that are perceived to have better governance mechanisms in comparison to the mid-sized and smaller banks.

The size of operations is an important determinant of interest margin (Maudos and de Guevara 2004). It may be argued that ICT makes legacy technologies obsolete. This would increase the turnover and market share of the larger banks, who are typically the first movers in terms of adopting such technologies. Consequently, the larger banks would be able to charge lower interest rates. Thus, the following is hypothesized:

H3: *The larger banks are expected to have more loanable funds and, hence, have a greater ability to offer lower interest rates. Moreover, in comparison to smaller banks, large-size banks are expected to have a greater ability to support a continuous increase in the latest ICT. Thus, the size of a bank is expected to have a favorable impact on deposit and loan market share. This is applicable to both domestic and foreign banks.*

3.3.4. Bank Age

The age of a bank reflects its years of operation since its inception. The effect of the age of a bank on its market share can be understood in terms of two opposing forces. The relatively older banks would have the benefit of the trust of the customers that is being accumulated over longer years of operation. The number of years the bank has rendered services determines the strength of its customer relationship. The older banks would also exhibit strong Arrow's "learning by doing" effect and, hence, enjoy more market power over the younger banks. This significantly impacts a bank's brand image and reputation. Older banks have more expertise that can facilitate innovation, the formulation of marketing strategies, and the evaluation of customer needs. All of these endeavors are likely to build a loyal customer base for banks. Hence, the conventional wisdom goes that banks already operating successfully are less likely to lose their incumbent customers (Banker and Kauffman 1988; Berger and Dick 2007). This would affect their market share in a favorable way.

In contrast, it may also be argued that in comparison to the order banks, the relatively newer banks would have a higher propensity to invest in ICT. Anecdotally, the older banks have demonstrated inertia in terms of investing in the latest digital technologies. Such banks are stuck with legacy systems which are outdated and inefficient. The older banks may face organizational resistance to risky projects (Alshwayat et al. 2023). Younger banks may demonstrate their willingness to take risks for an aggressive market share expansion. Such banks are also more receptive to new ideas and more agile in adopting

new technology (Malhotra and Singh 2007). By leveraging the new-age ICT, the newer banks are expected to increase their market share. Thus, it is essential to consider the potential non-linear relationship between these two variables. Therefore, the following is hypothesized:

H4: *There is an ambiguous relationship between age and market share of the domestic and foreign banks.*

3.3.5. Deposits

A large volume of deposits can significantly impact a bank's lending capacity and, therefore, its loan market share (Yitayaw 2021). A bank with a higher deposit base would be able to meet the credit requirements of individuals and firms. The volume of deposits of a bank is a key indicator of its financial stability and reliability. Thus, the following is hypothesized:

H5: *The volume of deposits is expected to have a favorable impact on the loan market share of domestic and foreign banks.*

3.3.6. Interest on Deposits

Interest-on-deposits banks play a crucial role in determining the extent of deposit mobilization. A significant motivation for individuals to deposit their funds with banks emanates from the attractive interest offered by the banks. When banks provide higher interest rates, the opportunity cost of holding money would increase. Consequently, higher interest rates incentivize individuals to deposit more with banks.

Additionally, a bank can differentiate itself from others by offering various deposit products with varying interest rates. This differentiation strategy allows the bank to cater to a broader range of customers. In essence, interest on deposits empowers banks to gain a competitive advantage by acquiring and retaining customers. Consequently, the following is hypothesized:

H6: *An increase in interest on deposits is expected to have a favorable impact on the deposit market share of domestic and foreign banks.*

3.3.7. Interest on Loans

Banks play an instrumental role in financial deepening through deposit mobilization and supplying loanable funds. Providing credit on flexible terms and competitive interest will enhance customer satisfaction. Loan interest should neither be too low nor too high (Yitayaw 2021). A low interest rate undoubtedly attracts borrowers, but at the cost of the bank's financial stability. On the other hand, high interest negatively affects the public's credit demand (Yitayaw 2021). Hence, a competitive interest rate is pivotal for banks to gain competitive advantage, manage risk, and foster lending relationships. Therefore, the following is hypothesized:

H7: *An increase in interest on loans is expected to have an unfavorable impact on the loan market share of domestic banks and foreign banks.*

3.3.8. Public vs. Private Ownership

During the post-1991 economic liberalization phase of the Indian economy, several important initiatives were undertaken to make the banking sector more competitive and efficient. Such liberalization led to the operational efficiency of the Indian banking system, largely comprising of the public banks (Bhattacharyya et al. 1997; Patra et al. 2023; Sathye 2003). Historically, the public sector banks have dominated the industry (Sensarma 2006). The public sector banks in India had already established a strong foothold in deposits and loan market share. Thus, it is plausible that the customers would *perceive* the public

banks to be more trustworthy than the private banks. They would try to maintain their business with the more familiar, government-backed public banks instead of the private banks. Nonetheless, post liberalization, the competition between public and private banks started to intensify. The private banks honed their operational skills in retail banking and better customer service. For instance, George and Chattopadhyay (2012) and Singh and Sirohi (2014) found that private banks started offering better-quality and user-friendly Internet banking services than public sector banks. This may be attributed to the better customer relationship management practices and technological focus of the private banks. Consequently, the following is hypothesized:

H8: *The impact of ownership on the market share of banks is ambiguous. The public banks may be able to increase their market share due to perceived trustworthiness among the historically well-established customer base. In contrast, it is also plausible that private banks would be able to increase their market share due to better customer relationship management practices and technological superiority in comparison to public banks.*

4. Data and Methodology

4.1. Sample Description

The sample consists of 154 banking firms in India, out of which 84 are domestic and 70 are foreign banks. The data were extracted from the Centre for Monitoring Indian Economy (CMIE) Prowess database from 2000 to 2020.

4.2. Econometric Specification

Customers' banking relations are generally enduring. Building relationships with new banks involves high transaction and information costs for customers (Clemes et al. 2010). This enduring relationship makes banks' market share persist for a long time. Likewise, marketing expenses incurred by banks in the past are likely to affect customer acquisition costs in the subsequent years. To capture the underlying *persistence* of bank share and Customer Acquisition Costs, using a dynamic panel data approach becomes more appropriate. By controlling for the persistence of the dependent variable, it provides consistent estimates of regression coefficients (Horobet et al. 2021). The two-step system GMM is also effective in tackling the issues of omitted variable bias, autocorrelation, and heteroscedasticity (Chattopadhyay et al. 2022). The method is considered to be more efficient and provides robust standard errors (Rego et al. 2013). The models to be estimated are specified as follows:

$$lnDMS_{it} = \alpha_0 + \alpha_1 lnDMS_{i,t-1} + \alpha_2 lnCum\_ICT_{it} + \Sigma controls_{it} + Year\_FE_t + \varepsilon_{it} \quad (1)$$

$$lnLMS_{it} = \beta_0 + \beta_1 lnLMS_{i,t-1} + \beta_2 lnCum\_ICT_{it} + \Sigma controls_{it} + Year\_FE_t + \varepsilon_{it} \quad (2)$$

$$lnCAC_{it} = \gamma_0 + \gamma_1 lnCAC_{i,t-1} + \gamma_2 lnCum\_ICT_{it} + \Sigma controls_{it} + Year\_FE_t + \varepsilon_{it} \quad (3)$$

The variables lnDMS_{it}, lnLMS_{it}, and lnCAC_{it} denote deposit market share, loan market share, and customer acquisition cost of bank i at time t. ε_{it} is the disturbance term. Control variables used in Equation (1) are lnAge, lnAge^2, lnAssets, and lnInterest_deposits. Likewise, in Equation (2), we control for effect of lnAge, lnAge^2, lnAssets, and lnInterest_loans. lnAge, lnAge^2, lnAssets, and lnDeposits are controlled in Equation (3). $\text{Year\_FE}_{\text{t}}$ denotes year-fixed effects. A concise description of the underlying variables is presented in Table 1.

Table 1. Description of variables.

Symbol	Variable	Description
lnDMS	Log of deposit market share	The ratio of each bank's deposits to total deposits of all banks at a given time period t
lnLMS	Log of loan market share	The ratio of each bank's loans and advances to total loans and advances of all banks at a given time period t
lnCAC	Log of customer acquisition cost	The sum of a bank's advertising and marketing expenses (Rupees in millions)
lnCum_ICT	Log cumulative ICT investment	The cumulative sum of net expenses towards software, net expenditure on computers and IT systems, communication equipment, and IT-enabled service charges in the preceding years, i.e., 2000, 2001, 2002, . . .till the year at time period t (Rupees in Million)
lnInterest_Deposits	Log on interest on deposits	Interest paid on time deposits, savings deposits, recurring deposits, current deposits, demand deposits, or other kinds of interest-bearing deposits (Rupees in million)
lnInterest_loans	Log of interest on loans and advances	Interest on all types of loans and advances (Rupees in million)
lnDeposits	Log of bank deposits	Total amount of deposits collected by banks (Rupees in million)
lnAge	Log of bank's age	Difference between the year of observation and year of incorporation
Size	Log of total assets	Size of bank (Rupees in million)
Ownership_Dummy	Dummy variable	Public Limited bank = 1 Private Limited bank = 0

Source: authors' preparation.

4.3. Descriptive Statistics

The summary statistics of the variables used in the study are presented in Table 2. As expected, considerable difference is observed between the domestic and foreign banks in terms of the mean values of the underlying variables like DMS, LMS, cumulative ICT investment, and CAC. The larger market share of domestic banks may be attributed to their sizable presence in rural and semi-urban areas. On the other hand, foreign banks have typically limited their operations to major cities and metropolitan areas in India. Most importantly, it is important to note that, on average, the domestic banks have been spending more on ICT investment as well as CAC in comparison to their foreign counterparts. The mean values of size, age, deposits and interest on loans are also found to be higher for domestic banks. In contrast, the interest on deposits is higher for foreign banks.

Table 2. Descriptive statistics.

	Domestic Banks					Foreign Banks				
Variable	**Observations**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**	**Observations**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
lnDMS	941	−5.014	2.26	−20.88	−0.36	519	−8.88	2.79	−20.28	−4.029
lnLMS	1198	−5.68	2.92	−20.69	−1.42	740	−8.54	2.5	−18.99	−4.01
lnCAC	995	2.95	2.85	−2.3	10.38	840	2.82	2.89	−2.3	10.16
lnCumulative ICT	1191	10.04	3.57	−1.6	13.62	739	8.48	4.23	−1.2	13.61
lnAge	1541	3.63	1.15	0	5.04	1080	3.26	1.21	0	5.11
Size	1214	12.17	2.56	−0.69	17.49	747	9.95	2.07	5.42	14.6
lnDeposits	941	12.6	2.25	−2.3	17.29	519	9.06	2.81	−2.3	14.27
lnInterest_deposits	988	7.99	3.11	−2.3	14.15	840	8.03	2.88	−2.3	14.2
lnInterest_loans	996	8.34	2.89	−2.3	14.29	843	8.21	2.85	−2.3	14.4
Ownership_Dummy	1786	0.75	0.43	0	1					

Source: authors' calculations. Note: DMS denotes deposit market share, LMS denotes loan market share, CAC denotes Customer Acquisition Costs, ICT denotes information and communication technology.

5. Results

The econometric analyses were conducted by using STATA version 17. Tables 3 and 4 report the results of the two-step system GMM analysis conducted for domestic and foreign banks, respectively.

Table 3. Two-step system GMM results for domestic banks.

	(1)	(2)	(3)	(4)
Variables	**lnDMS**	**lnDMS**	**lnLMS**	**lnLMS**
L.lnDMS	−0.351 ***	−0.336 ***		
	(0.107)	(0.105)		
L.lnLMS			0.585 ***	0.595 ***
			(0.154)	(0.164)
lnCum_ICT	−0.0711 **	−0.0987 ***	−0.0301	−0.0459 **
	(0.0353)	(0.0380)	(0.0201)	(0.0224)
lnAge	−0.117	−0.219	−0.377 **	−0.472 **
	(0.255)	(0.242)	(0.186)	(0.195)
$lnAge^2$	0.0403	0.0563	0.0469 *	0.0629 **
	(0.0365)	(0.0354)	(0.0260)	(0.0277)
Size	1.461 ***	1.477 ***	0.201 *	0.255 **
	(0.117)	(0.121)	(0.112)	(0.114)
lnInterest_deposits	−0.00486	−0.00370		
	(0.0147)	(0.0135)		
lnInterest_loans			0.00743	0.00837
			(0.0111)	(0.00965)
lnDeposits			0.279	0.239
			(0.207)	(0.223)
Ownership_dummy		−0.151 **		−0.0950 **
		(0.0642)		(0.0428)
Constant	−26.56 ***	−26.27 ***	−7.695 ***	−7.574 **
	(2.212)	(2.181)	(2.904)	(3.113)
Observations	240	240	273	273
Number of banks	56	56	61	61
AR(1) (*p*-value)	0.001	0.045	0.018	0.000
AR(2) (*p*-value)	0.450	0.444	0.549	0.577
Hansen Test (*p*-value)	0.466	0.551	0.349	0.293
No. of Instruments	31	32	31	31
Year FE	Yes	Yes	Yes	Yes

Source: authors' calculations. Note: standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. DMS denotes deposit market share, LMS denotes loan market share, CAC denotes Customer Acquisition Costs, ICT denotes information and communication technology.

Table 4. Two-step system GMM results for foreign banks.

	(1)	(2)	(3)	(4)
Variables	**lnDMS**	**lnDMS**	**lnLMS**	**lnLMS**
L.lnDMS	0.930 ***	0.203		
	(0.238)	(0.150)		
L.lnLMS			0.874 ***	0.654 ***
			(0.0285)	(0.0716)
lnCum_ICT	0.0197	0.200 **	0.243 ***	0.725 **
	(0.0704)	(0.0897)	(0.0911)	(0.313)
lnAge	−0.774 ***	−0.213	2.291	0.321 **
	(0.284)	(0.874)	(2.989)	(0.128)
$lnAge^2$	0.108 **	0.0183	−4.671 *	−0.0632 ***
	(0.0424)	(0.119)	(2.488)	(0.0185)
Size	0.0224	0.827 ***	1.018 ***	0.451 **
	(0.284)	(0.160)	(0.0959)	(0.200)
lnInterest_deposits		−0.0182		
		(0.0226)		
lnInterest_loans				0.0256 *
				(0.0141)
lnDeposits				0.293 ***
				(0.0542)
Constant	0.729	−16.47 ***	1.729	−7.685 ***
	(5.533)	(4.182)	(3.854)	(1.440)
Observations	387	136	519	129
Number of banks	43	33	50	33
AR(1) (*p*-value)	0.025	0.000	0.022	0.030
AR(2) (*p*-value)	0.802	0.258	0.763	0.433
Hansen Test (*p*-value)	0.624	0.634	0.247	0.136
No. of Instruments	27	31	51	36
Year FE	Yes	Yes	Yes	Yes

Source: authors' calculations. Note: standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. DMS denotes deposit market share, LMS denotes loan market share, CAC denotes Customer Acquisition Costs, ICT denotes information and communication technology.

Given the main research objective of this paper, the most important result relates to the impact of cumulative ICT investment on the DMS and LMS of the banks. From the results reported in Table 3, it is observed that cumulative ICT has a statistically significant, *negative* impact on the DMS and LMS of domestic banks. In stark contrast, as reported in Table 4, cumulative ICT is found to have a *positive* impact on the DMS and LMS of foreign banks. Moreover, the impact is significant in three specifications. Thus, hypothesis H1a is supported for the domestic banks across all of the model specifications. For the foreign banks, hypothesis H1b is supported in three out of four specifications.

Bank size is found to have a positive, significant effect on LMS and DMS for both the categories of banks. Therefore, hypothesis H3 is supported for both domestic and foreign banks.

In Table 3, the effect of age on the DMS of domestic banks is found to be non-linear but insignificant. However, there exists a U-shaped and significant relationship between age and LMS of domestic banks.

As reported in Table 4, for the foreign banks, the effect of age on DMS is U-shaped. This effect, however, is significant only in specification (1). The relationship between age and LMS is found to be inverted-U shaped and significant in specification (3) and (4). The graphical representations of the relationship between age, DMS, and LMS are provided in Figures 1 and 2.

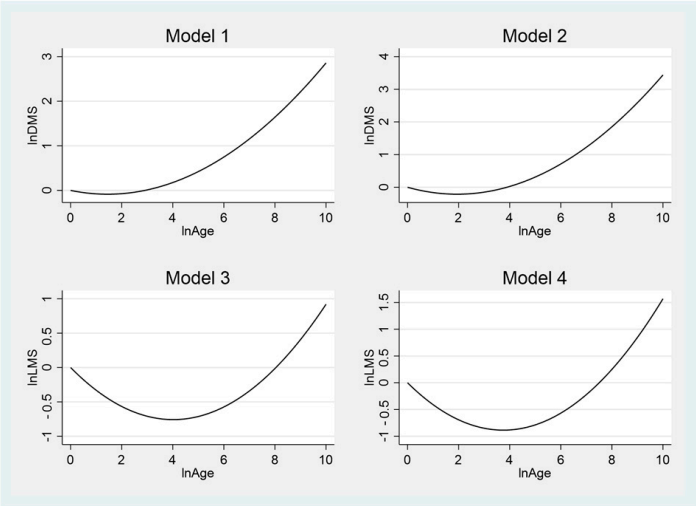

Figure 1. Effect of age on DMS and LMS of domestic banks.

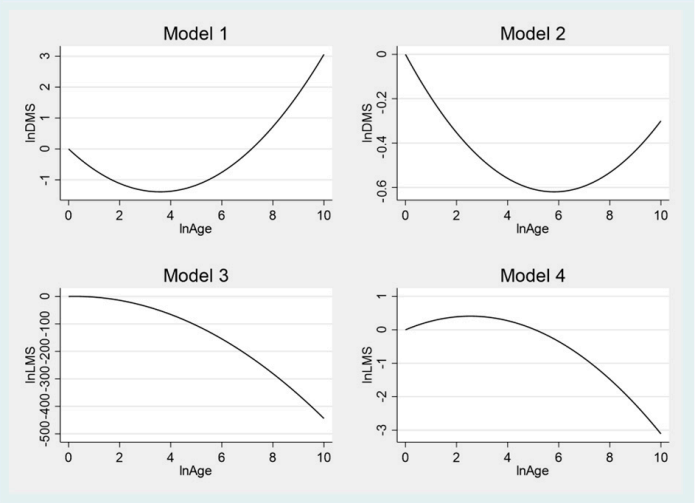

Figure 2. Effect of age on DMS and LMS of foreign banks.

In accordance with hypothesis H5, bank deposit is found to have a positive effect on the LMS of both domestic and foreign banks. However, this effect is significant only for the foreign banks.

The effect of interest on deposits on DMS is found to be negative and insignificant for both domestic and foreign banks. Hence, hypothesis H6 is not being supported.

Contrary to the expectation, interest on loans has a positive effect on the LMS of both categories of banks. This effect is significant for foreign banks. Thus, hypothesis H7 is not supported.

From Table 3, it is found that for the domestic banks, the coefficient of the ownership dummy variable is negative. It is statistically significant for DMS but not for LMS. The results indicate that in comparison to the private banks (base category), there is an unfavorable impact on the market share of public banks. Thus, private banks are found to be relatively better positioned in terms of increasing their market share. Hence, hypothesis H8 is validated in favor of the private banks.

Finally, given the important finding that ICT has a *differential* impact on the market share of domestic and foreign banks, what is the implication on the *strategic* variable, CAC of the banks? Table 5 reports the findings of this investigation.

Table 5. Impact of cumulative ICT on customer acquisition cost.

	(1)	(2)	(3)	(4)
	Domestic	**Domestic**	**Foreign**	**Foreign**
Variables	**lnCAC**	**lnCAC**	**lnCAC**	**lnCAC**
L.lnCAC	−0.310 **	−0.230 **	−0.131 *	−0.190 **
	(0.133)	(0.112)	(0.0743)	(0.0815)
lnCum_ICT	0.678 **	1.874 *	−0.787	−1.502 *
	(0.343)	(1.044)	(0.487)	(0.787)
lnAge		3.904		−0.229
		(3.947)		(1.233)
$lnAge^2$		−0.438		−0.0699
		(0.548)		(0.204)
lnAssets		−1.204		1.525 ***
		(1.215)		(0.493)
lnDeposits		−1.243		0.289
		(0.832)		(0.283)
Ownership_dummy		1.219 *		
		(0.653)		
Constant	−0.570	13.75 **	5.302 ***	−1.578
	(2.577)	(6.769)	(1.907)	(4.739)
Observations	377	309	261	162
Number of banks	72	64	58	43
AR(1) (p-value)	0.003	0.001	0.005	0.009
AR(2) (p-value)	0.121	0.192	0.678	0.455
Hansen Test (p-value)	0.100	0.316	0.336	0.286
No. of Instruments	36	43	40	44
Year FE	Yes	Yes	Yes	Yes

Source: authors' calculations. Note: standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. DMS denotes deposit market share, LMS denotes loan market share, CAC denotes Customer Acquisition Costs, ICT denotes information and communication technology.

One of the practical issues faced by banks pertains to the relevance of ICT on their Customer Acquisition Costs. Specifically, it is important to understand how ICT affects CAC for domestic and foreign banks. From Table 3, it is evident that ICT investment is found to have an *adverse* impact on the market share of domestic banks. Consequently, the domestic banks would need to strategically spend more on CAC. This explains the positive, significant coefficient of CAC in specifications (1) and (2) of Table 5. In contrast, results from Table 4 indicate that ICT investment leads to a *favorable* impact on the market share of foreign banks. Consequently, the foreign banks would be able to reduce their CAC. This explains the negative coefficient of CAC in specifications (3) and (4) of Table 5. Consequently, both hypotheses H2a and H2b are supported.

Validity of Methodology

As explained in Section 4.2, the dependent variables under consideration (DMS, LMS, and CAC) are expected to depend on their values in previous periods. This underlying logic justifies the use of dynamic panel specification. Consistent estimators are obtained by using the Arellano-Bond system GMM method, where appropriate lags of the regressors are used as instruments (Roodman 2009; Cameron and Trivedi 2010).

The validity of the system GMM methodology relies on two important conditions (Roodman 2009; Baltagi 2021). First, there must be the absence of serial correlation in the original error term. The null hypothesis is the absence of serial correlation in the first differenced errors, $cov(\Delta\varepsilon_{it}, \Delta\varepsilon_{i,t-k}) = 0$. If ε_{it} are serially uncorrelated, then the null hypothesis should be rejected at order 1 but not at order 2. As reported in Tables 3–5, the p-values corresponding to AR(1) indicate that the null hypothesis is rejected, i.e., AR(1) is significant at 5%. Additionally, the p-values corresponding to AR(2) indicate that the null hypothesis cannot be rejected, i.e., AR(2) is not significant at 10%. The absence of serial

correlation in the original error term is ensured in all model specifications. Consequently, the parameter estimates are consistent.

Second, the instruments must be exogenous, i.e., uncorrelated with the error term. This condition is examined by using the Hansen test of overidentifying restrictions. As reported in Tables 3–5, the *p*-values associated with the Hansen test statistic indicate that the null hypothesis (overidentifying restrictions are valid) cannot be rejected at 10%. Thus, it is ensured that the instruments are uncorrelated with the error term.

6. Discussion

One of the most important findings of this paper relates to the *differential* impact of ICT investment on the market shares of domestic and foreign banks operating in India. Specifically, it has been found that cumulative ICT investment has a significant, negative effect on the deposit and loan market share of domestic banks. It is plausible that the domestic banks are less efficient in utilizing ICT. In spite of investments in ICT, these banks are not able to enhance their customer service, which, in turn, explains the adverse impact on their market share. In contrast, there is a statistically positive, significant impact of cumulative ICT on deposits and loan market share of foreign banks. Thus, the foreign banks operating in India tend to exhibit greater efficiency in ICT utilization. This result corroborates with the *global advantage hypothesis* (Berger et al. 2000). This theory postulates that advanced technologies make foreign banks more efficient than domestic banks (Lensink and Naaborg 2007). Investment in state-of-the-art technology enhances foreign banks' operational efficiency, customer service, and risk-management capabilities. Another explanation for the favorable relationship between ICT investment on market share comes from the *resource-based view*. This theory contends that the unique resource endowment of a firm gives it a competitive advantage. The theory also holds that firms undertaking innovative activities and efficiently leveraging technology tend to perform better. Foreign banks have not only capitalized on technological efficiency but also benefited from the *first-mover advantage* of technology adoption. As early adopters, foreign banks introduced innovative technologies (like ATM) to the Indian banking system, thereby establishing technological leadership. This has played a crucial role in enabling foreign banks to have a favorable impact on market share.

In contrast, the slower technology diffusion among the domestic banks resulted in operational inefficiencies and limited customer engagement. It is interesting to note how the entry of foreign banks changed the dynamics of the Indian banking system. Heavy technology usage by foreign banks exerted competitive pressure on Indian banks to invest in ICT. The big push for technology adoption also came from the government in the early 1990s (Rishi and Saxena 2004). Indian banks, however, were reluctant to pivot away from their conventional banking operations. Organizational resistance to technological change has been a major obstacle to technology diffusion among Indian banks. For instance, HSBC introduced India's first ATM in 1987. However, it took almost two decades for ATMs to be adopted by domestic banks. Therefore, the slow diffusion and inefficient use of ICT would have an adverse impact on the overall performance of domestic banks. The finding that ICT has a negative impact on the market share of domestic banks also seems to corroborate with Solow's technological *productivity paradox* doctrine (Brynjolfsson and Hitt 1998; Malhotra and Singh 2007; Sharma 2023).

The impact of age on the DMS and LMS of domestic banks is found to be U-shaped. Such a non-linear relationship between age and market shares indicates that during the initial years of operation, new banks tend to face severe competition from the incumbent banks. However, as banks mature, they eventually gain improved market share. Banks that have consistently offered superior quality service over a long period are able to develop trust and goodwill. Customers are more likely to transact with those banks with which they have an enduring relationship. As a result, older banks have the potential to leverage their expertise, brand, and reputation to expand their market share. Long-term banking

relationships lead to greater trust and goodwill, which is expected to have a favorable impact on a bank's market share.

A U-shaped relationship is also found between age and DMS of foreign banks. Initially, foreign banks are likely to face challenges such as cultural differences, regulatory uncertainties in the host country, and intense competition from domestic banks. However, with increasing years of operation and *continuous* investment in ICT, these banks are able to collect more information about an erstwhile unknown market. Along with more information, the perceived superior customer service of the foreign banks leads to a snowballing effect. Thus, foreign banks are able to enhance their deposit market share by utilizing the benefits of ICT. In light of the results of this study, foreign banks ought to be patient in terms of their years of operation in host countries. They also need to put *persistent* efforts toward introducing innovative financial products and enhanced customer service in host countries.

The relationship between age and foreign banks' LMS is found to be inverted U-shaped. The non-linear relationship between age and LMS suggests that foreign banks would have a larger share of the credit market in their initial years. Subsequently, with increased years of operation, their loan market share diminishes. The *resource-based view* and *dynamic capability* theory can account for such a relationship. According to the *resource-based view*, younger banks' unique resources give them a competitive edge. Such banks are more agile in adopting technology, undertaking innovation and, thus, gain a larger market share. However, with maturity, they might face problems due to strategic transformation (Thornhill and Amit 2003). The *dynamic capability* theory postulates that a firm's ability to augment its competencies to align with the changing business environment would determine its competitive advantage. Hence, persistence in market share would depend on the bank's dynamic capabilities. It is plausible that younger banks are able to respond quickly to changes in the business environment. In contrast, the possible mismatch between the capabilities of older banks and the prevailing competitive environment might lead to customer disengagement (Denrell and Powell 2016).

The effect of bank size is found to be positive and significant on the market share of both domestic and foreign banks. This finding corroborates with previous studies (Kim and Davidson 2004; Sheng 2021; Świtała et al. 2020; Ünvan and Yakubu 2020). Nonetheless, a word of caution is necessary. The larger banks should not remain complacent with their extant market shares. This paper underscores the importance of *continuous* investment in ICT, even among the big players in the market.

The result related to the insignificant relationship between interest on deposits and banks' DMS is intriguing and warrants an explanation. While it is expected that interest on deposits would have a favorable impact on the DMS of banks, the counterintuitive finding can be explained as follows. Over the last few years, cash-surplus customers have been routing their investments to equity, stocks, and mutual funds, which tend to provide higher net returns than bank deposits. Indeed, the banks have been facing increased competition from these alternative investment channels. Therefore, it might not be sufficient just to increase deposit rates to entice the customers. Apart from interest rates, factors such as enhanced customer service and building long-term trustworthiness among customers through technological advancements are expected to play an important role in maintaining the market share of banks.

The effect of interest on loans on LMS is positive for both domestic and foreign banks but significant for only the latter. This counterintuitive result may be attributed to the market segmentation practiced by foreign banks. Foreign banks in India engage in 'cream skimming' (Gormley 2010; Sarma and Prashad 2016), where they tend to extend credit to the most profitable entities. Foreign banks would focus on individuals and entities that are less price-sensitive and value service quality over the cost of borrowing.

The results reported in Tables 3 and 4 indicate a positive impact of deposits on the loan market share of both domestic and foreign banks. Banks are able to seek new, profitable lending opportunities due to expansion in their deposit base. This result corroborates with

the extant literature that deposits have a positive impact on the loans extended by banks (Kashyap and Stein 1995; Genay 2000; Yitayaw 2021).

The results reported in Table 5 indicate that banks incurring high (low) CAC in the past would have to spend less (more) on CAC in subsequent periods. One plausible explanation might be that acquiring new customers is costlier than customer retention (Filiatrault and Lapierre 1997). Hence, banks that have previously acquired customers would focus on retaining their incumbent customers. It is also important to note that cumulative ICT investment is found to *increase* the CAC of domestic banks. This result highlights the strategic response of domestic banks to enhance their market share. In contrast, foreign banks are able to increase their market share by leveraging ICT. This enables them to *reduce* CAC in the Indian market.

There are certain limitations of this study which must be addressed. Future research is warranted on these important issues. First, the ICT data used in this study capture traditional forms of technologies like hardware, equipment, and software. They do not include investment in modern digital technologies that are currently being used by the banks. Digital marketing indeed plays a crucial role in augmenting a bank's customer reach and providing a competitive advantage. It also facilitates cost-effective customer acquisition. Another limitation of this study emanates from the lack of CAC data for several foreign banks. Thus, in comparison to the domestic banks, the sample size of foreign banks is less. Future studies comprising a larger sample of banks are warranted.

Second, the analysis of this paper has been conducted at the bank level, but not the branch level. This is predominantly due to the lack of coherent longitudinal data for all the underlying variables at the branch level. For instance, it is plausible that both CAC and market share would be determined by the location of a branch. It would be interesting to examine whether branches located in urban areas tend to outperform the rural branches.

Third, due to data availability constraints, the study is unable to incorporate some of the important variables that would presumably affect ICT investment strategies and market shares of the banks. For instance, the size and characteristics of the Board of Directors are expected to have an impact on investment strategies and bank performance (de Andres and Vallelado 2008; Belkhir 2009). Bank-specific internal factors, like impaired loans or gross interest margin, can also affect the performance of banks (Lamothe et al. 2024). In the context of the banks operating in India, detailed micro-data on these important variables is sparse. Given such practical limitations due to data constraints, the results should be carefully interpreted. It is stressed that the system GMM is an effective method in tackling the issues of omitted variable bias (Chattopadhyay et al. 2022). Future studies are warranted to take some of these variables into consideration, wherever feasible.

It is plausible that during the COVID-19 years, i.e., 2020–2022, the ICT investment of the banks might have been adversely affected. However, the pandemic also drastically altered consumer behavior and banking operations in *favorable* ways. This is particularly relevant in the post-pandemic era, wherein customers were more acquainted with digital technologies like mobile banking and WhatsApp banking. It may be argued that the pandemic has actually incentivized customers to shift more toward digital and online banking operations. The banks have also taken the signal and resorted to additional investment in modern ICT technologies that would facilitate digital banking operations at a larger scale. Therefore, in *cumulative* terms, it is expected that ICT investment by the banks would have registered an upward trend after the pandemic ended. In the present study, the COVID-19 years are excluded primarily due to the unavailability of consistent data related to the underlying variables for all the banks. Nevertheless, future studies are warranted to analyze the effect during the pandemic years and the rebounding effect, if any, during the post-pandemic years.

7. Managerial Implications

The findings of this paper have several important implications for bank management. First, the domestic banks must re-evaluate their ICT investment strategies, given the

adverse impact of ICT investment on their market share. Evidently, ICT investment is not sufficient. The management should continuously invest in quality training programs that would enhance the adoption of novel ICT tools among the bank employees. Such strategies would enhance the *quality of service* provided by the banks and, consequently, their market shares.

Second, investment in ICT should not be considered a one-shot game. Given the statistical significance of *cumulative* ICT, banks ought to update the software and equipment to the latest versions so that they can remain ahead of the competition. For instance, given the changing consumer preferences toward digital transactions, the banks must continuously differentiate themselves from their peers. In order to gain further market share, the banks would be better off introducing innovative products like digital wallets and, thus, have additional sources of revenue. Overall, the banks would need to enhance customer experience and convenience by introducing innovative products and services. *Continuous* investment in ICT is an important tool for achieving these goals.

Third, the impact of ICT is found to differ among domestic and foreign banks operating in India. It may be argued that both categories of banks would have access to similar, non-differentiable ICT tools. Almost all banks are vigorously using technology (like ICT) along with human capital (like Relationship Managers) to increase their customer acquisition. The banks are using the latest information technologies and advanced analytics to target new customers. Banks have also established dedicated customer acquisition centers that collect, process, and utilize customer-centric data. Nonetheless, the impact of ICT on market shares of domestic and foreign banks is found to differ. What is the economic explanation behind such an intriguing result? This may be attributed to the differentiation of *service* provided by the banks as perceived by the customers. The domestic and foreign banks seem to differ in terms of their ability to utilize ICT to create innovative products and provide improved services. The results indicate that domestic banks are relatively inefficient in terms of ICT usage and, therefore, would have to increase their CAC. Consequently, domestic banks should focus on leveraging ICT for targeted marketing strategies and cost-effective customer acquisition. The management must re-examine the efficacy of their currently deployed marketing strategies and the effectiveness of their Relationship Managers.

The study also provides important insights pertaining to the foreign banks. As reported in Table 4, cumulative ICT has a positive and significant impact on their market shares. Thus, foreign banks ought to maintain their ICT investment in a *sustained* manner. Since the lagged dependent variables (DMS and LMS) are found to be positive and statistically significant, it is important for foreign banks to sustain their high level of customer service. This underscores the strategic importance of sustained investment in ICT to offer enhanced customer service. Also, it is found that deposits have a significant, positive impact on the LMS of foreign banks. Consequently, foreign banks might consider offering higher interest rates in order to remain competitive in the Indian market.

8. Conclusions

This paper focuses on the differential impact of ICT investment on domestic and foreign banks operating in India. Specifically, the study examines the impact of stock of ICT investment on the market share and Customer Acquisition Costs of domestic and foreign banks. Market shares of the banks are considered to be a proxy for their market power. Sustained investment in ICT can be the right tool to enhance market power, albeit only when complemented with prudent customer service and management strategies.

The impact of ICT is found to differ among domestic and foreign banks operating in India. Since ICT is found to have an adverse impact on the market share of domestic banks, they need to strategically invest more in Customer Acquisition Costs. In contrast, since foreign firms are found to increase their market share by investing in ICT, they have the ability to reduce their Customer Acquisition Costs. Thus, foreign banks are found to be relatively more efficient than domestic banks in utilizing ICT. The differential impact of ICT can be attributed to the differentiation of the *service* provided by foreign banks from

the viewpoint of the customers. Consequently, it is important for banks to re-examine the effectiveness of their extant marketing techniques and implement appropriate strategies to enhance customer service by utilizing the information acquired through ICT investment.

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