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### 37. Digital Public Infrastructure and Bank Profitability: Navigating the Path to Viksit Bharat

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#### Abstract

*How to build a developed India by 2047 (Vikast Bharat). To do so, we'll use a mixed-methods approach that combines quantitative data from RBI (Reserve Bank of India), NPCI (National Payments Corporation of India), academic literature (2010-2024), and qualitative interviews to assess the impact of DPI adoption on bank profitability. In particular, we will focus on identifying how DPI reduces transaction costs, expands access to banking services (particularly in rural areas where residents may not have previously had access to banking services), creates data-driven credit underwriting, and ultimately drives profitability (i.e., NIMs, ROAs, ROEs, NPAs). Though the adoption of DPI has been a positive factor for banks (it has increased operational efficiencies and added new customers, particularly to previously unbanked or very underbanked populations), it has simultaneously decreased the fees assessed to customers and increased competition from Fintechs, which will continue to require investments in technology. Additionally, the review identifies significant challenges that banks will encounter while implementing the national strategy for developing India, including cybersecurity concerns, inadequate digital literacy and infrastructure, and maintaining an appropriate balance between innovation and regulation.*

**Keywords:** Digital Public Infrastructure, Bank Profitability, Viksit Bharat, UPI, JAM Trinity, Financial Inclusion, Fintech, Net Interest Margin, Account Aggregator, India

#### 1. Introduction

In India, DPI encompasses various systems, including interoperable, scalable and open systems that have been set up by the government to support financial inclusion, data portability and digital payment systems. The primary components of DPI are: (i) JAM (Jan Dhan Yojana) – bank accounts under the JDY program, Aadhaar biometric identity and mobile connectivity, which together serve as the foundation for financial inclusion in India; (ii) the Unified Payments Interface (UPI), developed by the National Payments Corporation of India (NPCI) and launched in 2016, which provides citizens with an easy way to make digital payments; (iii) the Account



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Aggregator (AA) framework which has existed since 2021 and allows for institutions to share financial data with each other after receiving consent from their customers. The proliferation of UPI alone has been staggering. UPI processed over 131 billion transactions worth ~₹200 lakh crore (~USD 2.4 trillion) in FY2023–24, making India the largest volume-based real-time payments processor globally. By March 2024, >500 million UPI users were registered and >300 banks were live. >530 million accounts have been opened under the Jan Dhan scheme (launched in 2014) by early 2024, with total deposits >₹2.3 lakh crore across accounts opened (initially) from this scheme. These developments are creating opportunities and challenges for commercial banks. On one hand, DPI is reducing customer acquisition costs, making compliant KYC easier (through Aadhaar-based e-KYC), and providing banks with new revenue sources. On the other hand, the growth of payment aggregators, neo-banks, and fintech lenders (which leverage the same DPI rails) has reduced banks' traditional sources of revenue and created additional competitive pressure on banks. Thus, the relationship between DPI adoption and bank profitability is complicated, multidirectional, and dependent on the size, business model, and technological sophistication of individual banks. The intent of this review article will be to systematically explore this relationship and address any gaps in knowledge along with providing evidence-based solutions to both banks and policymakers involved with navigating this DPI focused transformation occurring in India. This article is structured as follows: section 2 is a review of the literature; section 3 is an outline of the purpose of the research and hypothesized outcomes of the research; section 4 describes how the research was conducted; section 5 presents and analyzes the results of the research; section 6 contains the implications, limitations, and recommendations for future research.

## 2. Literature Review

### A. Digital Financial Infrastructure and Economic Development

There have been numerous studies done within the field of development economics regarding how the two concepts of financial infrastructure and economic development interact with each other. Levine (1997) identified that the development of financial intermediaries strongly signals future economic growth on a long-term basis (or over a sustained period). Recently, scholars have continued this analysis by looking at digital financial systems. For example, Beck, Demirgüç-Kunt, and Levine (2007) showed that having broader access to finance is associated with lower levels of income inequality which may encourage economic growth and has a direct application to achieving India's objective of greater financial inclusion. With respect to India, Ghosh (2016) found that having access to Jan Dhan accounts had a significant impact on the household savings rate of the rural population. Muralidharan et al. (2016) showed that using Aadhaar-based direct benefit transfer systems reduced the amount of mismanagement (leakage)



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of government welfare programmes by as much as 47%, which makes available additional fiscal resources for investment in productive uses. The results published in these early studies confirmed the macro-economic development potential of digital payments infrastructure.

### **B. UPI and the Transformation of Retail Banking**

Since its inception, there has been a great deal of research surrounding the Unified Payments Interface (UPI) paying particular attention to its influence on the growth of real-time payments in 14 sample countries. Chakravorti and Lubasi (2019) studied 14 countries and found that real-time payment systems improve the speed of transactions, decrease float income to institutions, and narrow net interest margin. In a longitudinal study looking specifically at India, the Reserve Bank of India (RBI) (2022) noted that banks that participate heavily in UPI transactions display increases in their CASA ratio, while also experiencing a reduction of 12-18 basis points in net interest margin from the years 2018 to 2022. According to a study conducted by the Boston Consulting Group (BCG) and FICCI (2023), UPI has brought down the average transaction cost of digital payments in India from ₹3.5 to below ₹0.50. Such efficiencies are of great benefit to consumers and to the Indian global economy, but have posed challenges to payment service providers and banks with fee income derived from their services. Kotak Mahindra Bank's annual reports (2020-2023) observed a significant decrease in fee revenue from payment services while payment volumes increased exponentially.

### **C. Account Aggregator Framework and Credit Penetration**

The Account Aggregator (AA) Framework is a major long term structural change in the credit markets, launched in 2021 and built on top of the Data Empowerment and Protection Architecture (DEPA). The framework will facilitate consent-based access to financial data such as bank statements, mutual fund holdings, insurance records and tax filings that will enable lenders to make more accurate credit assessments for thin-file borrowers who have not had access to formal credit before. As Sitapati and Raghunathan (2023) find, the AA framework could help formalise credit for some 450 million Indians currently outside the formal credit system, leading to an estimated new lending of ₹15–20 lakh crore. Moreover, Pradhan et al. (2022) provided some preliminary evidence that AA-enabled loans to micro, small and medium-sized enterprises (MSMEs) had lower rates of default relative to traditional credit scoring, indicating better quality of underwriting.

### **D. Fintech Competition and Bank Profitability**

Financial technology companies who process payments as an intermediary using a direct payment interface (DPI) are increasing competition for banks. Claessens, Frost, Turner, and Zhu



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(2018) found a negative correlation between fintech credit growth and bank profit across more than 60 countries. Payment aggregators such as PhonePe, Google Pay and Paytm alone account for more than 80% of all UPI transaction volumes in India, limiting the ability of banks to directly profit from these payment transactions. Kumar & Sachdeva (2021) found that private sector banks are using API banking to allow their customers to access all of the digital payment options have a greater ability to remain profitable than public sector banks with higher costs due to technology change. The exception to this finding is the State Bank of India (SBI) which is able to leverage its size and/or the YONO app, to generate revenue through digital engagement. SBI: Digital banking revenue rises 22% in FY2023.

### E. Financial Inclusion and NPA Dynamics

DPI is having a significant impact on Financial Inclusion by expanding the number of borrowers to those who were previously unbanked. Expanding the number of borrowers also leads to increasing credit penetration to borrowers where new credit risk arises. Acharya and Naqvi (2012) & Barik and Sharma (2022) found that lenders are experiencing very high levels of NPAs when rapidly lending into thin-file segments without adequate data infrastructure. But both found that digital footprint-based underwriting (via AA) can go a long way toward mitigating that risk. The gross NPA ratio of Scheduled Commercial Banks has declined from 11.2% in March 2018 to 3.9% in March 2023. However, the impact of declining NPA ratios has not been uniform across the different types of banks with Public Sector Banks still having higher level of NPA vis-à-vis Private Sector Banks. It is suggested in literature that further reduction of NPAs can be achieved through the use of DPI driven credit scoring tools, particularly for rural lending and MSME lending.

### 3. Objective of the Study

This review article's main aims include:

1. Study of various channels through which Digital Public Infrastructure (DPI) affects profitability of Indian banks.
2. Impact of UPI Adoption and rise of digital payment transactions on Key profitability indicators (NIM, ROA, ROE and NPA).
3. Impact of the Account Aggregator (AA) framework on credit market and bank profitability.
4. The impact of fintech companies using DPI rails on traditional banks' revenue models through competitive dynamics.



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5. To identify possible policy interventions that will allow Indian banks to reap the benefits of DPI, while maintaining stability and profitability in their journey towards Viksit Bharat 2047.

### 4. Hypothesis

Hypotheses for Additional Empirical Research Based on Previous Work and Theoretical Framework Are:

- Higher levels of DPI adoption will correlate to lower cost/income ratios of commercial banks because of reduced operating costs and fewer costs associated with acquiring customers.
- Higher annual transaction volumes of UPI will correlate to lower net interest margin because of compression in float-based fees and reducing fees associated with providing services.
- Banks Using Account Aggregator Data For Credit Decisions Will Show Fewer Non-Performing Loans Than Banks Using Only Traditional Credit Bureau Information
- The Higher The Level Of Fintech Competition In A Given Market, The Lower The Return On Equity For Banks Based In That Market.
- Although There Will Be Near Term Pressure On Profit Margins, In The Long Run Increased Financial Inclusion Through The Use Of DPI Will Positively Impact Banks' Profitability Through An Increased Customer Base And The Opportunity For Cross-Selling Of Products.

### 5. Methodology

#### A. Research Design

A systematic review approach was taken for this study in combination with secondary data analysis methods. The literature included in this systematic review consisted of articles published in peer-reviewed journals, publications of the Reserve Bank of India (RBI), publications of the National Payments Corporation of India (NPCI), World Bank Working papers, industry reports of KPMG, PwC, BCG and NASSCOM, and government policy documents published between 2010 and 2024. A total of 87 sources were identified from database searches conducted on



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JSTOR, SSRN, EPWRF and the authors' research on RBI without any bias. The 87 sources were reduced to 54 sources by applying inclusion criteria of relevance, recency, and methodological rigor to each source.

### B. Data Sources

The following sources have provided secondary quantitative data:

- Reserve Bank of India: Annual Reports; Statistical Tables Relating To Banks; Financial Stability Reports; Database On Indian Economy (DBIE) - covering the years FY2015 through FY2024.
- National Payments Corporation of India: A monthly collection of UPI transaction data, performance metrics for Rasputin, and IMPS.
- Ministry of Finance: Pradhan Mantri Jan Dhan Yojana (PMJDY) Progress Reports.
- World Bank Global Findex Database: Between 2014 and 2021 for International Benchmarking Of Financial Inclusion.
- IBA (Indian Bankers Association) and FIBAC Reports: Representing Sectoral Profitability Benchmarks.

### C. Analytical Framework

In this analysis, two tracks are employed to analyse the data. The first is to synthesize qualitative data using a narrative approach that draws upon existing literature. The second is to conduct a descriptive statistical analysis to quantify bank level as well as aggregate measures using the three measures of profitability (net interest margin, return on assets, return on equity), along with analysing banks' gross non-performing asset ratios (GNPA). The degree of adoption of digital payments is measured by economic proxies - UPI transaction volumes per banking organisation; eKYC penetration; amounts held by Jan Dhan accounts; and the generation of account aggregation (AA) consent for the organisation.

## 6. Data Interpretation and Results

### A. Growth of Digital Public Infrastructure in India

India's DPI ecosystem has witnessed exponential growth over the past decade.

Table 1 summarises key DPI metrics over the period 2016–2024.



**Table 1: Key DPI Metrics in India (2016–2024)**

| Metric                                     | 2016–17 | 2018–19 | 2020–21 | 2022–23 | 2023–24 |
|--|---------|---------|---------|---------|---------|
| UPI Transactions (Billion)                 | 0.18    | 5.35    | 22.3    | 83.7    | 131.0   |
| UPI Value (₹ Lakh Crore)                   | 0.07    | 8.77    | 41.0    | 139.1   | ~200    |
| Jan Dhan Accounts (Million)                | 253     | 354     | 416     | 502     | 530+    |
| Jan Dhan Deposits (₹ Lakh Crore)           | 0.64    | 0.98    | 1.31    | 1.98    | 2.30+   |
| Aadhaar e-KYC Authentications (Billion/yr) | 1.2     | 2.9     | 5.1     | 8.7     | ~12     |
| Active AA Users (Million)                  | —       | —       | 0.3     | 8.0     | 50+     |
| UPI-enabled Banks                          | 21      | 132     | 207     | 385     | 500+    |

### B. Impact on Bank Profitability Indicators

Table 2 presents the trends in key profitability indicators of Scheduled Commercial Banks (SCBs) in India, spanning the DPI build-out period from FY2015 to FY2024. The data reveals divergent trends across profitability metrics — ROA has improved while NIM has shown modest compression.

**Table 2: Profitability Indicators of Scheduled Commercial Banks in India (FY2015–FY2024)**

| Indicator             | FY15 | FY17 | FY19 | FY21 | FY23 | FY24* |
|-----------------------|------|------|------|------|------|-------|
| Net Interest Margin – | 2.80 | 2.66 | 2.60 | 2.92 | 3.02 | 3.05  |



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| Indicator                       | FY15 | FY17  | FY19  | FY21 | FY23  | FY24* |
|---------------------------------|------|-------|-------|------|-------|-------|
| SCBs (%)                        |      |       |       |      |       |       |
| Return on Assets – SCBs (%)     | 0.58 | -0.15 | -0.10 | 0.41 | 1.10  | 1.23  |
| Return on Equity – SCBs (%)     | 9.43 | -2.12 | -1.55 | 5.37 | 14.50 | 15.80 |
| Gross NPA Ratio – SCBs (%)      | 4.62 | 9.46  | 9.14  | 7.48 | 3.87  | 3.12  |
| Cost-to-Income Ratio – SCBs (%) | 47.8 | 50.1  | 49.3  | 46.7 | 43.5  | 43.0  |
| Credit-Deposit Ratio (%)        | 75.4 | 72.3  | 75.9  | 70.1 | 75.4  | 77.2  |

### C. DPI and Cost Efficiency

DPI has had a huge effect on how efficiently banks spend money when doing business. In the last year (2017), SCBs' cost to income ratios are (or were) about 50.1%, while now they are (or will be) approximately 43.0% by 2024. There are three main reasons for this decrease: (1) e-KYC using Aadhaar has replaced verifying documents with physical copies, costing an estimated 90% less in onboarding; (2) UPI and IMPS has provided alternative methods of handling cash and processing checks; (3) Digital lending platforms have replaced credit appraisal processes at branch locations. For example, the SBI's cost/income ratio was 58.8% in 2015 and decreased to 52.1% in 2023. The HDFC Bank has consistently maintained a cost/income ratio of less than 40% primarily due to their digital infrastructure. For public sector banks, the cost savings associated with DPI will help PSBs recover from the NPA crisis from 2015-2019.

### D. UPI and Net Interest Margin Dynamics

Compared to traditional methods of accepting payments, the relationship between the adoption of UPI and changes in NIM (Net Interest Margin) is more complicated than linear compression (the graphical representation of one variable being equal to another). With the removal of float income (interest earned on cash held in transit), banks' NIMs have decreased; however, the positive impact of increased CASA (current account saving account) ratios (through both Jan Dhan and savings accounts linked to UPI) has mitigated some of the decrease. Collectively,



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SCBs' aggregate NIMs rose from 2.60% during FY2019 to 3.05% for FY2024 due largely to both increased interest rates and better credit quality. At the disaggregated level, banks that rely heavily on payment fees — particularly mid-tier private sector banks — have experienced margin compression of 15 to 25 basis points. In 2020, the introduction of a zero-MDR (Merchant Discount Rate) policy for UPI payments greater than ₹2,000 resulted in significant reductions in revenue because banks no longer received transaction fees for these transactions. As per data from the National Payments Corporation of India (NPCI), the zero-MDR policy alone is estimated to have cost the banking sector between ₹8,000 crore and ₹10,000 crore annually in lost fee income.

### E. Account Aggregator and Credit Market Transformation

The AA framework's initial data presents a good outlook. According to a SIDBI-BCG Report (2023), MSME loans processed using AA data have experienced a reduction in processing time of 35–40% and have better (20–25%) first-year default rates than traditionally processed loans. Furthermore, the reduction in concealment of information(s) enabled through the AA Framework is critical for the estimated 63 million micro, small and medium-sized enterprises (MSMEs) in India; only 14% of these MSMEs currently have access to formal credit. By March 2024, over 50 million FIUs (Financial Institutions Users) were already registered on the AA network; this includes mainly Banks and NBFCs (Non-Banking Financial Companies). There were 3 million consents per month being exchanged through the AA Network. The estimated potential of the credit market as a result of the AA Framework is expected to expand by ₹5 to 8 lakh crores over the next 5 years — an important commercial opportunity for Banks.

### F. Financial Inclusion and Long-run Profitability

Jan Dhan accounts have expanded the banked population significantly, estimated at 530+ million. Of this number, 65% are from rural areas, and 55% are female; both groups have historically been excluded from formal finance. The McKinsey report (2023) estimates that a financially included customer will provide a bank with 3-5 times more revenue than a transactional-only customer does within ten years.

Table 3 compares India's performance regarding financial inclusion to other emerging economies, establishing the scope of India's achievement through digital payment initiatives (DPI).

**Table 3: Financial Inclusion Comparison — India vs. Selected Emerging Economies (2021)**

| Country | Account Ownership (%) | Digital Payment Usage (%) | Formal Credit Access (%) | Real-Time Payment System |
|---------|-----------------------|---------------------------|--------------------------|--------------------------|
|---------|-----------------------|---------------------------|--------------------------|--------------------------|



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| Country    | Account Ownership (%) | Digital Payment Usage (%) | Formal Credit Access (%) | Real-Time Payment System |
|------------|-----------------------|---------------------------|--------------------------|--------------------------|
| India      | 77                    | 65                        | 31                       | UPI (131 Bn txns/yr)     |
| China      | 89                    | 82                        | 55                       | Alipay / WeChat Pay      |
| Brazil     | 84                    | 61                        | 44                       | Pix (30 Bn txns/yr)      |
| Nigeria    | 45                    | 28                        | 6                        | NIP (Limited)            |
| Indonesia  | 52                    | 32                        | 21                       | BI-FAST                  |
| Bangladesh | 53                    | 27                        | 8                        | bKash (Mobile Money)     |

### 6.7 Challenges and Risk Factors

Despite the positive long-term trend, confidence is tempered by a number of risks:

- **Cybersecurity and Fraud:** The amount of UPI-related fraud reported to the RBI surged by more than ten times, from ₹94 crore in FY2019–20 to ₹1,087 crore in FY2022–2023. Systemic danger is posed by the increasing sophistication of SIM-swap and social engineering assaults
- **Technology Investment Burden:** In FY2022–2023, public sector banks spent an estimated ₹18,000 crore on IT infrastructure, and their needs are expected to increase by 15–20% a year. In comparison to large private banks and fintechs, smaller PSBs face a structural cost disadvantage.
- **Revenue Dilution from Zero-MDR:** A sizable fee revenue stream has been eliminated as a result of the government's zero-MDR requirement for UPI. Although data monetization and cross-subsidy models are considered, no large-scale, economically feasible alternative has been put into practice.

### 7. Conclusion

In light of the Viksit Bharat 2047 goal, this assessment has looked at the intricate, multifaceted relationship between bank profitability and India's digital public infrastructure. The evidence supports a number of important conclusions:



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- Through Aadhaar-based KYC, digital onboarding, and automated payment processing, DPI has been a potent enabler of cost efficiency, lowering the cost-to-income ratio of SCBs by roughly 7 percentage points over the past ten years.
- The effect on NIM is complex: higher interest rates and better CASA ratios have kept aggregate NIM around 3.0% in recent years, but zero-MDR and the removal of float revenue have reduced fee-based margins for some banks.
- The Account Aggregator framework has the potential to considerably increase bank profitability in the medium term by enhancing underwriting quality and growing the MSME and retail loan markets.
- Even while short-term monetization is still limited, financial inclusion at the scale made possible by JAM Trinity generates a sizable new customer base with substantial long-term income potential
- To keep risks like cybersecurity, technology investment costs, gaps in digital literacy, and regulatory compliance from undermining DPI's financial gains, proactive management is necessary.

India's banking system needs to be resilient, inclusive, and lucrative at the same time in order to meet the Viksit Bharat goal by 2047. DPI offers the foundation for all three characteristics, but in order to fully realize this potential, the state must co-invest in cybersecurity infrastructure, develop a commercially viable UPI revenue model, provide targeted assistance to smaller PSBs in adopting technology, and keep expanding its digital literacy initiatives. The distributional effects of DPI on profitability across public, private, small finance, and cooperative banks; the role of generative AI layered on DPI in further transforming credit markets and customer service economics; and panel data econometric studies linking bank-level DPI adoption metrics with profitability outcomes across bank types and geographies should be the main focus of future research.

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