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How successful have Indian banking reforms been?

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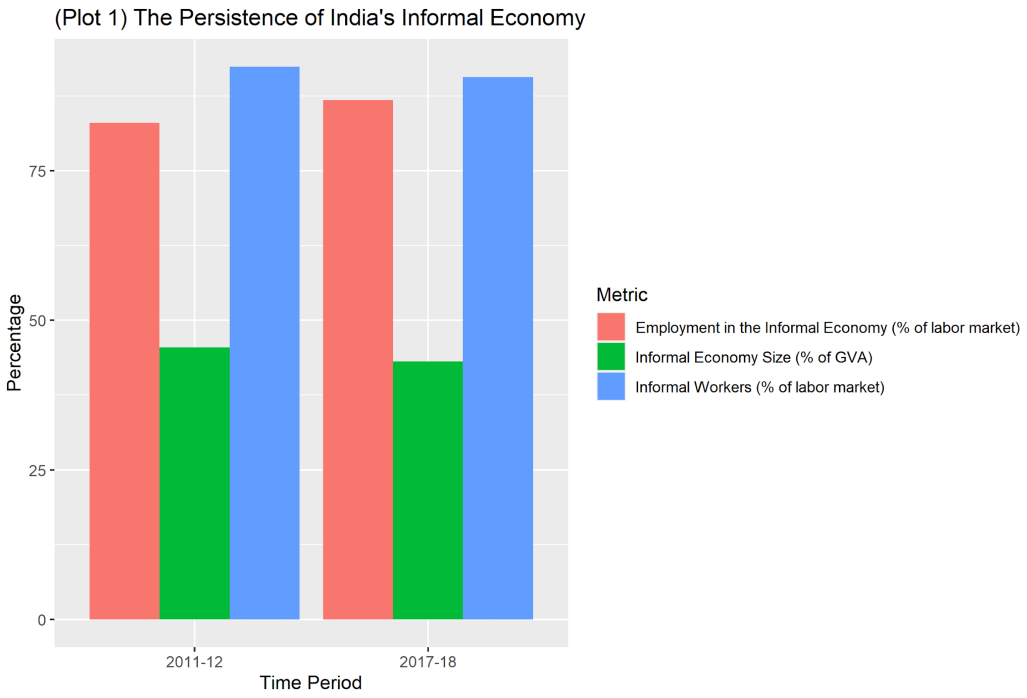
Abstract:

India's integration into the world economy and the increase in global demand for skilled services like IT outsourcing have propelled GDP per capita (PPP adjusted) from $1,232 in 1991 to $7,242 in 2021 ("GDP per capita, PPP"). Despite life expectancy increasing 11 years over that period ("Life expectancy at birth"), 10% of the population subsists on less than $2.15 a day, as of 2019 ("Poverty headcount ratio"). Successive Indian governments have adopted myriad schemes to involve the poorest in the nation's rapid growth. This paper examines the role of banking and governance digitalization.

In *Freedom at Midnight,* Dominique LaPierre and Larry Collins chronicle Mahatma Gandhi telling a violence-struck village during the Indian independence movement that "'a leader is only a reflection of the people he leads'" (59). Gandhi's vision of Indian prosperity runs counter to the increasingly advanced, industrial economy of today's India. However, he correctly notes that the effectiveness of policies is marked by who's included and who's not in an ethnically, religiously, and linguistically diverse subcontinent of 1.3 billion.

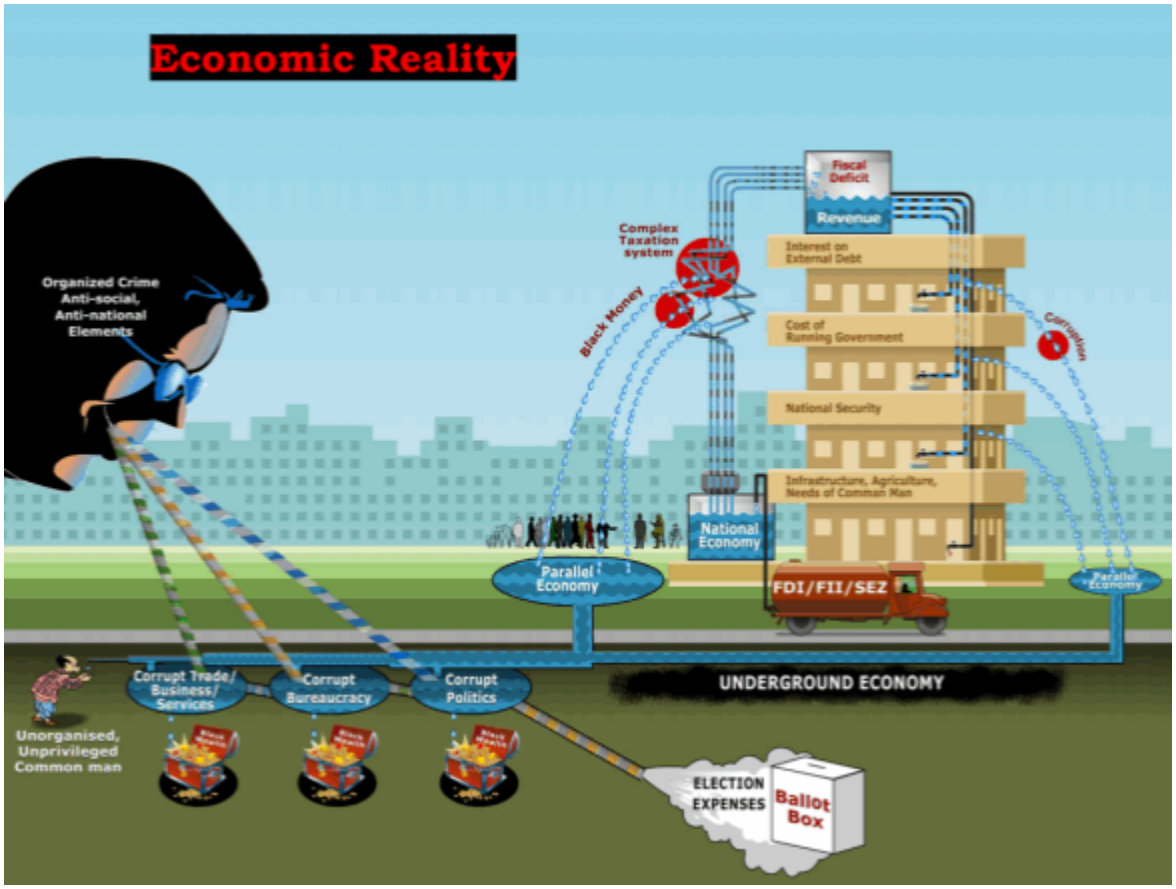
Background:

The *informal economy* describes businesses outside the state's taxation, regulation, and social protection systems. Informal firms tend to be smaller and less efficient than formal businesses, lacking financial access and skilled workers (Delechat). *Informal workers*, missing written contracts and social security, pose an obstacle to development in India. From 2011-12 to 2017-18, the share of employment in the informal economy rose from 83% to 86.8%, but the percentage of informal workers fell from 92.4% to 90.7%. This distinction occurs because formal workers work in informal firms and, more commonly, informal workers contract for formal firms (Murthy).



Employment in the informal economy is disproportionate to the gross value added (GVA) to the Indian economy, due to its low productivity. Additionally, employment in the informal economy has grown, but more workers have begun receiving social protections. Data is from Murthy.

Narendra Modi's government pursued a controversial *demonetization* policy in November 2016, targeting flows of nontaxable *black money* and promoting the banking system to facilitate economic formality. He rendered 500 and 1,000 rupee notes, 85% of India's legal tender, worthless, citing "anti-national and anti-social elements." Having only eight weeks to obtain new bills and facing conversion limits equivalent to $60 per day, many Indians lost their savings. Nonetheless, Modi's emphasis on curtailing illicit financial activity (particularly in the real estate sector) made the pain justifiable from the perspective of many ordinary Indians. Modi hoped that Indians would adopt taxable digital payments, a radical transformation in a country where businesses conduct 90% of transactions in cash (Vanek Smith).



Engineer Anil Bokil was the brainchild of India's demonetization plan (Vanek Smith). According to this screenshot from his presentation (included in an interview he conducted with NPR), the

causes of the common man's poverty are (1) a malfunctioning tax system that prevents the state from raising revenue and (2) corruption in government.

While the soundness of the demonetization scheme is debatable, it provides a useful framework to assess whether digitization catalyzes financial inclusion. Despite nearly 80% of Indians having a bank account as of 2017, only half of them are used, and many Indians are unaware of the available lending facilities. Communities often source finances from informal high-interest moneylenders (Sanghera).

Hopes for financial inclusion are not novel. The Reserve Bank of India (RBI) has long provided Basic Savings Bank Deposit (BSBD) accounts, eliminating the minimum balance requirements and service costs of typical savings accounts ("Reserve Bank of India"). Moreover, policymakers strive to remove structural barriers to economic activity. India's simplification of the tax code (instituting a uniform goods-and-services tax) and infrastructure projects (like the expansion of the national highway) are steps in the right direction ("India is likely to be").

Literature Review:

Scoping financial inclusion beyond access to simple savings accounts, Garg and Agarwal divide proposals into six categories (55). The most relevant to this study are new banking products, updated regulations, technology solutions, and government policies.

The *product-based approach* includes BSBD accounts and credit programs, like Kisan Credit Cards for farmers and General Purpose Credit Cards for entrepreneurs in other sectors (Garg and Agarwal 55). Acknowledging that documentation requirements block many clients from mainstream services, the *regulatory approach* allows individuals lacking documentation to be referred to financial services. It loosens the regulations on opening new bank branches. *Technology-based approaches* include mobile payment apps, like Airtel Money, and ATMs (Garg and Agarwal 57).

Government policies include not only traditional reforms, like oversight systems and self-help initiatives targeted at certain marginalized groups, but also a rethinking of how welfare is distributed. Expanding welfare access to all deserving recipients and curbing abuse are critical goals for a modern economy. Through the Aadhaar biometric authentication program, the government hopes to repair the ailing welfare apparatus (Garg and Agarwal 58). Aadhaar associates every Indian with a twelve-digit identification number linked with public services. The absence of intermediaries in service delivery (e.g., pension payments) supposedly mitigates fraud.

Agarwal and Garg track the progress of Financial Inclusion Plans implemented by public and private banks between April 2010 and March 2013 (58). They assess the expansion of brick-and-mortar bank branches and banking intermediaries, BSBDs, Kisan Credit Cards, and General Purpose Credit Cards (Garg and Agarwal 59). They conclude that these approaches are

insufficient without changes to the regulatory environment (Garg and Agarwal 60). Moreover, they call for the government to be cautious about the logistical challenges of Aadhaar; other academics raise similar concerns (Garg and Agarwal 61).

Khera focuses on whether Aadhaar mitigates the three types of commonplace welfare fraud: *eligibility fraud,* in which welfare recipients forge documents to receive additional entitlements; *identity fraud,* in which benefits are claimed by posing as another individual (3); and *quantity fraud,* in which welfare recipients are given lesser quantities than they deserve (7). She alarmingly concludes that Aadhaar is only effective against identity fraud, and that improper data entry excludes deserving Indians from the welfare system (6). Aadhaar-seeding associates citizens in existing government databases with new Aadhaar identification numbers, and after this process, prunes records lacking Aadhaar integration. This process, combined with the increasing use of Aadhaar-Based Biometric Authentication (ABBA), leads to exclusion. Consider the Public Distribution System (PDS), which allots wheat and rice to eligible households (Khera 4). In Rajasthan, of the ten million welfare cardholders, 25%-30% did not purchase entitlements from ABBA-enabled point-of-sale systems.

According to Khera, Aadhaar is concerning because it addresses the wrong problem. Low-tech reforms have helped the welfare state become more efficient. With the *National Rural Employment Guarantee Act (NREGA),* laborers willing and able to complete low-skilled jobs are entitled to 100 days of work. In 2008, the government mandated that NREGA compensate workers through bank and post office accounts, significantly curbing corruption and normalizing financial system use (Khera 8).

Some scholars are more optimistic about Aadhaar, arguing that it redefines how the government engages with the governed. Rao and Nair, introducing a seven-paper series on

Aadhaar, claim that Indian policymakers depend heavily on aggregate statistics, making targeted interventions infeasible (472). Aadhaar enables the state to provide personalized assistance and treats the individual as an investment rather than a dependent, helping them participate in the market economy (Rao and Nair 474). Concerns have arisen about Aadhaar's potential use for surveillance and unmonitored access to confidential data. Responding to broad legal attacks against Aadhaar, the Supreme Court ruled in September 2018 that Aadhaar was constitutional, but private parties could not use Aadhaar IDs. A 2017-18 survey of 3,000 households in Andhra Pradesh, West Bengal, and Rajasthan revealed that many households supported Aadhaar integration, despite privacy concerns (Rao and Nair 477). Aadhaar reflects Indian optimism about the startup sector, and politicians are eager to reimagine the state as a technology stack (Rao and Nair 479).

Rao and Nair concur with Khera that Aadhaar is plagued with logistical challenges, like poor infrastructure, human error, and the need to present documents to receive a digital identity. Indians lacking identity documents must return to their village, request witness testimony, and receive documents from the authorities. Thus, Aadhaar's ability to represent the truth is limited by the truthfulness of supporting documentation (Rao and Nair 480).

Mahajan and Singla warn that India's financial infrastructure is insufficient to support the transition to a cashless economy after Modi's demonetization plan. In 2014, two years before the scheme, India had about one-third as many bank branches per capita as advanced economies, and the disparity was even more apparent for ATMs: one-eleventh (Mahajan and Singla 339). Moreover, informal firms have begun losing business as middle-class consumers take advantage of the digital economy. The impact on Micro, Small, and Medium Enterprises (MSMEs) is borne most adversely in rural areas (Mahajan and Singla 341), where, as of 2014, the average bank

branch serves more than twice the number of clients as its urban counterpart (Mahajan and Singla 340). Disruptions to cash-denominated business activity cause informal businesses, which often take loans from microfinance institutions, to default. Consequently, banks lending to microfinance institutions have seen an increase in non-performing assets, leading to instability in the broader financial system (Mahajan and Singla 341).

Mahajan and Singla's research provides evidence that formal banking benefits wealthier, urban consumers, and that rural financial infrastructure is overburdened; the authors imply that the economic "shock therapy" of demonetization alone was insufficient. From their perspective, it is simply infeasible for informal workers, particularly rural workers, to transact frequently with a bank.

Dash takes a macroeconomic view of demonetization and the Reserve Bank of India's objectives. Dash notes how the banking system creates money through the multiplier effect (Dash 14). (In fractional reserve banking, banks loan the majority of deposited funds, which end up as more loans issued by other banks, leading to money creation.) Even with a conservative multiplier estimate, demonetization spurred rapid money supply growth, with deposits increasing by $75 billion between November 10-18, 2016.

RBI Rs.10000 Note in, 1938

RBI Rs. 5000 Note in 1954

India has previously taken high-denomination notes out of circulation, like the Rs. 10,000 and the Rs. 5,000 notes. However, the impacts were limited because they were used infrequently (Dash 13).

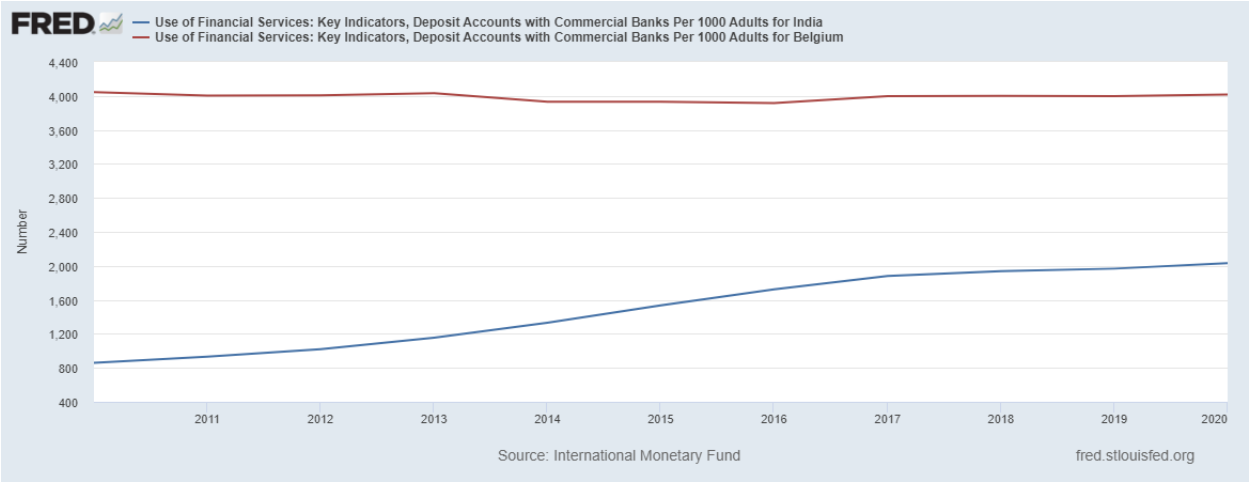
Research Methodology:

Meta-Analyses, such as this paper, consider the conclusions from existing literature and test them against data. Thus, reputable economic data sources, like the Reserve Bank of India's data repository, are vital. However, they are only well-utilized if the driving questions are clear.

Unpacking the reality of demonetization, digital banking, and welfare, this paper documents *applied* research, with useful insights for development economics. Though this research avoids making policy recommendations, it provides a useful framework to assess unorthodox economic policies. Narendra Modi's government spearheaded many of the initiatives described here; however, since 1947, Indian politicians across the political spectrum have aimed at the same challenges.

This research draws conclusions from both quantitative and qualitative data. Quantitative data suggests what happened, but qualitative data explains why it happened. A few core macroeconomic performance indicators are included in this paper's appendix to illustrate the broader context of the Indian economy.

- **Living Standards:**
    - GDP per capita, Purchasing Power Parity (PPP) adjusted
    - Life expectancy
    - Child mortality
- **Productivity (Total Factor Productivity)**



In the decade between 2010 and 2020, India has gone from having less than one-fourth the number of deposit accounts per 1,000 adults as Belgium to having slightly more than one-half that of the advanced Western economy ("Bank Deposits to GDP for Belgium"). However, does the number of per-capita bank accounts alone capture the reality for ordinary Indians?

This study is *observational*: Combining correlations between economic indicators with basic economic relationships provides meaningful conclusions. For example, did demonetization encourage the greater *use* of bank accounts? Aggregate money supply data, corroborated with the distribution of banknotes, answers this question.

Lastly, while economic indicators gauge economic progress well, they do not contain any context about cultural or spiritual factors. In India, different *castes* are associated with different occupations and privileges, contrasting with Western ideas about social mobility: Scheduled Castes, for instance, were barred from certain institutions, despite the Indian constitution prohibiting caste discrimination ("Castes"). Moreover, scholars like Fordham University's Hrishikesh Vinod have tried to reconcile Hindu values like Karmic predestination with India's liberal economy (Sassi). Analyzing the caste system and the influence of Hindu values is beyond the scope of this paper.

Meta-Analysis:

Unlike traditional experiments or observational studies, meta-analyses rely on existing datasets synthesized in novel ways. Nonetheless, they have been successfully conducted in medicine and psychology since the 1970s, and researchers in other fields, notably management, business, and economics, have adopted the technique. Christopher Hansen, Holger Steinmetz, and Jorn Block, writing in *Management Review Quarterly,* suggest the following eight-step procedure.

1. State the research question
2. Review existing literature
3. Measure effect sizes (different outcomes resulting from policy interventions)
    a. **Considerations:**
        i. *Z-transform* data so they follow a standard normal distribution
        ii. Compare bivariate correlations (e.g. influence of A on B) to other bivariate correlations
4. Choose an analytical method
    a. **Types:**
        i. *Univariate:*
            1. Reports the mean effect size
            2. Often the starting point for additional analyses
        ii. *Meta-regression:*
            1. Regresses the effect size against a set of influencing variables

2. Requires a sufficiently large number of influencing variables to be reliable

iii. *Meta-analytic structural equation modeling:* Applies meta-analytical methods (e.g. univariate analysis) to a *path model*, a tool to visualize complex relationships

iv. *Qualitative meta-analyses:* Involves qualitative data from case studies

5. Choose a software package
6. Develop coding sheets: Describes the data collected and transformations applied by other studies relevant to the research question
7. Conduct the analysis
    a. **Considerations:**
        i. Screen for outliers that bias results
        ii. Be cognizant of publication bias (results influence authors' willingness to publish)
8. Publish results: Answer the research question, interpreting effect sizes

Because most of the data considered in this study will come from the Indian government or multilateral organizations, most of the proposed steps are unnecessary.

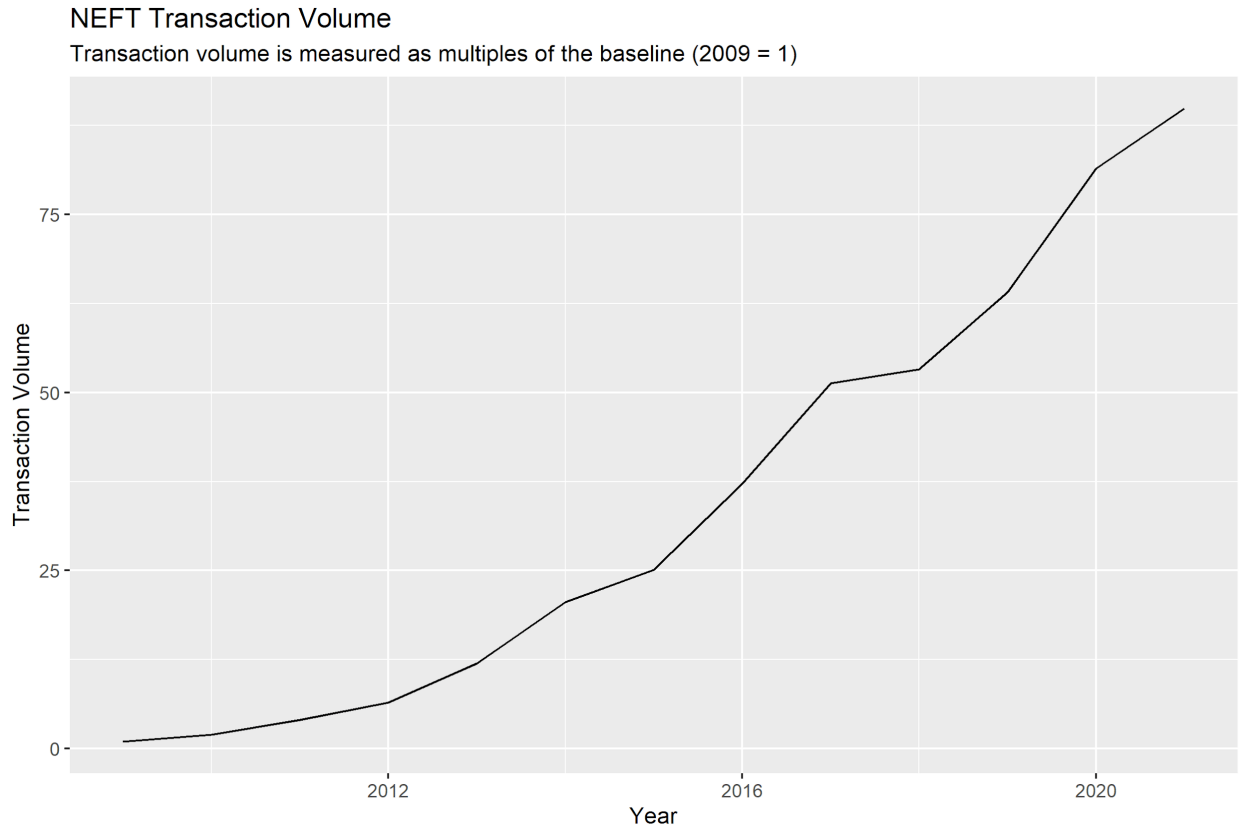
Research Timeline:

- **First Semester:**
    - State the research question
    - Review existing literature
    - Choose a software package
- **Second Semester:**
    - **January:** Analyze 2016 demonetization
        - Choose an analytical method
        - Conduct the analysis
    - **February:** Analyze digital banking
        - Choose an analytical method
        - Conduct the analysis
    - **March:** Analyze Aadhaar
        - Choose an analytical method
        - Conduct the analysis
    - **April:** Synthesize and publish results
    - **May:** Symposium

Data Visualization and Statistical Techniques:

This meta-analysis compiles economic indicators, survey results, and anecdotes from disparate sources, typically presenting them in tables. However, visualizations are occasionally generated using the R programming language and the ggplot2 library. R manipulates datasets (stored as CSV files) through *DataFrames,* which permit row- and column-wise operations.

For example, the following plot indicates the growth of NEFT, an RBI digital banking protocol facilitating transactions between individuals and corporations.



The R code loads data as a *DataFrame,* manipulates the *DataFrame* to show growth rates, and generates a plot concisely demonstrating the rapid growth of NEFT over the past thirteen years. High-quality research must be reproducible; other researchers can easily verify this paper's conclusions through comments and code versioning.

```r
# Digital Banking - National Electronic Fund Transfer
# 14 data points pulled from January 2009 to January 2021
# https://rbi.org.in/Scripts/NEFTview.aspx
# Plotted data is for outward debits
# The volume of outward debit transactions & inward credit transactions is roughly the same
# One lakh is 100,000 (10^5)

neft.transaction_volume = data.frame(
  year = 2009:2021,
  volume = c(
    3198764,
    6176882,
    12960745,
    20630753,
    38364041,
    65911714,
    80224999,
    118973141,
    164187826,
    170214005,
    205.1 * 10 ^ 6,
    2605.6 * 10 ^ 5,
    2874.9 * 10 ^ 5
  ),
  population = c(
    1217726217,
    1234281163,
    1250287939,
    1265780243,
    1280842119,
    1295600768,
    1310152392,
    1324517250,
    1338676779,
    1352642283,
    1366417756,
    1380004385,
    1393409033
  )
)

# 2009 is the baseline (1)
neft.transaction_volume["normalized_volume"] = neft.transaction_volume[,"volume"] / 3198764
neft.transaction_volume["normalized_population"] = neft.transaction_volume[,"population"] / 1217726217

# Plot
neft.plot = ggplot(neft.transaction_volume, aes(x=year)) +
  geom_line(aes(y=normalized_volume)) +
# geom_line(aes(y=normalized_population)) +
  labs(x="Year",
       y="Transaction Volume",
       title="NEFT Transaction Volume",
       subtitle="Transaction volume is measured as multiples of the baseline (2009 = 1)")
ggsave("./plots/neft_transaction_volume.png", neft.plot)
```

Comments to help other researchers

Data: Larger datasets parsed from CSV

Code version changes tracked in GitHub

DataFrame operations

Generate plot

Conducting Analyses:

Research Question Area	**Subtopic**	**Analysis Type**	**Datasets**	**Visualizations**
Demonetization	How did the composition of India's M_3 money supply change?	Univariate	(RBI) Indian Money Supply	Barplots
	How are banknote denominations distributed in India's cash economy?	Univariate	(RBI) Annual Report 2018	Barplots
Digital Banking	How is the number of ATMs per capita distributed across Indian states?	Univariate	(RBI) State-wise and region-wise deployment of ATMs (RBI) State-wise Indian population (last census conducted in 2011)	Boxplots
	How has the use of digital banking shifted over time?	Univariate	(World Bank) Global Financial Inclusion Database	Tables
	Which electronic banking protocols have the greatest forecasted growth? Why?	Univariate	(RBI) Payments Vision 2025 Report (Mint) How UPI is better than other digital payment modes	Infographic
Aadhaar	How has sensitive data collected by the	Univariate	(The Center for Internet and Society) 130	Tables

	government been compromised in the past?		Million Aadhaar Numbers Were Made Public (Human Rights Watch) Indian Government Moves to Remedy Its Violation of Children's Privacy (Citizen Lab) Tracking NSO Group's Pegasus Spyware to Operations in 45 Countries	
	How do welfare beneficiaries feel about Aadhaar?	Univariate	(Dalberg/State of Aadhaar) State of Aadhaar: A People's Perspective (2019 Edition)	Tables

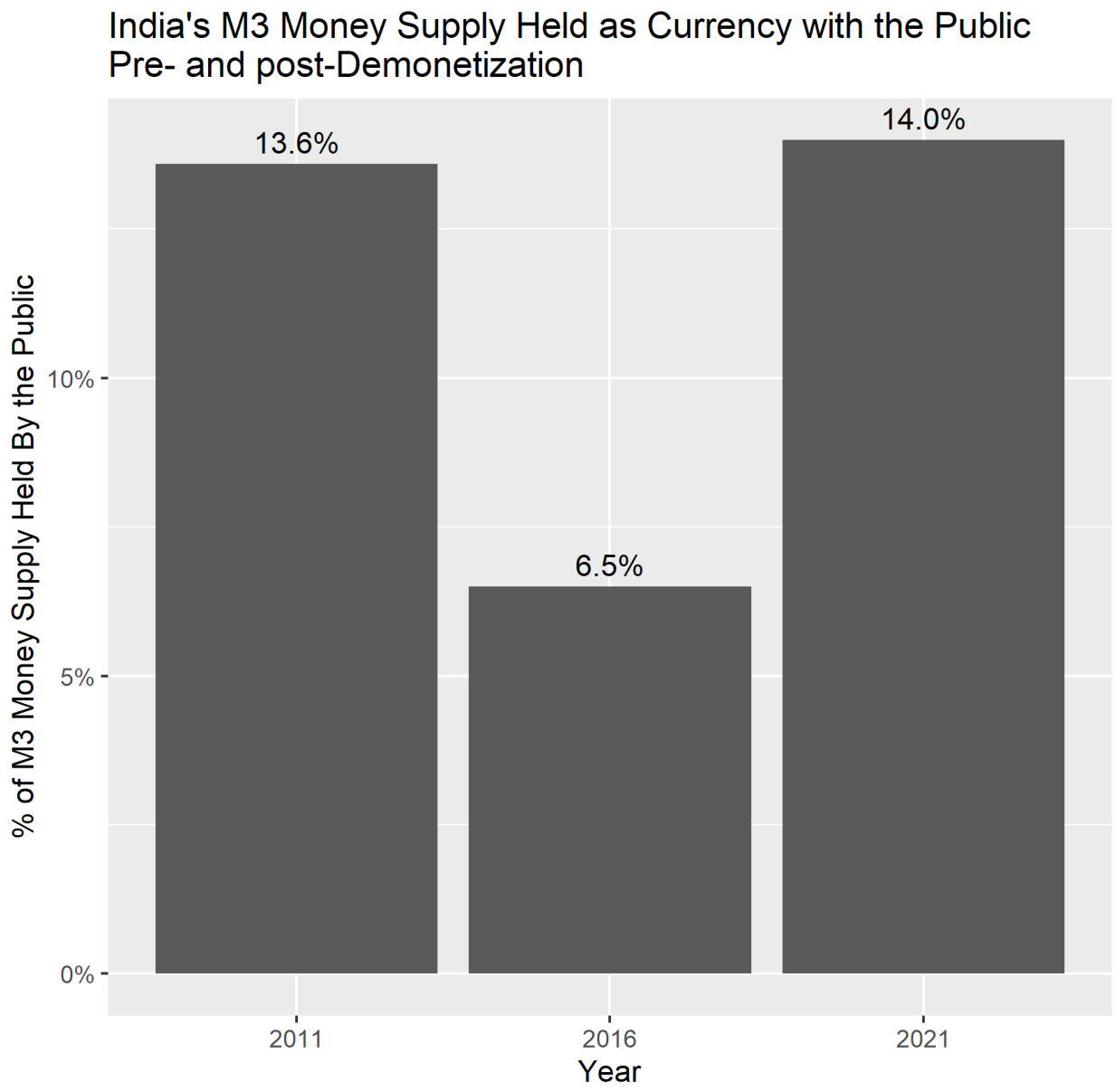
Demonetization:

Demonetization had two core objectives: Penalize illicit black money and encourage the broad adoption of modern, banked payment systems. The *money supply* is a useful tool for understanding the composition of money in the economy. The following table summarizes common money supply measures according to RBI definitions.

Supply	**Composition**	**Comments**
M_1	Currency held by the public + Banking system demand (checkable) deposits + "Other" deposits	
M_2	M_1 + Savings deposits of post office savings banks	Post office savings banks have serviced the needs of the rural poor since 1882. In 2007, they were estimated to be holding deposits totaling 3.5 trillion rupees ("From 'annas' to millions")
M_3	M_1 + Banking system time deposits	Time deposits do not need to be paid on demand: Examples include cash certificates and recurring deposits

Source: "Part I - Financial Statistics"

The following table and barplot indicate changes in the composition of India's M_3 money supply five years before and after demonetization. M_3 was chosen to avoid overrepresenting the proportion of cash in the Indian economy. Percentages have been added, indicating the relative sizes of each component each year.



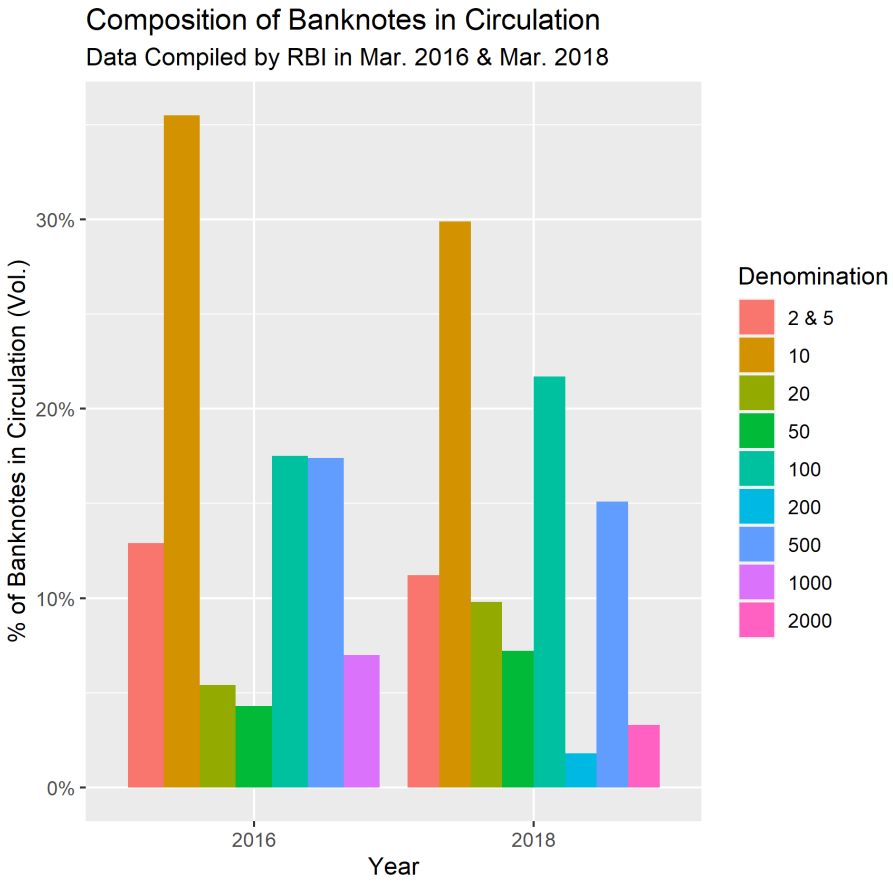
	Date			
Component of Money Supply		12/30/2011	12/23/2016	12/31/2021
	Currency with the public	9779.9 (~13.6%)	7829.1 (~6.5%)	28809 (~14%)
	Demand deposits with banks	7093.9 (~9.9%)	12001.7 (~10%)	22026 (~11%)
	Time deposits	55090.1	100466.0	149798 (~74%)

	with banks	(~76.5%)	(~83.4%)	
	"Other" deposits with the reserve bank	22.9 (~0%)	152.6 (~0.1%)	510 (~0%)
	Total (M_3)	71986.8	120449.5	201143

Sources: Money Supply for the fortnight ended December 30, 2011; Money Supply for the fortnight ended December 23, 2016; Money Supply for the fortnight ended December 31, 2021.

Currency held by the public, as a percentage of the total M_3 money supply, changed minimally between five years before and five years after demonetization. The public resumed economic activity using new banknotes, a direct substitute for the demonetized banknotes. This result concurs with an RBI analysis that of the Rs. 15.42 lakh crore worth of currency that was demonetized in November 2016, Rs. 15.31 lakh crore (99.3%) returned by 2018 ("99.30% of demonetised money").

Based on data published in the RBI's 2017-2018 annual report, the barplot below indicates the breakdown of India's currency in circulation by denomination. After demonetization, the Rs. 1,000 note (purple) was replaced by the Rs. 2,000 note (pink), and the Rs. 200 banknote (light blue) was added.



Source: Table VIII.1, 2017-2018 RBI Annual Report

Comprising 15.1% of India's unbanked currency in March 2018, India's Rs. 500 note remained prevalent, down merely 2.3% from two years before. Interestingly, the lower-denomination 20, 50, and Rs. 100 notes increased their share of currency in circulation. Perhaps Indians believed that lower-denomination notes would be immune from future demonetization attempts.

While demonetization may not have drastically changed the composition of India's money supply, Modi's government intended to target illicit black money. Did demonetization help the authorities trace black cash flows?

Per author Vivek Kaul, the accepted reason that black money hoarders were not identified was that they had others deposit the money for them. Additionally, according to the Income Tax Department, roughly 5% of black money was saved as cash; in fact, the Modi government had no estimated total of the amount of black money held as cash before demonetization.

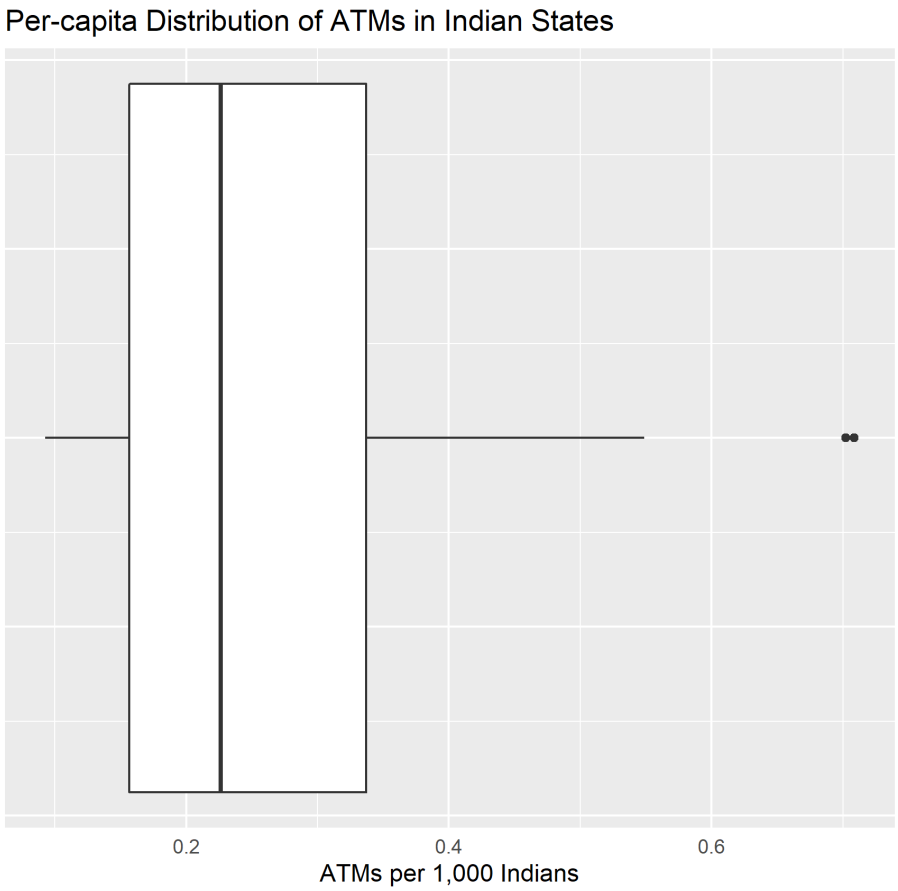
Domestic financial crimes in India are prosecuted under the Prevention of Money Laundering Act (PMLA) of 2002. In the 17 years since the enforcement of the PMLA began (2005), 23 people have been convicted for money laundering. The PMLA–enforced by the Enforcement Directorate of the Finance Ministry–has opened 5,422 cases (Joy). Given how few cases have resulted in convictions, it is clear that imprisoning holders of dark money would never be easy.

The Foreign Exchange Management Act (FEMA) of 1999, which regulates foreign exchange transactions, enables the government to bring a *civil* case against Fugitive Economic Offenders ("Money laundering"). Foreign exchange transactions, like remittances, often facilitate money laundering: In October 2021, six officials with the Bank of Baroda were arrested for 8,000 transactions made to Hong Kong for nonexistent imports ("CBI arrests six persons"). Modi's government gave FEMA more teeth with the 2018 Fugitive Economic Offenders Act: Prominent billionaires Vijay Mallya and Nirav Modi have been declared Fugitive Economic Offenders, but not for cases related to demonetization ("Money laundering").

Financial Inclusion:

ATMs were first introduced in India in 1987, but it was only at the turn of the century that their use grew rapidly. Between 1999 and 2003, the average ATM served 2.8x more transactions, and the ATM network dispensed 30x more cash. In a cash-driven economy often plagued by union strikes at banks, the Indian market is ideal for ATMs (“Here’s the story of ATMs”).

However, the distribution of ATM installations in India is far from equitable. The following boxplot describes the distribution of ATMs per capita in Indian states. Because this analysis uses 2011 census data, the states of Telangana and Ladakh are excluded since they were incorporated afterward.



Sources: Region wise deployment of ATMs for the quarter ended December 2022; Table 1, Handbook of Statistics on Indian States

Since this distribution is right-tailed, the vast majority of states have seen far slower progress than frontrunners **Chandigarh** and **Goa,** which have roughly 0.7 ATMs per 1,000 Indians. Even these states lack far behind developed nations, like the United States, which had 1.74 ATMs per 1,000 people in 2009. At least 75% of Indian states (third quartile in the boxplot) have fewer ATMs per capita than the 2021 world average of 0.4 ("Automated teller machines").

Digital Banking:

In this paper, *digital banking* encompasses electronic access to bank accounts and electronic payment fulfillment between customers and businesses. Scholars and authorities have penned digital banking as an instrument of *financial inclusion*, bringing unbanked Indians into the formal economy. The following statistics were selected from the World Bank's Global Financial Inclusion Index, compiled from surveys of 128,000 adults conducted in 2011, 2014, 2017, and 2021.

	2011	**2014**	**2017**	**2021**
% of Indians (15+) with a Financial Institution Account	35%	53%	80%	78%
% of Indians with a Financial Institution Account whose Accounts are Inactive	N/A	33%	38%	35%
% of Indians who Made or Received a Digital Payment	N/A	22%	29%	35%

% of Wage-Earning Indians who Solely Receive Cash	N/A	79%	59%	43%
% of Wage-Earning Indians who Receive Mobile Phone Payments	N/A	2%	2%	13%

In terms of bringing financial services to the population, traditional financial inclusion plans–such as those documented in the literature review–have worked; between 2011 and 2021, the percentage of Indians aged fifteen or older with bank accounts more than doubled. However, between 2014 and 2021, the proportion of Indians with bank accounts whose accounts were inactive hovered at roughly one-third: This indicates that a segment of the population is systematically excluded.

Notably, cash's chokehold on the informal economy has weakened, with a 46% drop in the percentage of respondents receiving cash-only wage payments between 2014 and 2021. Among the surveyed methods of receiving wages, the largest increase occurred in mobile phone payments.

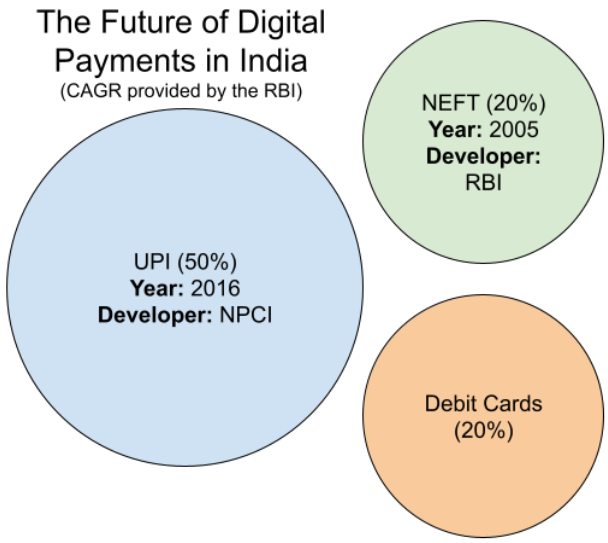
Unified Payments Interface (UPI)

The UPI payment system is the most visible product of India's digitalization drive. This homegrown payment processing network has seen broad adoption in the formal and informal economy and processes billions of monthly transactions. It is overseen by the National Payments Corporation of India, a public-private partnership (Mashal and Kumar).

Digital payment QR codes at a vegetable stall. Vendors like these used to rely heavily on cash.

Source: Atul Loke for The New York Times

However, UPI is not India's sole payment processing network. The following infographic summarizes RBI's expected annualized *Compound Annual Growth Rates* (CAGRs) for various protocols' transaction volumes between 2022 and 2025.



Source: Payments Vision 2025 (p. 11)

Citing the results of Payments Vision 2019-2021 in its Payments Vision 2025 report, RBI notes that UPI saw a 104% CAGR and debit cards a -3.7% CAGR over the report's timeframe (p. 6). Amid COVID-19 lockdowns, UPI payments–rather than debit cards or other traditional financial instruments–kept businesses afloat.

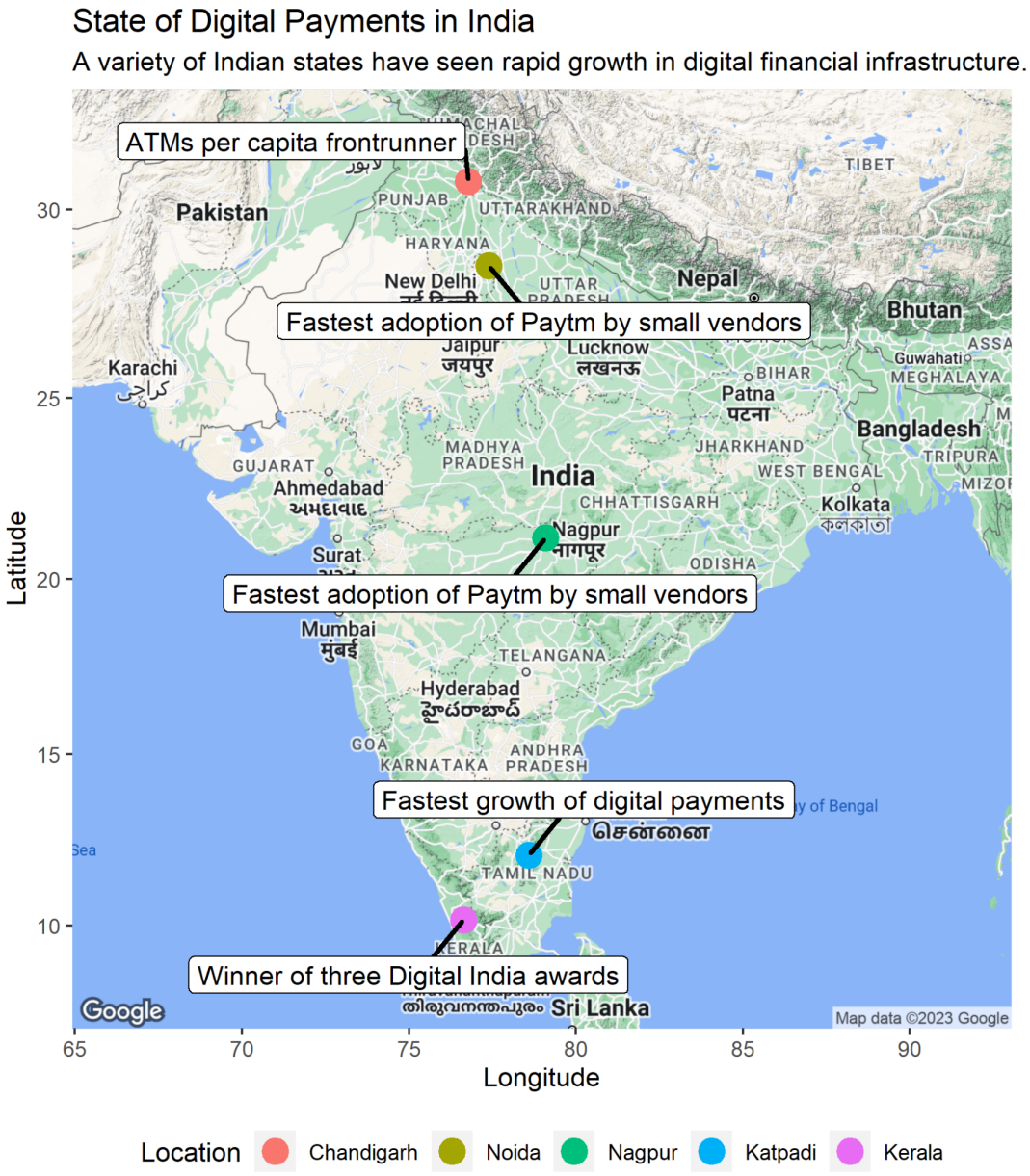
UPI's lead does not come from being the first ubiquitous network. Instead, it simplifies the experience for the user. The table below summarizes some advantages of using UPI for everyday payment tasks.

Task	**UPI**	**Other Payment Methods**
Digital payments	Enter UPI ID and confirm through the app	**Card:** Enter card details (name, card number, date, security code)
Peer-to-peer transactions	No beneficiary needed; solely IFSC code (NEFT identifier) is required for non-UPI recipients	Add beneficiary details (bank number, bank name, IFSC)
Avoid transaction fees	No network charges for transactions worth up to 2,000 rupees	Fees depend on the service
Send remittances	Indian expatriates (NRIs) from popular destinations for Indian immigrants–including the US and UAE–can link their SIM with UPI and use the network seamlessly	Traditional platforms, on average, charge 4.1% transaction fees for remittances to South Asia and may require intermediate bank accounts belonging to friends and relatives

Sources: Mint (Zoaib Saleem, Ahuja)

According to Paytm, a leading provider, UPI has addressed issues of equity. In its 2022 report, Paytm emphasized that transaction volume and value grew by 25% and 14% in semi-urban and rural areas, respectively. In Noida and Nagpur, street vendors–typically secluded from the formal economy–adopted Paytm at a breakneck pace. In Southern India, Katpadi in

Tamil Nadu saw the fastest growth of digital payments in 2022 (“Here’s what a Paytm report”), while Kerala became the first Indian state to digitize banking services fully and received three “Digital India” awards for the modernization of administrative tools (“Kerala becomes country’s first”). Chandigarh, one of India’s most developed territories, outpaced its peers in ATM adoption; however, mobile banking provides opportunities for states across India to build newer forms of financial infrastructure rapidly.



Aadhaar:

Innovative welfare programs are not unique to India; during the "Pink Tide" era, Latin American nations, like Brazil under President Lula da Silva, experimented with delivery models such as Conditional Cash Transfers. Indian Prime Minister Narendra Modi campaigned hard on the benefits of *digitizing* these services, accelerating a program initiated by his predecessor. Modi explored the advantages of information technology in governance when he was the Chief Minister of Gujarat, and he wanted to enact his policies nationally ("Narendra Modi's tough medicine").

Over one billion Indians are now registered with Aadhaar, bringing issues that Modi's government dismissed to the forefront. Some issues are understandable growing pains from administering public services in the world's second-largest nation, while others indicate institutional failure.

Institutional Failure

Aadhaar's database associates 12-digit identification numbers with biometrics and other personal identifiers. Welfare and financial services federate authentication to Aadhaar. Despite the sensitivity of Aadhaar, no substantial data protection laws exist in India; in 2010, when Indians were first eligible for Aadhaar, Parliament's Standing Committee on Finance rejected a privacy safeguard bill. A 2018 Supreme Court ruling governs using Aadhaar data, prohibiting private companies from accessing the database (Mukherjee). Nonetheless, private companies, such as telecom providers, began using Aadhaar for "Know Your Customer" (KYC) verifications *after the Supreme Court ruling* (Kumar).

Selected Indian Government Privacy Breaches			
Product	**Indians Impacted**	**Breach Method**	**Source**

Aadhaar (websites of National Social Assistance Program, National Rural Employment Guarantee Scheme, Chandranna Bima Scheme [Andhra Pradesh government])	130 million welfare beneficiaries	Search engine queries of public government websites	Center for Internet & Society, India
Diksha (education app)	Students in grades 1-12	Transmission of students' and teachers' PII and academic performance to third-party firms	Human Rights Watch
Pegasus (Israeli spyware allegedly used by the Indian government to target mobile devices)	Journalists & activists	Spyware	University of Toronto Citizen Lab

This table indicates that ineffective privacy safeguards are prevalent in India's social affairs departments, including welfare, education, and engagement with civil society. The Indian government tends to deflect responsibility for privacy breaches: When Human Rights Watch revealed possible violations of children's privacy in Diksha, the education ministry blamed EkStep, a contractor, for improper data storage practices (Han).

Entitlements

IIT Delhi professor Reetika Khera provides an insightful framework to assess Aadhaar: She believes it might be a valuable tool to address *identity fraud.* Intuitively, systems fitted with Aadhaar would prohibit nonexistent users from siphoning benefits. Unfortunately, poor safeguards have prevented Aadhaar from effectively policing identity fraud.

In a 2022 report, the media organization *Scroll.in* reported that Assam's PM-Kisan scheme, an Aadhaar-enabled entitlement system for farmers, was compromised. Of the program's 310,000 beneficiaries, state authorities estimated that 150,000 were fraudulent. Farmers with multiple accounts and non-farmers, like government officials, used funds unlawfully. According to *Scroll.in*, the culprit was parliamentary elections: Party officials in Assam aggressively sought to increase membership, enlisting local leaders for help. Some officials shared their Aadhaar portal credentials through unauthorized channels, allowing opportunists to register welfare beneficiaries without their knowledge. Reporting by *The Economic Times* and *Hindustan Times* corroborate *Scroll.in*.

Some observers claim that Aadhaar's rollout overran technical due diligence, citing a report from India's Comptroller and Auditor General warning that UIDAI–the entity operating Aadhaar–may not have established uniqueness for each citizen in the database due to unpaired identity documents. Aadhaar's deduplication system has not been performing worse than expected, however. Until November 2019, 475,000 Aadhaar duplicates were pruned (Office of the Comptroller and Auditor General). According to the results of a 2011 proof-of-concept run of Aadhaar's deduplication system for an 84 million user database ("Role of Biometric Technology"), roughly 400,000 duplicates (0.035%) should be expected in a population of 1.2 billion.

Despite institutional challenges, Indians are generally optimistic about Aadhaar. The most comprehensive civil society report on Aadhaar, the 2019 edition of *State of Aadhaar*, supports Rao and Nair's view that Aadhaar is the natural evolution of the state.

Selected Statistics: 2019 *State of Aadhaar* Report			
% Respondents who accessed welfare for	% Respondents who believe Aadhaar	% Respondents excluded from	% Students (aged 6-14) who could not

the first time through Aadhaar	improved service delivery	welfare due to Aadhaar	enroll in school due to Aadhaar
49%	80%	0.8%	0.5%

While this report paints a different picture than Khera's dire warnings, Indians do have some reservations. Of the 72% of survey respondents who were optimistic about universal identification, almost half were concerned about excessive linkage to public services. Additionally, given that children comprised roughly three-fourths of the 102 million people who lacked an Aadhaar when data collection began, as the survey notes, the conditioning of school enrollment on Aadhaar ownership is concerning.

There are notable shortcomings in using survey data, even if independently collected, to assess Aadhaar's success. For example, the scope of service reliability is unclear; do system failures include improper quantities dispersed by Aadhaar-enabled PoS systems? Nonetheless, because government statistics about the anti-corruption effects of Aadhaar are disputed, the end-user experience is currently the most reliable indicator.

Conclusion

This paper's analysis of demonetization agrees with Mahajan and Singla's view. Taken alone, demonetization did not lead to a behavioral shift favoring banking. Demonetization, however, still has its uses, not as the primary tool of national economic policy. On May 19th, 2023, the Indian government began withdrawing the Rs. 2,000 note from circulation, setting a September 30th deadline for depositing or converting the note to lower denominations. Economists hailed this move, stating that it would increase India's credit supply and help enforce campaign finance laws; Pronab Sen, the nation's former chief statistician, praised it as "a sensible form of demonetisation" (Dugal and Ahmed).

Digital banking is a *leapfrog innovation,* allowing India to bring its population into the formal banking system without building brick-and-mortar bank branches. Despite the staggering popularity of UPI payments, India may soon hit the ceiling on growth: Its relatively low smartphone penetration rate. As of October 2022, 790 million Indians have broadband mobile service, a marginal increase from one year before. The driver behind declining Internet connectivity growth rates is the rising price of smartphones in India's cost-sensitive market and the failure of content producers to cater to diverse languages (Biswas).

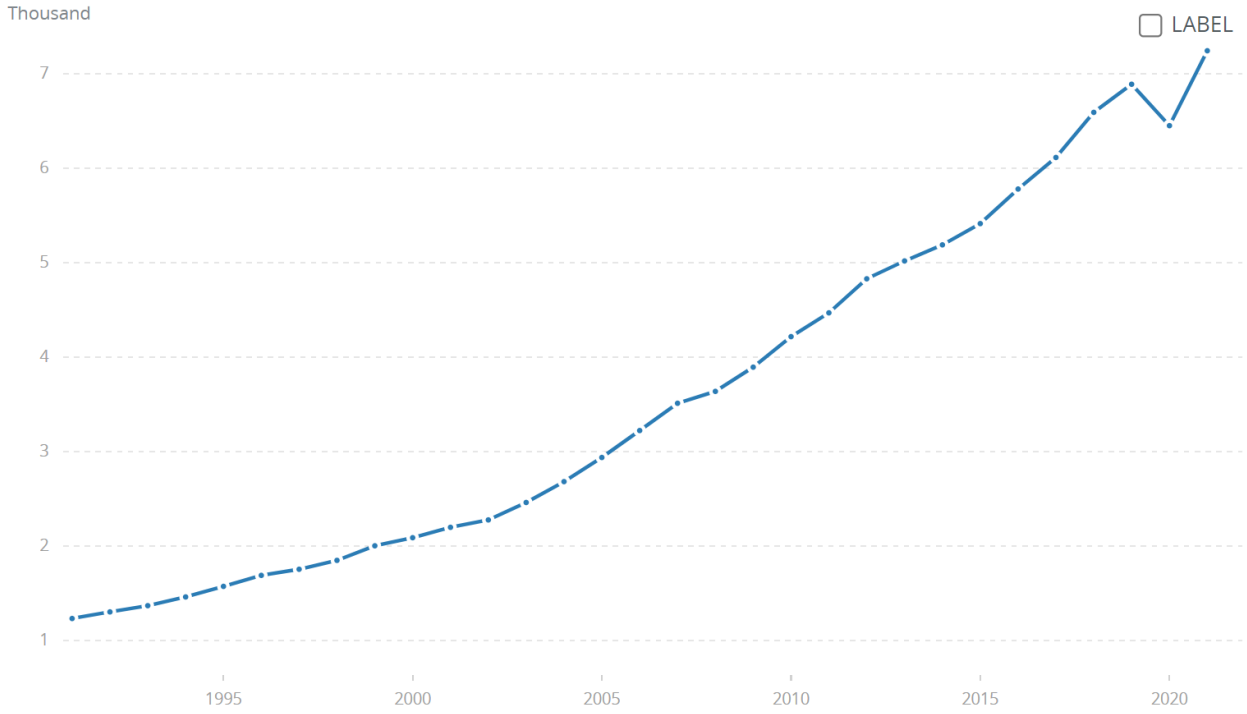
Indians are optimistic about Aadhaar, though it has often failed to provide the accountability they deserve. Necessary institutional safeguards were missing when massive Aadhaar enrollment began, turning a sensible rethink of India's entitlements system into an administrative disaster. Despite these shortcomings, Aadhaar inspires identity innovations worldwide. In 2019, the World Bank estimated that 1 billion people globally lack ID, most of whom live in the Global South. The organization's Identification for Development scheme, launched in 2014, fosters collaboration between governments and civil society to accelerate

identity projects in over 45 countries (“Inclusive and Trusted Digital ID”). One of the most fascinating identity innovations is the Modular Open Source Identity Platform (MOSIP), developed by the International Institute of Information Technology in Bangalore, India. This initiative democratizes a highly-scalable identity architecture and encourages trust by being open-sourced.

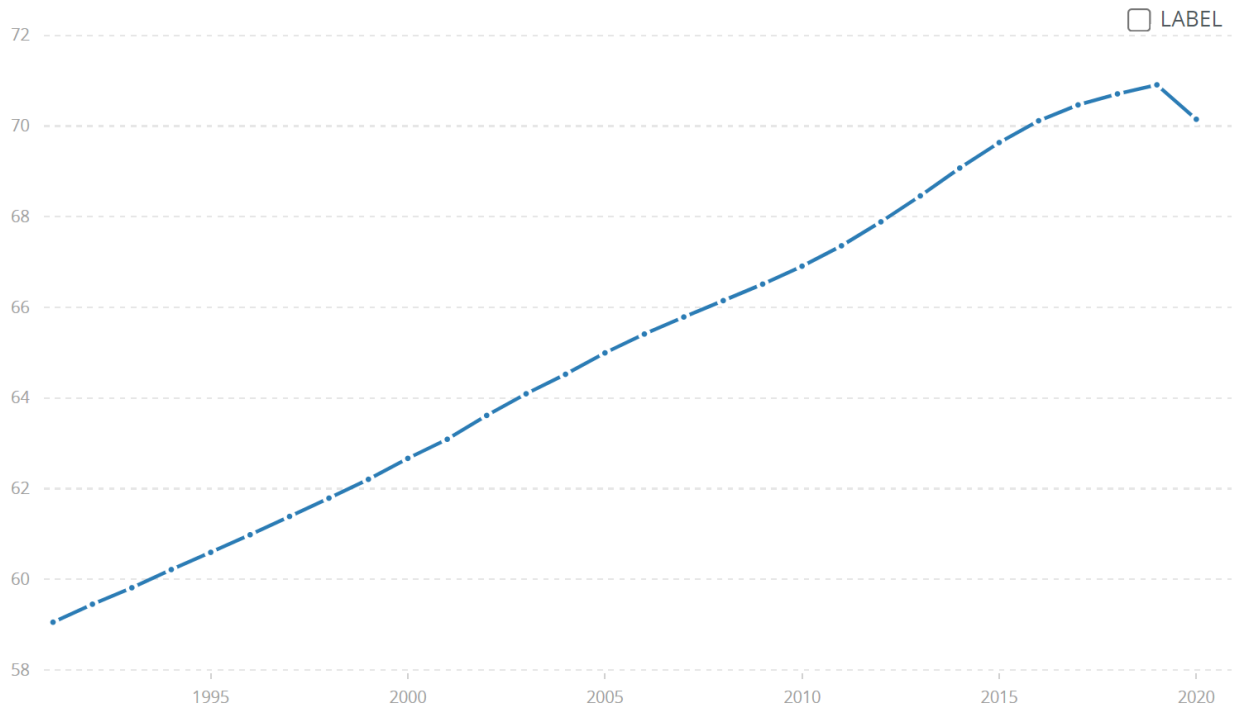
A key leader of the nonaligned movement during the Cold War, India is no stranger to charting its own course. Increasingly, India positions itself as the leader of the Global South, calling for renewed attention to debt relief, health equity, and climate justice as the world’s dominant powers focus on security crises like the Russia-Ukraine War (Baru). India’s foreign policy initiatives and economic policies, though often resulting in mixed success, are admirable for their pursuit of equity. India bursts with optimism in an increasingly pessimistic world.

Appendix: Indian Political Economy, post-1991

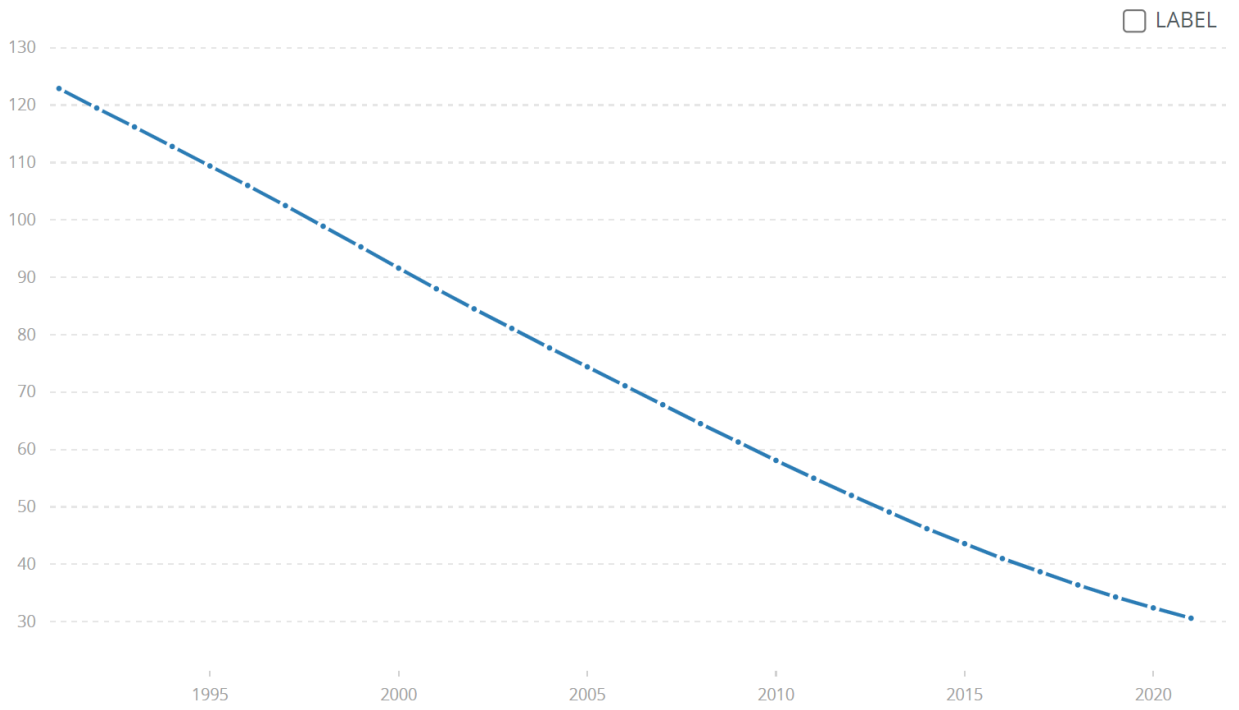
In 1991, India embarked on systematic economic liberalization, a break from the import controls, tariffs, and export subsidies that had prevailed since even before independence. Protectionism enabled self-sufficiency but hampered growth due to high costs, low quality, and inferior technology. India began moving toward liberalization in the 1980s–what some academics termed "liberalization by stealth" due to strong ideological opposition–but economic growth was often unsustainable, financed by borrowing (Panagariya). Any discussion of modern reforms must be situated in the post-1991 economic system.



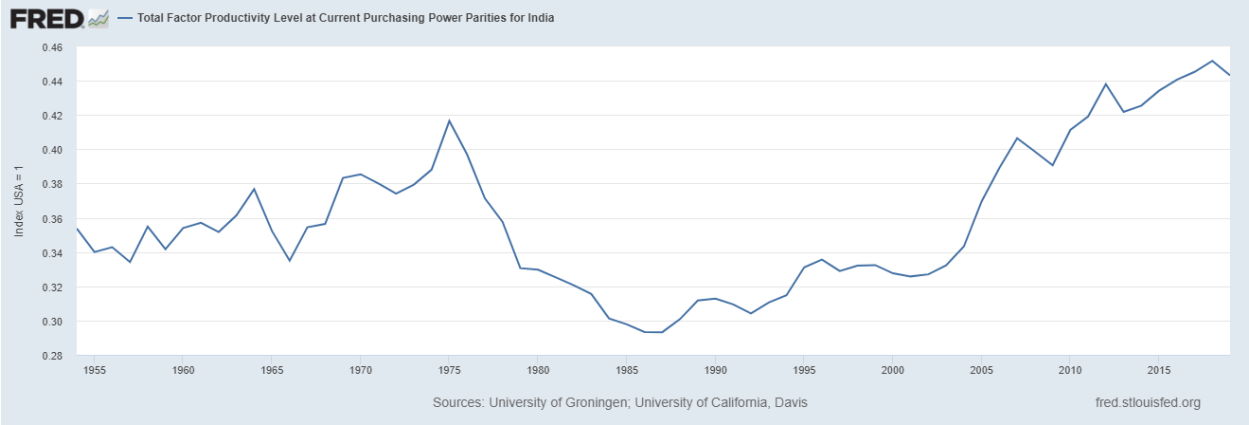
(Real) GDP per capita, PPP adjusted, the accepted measure for living standards, grew by roughly 488% between 1991 and 2021. World Bank ID: NY.GDP.PCAP.PP.CD



Life expectancy increased by 11 years between 1991 and 2020 (no 2021 data available). World Bank ID: SP.DYN.LE00.IN



The under-5 child mortality rate decreased from 12.3% in 1991 to 3.1% in 2021. World Bank ID: SH.DYN.MORT.



Total Factor Productivity measures how efficiently inputs are utilized; it is the key driver of economic growth. In 1991, productivity was roughly 69% of 2017 levels; by 2019, it had grown by 2% from 2017. FRED ID: RTFPNAINA632NRUG

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