Essays From *Ideas and Institutions*

Technology Policy

Anirudh Burman, Suyash Rai
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Carnegie Endowment for International Peace
Publications Department
1779 Massachusetts Avenue NW
Washington, D.C. 20036
P: +1 202 483 7600
F: +1 202 483 1840
CarnegieEndowment.org

Carnegie India
Unit C-4, C-5 & C-6, Edenpark,
Shaheed Jeet Singh Marg
New Delhi – 110016, India
P: +911 4008687
CarnegieIndia.org

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Contents

Introduction
Anirudh Burman

ESSAY 1
The Economics of Data Businesses
Anirudh Burman

ESSAY 2
Fintech and Public Sector Banks in India
Suyash Rai

ESSAY 3
A Tale of Two Payment Systems
Suyash Rai

ESSAY 4
The Complicated Story of Digital Financial Inclusion in India
Suyash Rai

ESSAY 5
ChatGPT, Intellectual Property, and Economic Development
Anirudh Burman
Introduction

Anirudh Burman

Technological changes both drive and emanate from economic development. This collection of essays explores the intersection of digital innovation and policy and market dynamics. It discusses the Indian state’s approach towards achieving welfare goals by leveraging technology, and how the development of at-scale technology has been used to meet financial inclusion objectives. While one set of essays in this collection tries to understand the nature and consequences of technological changes that are underway, another set of essays analyzes the larger political economy of the deployment of technology for governance. From data business economics to the deployment of a Unified Payment Interface (UPI), this compendium reveals how technology shapes, and is influenced by, economic and regulatory environments.

The essay titled “The Economics of Data Businesses” explores the underlying business models of data businesses and seeks to clarify its key features by highlighting the distinction between data-enabled and data-enhanced companies. It delves into the challenges of monetizing data and balancing infrastructure costs with innovation. In doing so, it tries to explain the business model of a successful data business that has a natural tendency towards scale.

The next essay looks at the adoption of technology by public sector banks in India. Under directives from the government, India’s public sector banks are integrating with account aggregator platforms. This has enabled secure and convenient access to customers’ financial information to other financial firms. This essay disaggregates the challenges and opportunities of this aspect of digital banking by assessing the impact of account aggregators as an efficiency enhancing tool in the context of the specific constraints faced by public sector banks. It also contextualises the use of tools like account aggregators in the face of the need for comprehensive reforms including privatization.

“A Tale of Two Payment Systems” compares India’s UPI and Brazil’s Pix. Both payment systems have seen remarkable growth in user base and transaction volume. The essay provides a comparative assessment of the successes of each system and the governance framework
within which these were achieved. It describes the different approaches taken up by both
governments to promote these tools—one being more coercive and the other more market-
driven. The experiences of India and Brazil offer lessons on policy measures in promoting
digital payments.

A closely related essay analyses the use of technology for financial inclusion in India over the
past decade. Titled “The Complicated Story of Financial Inclusion as a Success for Digital
Transformation in India,” the next essay in this compendium places India’s achievements in
a global context and challenges the perception of India’s success by comparing it to other
countries. It critically evaluates the role of government initiatives in enhancing financial
access and points to the significant degree of account inactivity as a metric of assessing the
claim of rapid increase in inclusion. The essay further highlights aspects of India’s digital
transformation that can be emulated, while cautioning against the coercive elements of
policy implementation.

The final essay, titled “ChatGPT, Intellectual Property, and Economic Development,”
addresses the conflict between intellectual property and AI from the perspective of India’s
economic opportunities. There are many possible legal and economic outcomes of copyright
infringement cases that could affect the potential benefits of generative AI in India. The essay
argues that the enforcement of copyright laws against generative AI products can have a
significant impact on economies like India where businesses primarily use existing generative
AI models. Building local and vernacular AI products will be key to local value addition.

Together, these essays explore and critique technology’s impact on India’s economic
development. From data business models to the power of fintech, and from global strides in
financial inclusion to the legal challenges in AI, this compendium invites readers to explore
the interplay between technology, policy, and markets.
The largest companies in the world today are data companies, and yet, the underlying economic utility of data for a data business is not understood well. Understanding the economic logic of data businesses proves difficult due to conceptual and semantic difficulties. What is a “data” business when all businesses are increasingly making use of data? Is there a fundamental difference in the underlying economic logic of a company like Google as a data-first business and say, McDonald’s, that uses data to enhance its business?

Nguyen and Paczos provide a helpful starting point by differentiating between data-enabled businesses and data-enhanced businesses. Data-enabled businesses primarily sell new data products and sell or license data. Data-enhanced businesses use data for improving internal processes, products, and services. For the latter, as Farboodi and Veldkamp argue, data “helps firms to choose better production techniques.” However, it is the former that essentially build up their core business by finding ways to monetize data. A more specific nomenclature for companies of this category is Data-As-A-Service or DaaS. Such companies either build their businesses on collecting and monetizing data, or provide ancillary services like data management but not infrastructural services like data storage. Essentially, data is the core product for these businesses.

The underlying business proposition for DaaS companies is to find competitive business cases that monetize data and develop the relevant data products. To do this, data must first be collected, aggregated, analyzed, and arranged into useful datasets before it can be monetized. In addition, building the data infrastructure is an initial fixed cost for most DaaS companies, and is usually “the most laborious and expensive part of building data infrastructure.”
The implication of this is that once the necessary infrastructure is built and the data acquired, other variable costs are low. However, tech entrepreneur and investor Thomas Abraham disagrees: “Obsolescence, maintenance and customization all impose recurring costs for both vendors and customers,” and data becomes obsolete much faster than software. This is because the reliability and accuracy of data decreases over time. Some underlying properties of data that make it monetizable are therefore critical to the organization of DaaS businesses.

Hal Varian in his paper *Artificial Intelligence, Economics, and Industrial Organization* (2018) states three important characteristics of data for businesses. One, data is non-rivalrous in character. The same data can be collected by one person without affecting another person’s ability to collect it. For businesses, this implies that product differentiation essentially takes place on the quality, veracity, and scope of information that the data provides. Nguyen and Paczos burnish this by stating that the utility of data depends on specific characteristics like linkable-ness, accessibility, timeliness, and representativeness. It also means, as Thomas Abraham points out, that while data may be non-rivalrous, datasets are not. Leo Polovets (2015) substantiates the argument about the rivalry of datasets. He points to the practice of companies often making their non-core software but not their datasets.

Second, Varian argues that like most other products, the use of machine learning in data first exhibits increasing returns to scale, before plateauing and exhibiting decreasing returns to scale. The predictive value of data has an upper limit of 100 percent! However, as Li et. al. (2018) point out, unlike many other intangible products, “... the aggregation and recombination of data can create new value ... through ways such as data fusion and/or a creation of new data-driven business models.”

Third, Varian challenges the notion that data markets are characterized by network effects. He argues that very few digital platforms exhibit true network effects, and that most successful ones in fact exhibit what the economist Kenneth Arrow described as the benefits of learning by doing.

The most incisive expositions of data businesses that tie their economic characteristics together are provided by Thomas Abraham and Safegraph CEO Auren Hauffman, both of whom are entrepreneurs and investors. According to them, building a data business is slow at first because all data products need a minimum scale or a “minimum viable corpus”. However, building the data product itself is a significant asset since it can be built once and sold repeatedly.

Once the product is built, the rate of acceleration increases over time and the cost of acquiring new clients decreases along with the marginal cost of acquiring new data. This in turn has a positive knock-on effect of making the data product more valuable, since the product usage increases also creates a positive feedback loop for data collection. As new clients and customers use the product, new avenues for data collection open up. This creates room for new opportunities for linking different datasets together and for expanding the scope of product offerings, thereby making the product more valuable. Going through the various stages of this process itself creates a learning curve that is hard for outsiders to replicate.
Both Abraham and Hauffman state that at some stage in this process, a successful data product becomes essential to one or more user industries, leading to market dominance. Successful DaaS firms also focus on gaining market share through either of the two techniques—lowering prices or acquiring competitors. The latter is easier for DaaS companies because they are essentially just buying up existing customer contracts, compared to software companies who have to worry about integration. These strategies allow DaaS companies to reduce prices further and become more dominant. This makes successful DaaS companies rare but very hard to displace. Since fixed costs remain similar for building the same dataset, it is hard to compete by offering lower prices.

A lot of this literature is based on experiential and qualitative evidence and needs to be tested empirically. However, this description of the economics of data businesses poses many questions for policy makers. One, what should open-data policies focus on, given that the most significant barrier to entry is not the availability of raw data but the learning curve involved in creating monetizable data products? Two, what are the best anti-trust strategies for policymakers to adopt, given that the basic economic logic of DaaS businesses leads to domination by one or two entities? Do existing notions of market dominance need to be reexamined for DaaS businesses? Three, should policy makers continue to behave as if data is non-rivalrous ‘oil’ rather than to focus on the monetizable characteristics of data?
On July 7, Finance Minister Nirmala Sitharaman instructed all public sector banks to onboard the account aggregator platform. Once implemented, this would mean that the banking transaction information for the consumers of public sector banks would become available, subject to consent, to any other financial firm in the system. Even today, the accountholders are free to download and share their financial information, but this process is cumbersome and relatively easy to tamper with. Account aggregators can make this much more secure and convenient. Brought together in one place, based on the consumer’s consent, this information could become useful for underwriting loans and insurance policies. It can also make it convenient for consumers to manage their financial lives by giving them one place to access all their financial information.

While it is important to consider the long-term implications of account aggregator framework for the financial system and for the economy, in this essay, we focus on the potential impact on public sector banks, which will now make their financial information available, irrespective of their size and market share. Once these banks make this information available through the account aggregators, any financial information user in the system will be able to use the information to provide financial services to the consumers of these banks.

In a way, this can be seen as a loss of advantage. Public sector banks have built up transaction histories of their consumers, some of them going back several years. This information is valuable for understanding the consumers, something for which they incurred costs. While the consumers will be empowered, the public sector banks would lose some of the advantage that came from having this information. For each financial institution, it is a matter of judgement whether joining this system is in its interest. The institutions that use this access to financial information better than others would gain from this framework.
Two facts are worth considering while analyzing the potential impact on public sector banks—the background condition of poor growth in public sector banks’ credit book and the challenges that the public sector banks face in making the most of new technologies.

First, the government’s instruction to the public sector banks to onboard the account aggregator platform comes against the backdrop of several years of poor credit growth in these banks. Between 2014–15 and 2021–22, the total credit by public sector banks saw no growth at all in real terms. In spite of trillions of rupees of capital infusion in public sector banks, the growth rate in credit has been about the same as the inflation rate during this period. In the same period, the average growth in private sector banks’ total credit, net of inflation, was about 13.1 percent per year.

Because of a variety of reasons, public sector banks have not succeeded in growing their credit books. Now, when they will be forced to share the financial information with others, they will lose another source of advantage. Among the categories of loans given by public sector banks, only personal loans saw a significant increase in recent years. This is also the category in which loan underwriting can benefit a lot from intelligence generated by transactional data.

Second, as the advent of technology-driven banking has been changing the role of human resources in the field, the public sector banks have not been able to make the most of this shift. Functions earlier performed at branches are now performed at ATMs or are completely online. Functions earlier performed by human beings are now automated. With the growth in business, banks do hire more personnel, but the profiles of employees and their skillsets are different. As technology has started replacing humans for some of the functions, private sector banks have been quite agile in restructuring their human resource strategy. However, public sector banks have not enjoyed such flexibility and have been losing competitiveness in the process.

In 1999-2000, the share of clerks and subordinates in the total number of employees of public sector banks was 75 percent, and that for private sector banks was 72 percent (the other employees were categorized as officers). By 2019–2000, the same, for public sector banks, had shrunk to 50 percent, but for private sector banks, they comprised only 6.5 percent. As anyone who has dealt with private banks knows, they hardly have any clerical or subordinate personnel on their rolls. So, even as they have deployed technology, the cost-saving advantage for public sector banks has not been as much as that for the private banks.

With the expected rise of fintech, the public sector banks will face even more challenges on both these fronts. They will find more competition in the credit business, with many of their competitors using the financial information of their consumers for underwriting loans and providing other financial services. Further, as the role of technology grows, the lack of flexibility in these banks might incapacitate them even more. While it is too early to predict the long-run impact of fintech on banks, there are scenarios in which banks may face
significant disruption to their business. The Bank for International Settlement has presented plausible scenarios in which banks would either be relegated to playing second fiddles to fintech firms that would own the customer relationships, or be completely disintermediated as the functions previously performed by banks would be performed by fintech firms. A key force in the actualization of these potentialities is the unbundling of banking. Payments have already been substantially unbundled, with independent fintech firms debiting and crediting bank accounts through the unified payment interface. Loans underwritten based on the banks’ financial information would progressively take the credit business away from banks. The disruptions may not happen suddenly, but as the experience of the last few years of negligible credit growth shows, over time, the public sector banks may lose ground.

In and of itself, the reduction in the role of public sector banks is not a cause for worry. But since they still hold more than 60 percent of the total deposits with scheduled commercial banks, the government needs a strategy for them.

So far, the government has deployed three strategies to improve the performance of public sector banks: recapitalization, reform, and restructuring. Since 2015, the union government has pumped in more than three trillion rupees to recapitalize public sector banks through budgetary allocation and recapitalization bonds. This capital was required to absorb losses arising from high levels of non-performing loans. The government has also tried to implement various reforms to improve the performance of public sector banks. This has been done through annual reform packages under the title of EASE (Enhanced Access and Service Excellence). The latest of these was announced in June this year. Certain governance and management reforms have also been implemented occasionally. Finally, government also restructured public sector banks by merging some of them. Based on an announcement in 2019, ten of the public sector banks were consolidated into four banks.

These strategies have yielded mixed results. Credit growth has not picked up, and public sector banks have continued to lose ground. The share of public sector banks in the total outstanding credit of scheduled commercial banks fell from 73.3 percent in March 2014 to 54.9 percent in March 2022. To be sure, the lack of credit growth in these years is not just about the competitiveness of these banks. A major reason was the clean-up that was necessary after years of aggressive lending. However, even after the clean-up of their balance sheets, credit growth has remained tepid.

The government should consider enhancing the set of strategies with respect to the public sector banks. A key missing strategy is resolution. Under the present legal framework, it is very difficult for the government to use resolution tools for failing public sector banks. The most common tool of resolution—merger with another bank through a competitive bidding process—is likely to face legal hurdles. A legal reform, which amends the bank nationalization laws and also creates a legal framework for the resolution of failing banks, is required to enable this option.
Another strategy is to privatize some of the public sector banks to test the process, and then to implement the process for more and more public sector banks. In Budget 2021–22, the finance minister did announce the intention to privatize two of the banks, but no action has been taken yet.

The coexistence of public sector banks with the more agile private sector ones is challenging enough. Now with the advent of fintech and the unbundling of banking, the challenges are only likely to increase. Continuing with the strategies of recapitalization, reform and/or restructuring may not suffice. The government will need to develop a more comprehensive set of strategies to deal with banks that are not able to compete in the context of the rise of fintech.
ESSAY 3

A Tale of Two Payment Systems

Suyash Rai | September 13, 2022

Arthur C. Clarke once observed that any sufficiently advanced technology is indistinguishable from magic. While the world of modern technology is full of things that appear conjured by a spell, the experience of making a payment anywhere in the world in an instant is particularly magical. But the systems that enable this magical experience are quite prosaic and complex. In recent years, two systems that have stood out for their success are from India and Brazil.

Unified payment interface (UPI) is an instant payment platform in India. It was made operational in April 2016. In July 2022, it settled about 6.3 billion transactions, with the aggregate transaction value of $132 billion. UPI is reported to have 260 million users, which is a little less than 20 percent of the population. The average user transacts about 24 times a month.

Pix is an instant payment platform in Brazil. Brazil’s central bank Banco Central do Brazil created Pix. In July 2022, more than 2 billion transactions with the aggregate transaction value of about $181 billion were settled through it. It had 132 million users, including more than 122 million natural persons. So, the number of users is more than half of the population of Brazil, and the average user did about fifteen transactions a month. The platform was launched in November 2020, and this scale has been achieved in twenty-one months.
Comparative Successes

Both systems are remarkable successes. They seem to have improved the efficiency and ease of usage for digital payments. Since digital payment is one of the foundations of the modern digital economy, the benefits of such innovations go beyond the immediate efficiency improvements. Many innovative business models can be built because such instant, low-cost payment systems are available.

While both are successes, Pix has done better in terms of usage penetration and the volume and value of transactions. Brazil’s population is less than a sixth of India’s, but the number of users on Pix is about half of that on UPI. While the transactions per user are more for UPI, the total number of transactions on the platform are more for Pix if you scale for population. Also, the transaction value as percentage of GDP is higher for Pix. In 2021, India’s GDP was about double than that of Brazil in nominal terms and almost triple in purchasing power parity terms, but the aggregate transaction value for UPI is much smaller than that for Pix. More importantly, Pix has scaled faster than UPI. While UPI has achieved its scale in more than six years, Pix has done so in less than two years.

Similarities Between Pix and UPI

Both systems reduce the time for initiating the transaction by allowing users to simply enter a key to address the payee, instead of entering the details of bank account number, bank routing number, etc. This is possible because the key is linked to a directory where information is stored. This protects the privacy of the recipients while also drastically reducing the transaction time. By enabling direct transfer from one account to another, both systems have reduced the number of intermediaries, thereby lowering the acceptance cost for payments. In both these systems, information and funds flow together. So, clearing and settlement happen at the same time, in an instant. Both systems enable their users to send or receive payment transfers at any time.

Both the systems allow open access, albeit not in the same way. UPI allows separation of the customer interface from account holding. So, an account with a bank can be transacted through third-party applications like Google Pay. This unbundling is a major innovation that has allowed UPI to grow rapidly. Pix allows non-bank accounts to directly participate in the system based on access rules, which are risk-based and publicly disclosed. Although Pix initially did not allow third-party applications to initiate transactions, under its Phase 3, it has allowed third parties to initiate payment transactions based on instruction from a user whose account is held with another financial institution.
Both Pix and UPI are initiatives under broader central bank-led strategies to open up the financial system. In India, UPI and account aggregators are among the initiatives being implemented under this strategy. Brazil is also actively pursuing various initiatives to break barriers in the financial system. While Pix is its flagship open payments initiative, it is also pursuing open banking. Brazil’s central bank governor Roberto Campos Neto stated that the Pix system could usher in the end of credit card use.\(^{25}\)

**Differences Between Pix and UPI**

The histories and design choices of Pix and UPI also diverge in certain ways. The main aspect of divergence is in the use of government or central bank intervention to promote digital payments.

Creative destruction sometimes requires inducements from the policymakers as the incumbents in a market may have little incentive to pursue disruptive innovation. The emergence of instant payment platforms like UPI and Pix as competitors to traditional payment platforms like credit cards and prepaid wallets can be good for the system. However, since state power is coercive in nature, the inducements need to be precisely directed toward solving problems that require state intervention.

In Brazil, the central bank has focused on designing Pix as an efficient and secure platform and making it easily available as an alternative to traditional payment platforms. Neither the government nor the central bank has used much coercion to promote Pix in particular or digital payments in general. Although the central bank did prohibit charging customers directly, merchants are charged fees. There is no cap on the fees, and it is left to the market to determine the fees. Although the central bank has mandated all large financial institutions (more than 500,000 customers) to offer Pix as an option, there is no mandate on businesses to accept it. Still, the power of the innovation is such that there is widespread adoption.

In India, the government has banned any fees to be charged from customers or merchants for UPI. The government has also made it mandatory for businesses with more than Rs. 500 million (about $6 million) annual sales to accept UPI payment, with a penalty to be enforced by the joint commissioner of income tax for each day of non-compliance.\(^{26}\) This was done in 2019 through an amendment to the Payment and Settlement Systems Act that was included in the finance bill, which was a money bill. The amendment did not seem to pertain to the matters listed in Article 110 of the Constitution, which defines the scope of money bills. This suggests that the government was willing to take a legal risk to impose these restrictions. Further, the government and its surrogates have often defended the demonetization decision of November 2016, in which about 86 percent of the currency in circulation was cancelled, by showing the increase in digital payments since the decision was taken.\(^{27}\)
The story of Pix comes close to serving as a counterfactual for what might have happened with UPI without the use of shock (demonetization) and coercion (banning fees and mandating businesses). Pix has achieved as much, and perhaps more, success than UPI in less than a third of the time. If an innovation constitutes a considerable improvement, it can grow without such interventions. Considering the creditable innovation and system-building that have gone into creating UPI, the innovation could have scaled on its own accord.

The UPI-related restrictions and mandates also have other consequences. They impede further innovation in the payments market because the commercial incentives to invest have been considerably weakened. They also concentrate market power in the hands of the National Payments Corporation of India (NPCI), which runs the UPI platform. The policymakers seem to be assuming that the NPCI will always do a good job and that there is no need to promote further competition in the sector. Experience shows that such market power creates problems sooner or later. In the long run, a dominant player has little incentive to provide effective grievance redressal, pursue further fundamental innovations, invest in high performance systems, give fair terms to stakeholders, and so on.

The economist Ajay Shah once stated the Occam’s razor of public policy as: “When two alternative tools yield the same outcome, we should prefer the one which uses the least coercion.”

This is a useful principle to apply when a policy decision is being made. It can also be applied to reflect on the decision after it has been made—to understand whether a less coercive path could have been chosen. It seems clear that for all the talk about the necessity of shock and coercion for promoting digital payments, the example of Pix has shown that perhaps a path with much less coercion could also have worked. India should pay heed to this example and take steps to dilute the restrictions and mandates.
There seems to be an emerging consensus that India is undergoing a rapid digital transformation that is delivering impressive improvements in the working of the government and the economy with the help of a digital identity system, a fast payment system, and various systems for accessing and exchanging data and information in domains ranging from health to credit. This is working up to be a remarkable story. However, it often happens that we go overboard in telling such stories. Certain nuances and details are missed out. In this essay, we contextualize India’s achievement in one domain—financial inclusion—to highlight some of the nuances that are important for interpreting the headline numbers and to understand what is worth learning from India’s experience and what is not.

It has been claimed that India has accelerated progress on financial inclusion to such an extent that it has achieved in less than a decade what would otherwise have taken half a century. The headline numbers support this claim. According to the World Bank’s Global Findex Database (GFD), back in 2011, only 35 percent of those above fifteen years of age in India had accounts with a bank, other financial institution, or mobile money service provider. By 2014, this had increased to 53 percent and to 81 percent in 2017. In 2021, this was 78 percent. Based on this, some have argued that India’s approach to financial inclusion is worth emulating.
To Understand, We Must Compare

This achievement needs to be placed in a comparative perspective. Table 1 covers seventy middle-income countries for which data on this measure is available in the GFD. The table shows that, in the decade between 2011 and 2021, most countries have seen impressive progress in opening accounts. The achievement, or lack thereof, should be seen in the context of the country’s starting point. Arguably, Mongolia going from 78 percent to 98 percent within a decade is no less impressive than the Kyrgyz Republic going from 4 percent to 45 percent during the same period or Kenya going from 42 percent to 79 percent.

Many of the countries started with a relatively low base (that is, less than a quarter of the population had accounts in 2011) and made impressive progress. In total, there are twenty such countries, including Armenia, Azerbaijan, Bangladesh, Cambodia, Cameroon, the Republic of Congo, Egypt, El Salvador, Gabon, Indonesia, the Kyrgyz Republic, Lesotho, Moldova, Paraguay, Peru, Senegal, Tajikistan, Tanzania, Vietnam, and Zambia. Then there are countries that started with a high base (that is, more than half of the population had accounts in 2011) and achieved impressive improvements. In total, there are twelve such countries, including Bosnia and Herzegovina, Brazil, Bulgaria, China, Iran, Malaysia, Mongolia, Serbia, South Africa, Sri Lanka, Thailand, and Turkey. There are also those countries that started with a moderate base (that is, between a quarter and half of the population had accounts in 2011) and achieved huge improvements. In total, there are sixteen such countries, including Argentina, Bolivia, Botswana, Colombia, Ecuador, Georgia, Ghana, India, Kazakhstan, Kenya, Mexico, Nepal, the Philippines, Romania, the Russian Federation, and Ukraine.

Put together, these add up to forty-eight countries, or about 70 percent of the middle-income countries covered by the database. Most of the remaining twenty-two countries have also seen significant improvements on this measure. Only two countries, Lebanon and Jamaica, seem to have made no progress on this measure.

As the table shows, on this measure, the median for the middle-income countries almost doubled between 2011 and 2021. The unweighted mean also registered a similar growth. Since it more than doubled the percentage of the population with accounts, it might seem like India did better than the median for middle-income countries. However, it is important to consider how many of the accounts are active and how many people are using them for fulfilling their financial needs.
<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage of those above 15 years of age with an account with a bank, other financial institution, or mobile money service</th>
<th>Percentage of inactive accounts (2021)</th>
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The GFD reports that in 2021, 35 percent of those who had reported having an account in India had inactive accounts (that is, they had neither made a deposit into nor a withdrawal from their account during the year, either in cash or digitally). This was 33 percent and 38 percent in 2014 and 2017, respectively. No other country had such a high percentage of inactive accounts. The median for middle-income countries was only 6.5 percent, and the mean (unweighted) was 8.1 percent.

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<tr>
<td>Mean (unweighted)</td>
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<tr>
<td>Median</td>
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Source: Global Findex Database, World Bank
If we exclude the inactive accounts, the number of those with accounts in India would be just over half of the population. This is less than the median for the same measure among middle-income countries.

**Regulatory and Technological Innovations Driving Inclusion**

The table shows that in the last decade, progress on account opening has accelerated sharply in most countries. Countries with very different starting points, located all over the world, with considerable variety in political regimes, economic structures, and demographic profiles, have been able to achieve significant progress on this front.

Technological advances have made this possible in such diverse contexts. Among others, the improvements in and spread of internet connectivity, mobile telephony, handheld point of sale devices, core banking, authentication, and encryption technologies have changed the technological context in which accounts are opened and operated, making it less expensive to open and service bank accounts. This is one side of the story. The other is that the countries have adapted their institutional frameworks to make the development and adoption of technology possible. Each country has done so in its own way. There are country-specific institutional paths that were taken because of the unique context in each country. How should we describe India’s journey?

First, India has seen several regulatory adaptations to enable the use of technological advances and new business models for financial inclusion. For instance, a regulatory path was cleared when, in 2006, the banking regulator allowed banks to appoint agents who could provide routine banking services on their behalf, and this model evolved over time. For the routine transactions, the costs in bank branches were much higher than those made possible by the agents. Agents with handheld devices could do many routine transactions that bankers in branches did but at a fraction of the cost and at times and places convenient for the customers. The number of agent-based banking outlets increased from 34,621 in March 2010 to 3,257,261 in December 2021. Without this agent-based model, some of the advantages of the technological advances would have been slow to accrue to financial inclusion. Similar regulatory innovations were made in many other countries.

Second, India has developed certain digital systems that help overcome some of the barriers to financial inclusion. Due to many people not having the individual identification documents required for account opening (many had only family-based documents, such as ration cards) and a rather simplistic and excessively prescriptive application of know your customer rules, the development of Aadhaar, a digital identity system, played an important role in easing the process of account opening in India.

Third, the development of new services, which combined regulatory innovation, technological advances, and business process changes, has helped financial inclusion. A prominent example is the development of the Unified Payments Interface (UPI), India’s
flagship fast payment system. It has improved the experience of digital payments and thereby enhanced the value proposition of an account. UPI required as many technological innovations as it did regulatory innovations—allowing the transaction of a payment by an account through a third-party application—and business process innovations—for example, the use of a key linked to a directory to address the payee. By 2021, more than sixty jurisdictions had launched such fast payment systems, with a variety of different regulatory, technological, and business process designs. This suggests that the story of fast payments is also a global one, albeit with local variations.

It is not easy to build and implement such systems at India’s scale. In most of these stories of innovation and adaptation, there are many stories of visionary leadership, exemplary volunteer effort, and employees going above and beyond, in addition to organizations simply doing their job well. However, since most countries have seen impressive improvements in financial inclusion, it is likely that if we look closely at other countries, we will see such stories that contributed to their achievements on financial inclusion.

An Uneasy Mix of Innovation and Coercion

A key aspect of the story of financial inclusion in India is the uneasy mix of the kinds of creditable innovations discussed above with gratuitous acts of coercion by the government. These acts have come in various forms.

First, many accounts have been opened through top-down campaigns enforced by the government. The biggest of these is the Pradhan Mantri Jan Dhan Yojana (PMJDY). Since these campaigns were implemented mostly by government-owned banks, with the help of bank agents, handheld devices, and Aadhaar, it was relatively easy to deliver many account openings. It soon became clear that many accounts were inactive—a year after the launch of the PMJDY, almost half of the accounts had zero balance. Once the focus shifted from opening accounts to showing them as active, there were reports that in some places bankers were depositing Re. 1 to show the accounts as active. All these are signs of responding to the incentives set by the political leadership. However, delivering quality of service is a different matter. Just as looking at the amount spent is inadequate to understand the effectiveness of the expenditure, looking at the number of accounts is inadequate for understanding the effectiveness of the financial inclusion measures. Finance is subtle—it requires understanding the needs of consumers and providing them services that meet those needs efficiently. Top-down campaigns can only go so far in improving financial inclusion. While the average balances in these accounts have increased over time, the problem of inactive accounts persists. Since there are costs involved in opening and maintaining accounts, each inactive account represents a waste of resources.

Second, when UPI was launched, it was a leap forward for fast payments in India, but the government used coercive measures to promote its usage without offering justification for why these were necessary. The government has banned charging any fees to customers or
merchants for UPI transactions. It has also made it mandatory for businesses with more than Rs. 500 million (about $6 million) in annual sales to accept UPI payments at all their outlets, with a penalty to be enforced by the joint commissioner of income tax for each day of non-compliance. The economic rationale for such coercion was never given. UPI had been growing well even before these measures were announced. Such restrictions and mandates impede further innovation in the payments market because the commercial incentives for investing in totally different systems have been considerably weakened. Further, as the experience of similar systems in other countries shows, such coercion is not necessary. Brazil’s Pix payment system has done better than UPI in less time without the use of comparable coercive measures.\(^\text{38}\)

Third, while Aadhaar was developed as an enabler, it later became mandatory to link Aadhaar with bank accounts. In 2017, the government issued a notification to mandate the linkage of all bank accounts with Aadhaar.\(^\text{39}\) In 2018, this decision was struck down by the Supreme Court, which found that it did “not meet the test of proportionality and, therefore, violates the right to privacy of a person which extends to banking details.”\(^\text{40}\) However, recent reports suggest that the judgment is not being properly implemented in bank branches, where Aadhaar continues to be mandatory de facto.\(^\text{41}\)

Finally, a subtle aspect of coercion is that central planning has led to specific technological and business model choices that preclude the emergence of other choices. When accounts are opened through large-scale campaigns driven by the government, more gradual, business-driven approaches to financial inclusion may be crowded out. We have seen this in rural credit markets for decades, where heavy government intervention in directing and pricing credit made it difficult for a credit market to develop. Further, when only one national champion like the National Payment Corporation of India (NPCI) is entrusted with the fast payment system, it restricts competition in the sector, thereby impeding possibilities for future innovation.

The use of coercion must always come with a well-reasoned justification. The government must show, with plausible arguments, that without the use of such coercion, there would be a significant inefficiency in the system. Such intervention is typically justified based on some market failure, such as the existence of monopolies, information asymmetry, externalities, and so on. Market failures require subtle regulatory responses and not broad-brush coercion around business decisions, such as when to open an account, which service to provide, and whether to charge for the services.

An unnecessary paternalism has partly underwritten the scaling up of India’s digital systems. When we call it unnecessary, we mean this in the economic sense—it is hard to see the specific market failures that justify these coercive interventions by the government. However, in another sense, these interventions may have been necessary. As the political rhetoric around India’s digital transformation shows, the government is keen to take credit for what has been achieved. To do so, it must show some direct causal linkage between its actions and the successes of digital transformation. This would be hard to do if the government had
simply allowed these innovations to scale on their own. Politicians will do what they must to win elections, but even many experts in the private sector who helped build these digital systems have either remained silent about the use of coercion or actively supported it. In 2016, some even cheered the draconian decision to demonetize high-value currency notes, because the move was expected to boost digital transformation.

In summary, India’s performance on financial inclusion is creditable but not exceptional, and the achievements have resulted from a mix of useful innovations and unnecessary acts of coercion. The countries looking to learn from India should pick and choose the better aspects—regulatory adaptation, technological advances, business process innovation—and be wary of the other aspects of this story. Further, to realize the full benefits of digital transformation in India, our elites should consider eschewing their tendency to support the use of coercion and allow sound principles to inform the respective roles of the state and the markets. But will politics allow this?

Looking Forward

One possibility is that as India tries to take its digital transformation story global, it might need to revisit the principles. As India’s digital transformation story was told and retold in this year of its G20 presidency, the language broadened and became more normative. In the recently issued outcome document, the G20’s Digital Economy Working Group (DEWG) has welcomed a “G20 Framework for Systems of Digital Public Infrastructure (DPI)” as a “voluntary and suggested framework for the development, deployment, and governance of DPI.”

The framework goes beyond technology to include governance to establish trust and vibrant and inclusive community participation to enable value creation. It suggests certain principles for developing and deploying DPIs, such as inclusivity, interoperability, collaboration with community actors at different stages to promote a culture of openness and collaboration, the development of user-centric solutions, a building block or modular architecture to accommodate changes or modifications without undue disruption, and so on. However, it does not suggest “open source” as a principle, perhaps because most of India’s own DPIs are not open source. It is possible that as India tries to take its digital transformation story global, it may need to promote better principles. But that will depend on the political economies of the respective funders and countries.
ChatGPT, Intellectual Property, and Economic Development

Anirudh Burman | September 20, 2023

In July this year, American stand-up comedian and author Sarah Silverman, along with others, filed copyright infringement suits against OpenAI and Meta. These cases, and others, allege that companies like OpenAI have been using publicly available online material that is copyrighted without requesting any permission, consent, or license from the authors and creators. The outcomes of these cases could very well shape the future of generative artificial intelligence (AI). As this essay speculates, this in turn has implications for how countries like India can benefit from products such as ChatGPT.

As of now, there have not been any definitive judgments in India or elsewhere on the issue of intellectual property and generative AI. However, it may be worthwhile to think through the implications that legal developments will have in shaping this market of generative AI products and the economic consequences for markets like India. In this essay, I pose questions exploring these issues.

What Is Generative AI?

The term generative AI is used for “any artificial intelligence tool that generates something new from existing data when prompts are given, like an image or text.” OpenAI’s ChatGPT, Google’s Bard, and Microsoft’s AI-powered Bing are some of the most prominent examples of generative AI products. Other products include image generators like Stable Diffusion, audio generators such as Resemble AI, and also code generators like Copilot. Indian enterprises have created generative AI products as well; some examples include KissanAI, Bharat GPT, and Jugalbandi.
Generative AI products have become extremely popular. ChatGPT, for example, had over 100 million users in less than three months of its introduction. Since then, OpenAI has also introduced a subscription-based version of ChatGPT. Many generative AI products are similarly available both for free and with additional features for subscribers. This subscription-based model is significant for the ensuing discussion.

But how is generative AI trained? Amazon Web Services’ website explains that “generative AI is powered by very large machine learning models that are pre-trained on vast amounts of data, commonly referred to as foundation models (FMs). A subset of FMs called large language models (LLMs) are trained on trillions of words across many natural-language tasks. These LLMs can understand, learn, and generate text that’s nearly indistinguishable from text produced by humans.”

According to one scholar at Georgetown University, the quality of the product is dependent on three things: the quality and quantity of data, algorithms, and computing power. The data used to train FMs and LLMs is becoming an increasing source of contention.

Generative AI and Intellectual Property Issues

First, a generative AI product uses large amounts of data to be trained. Second, it responds to a user’s input or prompt in a chat box to generate an output. Given this process, there are at least two potential sources of conflict over intellectual property rights (IPR) in a generative AI product.

1. Intellectual property issues over the training data.

2. Intellectual property issues over the generated output.

The second issue is already being discussed at various forums. The question in this case is: Does someone using a generative AI product to write a story or create art deserve a copyright over his or her creation?

Government agencies, international bodies, and professional associations have already released preliminary statements on these issues. In March this year, the U.S. Copyright Office published a statement to the effect that human authorship is necessary for any grant of copyrights. The World Intellectual Property Organization (WIPO) has also flagged these issues. The International Association for the Protection of Intellectual Property passed a resolution on the same lines as the U.S. Copyright Office, declaring that human intervention is necessary for the grant of a copyright.

While the second issue will continue to be discussed, in this essay, I focus on the implications of the first: are there IPR issues related to the data used to train the FMs that power generative AI products?
Sarah Silverman’s suits claim that there are. Her suits against OpenAI\textsuperscript{7} and Meta\textsuperscript{8} allege that the datasets on which ChatGPT and Llama were trained used her and her fellow plaintiffs’ copyrighted books without their consent. They allege that “shadow library” websites, such as Library Genesis, Z-Library, and Sci-Hub, were among the datasets used for training the FMs. They further add that “these shadow libraries are also flagrantly illegal.”

The suits also allege that because these generative AI products cannot function without the information extracted from the infringed copyrighted works, the FMs themselves are “infringing derivative works.” In addition, the suits claim that during the process of training, OpenAI and Meta removed the copyright management information, which includes the copyright notice, title, names of owners, and so on. Because of these violations, the suits claim that OpenAI and Meta can also not claim to have any copyright over the language models.

A similar suit was filed against Stability AI, which runs Stable Diffusion.\textsuperscript{9} The product generates images in response to text prompts. The suit alleges that to create its training dataset, Stability AI “scraped, and thereby copied over five billion images from websites as the Training Images used as training data. Stability did not seek consent from either the creators of the Training Images or the websites that hosted them.” Further, the suit alleges that “every output image from the system is derived exclusively from the latent images, which are copies of copyrighted images.”

**Implications for Generative AI Businesses**

There is therefore a set of interesting cases that could lead to extremely consequential outcomes for generative AI products. If we assume for a moment that the suits will be completely successful, that is, a hundred percent of the plaintiffs’ claims in each of these suits are decided in their favor, it will probably lead to the following outcomes and questions:

1. Generative AI product companies will have to either seek the required use permissions or licenses or/and pay royalties for every copyrighted or creative work they use for training FMs. How would this be managed? What are the contractual and financial costs this would impose on generative AI businesses?

2. In the absence of such permissions or licenses, they would not be able to use copyrighted works for training FMs. Would their datasets then be trained only on works in which no copyright subsists or has already expired?

3. Generative AI companies will not be able to remove copyright management information (under U.S. law, at least) from the training dataset or will have to create some mechanism to make sure this information is visible in the output. How will this be implemented in a manner that retains the current “chat box” nature of the products and therefore makes them easy to access?
4. On a related note, if generative AI products themselves are considered infringing works because they are trained on infringing data, would this lead to reduced commercial interest in creating the kinds of products available in the market today?

5. How would this impact the many companies that are building application-based products using the FMs built by OpenAI, Meta, and Google? If the underlying dataset is held to be copyright infringing, would this lead to significant negative impacts on such businesses?

While it is unlikely that these suits will be completely successful, they may be partially successful. Similar suits down the line may chip away to create more IP rights slowly; some elements of author and creator rights may be recognized gradually in disparate cases or laws. If the training methodology described in the suit is accurate, it will also be hard to argue that companies should be simply permitted to collect pirated books and copyrighted art from the internet and develop commercial products using them, including, as I mentioned earlier, subscription-based products.

At the same time, there is another alternative that should be discussed: Does IPR law need to change because of generative AI and the possibilities it creates? WIPO’s document referenced earlier frames these alternatives well:

(ii) If the use of the data subsisting in copyright works without authorization for machine learning is considered to constitute an infringement of copyright, what would be the impact on the development of AI and on the free flow of data to improve innovation in AI?

(iii) If the use of data subsisting in copyright works without authorization for machine learning is considered to constitute an infringement of copyright, should an explicit exception be made under copyright law or other relevant laws for the use of such data to train AI applications?

... 

(vi) Would any policy intervention be necessary to facilitate licensing if the unauthorized use of data subsisting in copyright works for machine learning is considered an infringement of copyright? Would the establishment of mandatory collective management societies facilitate this? Should remedies for infringement be limited to equitable remuneration?

While no clear answers have emerged yet, as is clear, the conflict between the existing ways of developing generative AI products and IPR will be important. Many commentators have, for example, talked about the impact these products will have on employment and the future of work. These take for granted the present design of generative AI products. If the enforcement of IPR laws mandates a change in how these products are designed, many such forecasting exercises will become entirely academic.
Generative AI, IPR, and Implications for India

NASSCOM’s recent report on generative AI in India states that the greatest amount of market activity related to generative AI in India is in the applications and services market. In other words, the sector reliant on using FMs created by other companies. It states that, in fact, there are no Indian FMs in existence yet. This could mean that, if copyright law is enforced in a manner that gives the authors and creators significant rights against generative AI companies and their FMs, a number of Indian companies would be significantly affected.

In addition, since most of the existing FMs have already scraped a significant portion of the information available on the internet, a lot of the value-add that FMs in India can offer is by creating more diverse and unique FMs, for example related to Indian vernacular languages, undigitized data, and so on. The process of developing these can potentially become problematic if we do not adequately consider the balance between IPR and innovation. An extreme focus on innovation would leave authors, creators, and existing knowledge repositories uncompensated and unrecognized, while an extreme focus on IPR would inhibit India’s ability to create genuine economic value and innovate.

This developing conflict between IPR and generative AI is still nascent but may have significant economic implications. In India, we must therefore initiate deliberations on this seriously to create a situation that leaves the gainers better off and no one else worse off.
About the Authors

**Anirudh Burman** is an associate research director and fellow at Carnegie India. He works on key issues relating to public institutions, public administration, the administrative and regulatory state, and state capacity. He has also worked extensively on financial regulation and regulatory governance.

**Suyash Rai** is a deputy director and fellow at Carnegie India. His research focuses on the political economy of economic reforms, and the performance of public institutions in India. His current research looks at the financial sector, the fiscal system, and the infrastructure sector.
Notes

6. Abraham Thomas, (see note 4).
7. Hal Varian, (see note 5).
11. Abraham Thomas, (see note 4).
12. Auren Hoffman, (see note 3).
15. Ibid.


57. Silverman v. OpenAI, (see note 43).


59. Andersen v. Stability AI Ltd., -3:23cv00201-, (N.D. Cal.)


For complete source notes, please read this compendium at CarnegieIndia.org.
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