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# Data Exchange Market Deep Dives

## In-Depth Exploration of Data Exchange Models and Initiatives in Brazil, India, Singapore, and the European Union

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# Summary

This deep dive report serves as the foundational research that informs the flagship report titled *The Role of Data Exchange in Financial Inclusion: Lessons from Leading Markets and Emerging Policy Solutions*. While the flagship report offers a high-level summary of findings and recommendations, this document delves into the granular details and extensive case studies from Brazil, India, Singapore, and the European Union to substantiate those conclusions.

The report focuses on reviewing experiences with new and alternative data sharing and exchange arrangements, moving beyond traditional credit reporting and bilateral data sharing to examine multilateral, government-led, market-led, and decentralized ecosystems. These ecosystems are aimed at broadening data access and usage in sectors where market failures could hinder economic welfare, innovation, and digital development.

The selected case studies from the European Union, Singapore, India, and Brazil were chosen for their diverse approaches to financial inclusion, data sharing, and protection policies. These markets offer unique insights and serve as archetypes for emerging and developing economies (EMDEs) looking to enhance financial inclusion through data exchange.

The report is structured into three main sections, each offering a comprehensive exploration of different dimensions of data exchange initiatives. The first section delves into the financial sector, analyzing how various frameworks have been implemented to enhance data sharing and improve financial inclusion. The second section extends the analysis to non-financial data exchanges, focusing on their potential to integrate with and support open finance. This part of the report explores how data exchange can be leveraged across different sectors to drive broader economic and digital development. Finally, the third section synthesizes the insights from these analyses, discussing the key outcomes of these initiatives, the critical factors that enable successful data exchange, and the emerging markets that are being shaped by these evolving data ecosystems.

# Contents

# 01 Introduction

This deep dive report describes the underlying research used to inform our flagship report *The Role of Data Exchange in Financial Inclusion: Lessons from Leading Markets and Emerging Policy Solutions*. While the flagship report provides a high-level overview of key findings and recommendations, this document presents granular details and extensive case studies primarily from Brazil, India, Singapore, and the European Union to support these conclusions.

**This report reviews the experience to date of specific examples of new and alternative data sharing and exchange arrangements.** We use the terms "data sharing" and "data exchange" somewhat interchangeably to refer to the ensemble of arrangements needed to capture, store, manage, access, analyze, share, or trade and exchange data artifacts. This report looks beyond legacy credit reporting and bureaus as well as the many bilateral data sharing arrangements firms use, and focuses on the multilateral, government-led, and decentralized data sharing ecosystems that aim to broaden data access and usage in domains where market failures may result in suboptimal outcomes in terms of economic welfare, innovation, and digital development.

## 1.1 RATIONALE FOR COUNTRY SELECTION

CFI considered over 10 markets as potential exemplars before focusing on four key markets: the European Union, Singapore, India, and Brazil. These markets were chosen based on a range of factors, including the need to represent diverse approaches, geographic regions, and political and economic contexts. Each of these markets serves as an archetype, offering unique perspectives on financial inclusion, financial market structures, and approaches to data sharing and protection policies.

These selected archetypes illustrate distinct strategies driven by specific, country-level objectives, such as countering market concentration in banking or fostering innovation. Their financial inclusion outcomes must be understood within the context of these objectives and the broader market environment. Despite their differences, these four markets provide valuable use cases, insights, and lessons for emerging and developing economies aiming to enhance financial inclusion through data sharing. Their varied experiences highlight the potential pathways and challenges that other markets may encounter as they develop their own data exchange frameworks.

**TABLE 1: PRIORITIZED "EXEMPLAR" MARKETS AND RATIONALES**

| COUNTRY | ARCHETYPE | RATIONALE FOR "EXEMPLAR" STATUS | RELEVANCE FOR EMERGING MARKETS AND DEVELOPING ECONOMIES (EMDEs) |
|---|---|---|---|
| European Union | Regulatory-driven | → Exemplar for consumer-centered data protection regulation with GDPR<br>→ Comprehensive approach to data and digital markets | → GDPR is emulated by many EMDEs<br>→ Insights from the creation and execution of data strategies<br>→ Approach to "open data spaces" for an open data economy |
| India | Technology-driven | → Example of state-led data governance<br>→ Focus on digital public infrastructure (DPI)<br>→ Regional influence in South Asia<br>→ Delayed adoption of data protection policies | → Learning opportunity on DPI-related data governance, including AgStack and ONDC<br>→ Learnings from data aggregators model<br>→ Socioeconomic similarities to other EMDEs |
| Brazil | Regulatory-driven, participatory | → Vibrant digital economy and emerging open finance ecosystem<br>→ Participatory approach and phased policy implementation<br>→ Regional influence in South America and peer influencer among BRICS | → Relevance for more resource-constrained public sectors<br>→ Relevance for markets aligning with GDPR<br>→ Emerging adoption of open data in non-finance sectors (e.g., healthcare, energy) |
| Singapore | Use-case driven, public-private partnerships (PPP) | → Exemplar in use-case driven approach, focused on innovation<br>→ Driven by PPPs<br>→ Voluntary data sharing initiatives<br>→ Regional influence in Southeast Asia | → Learning from PPP-driven approaches<br>→ Examine benefits of alternative approaches (e.g., voluntary vs. compulsory data sharing) |

## 1.2 STRUCTURE OF THE REPORT

The report is divided in three main sections:

1. A review of data exchange initiatives in the financial sector (chapter 2). This includes:
   - → The account aggregator framework in India
   - → The Open Finance model in Brazil
   - → The Payment Services Directive 2 in the EU
   - → The SGFinDex platform in Singapore

2. A review of non-financial data exchanges, with a focus on their opportunity to integrate with open finance (chapter 3). The experiences analyzed in the report include:
   - → Agri Stack in India, including state level programs (e.g., Krushak Odisha)
   - → The Open Network for Digital Commerce (ONDC) in India
   - → Common data spaces in the EU
   - → SGTraDex in Singapore (trade and logistics data exchange platform)
   - → Examples of firm and agricultural identifiers in the trade and agriculture sector

3. An analysis of key outcomes, enablers, and markets emerging from data exchange initiatives (Chapter 4). The final section of this report looks into the aggregate findings from the market deep dives, and it identifies a series of key outcomes associated with data exchange initiatives, the key enablers that make that possible, and markets emerging from data exchange.

# 02 Data Exchange Models in the Financial Sector: Deep Dives from Four Leading Markets

The next section details case studies from the four selected exemplar markets — India's account aggregator (AA) framework, the European Union's Second Payment Services Directive (PSD2), Singapore's SGFinDex, and Brazil's Open Finance model. By looking at these examples, we can draw conclusions about progress in data exchange and key policy approaches emerging in leading markets.

## 2.1 INDIA'S ACCOUNT AGGREGATOR FRAMEWORK

| INDIA – ACCOUNT AGGREGATOR FRAMEWORK | |
|---|---|
| Model | Account aggregator (AA) framework |
| Summary | Account aggregators are a type of RBI-regulated entity that helps an individual access and share information from one financial institution they have an account with to any other regulated financial institution in the AA network.[1] |
| Licensing/Regulatory Regime | Account aggregators must meet requirements set out by and be licensed by RBI.<br><br>The role of consent managers is further formalized in the Digital Personal Data Protection Act (DPDP), 2023. |
| Technical Standards | Standards are set by the RBI dependent ReBIT. |
| Fees and Revenue Models | AAs cannot access or utilize data, only act as a pass-through<br><br>AAs can either charge FIUs for using their service or charge consumers for secure data transfers. |
| Civil Society and Industry Involvement | Sahamati is a member-driven industry alliance formed to promote and strengthen the account aggregator ecosystem in India. It is a not-for-profit private limited company under Section 8 of the new Companies Act of India.[2] |

1 Ministry of Finance, India. (2021, September 10). Know all about Account Aggregator Network- a financial data-sharing system [Press release]. https://pib.gov.in/PressReleasePage.aspx?PRID=1753713

2 DigiSahamati Foundation. (n.d.). About DigiSamahati Foundation. Retrieved January 2024, from https://sahamati.org.in/about/

**India has developed a comprehensive strategy and set of institutions and infrastructures for digital financial services.** India has introduced several elements of a digital infrastructure as part of their "India Stack," including for identity (Aadhar), access to payments (UPI), and the "consent layer," which was implemented with the Data Empowerment and Protection Architecture (DEPA). With regard to data sharing, the RBI introduced the account aggregator (AA) framework to enhance and secure sharing of banking data by consumers with other authorized parties. In addition to this framework, other initiatives related to financial services include the Open Network for Digital Commerce (ONDC) (see Section 3.3), the RBI Trade Receivables Discounting System (TReDS), which is an institutional mechanism set up to facilitate the discounting of trade receivables of micro, small, and medium enterprises (MSMEs) from corporate buyers;[3] the Open Credit Enablement Network[4] (OCEN), and the Government e-Marketplace portal (GeM), to facilitate greater access by SMEs to tenders and enable them to share confirmed data with banks or other providers of working capital.

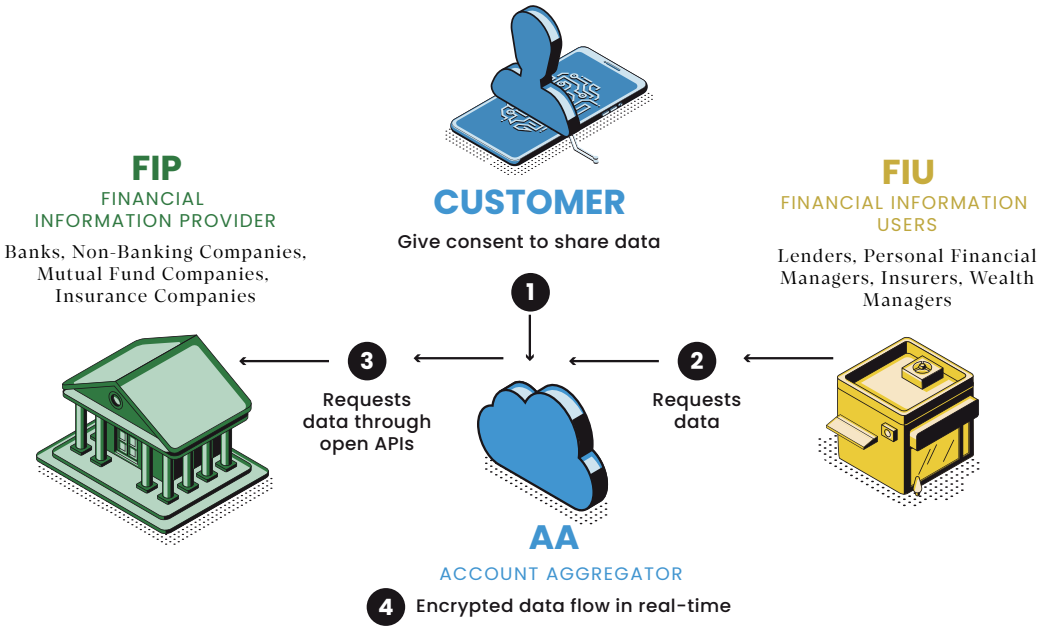
The AA framework is defined under the RBI Master Direction - *Non-Banking Financial Company - Account Aggregators*[5]. To become part of the AA ecosystem, entities must obtain AA licenses issued by the RBI and adhere to specified requirements. Eligible participants in this ecosystem include entities regulated and registered under the Reserve Bank of India, as well as those under the jurisdiction of authorities such as the pension authority, insurance authority, and the Securities and Exchange Board. AAs play a crucial role as impartial and trustworthy intermediaries responsible for obtaining consent from data subjects. They facilitate the retrieval and transmission of data from financial institutions, including banks, to authorized users of the data. The diagram presented in Figure 3 below provides a visual representation of this ecosystem.

3 The Reserve Bank of India. (2018, July 2). Guidelines for the Trade Receivables Discounting System (TReDS). https://m.rbi.org.in/scripts/Bs_viewcontent.aspx?Id=3504

4 The development of OCEN as a standalone initiative seems to have stalled, based on conversations with various individuals in the Indian market. The integration of financial services into the ONDC platform appears to have diverted resources and demand for a dedicated credit marketplace.

5 The Reserve Bank of India. (2016, September 2). Master Direction- Non-Banking Financial Company - Account Aggregator (Reserve Bank) Directions, 2016. https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=10598&Mode=0

FIGURE 3: OVERVIEW OF INDIA'S ACCOUNT AGGREGATOR FRAMEWORK




Source: Sahamati. As of January 2024, there are 16 approved account aggregators.

### 2.1.1 Actors and Roles in the AA System

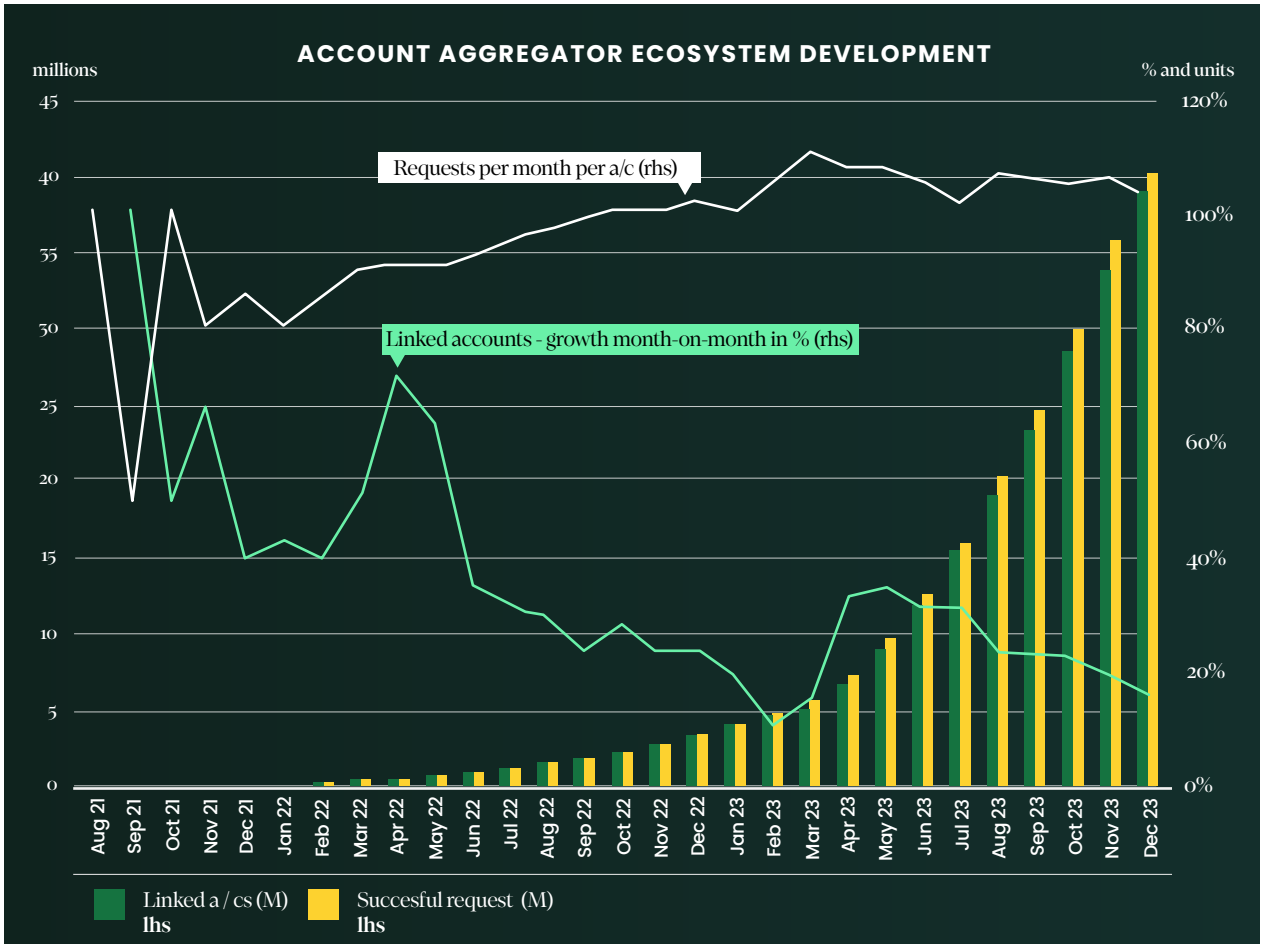
**Account aggregators serve as licensed intermediaries that operate with explicit client consent to retrieve or collect financial information per the customer's instructions. Their primary role involves facilitating the exchange and sharing of customer data sourced from financial information providers (FIPs).** These FIPs are institutions, typically banks and non-banking financial companies (NBFCs), that hold user data. Account aggregators play a key role in mediating data requests between FIPs and financial information users (FIUs). FIUs receive digitally signed data from FIPs through the account aggregators and utilize this information to offer a range of services to consumers, including loans, insurance, and wealth management. Within this ecosystem, technology service providers (TSPs) collaborate with both FIUs and FIPs to deliver account aggregator products and services. Currently, there are over 60 registered TSPs, and they play a key role in connecting FIPs and FIUs to the account aggregators. Additionally, TSPs can extend their support to fintech products in various aspects, such as underwriting models, SME scorecards, and the design of applications, among others.

**There is no single designated market or program operator to which AAs and other participants must adhere.** As of today, there is only Sahamati that operates as a member-based program to support the AA framework. They provide coordinated standards, registries, legal templates, and other services that enhance transparency and collaboration within the ecosystem. The future role and structure of Sahamati is currently an open question, but there

are indications (including from Sahamati itself) that their goal is to serve as a self-regulated organization (SRO). While this could prove beneficial for improving the speed of implementing new regulation, there are also concerns. When regulation is driven by the participants of that industry, there is a significant risk that decisions will be made more in the interest of those industry actors than the end consumers. Taking on a regulatory role may also cause tension in terms of balancing their mission to grow and develop the ecosystem while having a larger role in reducing risks.

**Linked and active accounts are growing steadily.** While the service applies in principle to the whole ecosystem of financial institutions in India, the number of linked accounts and active institutions is not automatic. From a very low base at the start, by 2023, the number of live FIPs grew to 146 and the number of financial information users to 363. The cumulative number of accounts linked is 89 million in August 2024, and the cumulative count of consent requests successfully fulfilled was 103 million in the same period. In 2023, there were 36.79 million successful data sharing transactions[6]. This covers data sharing across 16 live types (out of a targeted total of 23).

FIGURE 4: INDIA AA ECOSYSTEM METRICS




6 DigiSamahati Foundation. (n.d.). AA Ecosystem Dashboard. Retrieved August 2024, from https://sahamati.org.in/aa-dashboard/

**Development and usage of the AA ecosystem is growing, but primarily concentrated in urban and wealthier demographics.** The absolute number of linked accounts remains low as a percentage of the total population, at just under 40 million. Most of these are linked to savings or payment accounts among 72 institutions.[7] To date, usage statistics indicate on average one successful data sharing request per linked account per month. While the development and utilization of the AA ecosystem are on the rise, early adoption patterns suggest a concentration among urban and relatively affluent segments of the population. Although official statistics are currently unavailable, insights gleaned from discussions with key informants and industry stakeholders shed light on this trend.

### 2.1.2 Learnings From India

**The perception among many local market observers is that uptake of AA services has been slow and revenue potential from them is limited.** While the framework is still evolving, some of the issues cited include the continued need for bilateral contracting between FIUs and FIPs, user experience issues including heterogeneous implementations and slow response times for "pulling" data from a financial information provider, and the low level of direct fee-based remuneration of aggregator services. Many of these issues are likely to be addressed over time, as market uptake increases and implementation issues are resolved.

**Recent assessments point at increased competition and decreasing price levels among account aggregators.** While specific figures are not provided via official channels, recent analysis in the Indian media showed that there are questions regarding the viability of business models.[8] The cost per consent for AAs in this landscape was initially in the range of $0.14 to $0.42 in 2021. However, competition has led to a significant reduction in prices, with costs currently as low as $0.07 to $0.14 and potentially even as low as $0.01 per pull for high volumes. For example, the price mentioned NeSL Asset Data, an aggregator, is only $0.03 per pull.[9] Given the volumes achieved so far, the sustainability of aggregators will be difficult to achieve in the near future unless AAs identify additional sources of income.

TABLE 3: ESTIMATED REVENUES IN AAS

| | |
|---|---|
| Charges for Data Pulls* | → Approx. $0.00065 (10 INR) to $0.0019 (50 INR) in 2021<br>→ Decreased to $0.00052 (5 INR) on average in 2024, though variability depending on use case and volume |
| Volume of Data Pulls | → Approx. 5 million in December 2023 |
| Estimated Monthly Revenues | → Approx. $500,000 to $600,000 total AA revenues in December 2023 |

Source: Singh (2023), Sahamati, Authors' computations

Technology service providers nevertheless may play an increasingly important role in

7 Refer to the Sahamati ecosystem statistics: https://sahamati.org.in/account-types-activated-by-banks-on-aas/

8 Pricing data of account aggregators is not publicly available, but estimates have been reported in various online media outlets. See, for example: Singh, A. (2023, December 13). Tariff for NADL Account Aggregator Services. Mint. https://www.livemint.com/industry/banking/how-price-wars-hurt-account-aggregators-11702464234857.html; and Vir, A. (2023). The Account Aggregator Bible. Tigerfeathers. https://tigerfeathers.substack.com/p/the-account-aggregator-bible

9 NESL Asset Data Limited. (n.d.). Tariff for NADL Account Aggregator Services. Retrieved January 2024, from https://www.nadl.co.in/tariff

the ecosystem. Technology service providers are poised to have a growing impact within the ecosystem, offering essential services such as data encryption, decryption, and interpretation, for which they charge premiums ranging from $0.28 to $0.56 per analysis.[10] As the raw data transferred through account aggregators often requires several steps to clean, analyze, and interpret, technology service providers can play an important role in these early stages of market development in facilitating the exchange of data between the various ecosystem participants.

**Despite the government initiatives to promote participation and Sahamati's role in establishing recommended technical and commercial standards for the ecosystem, lack of incentives for incumbent banks continues to be a challenge.** The engagement of major banks in the data exchange ecosystem remains limited. Many of these banks have established links with the ecosystem but are not actively involved. For instance, it has been reported that some banks experience error rates exceeding 99 percent in data retrieval processes.[11] Sahamati's dashboards focused on the "API health" show inconsistent participation. At the time of our analysis, almost half of the institutions had high failure rates.[12] Additionally, interviews revealed that the data obtained is sometimes incomplete or lacking the necessary structure, making it challenging to work with. More research is needed to understand the underlying causes for this. According to experts interviewed, a lack of sufficient incentives for banks to actively participate is a significant contributing factor to their limited engagement.

## 2.2 EUROPEAN UNION'S SECOND PAYMENT SERVICES DIRECTIVE (PSD2)

| EUROPEAN UNION – PSD2 | |
|---|---|
| Model | Payment services directive governing the role of payment initiation and account information services and service providers. |
| Licensing/Regulatory Regime | Existing licensed financial institutions are automatically eligible; specific licenses can be obtained by firms offering payment initiation and/or account information services. |
| Licensing Requirements and Cost | Minimum capital requirements apply on an EU basis with licensing fees set by individual national competent authorities. |
| Technical Standards | There is no single EU technical API standard, but there are technical regulatory guidelines issued by the EBA and related technical requirements set under rules for QTSPs to issue digital certificates to be used by participants. |
| Fees and Revenue Models | Customers cannot be charged for access to basic data services identified by the Directive. |
| Civil Society and Industry Involvement | Industry bodies including the Berlin Group, national banking associations, and payment networks have developed standards and programs. |

10 Singh (2023)
11 Singh (2023)
12 Note that the metrics are calculated weekly, and we collected our observations in January 2024. Metrics analyzed include API calls and linking confirmations, among others. See more at https://sahamati.org.in/saans-api-health-dashboard/

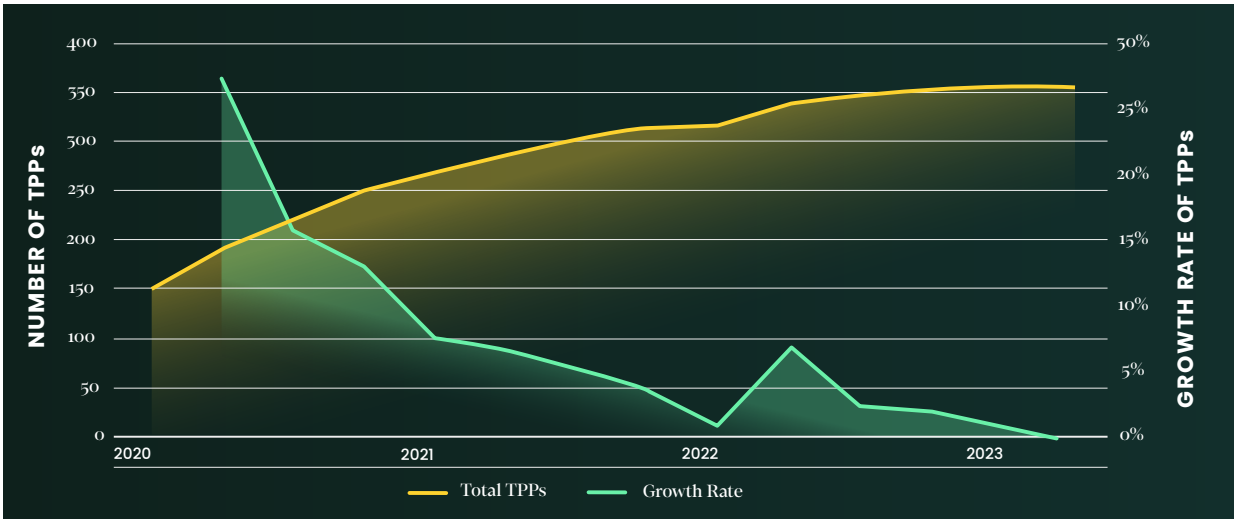
**Open finance data sharing arrangements in the EU are framed by the Second Payment Services Directive (PSD2).** This introduced a new type of licensed service for facilitating consent-based access to and sharing of account information. The PSD2 puts a structure around these services, sets out obligations of account servicing entities (primarily banks), and enables new actors, including relatively new startups, to apply for and obtain licenses to intermediate data flows between banks and other service providers.

The architecture of PSD2 is based on delegation of acWcess rights by account holders to third parties. The data subjects do not hold their own data, but, as account holders, provide consent or authorization to licensed intermediaries and users to obtain data held by financial institutions on their behalf. The rules apply equally to traditional banks and innovative payment services and fintechs, with the aim to facilitate innovation and competition from new service providers. Firms accessing data can use it for legitimate purposes themselves to provide specified services or pass to other parties authorized by the account owner/data subject.

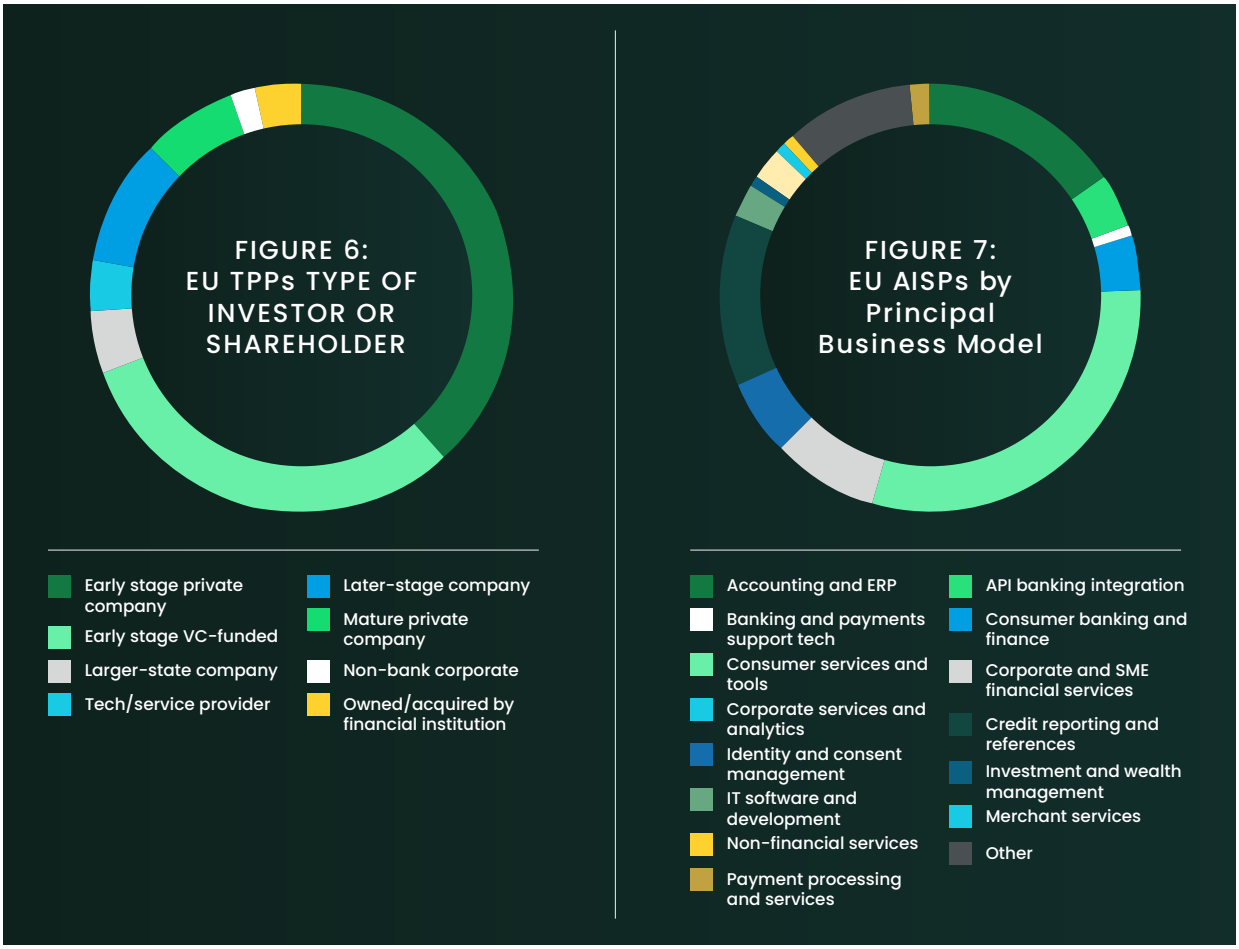
**There is no single, centrally funded implementing agency or standards covering all member states.** Unlike national jurisdictions such as Korea, Australia, or the U.K., the EU mandate provides a framework for multiple member states and authorities. PSD2 provides guidance on regulatory technical standards, as issued by the European Banking Authority, but has powers to assign a single entity to set operational standards, operate, or manage a single program. It allows for competing (or complementary) standards and programs to be developed and operate within the EU.

The arrangements in the EU have given rise to a new class of payment initiation and account information service providers (PISPs and AISPs). Since its introduction, the number of licenses issued in these categories has grown to over 350 within the European Economic Area (EEA) and, originally still in the EU, over 250 in the U.K. These entities are spread across the EEA, with many of them taking advantage of passporting rights to offer services outside their home market.

FIGURE 5: EU AISP & PISP MARKET EVOLUTION



**The population of these licensed AISPs and PISPs is relatively diverse.** They exhibit different investment origins, owners, business models, and services.[13] This diversity suggests that firms are trying to make use of data in several different ways and that, at least so far, there are multiple viable business models for intermediaries. AISPs include firms set up as VC-backed startups, incumbent credit analysis firms, bank-owned specialist firms, accounting and ERP software platforms, and consumer-focused loyalty program managers. In terms of business models and services, AISP firms include specialist API integrators and those focused on consumer finance, as well as SME finance, wealth management, and payment services.

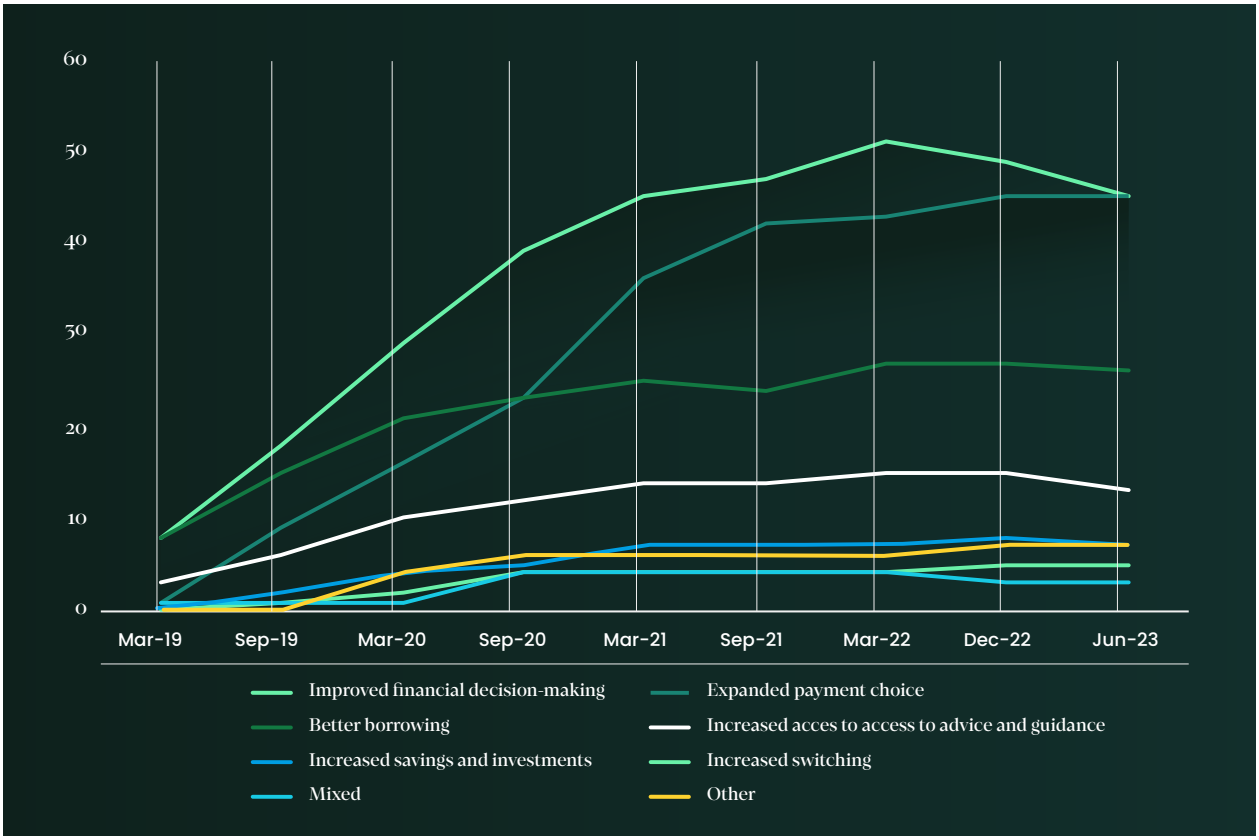



Source: Bär & Mortimer-Schutts (2020)

Overlapping with this data, the U.K. OBIE has also analyzed TPPs by their principal outcome area. Figure 8 provides a breakdown of their classification of TPPs licensed and operating in the U.K. as of October 2023. These companies include those serving both consumer and SME or business banking clients and those TPPs focused on payment initiation services. A significant proportion are assessed by OBIE as focusing on improving financial decision making and "better borrowing" (30 percent and 17 percent, respectively).

13 Bär, F., & Mortimer-Schutts, I. (2020). Innovation in open banking: Lessons from the recent wave of payment institutions that have been authorized to provide payment initiation and account information services. Journal of Payments Strategy & Systems, 14(3), 268-285. https://www.ingentaconnect.com/content/hsp/jpss/2020/00000014/00000003/art00008

FIGURE 8: U.K. OPEN BANKING TPP BY PRINCIPAL OUTCOME AREA[14]




In the U.K., usage of AISP data services is spread unevenly across a range of use cases. While there is no official and public data, inputs from industry experts in the U.K. highlight some trends of note which are outlined below and in Figure 8.

- Among **individuals or consumer banking clients,** automating credit card repayments and wallet top-up services are the most frequently used applications of open banking services. These payment services depend not only on payment initiation APIs but also on the ability to check balances and account details to automate or pre-plan transfers based on the liquidity position of clients. To a lesser extent, consumers also use aggregators to view and track banking data from multiple institutions. Another important AISP service used relatively widely among some segments is for the enhancement of thin-file clients as part of their applications for loans or similar financial products such as mortgages or car loans.
- Among **business clients,** in particular small businesses, the most important use case is to support integration with accounting and ERP systems, to help automate accounts payable and receivables and for cash forecasting and treasury. One bank reported this to be the case for nearly 98 percent of eligible users. Several of the licensed providers offering services in these areas not only have partnerships with banks but also have received investments from

14 Open Banking Limited. (2023). The Open Banking Impact Report. https://openbanking.foleon.com/live-publications/the-open-banking-impact-report-october-2023/outputs-availability

financial institutions that recognize the synergies these services have with their core SME banking business lines.

TABLE 4: USE CASES FOR PISPS AND AISPS, EUROPE

| PARTICIPANT USE CASE | CUSTOMER SERVICES | | | |
|---|---|---|---|---|
| | PERSONAL CUSTOMERS | | BUSINESS CUSTOMERS | |
| Account Information Sharing (e.g., balance, transaction history) | Account Aggregation | Enable customers to view finances across different institutions via single interface | Accounting Platform Integration | Enable businesses to integrate banking services with their accounting and enterprise resource planning systems |
| | Credit Decisioning | Enable customers to share financial data with third parties to inform/ enhance credit risk assessment, e.g., for loans | Cash Forecasting | Enable businesses to use third-party analytics for cash management optimization |
| Payment Initiation Service (e.g., bank transfer) | Wallet | Enable easier, programmed transfers to and balance management of e-wallets or mobile money accounts | Accounts Payable/ Receivable | Enable businesses to better manage cash management and reconciliation processes across different applications |
| | Credit Card Payments | Enable customers to program credit card balance check and repayments | Merchant Payments | Enable businesses to offer new payment mechanisms to customer, different rates, and loyalty services |

**An overall decline in the number of TPPs in open banking has raised concerns about their commercial potential.** For the first time since the implementation of PSD2, the landscape of TPPs in the financial sector has witnessed a slight decline by the end of 2023.[15] This decline can be attributed to various factors, including mergers and the intensified competition prevailing within the sector. Despite the dynamic nature of the market and the influx of venture capital investments in recent years, there are looming uncertainties surrounding the commercial viability of TPPs in the foreseeable future. A pertinent example is reflected in the performance of prominent market players within the EU and the U.K.. Notably, companies such as TrueLayer and Yapili, which operate across multiple EU markets and the U.K., reported relatively modest revenues in 2022. TrueLayer's estimated revenue for the entire year stood at $5 million, while Yapili recorded approximately $4.1 million in revenue.[16]

15 Konsentus. (2023, July 24). Q2 2023 Konsentus Third Party Provider Open Banking Tracker. https://www.konsentus.com/tpp-trackers/q2-2023/

16 Barraclough, G. (2023). Yapily results show slow pace of Open Banking growth. Business of Payments. https://businessofpayments.com/2023/10/03/3044/; Barraclough, G. (2023). TrueLayer claims open banking leadership in four markets but generated just £4m sales in 2022. Business of Payments. https://businessofpayments.com/2023/10/04/truelayer-claims-open-banking-leadership-in-four-markets-but-generated-just-4m-sales-in-2022

### 2.2.1 Learnings from EU Open Banking

The licensing framework of PSD2 has been **relatively successful in attracting a wide array and relatively large number of AISP and PISP companies** to enter this new market segment and experiment with the value of data and different business models. It provides an early set of insights into the types of companies that see value in better and more comprehensive access to banking data. Preliminary indications reveal that there is neither a dominant business model nor a single dominant use case that has emerged. Instead, a broad variety of use cases are emerging and there is evidence of what might be considered a healthy mixture of company structures using AISP licenses, ranging from niche service providers in consumer (loyalty) and SME (accounting platforms) and even nonprofits (expense management) to bank-owned firms as well as services owned by non-bank incumbents such as CRIF and Experian.

**Common standards and program rules are a prerequisite** for ecosystems to scale and minimize opportunities for banks to exploit operational loopholes in the regulation. In the implementation in the EU and the U.K., it was widely noted that compliance by banks — with the aim of regulation being to have reliable and compliant APIs available to third parties — was often, and still can be, quite poor. This reflects not only interim technical and capacity issues but also a lack of incentives for banks to make data access reliable and widespread. While the EU has not been in a position to impose a single union-wide implementation structure, in the further evolution of digital policy and data strategy, a stronger and more operational role is foreseen for industry-led data sharing programs that can have greater capacity and authority to impose adherence to standards.

**Screen scraping continues to be in use after the adoption of PSD2.** Screen scraping, where consumers give their own online banking credentials to an external party that gains access to their financial data, has continued in the EU even as PSD2 mandated secure APIs for sharing payments data (and even updated security requirements in 2023 with PSD3) via TPPs. Thus, for data beyond payment accounts, such as savings, insurance, and mortgage accounts, screen scraping is still permitted. In practice, this may mean that individual AISPs and PISPs utilize different methods to acquire different types of data: APIs for payment accounts and customer facing, such as screen scraping, for non-payment accounts. While screen scraping can be clunky and comes with predictable risks of fraud, identity theft, and other associated issues, its continued existence suggests demand for sharing financial data beyond payments.

**The next evolutions of open banking and open finance in Europe address compensation differently.** In the summer of 2023, the EU published distinct proposals that sketched out plans for evolving open banking and building a broader open finance market. For open banking, the proposed Payment Services Directive 3 (PSD3) and the Payment Services Regulation (PSR) were anticipated to succeed PSD2. If approved, they are expected to enhance fraud protection and user confidence, require more uniformity in open banking user data interfaces, and enable access to

bank accounts for Payment Institutions/ Electronic Money Institutions (PI/EMIs). Compensation for incumbent financial institutions for sharing payments data for basic open banking services would remain unchanged. Beyond payments data, the draft Financial Data Access Act (FiDA) would expand the pool of financial data and institutions that are obligated to share data with customers and/or authorized third parties. FiDA goes far beyond payments data to include mortgage credit agreements, crypto-assets, loans and accounts, savings, investments, pensions, and non-life insurance products. Given the sources of data, the rollout will likely require coordination from the European Banking Authority, the European Insurance and Occupational Authority, and the European Securities and Markets Authority. There are some notable differences in the draft act as compared to PSD2 and PSD3 — one is that data holders, such as banks, will be entitled to "reasonable compensation" for sharing data; the second is that data users will have read-only access but will not be allowed to initiate transactions.[17] FiDA is expected to go into effect in 2025.

**"Premium APIs"** have been proposed as a potential vehicle for incumbent financial institutions to monetize their involvement in PSD2. Under the aegis of the industry association the European Payments Council, the Single Europe Payments Area (SEPA) Payments Account Access program, called SPAA, has been developed to facilitate "value-added" or "premium" services that go beyond PSD2. The European Payments Council currently has 78 members that are among the largest banks in Europe, including the likes of BNP Paribas, Grupo BBVA, HSBC, and UniCredit.[18] SPAA has developed a set of rules, an API framework, and a remuneration model for premium services; these services could include multiple payments or dynamic recurring payments.[19] SPAA does not allow charging for data sharing that is permitted under PSD2, as that will still be free to TPPs.

17 Gallo, V., & Nair, S. (2023). The new EU Financial Data Access framework: opening up data across financial services. Deloitte. https://www2.deloitte.com/uk/en/blog/emea-centre-for-regulatory-strategy/2023/the-new-eu-financial-data-access-framework.html

18 European Payments Council. (n.d.). List of EPC Members. Retrieved January 2024, from https://www.europeanpaymentscouncil.eu/about-us/epc-members/list-epc-members

19 The Paypers. (2023, December 7). The resurgence and future prospects of the SPAA scheme. https://thepaypers.com/expert-opinion/the-resurgence-and-future-prospects-of-the-spaa-scheme-

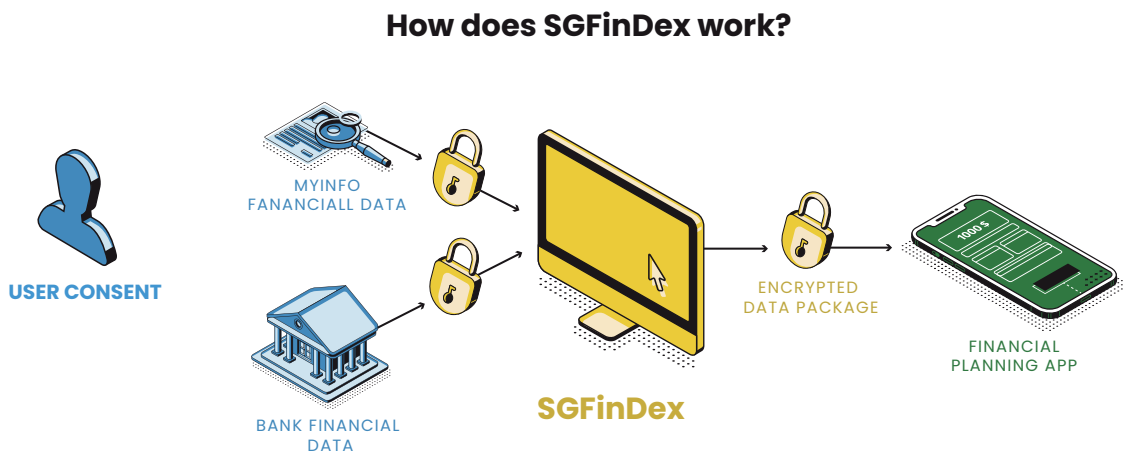
## 2.3 SINGAPORE'S SGFinDex

| SINGAPORE – SGFinDex | |
|---|---|
| Model | SGFinDex |
| Licensing/Regulatory Regime | The initiative is not led or framed by regulation, but has been encouraged through collaborative efforts initiated and guided by the Monetary Authority of Singapore. |
| Licensing Requirements and Cost | No non-bank institutions or new entities are currently authorized participants in the program, although a broadening of membership is foreseen at later stages. |
| Technical Standards | The standards are set and supported by GovTech. |
| Fees and Revenue Models | N/A |
| Civil Society and Industry Involvement | The Association of Banks of Singapore (ABS) is instrumental in its design and ongoing operation. |

**Singapore's financial data and digital ecosystem has been developed through cross-ministerial collaboration under leadership of the Monetary Authority of Singapore (MAS).** Certain agencies and ministries, notably GovTech, have played a key role in the operational developments. Among the many initiatives spearheaded by the MAS, the ABS API Playbook and the SGFinDex initiatives are most similar in terms of scope to open banking and finance arrangements in other markets. Other initiatives related to data and financial services, many of which aim to support Singapore's role as an international trading hub, include Business sans Borders (now Proxtera), SGTraDex, APIX, and IMDA's Trade Trust platform.

**The Singapore SGFinDex ecosystem has been designed with existing financial institutions and state entities.** It facilitates user-initiated sharing and aggregation of highly controlled and limited data by consumers with other select institutions. There are no third-party intermediaries at this stage. The shared information is basic and the scope was designed around the value propositions for wealth and retirement management. SGFinDex was initiated by the MAS in collaboration with the Association of Banks of Singapore (ABS). One of the primary aims of the MAS was to develop an initial phase of services that would motivate participation by incumbent institutions and provide a first step towards eventually broadening participation to other types of institutions and other types of data.

FIGURE 9: SGFinDex OVERVIEW




Source: Fintech News Singapore

The SGFinDex ecosystem builds on existing identity solutions (Singpass) provided by GovTech. The identity of users is thereby confirmed through trusted and universally available government sources rather than through the identities established by account holding institutions. Other participants can therefore rely on the provenance of the data holder's identity.

**Usage is reported to be relatively low.** Anecdotal evidence from key informant interviews suggests that this is not only due to the limited number of ecosystem users and use cases but also because the data available is relatively limited in scope. The focus of first phase development has also been on a relatively niche area of wealth management and retirement planning. The MAS's aim was in part to ensure the early stage use cases were of direct commercial interest for incumbent players. The MAS expects and — subject to industry support — plans to expand the use cases, data, and participants in an organic and incremental manner. The MAS considers it important to ensure that commercial business interest is sufficient to develop and sustain new services at each stage of ecosystem expansion.

**The broader market context and policy-led initiatives in Singapore provide insights into the dynamics of data exchange and usage in the private sector.** The MAS has pursued a wide range of other initiatives to more broadly foster innovation, investment, and competition in the digital economy and financial services. Unlike many other jurisdictions, Singapore's approach is significantly influenced by its role as an international business and financial center. Comparisons with domestic open banking and finance initiatives of other larger markets therefore are less useful than an analysis of the other policy initiatives undertaken by the MAS and private sector institutions.

Beginning around 2016, Singapore launched a sector-wide strategy to promote fintech and digital investments that contribute to the data economy:

→ The MAS-ABS API Playbook was part of

a **strategy to encourage local banks to embrace standardized API-based data sharing**, exchange, and integration with a broad range of users. While there was never any regulatory requirement to adhere to specific standards, industry dialogue, co-financing of projects, and sponsorship of fintech sector startups contributed to investments by local banks including DBS and UOB to new data-enabled services. DBS and UOB are now seen as two of the region's most advanced and sophisticated users of API-based service integrations and embedded finance covering a wide range of areas not just in Singapore but through their international subsidiaries.[20]

- Singapore has made parallel investments in fintech development. Through a range of matched grants, investment incentives, and MAS-led projects in diverse areas, Singapore has grown its base of financial sector and digital companies. As most of these companies are highly data driven, they have had an indirect effect of boosting the scope of market-driven use cases for data. Such firms have developed a wide array of bilateral data agreements, largely with companies operating beyond Singapore's borders in multiple jurisdictions.
- **Investments have also been made in core infrastructure and institutions that have a catalytic effect on data and digital market development.** Through targeted investment promotion as well as through the investments of state-supported companies such as Temasek and Singtel, Singapore has expanded its role as a hub for data server hosting and many of the key global companies (e.g., AWS, Google, Experian, and ANT Financial, among others) that rely upon or promote the usage of such infrastructures for data-driven business. Again, while these actions do not directly translate into data sharing arrangements, they do create a critical mass of ecosystem players that are constantly seeking ways to improve access to and usage of data in commercially viable ways.
- Singapore has also made very **methodical and concerted efforts to push forward with bilateral trade agreements and attract key actors in the broader policy and international space** that will influence multilateral digital economy developments. This includes sponsoring and establishing the first BIS Innovation Hub, hosting the ICC-DSA, strengthening the presence of the World Bank Group and UNDP, and hosting a growing number of events such as the Milken Summit and the Singapore Fintech Festival, focused on policy and investment. They have initiated digital trade agreements with multiple jurisdictions, embedding highly operational plans regarding cross-border data processing, and sought to develop bilateral projects with other central banks in the region to promote cross-border finance (for instance, with

20 DBS is often rated the best digital bank in Asia if not also globally. UOB has developed their own digital bank unit called TMRW and implemented partnerships in other markets around the region with ecommerce players, accounting platforms, and other digital companies to enhance digital banking services using data exchange to improve the distribution economics and risk analysis functions. DBS counts digital leaders such as GRAB among its clients, tailoring payment and banking services to their business model by using data-enabled processing and analytics.

counterparts in Dubai, the Philippines, and India).

→ This has put the Singaporean government in a favorable position to observe and understand the real commercial role of data and barriers to access and use it in its many forms across jurisdictions. Singapore has constant dialogue with local and international firms to better understand the issues they face in grasping new opportunities and addressing risks related to data-enabled business, including cryptocurrency, artificial intelligence, cross-border payments, and digital assets. They have also made significant investments, specifically in financial inclusion efforts, to enhance access to technology (e.g., through the APIX platform), support SME trade finance (e.g., Proxtera and pilot projects with Ghana), and decentralize data (e.g., collaboration with UNPD and GLEIF).

→ Lastly, **the role of Singapore as a host of regional digital and ecommerce companies** also strengthens the motivation for and experience in how to harness data. Singapore is now the home base (or at least regional base) of many digital native companies driving change in the way financial services use data. This includes ecommerce and platform companies like Grab, Lazada (now ANT), and Shopee, as well as a range of specialized finance firms including ASPIRE, NIUM, Wise, and TYME. All these companies are critically dependent on access to data ecosystems and the ability to scale them in commercially viable ways.

- What do Singapore's stakeholders see as **the role of the government?** Interviews notably with the digital lead of UOB highlighted some of the forward-looking challenges related to data. A key role for governments to play is in establishing the foundations for data sharing. This means: (i) making trusted, interoperable, and reliable identifier data available (for consumers as well as businesses); and (ii) publishing national and sectorial statistics in appropriate forms and ensuring that the basic physical infrastructure, including mobile bandwidth and handset capacity, is sufficient for high volume and rapid data exchange to reach down to end consumers even in remote areas (e.g., with reference to UOB business in Indonesia).

## 2.4 BRAZIL´S OPEN FINANCE MODEL

| BRAZIL – OPEN FINANCE | |
|---|---|
| Model | Open finance |
| Summary | Model is a broad, regulatory-led open finance regime with mixed mandatory and voluntary participation by licensed financial institutions, initiated to drive competition and reduce concentration in the banking sector.<br><br>Governance has been set up to ensure strong industry involvement and equal representation among stakeholders. |
| Licensing/ Regulatory Regime | Banco Central do Brasil manages the ecosystem, with compulsory participation in data exchange for large players and voluntary for others.<br><br>Licensing is required for payment initiation, but no additional license is required for regulated providers to exchange other data. |
| Licensing Requirements and Cost | Institutions must meet technical standards and enable reciprocity of data sharing; PISPs have minimum capital requirements (approx. US$177,100 [R$ 1M]).<br><br>Costs of maintaining governance structure is borne by the participating institutions, with costs divided proportionately by size of participants. [21] |
| Technical Standards | API standards are determined and proposed by industry representation in technical groups; BCB has authority to reject proposals and provides monitoring and reporting functions. |
| Fees and Revenue Models | Consumers are not charged directly for data sharing, but data receivers may charge customers for services developed from processing data. [22]<br><br>The regulation was written to allow for reimbursement for API calls exceeding set limits, but BCB has not implemented this, resulting in no fees charged between ecosystem participants. [23] |
| Civil Society and Industry Involvement | Industry and other representatives are integrated through the Joint Deliberative Council and technical working groups. |

**The central bank of Brazil, the Banco Central do Brasil (BCB), introduced regulations on open banking through the Joint Resolution of May 2020.** It has broad application to the financial sector, with mandatory application to large institutions (classified as S1 and S2) and voluntary for other regulated institutions. As per the pronouncements of the BCB, the aim of the open finance regime is to: (i) encourage innovation; (ii) promote competition; (iii) increase efficiency of the national financial system and payment system; and (iv) promote

21 Braga, F., & Andreoli, D. (2021). How Brazil regulates Open Banking. International Bar Association. https://www.ibanet.org/how-brazil-regulates-open-banking

22 The Paypers. (2021, September 20). Open Banking in Brazil: all questions answered by the Central Bank Brazil (Part 2). https://thepaypers.com/interviews/open-banking-in-brazil-all-questions-answered-by-the-central-bank-brazil-part-2--1251623

23 Banco Central do Brasil. (2020, May 4). Regulation on Open Banking. Joint Resolution No. 1. Open_Banking_Regulation_Joint Resolution_No_1_Updated.pdf (bcb.gov.br)

financial citizenship.[24] With regard to competition and innovation, the expectation is that broader and more open access to data sharing will enable digital financial services to be integrated in the financial customers' day-to-day services and facilitate new business model implementation and development.

**The open finance framework is governed by the Joint Deliberative Council with the support of technical groups and a secretariat.** The Deliberative Council is composed of one independent director and six other members, appointed by six associations (or groups of associations) with significant representation of institutions providing services within the initial scope of open finance. The role of the Deliberative Council is to make decisions on issues related to the implementation of open finance and propositions of technical standards to the BCB.[25]

The participants of the open finance ecosystem are denominated as:

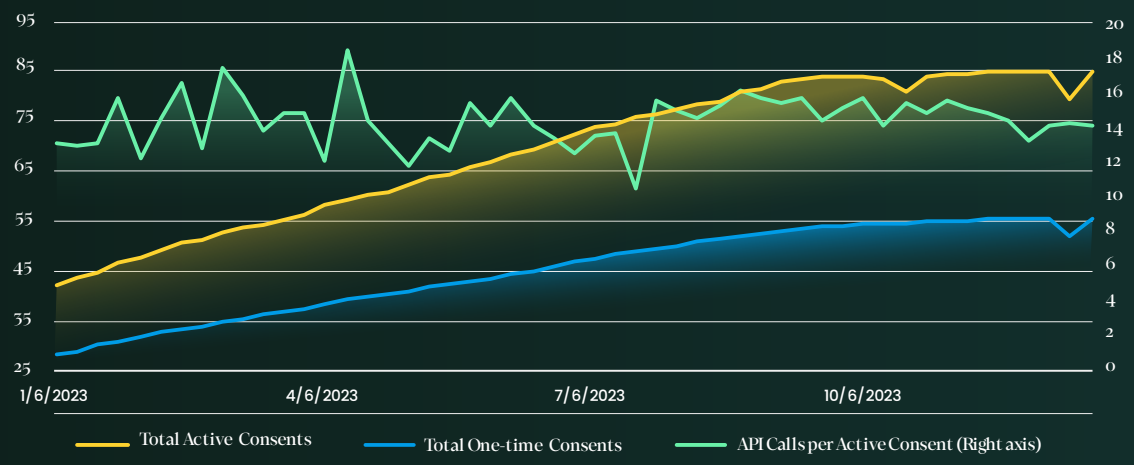
- **Data Transmitter:** Participating institution that shares the data with a recipient institution
- **Data Recipient:** Participating institution that submits a request for data sharing to the data transmitter institution
- **Account Provider:** Participating institution providing customer's deposit, savings, or pre-paid payment account
- **Payment Initiation Service Provider:** Participating institution that provides a payment initiation service without holding, at any moment, the funds that were transferred while rendering the service [26]

Preliminarily to any data sharing procedure, customers must provide consent to the data recipient institution or the payment initiation service provider.

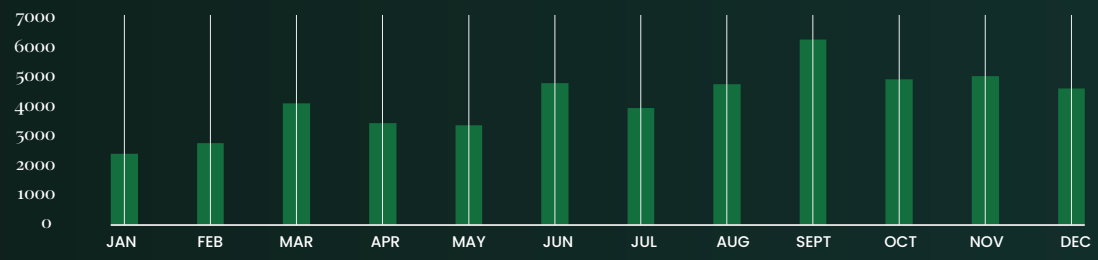
To further clarify the scope of its Resolution Article 5 concerning scope, the BCB Circular of May 4, 2020 specifies a relatively broad and specific array of data points. Brazil has therefore moved quickly to expand open banking data to a wider array of information on products, services, service channels, and customer and account data.

24 Banco Central do Brasil. (n.d.). Open Finance. Retrieved January 2024, from https://www.bcb.gov.br/en/financialstability/open_finance
25 Future Entity Working Group. (2023, December). Future Entity Working Group report to JROC. future-entity-working-group-report-jroc-december-2023.pdf (fca.org.uk)
26 Banco Central do Brasil (n.d.)

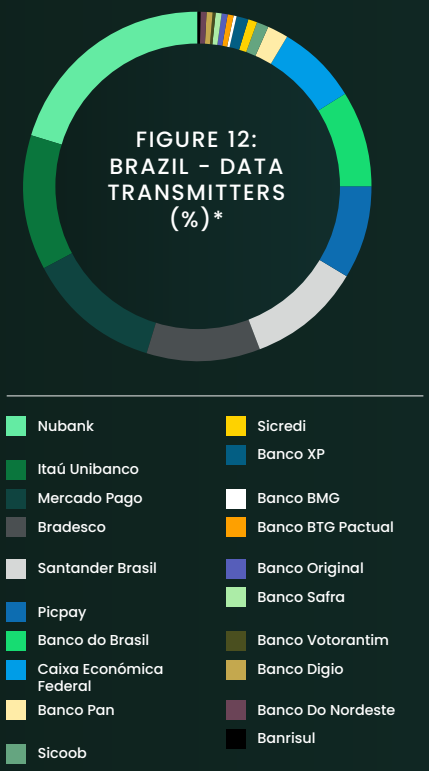
## FIGURE 10: BRAZIL - EVOLUTION OF API CONSENT



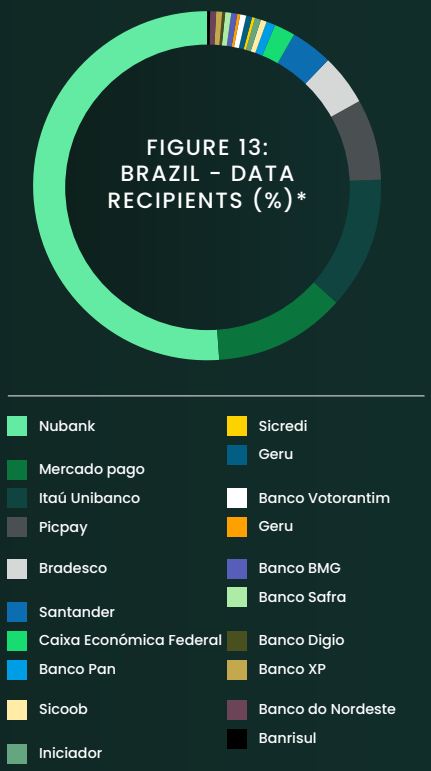

## FIGURE 11: BRAZIL - EVOLUTION OF API CALL VOLUME




## FIGURE 12: BRAZIL - DATA TRANSMITTERS (%)*




## FIGURE 13: BRAZIL - DATA RECIPIENTS (%)*




Source: Banco Central do Brasil (BCB). Data reflects volumes in December 2023 (Total: 4.6 billion)

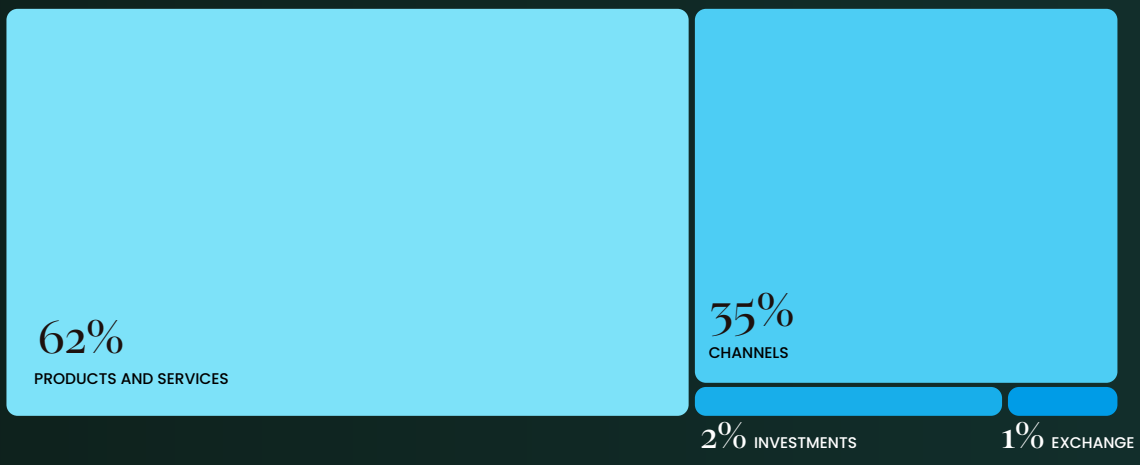
Statistics consolidated by the BCB indicate that total open banking API calls for registration and transaction data reached 4.6 billion in the month of December 2023. Customers may provide consent on a one-off basis or for a specified purpose and period of time, with validity up to a maximum of 12 months. The number of customers providing such consent on a one-off basis stands now at approximately 42 million and 28 million one-time consents.

Data requests and receipts statistics from December 2023 indicate that one bank in particular — Nubank — was by the far the most active and important recipient of data requests, followed by Itau and Mercado Pago, while the distribution of data transmissions is more broadly spread across institutions in Brazil in closer proportion to their overall market share.

BCB categorizes API calls into three categories: open data (products, services, channels), registration and transaction data, and payment initiation. We can see below the most prevalent use of data sharing APIs in the open data and registration and transaction categories.

**FIGURE 14: REGISTRATION AND TRANSACTION API CALL VOLUME % OF TOTAL**


**FIGURE 15: OPEN DATA API CALL VOLUME % OF TOTAL**




Source: Banco Central do Brasil. Data updated as of December 2023.

**Open finance is a continuation of efforts by the BCB to drive competition and inclusion in a financial sector that traditionally lacked both.** In recent years, there were numerous other initiatives working to achieve these ends. There have been key developments to end exclusivities in the card receivables market through establishing registration entities which allow SMEs to shop their receivables to different providers, with potential to greatly expand credit access.[27] The BCB has also modernized their licensing regime to allow different types of payment and credit institutions to provide specific services with a lower barrier to entry. Additionally, the rollout of Pix, Brazil's instant payment system, in 2020 introduced many new customers to digital financial services while also generating new data trails and building interest and momentum in modernizing Brazil's financial sector. Pix benefitted from some key enablers and drivers (e.g., standardized interface and rapid shift to digital during COVID-19), which saw its usage increase rapidly across all levels of the Brazilian population. The ease and consistency of Pix led to a more unified financial sector and many people engaging with digital services for the first time. This has also generated significant new sources of transaction data which are not yet being fully exploited.

**Open finance in Brazil has spurred a rush of investment and new players, but many are unable to fully benefit from the data exchange ecosystem.** While we have not heard indications that licensing costs are prohibitively expensive, there are still resource and technical constraints that prevent many new providers from engaging with open finance. At an early stage, new players must establish the necessary internal architecture and systems that not only enable the collection and exchange of data, but also would meet the stringent security and technical standards required for participating in open finance. Beyond that, providers must build the internal expertise and capacity to be able to meaningfully manage and extract value from large datasets. Engaging in the open finance ecosystem is neither possible nor meaningful until those issues are addressed.

**The BCB implemented strong policies and controls to ensure strong industry participation (and participation on equal terms for players of different sizes), but there has been increasing pushback.** Given the stated intention to increase competition, Brazil made it mandatory for banks of a certain size (segments S1 and S2 [28]) to participate in open finance. This was seen as necessary to drive the scale and adoption of the data exchange ecosystem. Additionally, the contribution required to the operational costs of the technical groups and deliberative councils which defined open finance in Brazil was differentiated so that larger players paid a larger proportion without receiving additional voting power. While there was some tension in this arrangement (e.g., smaller fintechs felt the legacy banks were insisting on higher standards that would require more time and resources to implement in order to slow and limit implementation), it was largely seen as successful and also led to significant collaboration between different

27 B3. (n.d.). Card Receivables. Retrieved January 2024, from https://www.b3.com.br/en_us/products-and-services/trade-repository/card-receivables/

28 Segments S1 and S2 include BCB-regulated institutions that are larger than 1 percent of GDP.

sector stakeholders. This arrangement and differentiated cost of participation has been receiving more scrutiny as the ecosystem develops, with legacy banks pushing for more equal responsibility to maintain.

**In contrast to India and the EU, Brazil has not implemented dedicated licensing procedures for account aggregator services.** In Brazil's open finance ecosystem, the regulatory framework does not provide a distinct license for account aggregators, unlike the model observed in the European Union. The main reason is that BCB does not have the legal mandate to regulate aggregators as a standalone category, and this mandate is not currently covered by any other regulatory authority. BCB therefore permits institutions participating in open finance to aggregate account information only if they also provide additional financial services, such as payments or credit, ensuring a model that requires reciprocity in data sharing. This approach addresses pre-open finance market practices where data aggregation occurred in an unstandardized and less secure manner, aiming to standardize data sharing, enhance security, and promote a balanced ecosystem. Existing account aggregators such as Belvo and Pluggy have experienced significant growth in Brazil, offering a range of services like payment initiation, for which they obtained authorization from the BCB, as well as services related to data enrichment and APIs. Revenue figures for these account aggregators in Brazil are not readily available; however, insights from interviews with industry experts suggest that the sector has experienced growth in recent years, fueled by significant VC investments.

**In Brazil's open finance ecosystem, noncompliance with regulatory standards, particularly among larger institutions, has emerged as a significant challenge.** These institutions have struggled with ensuring data quality and adherence to the timely sharing requirements, raising concerns about the overall effectiveness and integrity of the open finance system. In response to these challenges, the BCB has developed a comprehensive sanction approach aimed at enhancing compliance. This regulatory mechanism introduces a phased process, beginning with institutions justifying their noncompliance, followed by submitting a rectification plan, and progressing through warnings to fines for persistent noncompliance. This approach is designed to incrementally encourage institutions to align with regulatory expectations, improving the ecosystem's efficiency and reliability.

**Concurrently, the regulatory body has taken a cautious stance on the introduction of fees within the open finance framework.** Initially, there was contemplation of allowing institutions to charge fees for data sharing and payment initiation services, which sparked concerns about potentially undermining the open finance principles of open access and competition. Acknowledging these risks, the BCB decided against permitting institutions to impose fees on clients or each other for such services. This decision aims to maintain the system's openness and foster an environment conducive to innovation and equitable participation. As the ecosystem evolves, there's ongoing discussion about revising the governance structure and exploring sustainable funding models, including the possibility of usage-based fees, to manage the operational costs associated with open finance participation more

equitably across all institutions.

**While open finance has seen significant growth, trust in sharing data remains low and understanding of the function and benefits of open finance is still limited, particularly among traditionally excluded consumers.** As with many developments in digital services, awareness and adoption has been greater among groups that have been traditionally included in the financial sector (e.g., males and those with higher income and more education). A survey by the Consultative Group to Assist the Poor (CGAP) found that adoption among higher income consumers is more than two times greater than the lowest income groups (17.2 percent vs. 6.4 percent), and this difference is also seen between males and females (15 percent vs. 7.4 percent).[29] While these findings demonstrate the current challenges with adoption among the groups with greatest need, CGAP's findings also demonstrate the significant barriers that remain to increasing this adoption. When presented with examples of the benefits that open finance could provide (in this case, an improved loan or credit limit), only 27 percent of respondents indicated a willingness to share data to obtain that benefit.[30] This shows there is significant work needed to establish trust and clearly demonstrate the potential of open finance.

**While open finance in Brazil is expanding to encompass insurance and investments, broadening its integration to other sectors such as energy and health is not immediately on the horizon.** Discussions about extending the principles of open finance beyond the financial sector highlight the complexities and technical challenges of achieving cross-sectoral interoperability. These include concerns over regulatory compatibility, data security, and the trustworthiness of participating entities across different regulatory landscapes. Although there is an interest in laying a technological and regulatory foundation that does not preclude future cross-sectoral integration and even international interoperability, the immediate focus remains on consolidating the open finance ecosystem within the financial sector itself. This approach aims to ensure that the infrastructure and regulatory framework are robust and inclusive before considering more ambitious expansions.

29 CGAP. (2025, November 9). Open Finance: Lessons from Brazil [Webinar]. https://www.cgap.org/events/open-finance-lessons-brazil
30 CGAP (2025)

# 03 Non-Financial Data Sharing Architectures

**The growing field of non-financial data exchanges exhibits considerable potential for inclusive finance, yet it remains in an emergent state, marked by ongoing development and exploration.** The emergence of various models of data exchange in agriculture, ecommerce, and trade, as well as economy-wide initiatives, are providing valuable lessons on the challenges and potential for further integration with open banking and open finance initiatives. In the agricultural sector, platforms such as Agri Stack in India and the AgriDataSpace in Europe, along with nascent approaches in Africa,[31] are pioneering new approaches, while ecommerce and trade/logistics sectors are witnessing similar transformations through initiatives like ONDC and SGTraDex. These platforms are instrumental in providing deeper insights into sectors and consumers with poor data trails and who are traditionally underserved by the financial sector. Broader sector-wide data exchange policies, as seen in the EU's common data spaces, underscore a growing trend towards establishing more integrated data ecosystems. These policies and platforms collectively aim to foster a more interconnected and efficient exchange of data, which could significantly enhance economic inclusion.

**In many markets that have initially embraced open banking, there exists a broader vision of progressing towards open finance and ultimately an open data economy.** While this vision holds significant promise, the current landscape reveals a more fragmented reality. Numerous initiatives are unfolding in parallel, each with its own set of objectives, standards, and ecosystems. This parallel development risks the creation of isolated silos within industries, hindering the potential for seamless interindustry interoperability. However, it is crucial to emphasize that these interconnections are critical, especially in sectors like agriculture, trade, and transport that engage large segments of the population. Achieving interoperability between these sectors can yield mutual benefits — financial sector providers gain access to richer data sources for the development of innovative services, while the real economy gains improved access to working capital and asset ownership in vital segments of the economy.

31 These are not reviewed in-depth in this paper. See box below on CGIAR's approach.

## 3.1 AGRI STACK (INDIA)

**India is witnessing a transformative phase in agricultural data exchange, with several initiatives underway to harness technology for the benefit of smallholder farmers.** At the federal level, the central government has introduced Agri Stack, a digital infrastructure framework aimed at coordinating various state-level data exchange initiatives in agriculture.[32] Agri Stack's primary focus is to establish three basic building blocks: (i) farmers databases linked to land records; (ii) geo-referencing of village maps; and (iii) real-time crop surveys.[33] Its objective is to create a cohesive and interoperable digital environment that spans India's diverse agricultural landscape, providing a foundation for data-driven agricultural practices. Although state-level projects aim to align with the federal framework, the long-term challenge remains in achieving interoperability and coherent approaches across states. This is due to the complex governance and diverse agricultural practices prevalent in different regions of India.

**State-level initiatives in India are complementing federal efforts in advancing agricultural data exchange within the country's emerging non-financial data exchanges.** Agriculture in India is predominantly managed at the state level, reflecting the diverse agricultural practices and governance structures across the country. This section describes two key aspects: (i) an active initiative in the state of Odisha, which has made significant strides in integrating agricultural data for the benefit of smallholder farmers; and (ii) ongoing pilots in three other states, aimed at enhancing agricultural data management and accessibility at the local level.

TABLE 5: KRUSHAK ODISHA OVERVIEW

| INITIATIVE NAME | KRUSHAK ODISHA (INDIA) |
|---|---|
| Ownership | Collaborative initiative involving the Government of India, state government, BMGF |
| Focus Segment | Farmers |
| Key Dates | Launched in 2019<br>Finance offering introduced in 2023 |
| Data Exchange Architecture | Centralized |
| Monetization of Data Exchange | None |
| Key Metrics | → 7.9 million farmers in database, 2.8 million women<br>→ Approx. 3,000 loan applications in 2023: 10–15 percent approved, 35–40 percent rejected, the rest are pending<br>→ Loans disbursed (total value): $577,000 |

32 Department of Agriculture & Farmers Welfare. (n.d.). Agri Stack: Digital Infrastructure by the States and the Central Government. Government of India, Ministry of Agriculture & Farmers Welfare. Retrieved January 2024, from https://agristack.gov.in/#/

33 Ahuja, M. (2022, June 22). Letter to Chief Secretaries. Secretary, Department of Agriculture and Farmers Welfare, Government of India. https://agristack.gov.in/assets/pdf/circularNotification/letter_to_chief_secretaries.pdf

**The Krushak Odisha initiative, launched in Odisha in 2019, represents an important agricultural data exchange initiative in India.**[34] The initiative focuses primarily on aiding smallholder farmers' access to government services, providing more efficient extension services, and facilitating access to credit. The significant accomplishment of Krushak Odisha is its creation of a unified farmer database with more than 7.9 million profiles, which then allowed the government to provide an Android-based agri-extension app and targeted support to farmers.
The platform has successfully integrated approximately 2.8 million women farmers and 5.8 million landholding farmers into its database, processing approximately 200,000 assistance applications and reducing processing times by 45 percent. Notably, almost half of these applications were submitted independently.

**The data sourcing and maintenance involves multiple steps to gather, verify, and update farmer data.** This strategy begins by aggregating existing government databases, leveraging unique identifiers from Aadhaar for linking and verifying individual records. Ground-level verification by extension workers, combined with self-registration portals, enables the creation of a comprehensive and up-to-date database of farmer profiles. Continuous updates are facilitated through the integration of transactional data from various government interactions with farmers, such as procurement and insurance, which ensures dynamic and accurate representation of farmers' activities. The use of algorithms for data quality monitoring and the emphasis on farmer consent for data sharing through APIs for third-party services aims at maintaining data integrity over time. The system features open APIs for credit and extension services, linking government databases to business offerings for farmers.

**The agriculture financing platform built on Krushak Odisha demonstrates potential but has suffered from low demand and high rejection rates.** SAFAL (Simplified Applications for Agricultural Loans) is a program launched by the Government of India to provide financial assistance to small and marginalized farmers who are unable to access credit due to lack of collateral or other reasons.[35] The initiative, initially launched in 2016 at a national level, linked to Krushak Odisha in 2023. Under SAFAL, farmers can obtain loans up to Rs. 10 lakh ($12,000) per annum for one acre of land, making it a significant source of income. The program provides a subsidy on the interest rates charged by banks and cooperative societies on loans taken by farmers for agricultural activities. To enroll in the SAFAL program in Odisha, farmers need to apply through the SAFAL portal and meet certain criteria — such as being a smallholder farmer, having less than five hectares of land, and not owning any other agricultural land. The initiative, as of January 2024, has experienced a modest level of engagement, having processed roughly 3,000 loan applications and disbursed close to $577,000 within its initial eight-month period. This limited uptake can be attributed to challenges from both ends of the spectrum. On one hand, there is the

34 Government of Odisha. (n.d.). Krushak Odisha Portal. Retrieved January 2024, from https://krushak.odisha.gov.in/
35 Government of Odisha. (n.d.). SAFAL: Simplified Applications for Agricultural Loans. Retrieved January 2024, from https://safal.odisha.gov.in/website/home

demand-side hurdle — many farmers are still acclimating to the concept of seeking credit via digital platforms, a relatively new practice in this sector. On the other hand, there's a notable barrier in terms of loan approvals, with a strikingly high rejection rate where only approximately 10 to 15 percent of the applications are being approved, 35 to 40 percent rejected, and the remaining are pending. Despite these obstacles, the valuable insights gained from the program's performance are proving instrumental in shaping future government initiatives.

**Unlike other digital public infrastructure (DPI) initiatives in India, Krushak Odisha operates without authorized data intermediaries or data monetization, with most data being government-owned.** This approach limits private sector participation, thereby necessitating reliance on government and donor subsidies. Future plans include forming a nonprofit organization to oversee Krushak Odisha, similar to the Open Network for Digital Commerce (ONDC) model. However, for the foreseeable future, the initiative is expected to depend on governmental and donor support until it becomes robust enough to attract a wider range of investments.

**Similar projects are being piloted in various Indian states, including Uttar Pradesh, Madhya Pradesh, and Telangana.** These pilots have similar objectives as the Krushak Odisha project described above, with the aim of integrating agricultural data encompassing farmer data, farm data, and crop data, which includes types of crops and average yield information.[36] These pilots, particularly in select districts of Uttar Pradesh, are designed to test the feasibility and effectiveness of these objectives. The main pilots are currently being planned in three districts in Uttar Pradesh, out of a total of 75, and are adapted to different crop seasons. The use cases for this data are diverse, including providing farmers with weather and commodity price information, creating market linkages, facilitating infrastructure investment, and offering agricultural finance solutions. The data collection process focuses on real-time data, deliberately excluding historical data due to the challenge of collecting standardized quality data. This initiative is a collaborative effort involving the Government of India and state governments, with technical assistance from the International Finance Corporation (IFC) and various tech companies. Advanced technologies such as remote sensing, AI, and machine learning are being used for crop identification and yield estimation.

36 See more details: Mehrotra, N. (2023). Open DataStack to power Government of Uttar Pradesh's AgriStack: An approach note on Agri DataStack from International Finance Corporation (IFC)/The World Bank Group to the Government of Uttar Pradesh. IFC/The World Bank Group. https://cgspace.cgiar.org/server/api/core/bitstreams/48539a15-98bf-4216-9641-73a8a566c668/content

TABLE 6: OTHER STATE AG DATA INITIATIVES

| INITIATIVE NAME | AG DATA EXCHANGE (UTTAR PRADESH, MADHYA PRADESH, AND TELANGANA) |
|---|---|
| Ownership | Collaborative initiative involving the Government of India, state governments, and IFC |
| Focus Segment | Farmers |
| Key Dates | Pilot to be launched in 2024 |
| Data Exchange Architecture | Centralized |
| Monetization of Data Exchange | None |
| Key metrics | Not launched |

In the agricultural data exchange project spanning Uttar Pradesh, Madhya Pradesh, and Telangana, the mechanisms and business models for data exchange are still under development. The project involves integrating various data sets, including farmer IDs, land information (farm stacks), and crop data, to enhance efficient data sharing among stakeholders. Blockchain technology is being considered to ensure secure and reliable data integration and sharing while maintaining privacy. This data exchange includes both government and private databases, like banks, insurance companies, and agricultural departments. A farmer-centric consent model is central to this approach, requiring farmer consent for data access and ensuring privacy protection. The project is collaborating with tech companies for technical support in managing data exchange and is expected to evolve its protocols based on insights from pilot testing in selected districts.

### CGIAR's Approach to AgDataHubs in Africa

In 2022, CGIAR's Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) program pioneered the development of AgDataHubs, digital platforms designed to facilitate access and integration of agricultural and climate data. These hubs have been commissioned in several African countries, including Senegal, Mali, Ghana, Ethiopia, Kenya, and Zambia.[37] By providing weather- and climate-informed agro-advisory services that are data-driven and contextually relevant, the initiative emphasizes the importance of integrating meteorological and agricultural sectors for more effective and impactful climate information services.

CGIAR advocates for a digital public infrastructure (DPI) approach to further enhance the sustainability and effectiveness of these AgDataHubs.[38] Currently, the program

37 Dhulipala, R., Joseph, J., Konte, O., Faye, A., Worou, O., & Whitbread, A. (2022). Catalyzing the use of climate information in agriculture decision-making through datahubs. Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA). https://cgspace.cgiar.org/server/api/core/bitstreams/8524256f-8579-4bb6-9c2d-33817cbfcd5d/content

38 Dhulipala, R., & Whitbread, A. (2023). Improving the reach and relevance of Climate Information Services through a Digital Public Infrastructure approach. Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA). https://cgspace.cgiar.org/server/api/core/bitstreams/d633e4eb-b4b9-4804-a5cb-65bd51e03da6/content

has yielded data dashboards that offer weather and climate data and visuals. However, according to CGIAR, the scalability and long-term sustainability of the project could face limitations without the transition to an interoperable infrastructure stack that interacts with other players in the ecosystem. If AgDataHubs remain as standalone platforms without integration to other stakeholders, they risk becoming isolated systems with limited interoperability and reduced potential for widespread adoption. Adopting a DPI approach is thus seen as a crucial step to ensure that these digital platforms evolve, integrate with broader digital ecosystems, and ultimately contribute more significantly to the resilience and productivity of smallholder farmers in the face of climate change.

## 3.2 COMMON DATA SPACE (EUROPEAN UNION)

**The European Union has articulated the central role data and data sharing must play in its economic future.** Its horizontal cross-sectoral approach has rolled out in parallel, and often intersects with, the EU's digital finance strategy. In 2020, the EU Data Strategy set out several problem statements and perceived market failures that hinder the secure and productive harnessing of data for various economic purposes. This encompasses challenges like scarce data availability, market power imbalances, issues with data quality and interoperability, deficits in data skills and literacy, data governance concerns, and cybersecurity weaknesses. The strategy outlines actions around four key pillars:[39]

1. A cross-sectoral governance framework for data access and usage, including the development of the EU Data Act and the work on creating EU data spaces;
2. Investments in data and strengthening Europe's capabilities and infrastructures for hosting, processing, and using data, and interoperability;
3. Capacity building, especially for consumers and SMEs; and
4. Common European data spaces in strategic sectors and domains of public interest.

**To date, the EU data spaces cover 14 specific sectors and initiatives therein that include agriculture, mobility, energy, green deal, industrial, finance, health, and cultural heritage, among others.**[40] In practice, a "data space" is not a single infrastructure but rather a sector-specific umbrella for one or more programs to bring together "relevant data infrastructure and governance frameworks to pool, access, and share data."[41] For example, in finance, the EU digital finance strategy is seen as the key instrument for facilitating "financial data spaces" which includes the aforementioned Payment Services Directive (PSD2) as well as the proposed framework on Financial Data Access (FiDA). However, the financial data

39 European Parliamentary Research Service. (2022, July). Governing data and artificial intelligence for all: Models for sustainable and just data governance. https://www.europarl.europa.eu/RegData/etudes/STUD/2022/729533/EPRS_STU(2022)729533(ANN1)_EN.pdf

40 European Commission. (2024). Staff working document on Common European Data Spaces. https://digital-strategy.ec.europa.eu/en/library/second-staff-working-document-data-spaces

41 European Commission (2024)

space label also applies to other initiatives including the European Single Access Point (ESAP, to be launched in 2027), Digital Europe,[42] and the European Digital Finance Platform, which is discussed in more depth below.

**The EU expects that the benefits unlocked by data spaces will be leveraged by existing actors in the public and private sector — but it has also created a new mechanism through regulated data intermediaries.** [43] Under the Data Governance Act, organizations can register as "data intermediaries" or "data altruism organizations" that support bilateral or multilateral data sharing, across and within sectors, and for the benefit of end users. Observers also ground the rationale behind data intermediaries in the aspirations of Article 20 of GDPR, which established the right of data portability. [44] Certain potential data intermediaries might prioritize technical solutions and economic transactions between data holders, users, and subjects, like data marketplaces, while others use legal constructs, like data trusts or other collective governance tools to pursue collective benefits or value for users.[45] While only one organization has officially registered (a Finnish organization named Dataspace Europe OY[46]), there are a range of models that could, under the Data Governance Act, register as data intermediaries. For example:

- **CARUSO** offers in-vehicle data from multiple automobile manufacturer and makes the data available through a subscription model to a swath of players, from insurance companies to car-sharing platforms to apps allowing drivers to find and book electric charging stations.[47] CARUSO is co-owned by several automotive industry companies, including suppliers.[48]
- **JoinData,** as another example, caters to Dutch commercial farmers and, through an annual subscription fee, helps farmers manage permissions around their farm data (e.g., milk yield, accountant invoices, etc.) in a single platform. It also facilitates select sharing of those data points with stakeholders, including governments, suppliers, and customers.[49] It is worth noting that AISP and PISPs are not considered data intermediaries under the Data Governance Act, nor are API aggregators; thus, financial payment data for the purposes of initiating payments and aggregating account information continues to be ring-fenced by the PSD2 and TPPs. Whether data intermediaries find sustainable, scalable business models that fully leverage the European data spaces is still to be determined.

**Four years since the launch of the EU Data Strategy, the various sectors' data spaces have developed at different paces.** Certain data spaces are still in the planning phases while others have officially launched. Despite the variance, the

42 The creation of Digital Europe for finance is still in procurement.
43 Key Informant Interview, (former) European Commission, December 7th 2023
44 Key Informant Interview, (former) European Commission, December 7th 2023
45 Micheli, M., Farrell, E., Carballa Smichowski, B., Posada Sanchez, M., Signorelli, S., & Vespe, M. (2023). Mapping the landscape of data intermediaries. Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC133988
46 European Commission. (n.d.). EU register of data intermediation services. Retrieved January 2024, from https://digital-strategy.ec.europa.eu/en/policies/data-intermediary-services
47 Caruso Dataplace. (n.d.). Homepage. Retrieved January 2024, from https://www.caruso-dataplace.com/
48 Micheli et al. (2023)
49 JoinData. (n.d.). News, Updates, and Articles. Retrieved January 2024, from https://join-data.nl/en/actuals/

European Commission has supported several cross-sectoral initiatives including the creation of the Data Spaces Support Centre (DSSC) and the development of an open-source, smart, cloud-to-edge middleware platform called Simpl.[50] The DSSC aspires to develop public goods to help builders of data spaces, including a starter kit and blueprint as well as standards and technical specifications. The procurement of Simpl has been framed as contributing a common cloud-to-edge software used by data spaces funded directly by the EU under Digital Europe; initial prototypes are under development as of January 2024 and the MVP will be open source.[51] The EU provides funding for the deployment of data spaces under the Digital Europe Program, while supporting relevant research initiatives under Horizon Europe.

**TABLE 7: AgriDataSpace OVERVIEW**

| INITIATIVE NAME | AgriDataSpace |
|---|---|
| Ownership | Government-backed |
| Focus Segment | Farmers, industry, public sector |
| Data Exchange Architecture | Production, land use, IOT, and farm sensing technology |
| Monetization of Data Exchange | Debates are ongoing on the business model |

**The common European agricultural data space (AgriDataSpace) is driven by the European data strategy goals as well as the sector-specific Common Agricultural Policy as well as the Farm-to-Fork strategy and the Green Deal.** Currently, AgriDataSpace is under development through a consortium that includes representatives from leading research institutes, industry associations, and existing agricultural data intermediaries. Their focus has been on identifying the existing agricultural data exchanges across the EU and how they might be integrated, as well as facilitating discussion on the business model of AgriDataSpace. Proposed revenue models have included freemium, SaaS, and licensing.[52] At the same time, the public sector is preparing programs and identifying relevant public data collection efforts to eventually integrate into AgriDataSpace that include geospatial data, economic performance of farms, beneficiary data from the Common Agricultural Policy, and public data on nutrient and fertilizer management.[53]

**As the AgriDataSpace is being built, the EU has funded several R&D agri-data initiatives under Horizon Europe to develop proof-of-concept use cases.** ScaleAgData, for instance, is working to improve precision farming in domains like irrigation regimes, yield monitoring, soil

50 European Commission (2024)
51 European Commission (2024)
52 AgriDataSpace. Key Takeaways from AgriDataSpace Workshops. Retrieved January 2024, from https://agridataspace-csa.eu/key-takeaways-from-agridataspace-workshops/
53 European Commission (2024)

health, and grasslands monitoring through novel approaches in data collection, data sharing, and data analysis. For example, ScaleAgData is piloting collection and analysis of farm IOT/sensor technology to collect data on individual fields and combining it with existing local and regional public data sets as well as enhanced geospatial data. They envision their analysis being of use to individual farmers as well as public sector actors alike. DIVINE is another funded R&D project that combines public and private agricultural data to improve data interoperability. Pilots include building a crop yield production model in Ireland and a data space for sustainable food production in Slovenia.[54] These intermediaries, ScaleAgData and DIVINE, are currently subsidized through the Horizon Europe program and have no stated business model.

Particular to individual farmers and their rights, the EU drafted and passed a Code of Conduct on agricultural data by contractual agreement in 2018. It establishes general principles for sharing agricultural data that can be imported into any contract between farms to other businesses across the agri-food chain (e.g., agricultural suppliers). It aims to empower farmers to benefit from the use of data created by their farms. Compliance with the code is voluntary. [55]

**TABLE 8: EUROPEAN DIGITAL FINANCE PLATFORM OVERVIEW**

| INITIATIVE NAME | EUROPEAN DIGITAL FINANCE PLATFORM |
|---|---|
| Ownership | Government-backed and -funded |
| Focus Segment | Provide data for fintechs and startups |
| Key Dates | Launched in 2023 with first synthetic datasets uploaded in December 2023 based off of Lithuania Credit Register |
| Data Exchange Architecture | Centralized by EU; data sharing is not mandated |
| Monetization of Data Exchange | No monetization |
| Key metrics | Synthetic data based off three years of central credit register from Central Bank of Lithuania on company loan-level data |

The European Digital Finance Platform was created to improve data sharing between financial supervisory authorities and the private sector, namely fintechs and financial startups, to spark product innovation. According to the platform manager, its provenance was rooted in the goals of the EU Data Strategy as well as the sector-specific Digital Finance Strategies.[56] Thus, the objectives are to both boost economic growth through data sharing as well as provide competition to incumbent financial institutions by providing new data resources to fintechs.

Financial supervisors have long been constrained from reusing or sharing data under their

54 DIVINE Project. (n.d.). Pilots. Retrieved January 2024, from https://divine-project.eu/pilots
55 COPA & COGECA. (2020). EU Code of conduct on agricultural data sharing by contractual agreement. https://fefac.eu/wp-content/uploads/2020/07/eu_code_of_conduct_on_agricultural_data_sharing-1.pdf
56 Key Informant Interview, Digital Finance Platform Staffer, November 21st 2023

purview due to privacy concerns. The European Digital Finance Platform's central innovation, through its data hub, is to create synthetic datasets based off supervisory data from national competent authorities, thus avoiding privacy issues. According to platform staff, these synthetic datasets could be built off of data from any number of national competent authorities across the 27 member states including central banks, insurance authorities, or capital markets authorities.[57]

The platform has liaised closely with the European fintech community to understand their needs and potential use cases for synthetic supervisory data.[58] Thus far, fintechs have expressed interest in synthetic data primarily for two use cases; the first is to build underwriting models that are fairer and avoid bias, and the second is to improve fraud detection. Their ability to achieve this depends on participation from national competent authorities.

Participation in the platform is entirely voluntary, and to date, only one European central bank, Lithuania, has allowed synthetic data to be built off their data sets and shared publicly, while several others have conducted pilots.[59] Currently, the Lithuanian Central Bank has allowed synthetic data to be generated from three years — 2020, 2021, and 2022 — of loan-level data from companies that reside in Lithuania. It is not clear whether any fintechs have utilized this data to build models.

According to staff, national competent authorities have hesitated to participate in the data hub for two key reasons. The first is fear of deanonymization or that fintechs or others will be able to trace the data back to an individual. This is a false fear, as synthetic data is not the same as anonymous; it is completely new data that has the same statistical properties as the underlying data but cannot be traced to anyone. As an additional precaution, procedurally, the synthetic data is generated onsite and the real data does not leave the premises of the national competent authority. The second barrier to participation is that national competent authorities are more concerned about stability and issues of privacy than innovation, so most are not innately excited about innovation and data sharing.[60]

57 Key Informant Interview, Digital Finance Platform Staffer, November 21st 2023
58 EU Digital Finance Platform. (n.d.-a). Fintech mapping. Retrieved January 2024, from https://digital-finance-platform.ec.europa.eu/eu-fintech-map
59 EU Digital Finance Platform. (n.d.-b). Synthetic datasets. Retrieved January 2024, from https://digital-finance-platform.ec.europa.eu/data-hub/datasets
60 EUDFP (n.d.-a)

## 3.3 OPEN NETWORK OF DIGITAL COMMERCE (ONDC, INDIA)

TABLE 9: ONDC OVERVIEW

| INITIATIVE NAME | OPEN NETWORK FOR DIGITAL COMMERCE (ONDC) |
|---|---|
| Ownership | Government-backed, funded by banks, technology companies, and other financial institutions |
| Focus Segment | Ecommerce sellers and buyers |
| Key Dates | Piloted in 2022, launched in 2023 |
| Data Exchange Architecture | Decentralized, no data storage within ONDC |
| Monetization of Data Exchange | Commissions capped at 3 percent in some ecommerce transactions |
| Key metrics | 5.5 million ecommerce transactions in December 2023<br>Financial offering on ONDC not yet launched |

**The Open Network for Digital Commerce (ONDC) represents a significant stride towards reshaping the ecommerce landscape in India.** Conceptualized by the Department for Promotion of Industry and Internal Trade in 2021, ONDC's primary goal is to democratize digital commerce by breaking the monopoly of major ecommerce giants and fostering an inclusive, open network connecting sellers and buyers across various platforms.[61] The ONDC defines itself as "backed" by the government but not owned by it; it operates as a nonprofit entity, financially supported by the broader ecosystem, including banks and ecommerce platforms.

TABLE 10: ONDC INSTITUTIONS AND FUNDING OVERVIEW

| PHASE | INSTITUTIONS INVOLVED | FUNDING ESTIMATES |
|---|---|---|
| Conceptualization | Department for Promotion of Industry and Internal Trade (DPIIT) | - |
| Seed Funding (2021) | Quality Council of India<br>Protean eGov Technologies Limited | Approx. $1.2m |
| Early-Stage Investments (2022-2023) | 20+ banks, financial institutions, technology companies, private-public partnerships [62] | Approx. $32m |

61 Open Network for Digital Commerce. (2022). Democratizing Digital Commerce in India. https://ondc-static-website-media.s3.ap-south-1.amazonaws.com/res/daea2fs3n/image/upload/ondc-website/files/ONDCStrategyPaper_ucvfjm/1659889490.pdf

62 List of investors include public sector banks (e.g., Punjab National Bank, State Bank of India, Small Industries Development Bank of India), private banks and financial institutions (e.g., Axis Bank, ICICI Bank, HDFC Bank, etc.), and diverse government agencies (National Payment). See list of available funders in Annex.

**Despite its short history, ONDC's ecosystem is growing increasingly complex and poses increasing governance challenges.** In its initial conceptualization, the ONDC ecosystem entailed two main categories of players in the ecosystem: buyer-side applications and seller-side applications, which essentially linked the demand side for ecommerce through apps such as PhonePe/Pincode and Paytm, and the seller side through platforms such as Byzome. After additional consultations in 2022,[63] the type of participants' categories increased, and the current list includes logistics providers as well as diverse types of sellers, namely "inventory sellers" (individual sellers selling through ONDC) and "marketplaces" (platforms such as Ninjacart or Magicpin) connected to the network. ONDC also enlists six additional categories of "ecosystem participants" providing a variety of services in the network, ranging from online dispute resolution, reconciliation service providers, and technology service providers. According to the interviews conducted, the growing complexity is increasing the pressure on ONDC to develop clear governance mechanisms, particularly regarding the vetting of new participants and better management of complaint resolution and reconciliation.

**The ONDC's steady growth reflects its evolving presence in the market, although it still only accounts for a small fraction, with major players entering the network in a measured manner.** ONDC has experienced a steady increase in uptake throughout 2023, marking its growing influence in India's digital commerce landscape. By December 2023, the network saw a significant rise to 5.5 million transactions, reflecting rapid adoption, particularly in retail and mobility sectors. The retail sector alone witnessed remarkable growth, with transactions surging from just over 1,000 in January 2023 to 2.1 million by the end of the year and over 5 million in December.[64] Despite these advances, ONDC's transaction volume still accounts for a fraction of India's digital commerce, which was estimated at over 35 billion transactions in 2021.[65] Alongside this growth, there has been an uptick in participation from individual sellers and marketplaces. However, major ecommerce platforms like Amazon are cautiously engaging with ONDC. While responding to government calls for more inclusive digital commerce, these large platforms are strategically integrating only certain services, like warehousing, into ONDC. By selectively participating, they retain control over key business aspects such as payment and delivery systems. This approach signifies a symbolic commitment to ONDC, balancing the need to comply with regulatory frameworks while preserving their established business models and market dominance.

**ONDC's success will hinge on its capacity to improve competition in a notoriously concentrated ecommerce market.** ONDC's impact on competition

63 Open Network for Digital Commerce. (2022). Building Trust in the ONDC Network. https://ondc-static-website-media.s3.ap-south-1.amazonaws.com/res/daea2fs3n/image/upload/ondc-website/files/ONDC_Building_Trust_Consultation_Vf_utbodw/1664541553.pdf

64 The Economic Times. (2024, January 4). ONDC crosses record 5.5 million transactions in December. https://economictimes.indiatimes.com/tech/technology/ondc-crosses-record-5-5-million-transactions-in-december/articleshow/106552745.cms?from=mdr

65 International Trade Administration. (2024). India - Country Commercial Guide: Online Marketplace and E-Commerce. https://www.trade.gov/country-commercial-guides/india-online-marketplace-and-e-commerce#:~:text=According%20to%20Statista%2C%20India%20had,expected%20to%20exceed%20210%20billion

among ecommerce platforms has two opposing perspectives. On the one hand, the core goal of ONDC is to address the problem of anti-competitive behaviors by large platforms — competition issues such as self-preferencing, where large platforms prioritize their own products over those of the sellers, or predatory pricing and the use of proprietary data to imitate and undercut products from smaller businesses.[66] ONDC aims to address these issues by fostering a more decentralized and equitable online marketplace, reducing entry barriers, and diluting the concentration. On the other hand, experts have expressed concerns for the potential anti-competitive nature of ONDC. In addition to the 3 percent cap on commission rates on the platform (compared to 25 to 30 percent in commercial platforms), ONDC is also providing significant discounts to buyers in its early stages, making ONDC in some cases more than 25 percent less expensive than other food delivery platforms such as Zomato or Swiggi.[67] While ONDC clarified that the discounts were financed through its own equity and not through government subsidies, the direct and indirect participation of government agencies and government-owned banks in ONDC has raised concerns on the potential implications for commercial players.

**ONDC's planned financial services offering shows great potential, but the current governance structure is limiting the market-making potential of the network.** ONDC is well positioned to play a critical role in inclusive finance as an alternative financing model for small traders in the digital economy. The roadmap for its financial services component, set to launch in 2024, starts with small-ticket personal loans, catering to individual needs, and extends to more complex financial solutions like GST database invoice financing and supply chain finance, particularly beneficial for FMCG dealers and retailers. Future phases will include insurance, investments, and gift cards. Despite its promising trajectory, experts have expressed concerns that ONDC's strictly technical mandate as a protocol builder may limit its potential for creating market demand, developing capacity, and raising awareness, particularly in the early phases of its implementation.

**The detailed revenue models within both ONDC's ecommerce and fintech offerings are still being negotiated, yet there is consensus on the initial fees to be applied to ecosystem participants.** Presently, ONDC functions as a nonprofit entity and does not levy any fees on participants within its network. Nonetheless, ONDC might consider implementing a minimal charge on the ecommerce transactions in the future to support its operational expenses. The revenue models in the fintech offering are also not determined and, as of now, there is limited transparency regarding the exact charges and the potential revenue streams. Our interviews with ONDC revealed that the plan is to introduce the following categories:

1. **Finder's Fee for Buyer Apps:** This is a significant component where platforms that assist in facilitating transactions, particularly in loan processing, receive a finder's fee upon the successful

66 Paikine, R. (2022, September 12). Does ONDC address the competition concerns that plague Indian E-commerce? D91 Labs. https://d91labs.substack.com/p/does-ondc-address-the-competition

67 Business Today. (2023, October 31). ONDC vs Zomato, Swiggy: Here's what India's top restaurateurs prefer. https://www.businesstoday.in/entrepreneurship/start-up/story/ondc-vs-zomato-swiggy-heres-what-indias-top-restaurateurs-prefer-403892-2023-10-31

completion of a loan. This fee serves as a revenue source for the apps that enable these financial transactions, primarily benefiting borrowers through enhanced access to loans.

2. **Revenue From Loans:** Lenders benefit financially from the interest accrued on the loans they issue. While this forms a crucial part of the revenue model, the specific interest rates or percentages are not clearly outlined in the existing information.

3. **Commission From Insurance and Mutual Funds:** In a manner akin to loan transactions, insurance and mutual fund dealings also involve commission payments. These commissions, paid to the buyer apps, constitute a revenue stream, while mutual fund companies generate income through management fees. Similar to other aspects of the revenue model, the exact rates or percentages applicable to these commissions have not been detailed.

## 3.4 TRADE DATA PLATFORM (SINGAPORE)

**Large-scale initiatives exist to digitize — operationally and legally — trade documentation and processes that underpin global trade finance.** While many industry and policy-driven initiatives are focused on mature markets beyond the scope of financial inclusion, their architectures and learnings may eventually impact developing markets and suppliers at the bottom of extended value chains. The focus of trade digitization initiatives is to enable myriad data concerning trade to be shared, managed, traced, and, above all, trusted while passing from one party to another in the long and often complicated chain of events in both finance and physical handling of goods.

The approach of the ICC Digital Standards Initiative is relevant for the design of broader data sharing arrangements in the trade sector.[68] The broader program, including other stakeholders, encompasses efforts to: (i) agree on common data standards, definitions, and controls between stakeholders for prioritized trade documents; (ii) adopt legal reforms and standards such as for digital bills of lading and the Model Law on Electronic Trade Receipts (MLETR); and (iii) adopt the legal entity identifier (LEI) by trading partners.

TABLE 11: STRUCTURE OF THE ICC DIGITAL STANDARDS INITIATIVE

| | |
|---|---|
| Certificate of Origin | Form that certifies expressly that a set of goods originated in a specific country |
| Customs/Goods Declaration | Enables a declarant to indicate the customs procedure to be applied to the goods |
| Packing List | Covers the physical delivery of goods from one site to another with a transport contract obligation |
| Bill of Lading | Provides evidence of contract of carriage; confirmation of receipt for the goods or document |

68 ICC Digital Standards Initiative. (2023). Key Trade Documents and Data Elements: Digital standards analysis and recommendations. https://www.dsi.iccwbo.org/_files/ugd/8e49a6_2d93b2f219cf404ab91bafd028e31fcc.pdf

| | |
|---|---|
| Commercial Invoice | Consists of an itemized account of goods or services delivered together with payment demand |
| Warehouse Receipt | Acknowledges receipt of goods placed in a warehouse |
| Insurance Certificates | Serves as proof of a cargo insurance cover for a shipment of goods |

Source: ICC Digital Trade Initiative [69]

Closely related to the global efforts to digitize trade are several large-scale distributed ledger technology (DLT)-supported platforms. These include Marco Polo Network, we.trade, Contour, and TradeLens, all of which were developed by a consortia of banks, IT companies, and logistics providers.[70] All four of these initiatives have since closed down. A reason for their lack of success was the operational and strategic difficulties of getting the broad array of actors involved to join a common platform. Interoperability between these ledger projects was a hurdle to their business models. This highlights the need for decentralized approaches to sharing trusted data and for common standards to be agreed upon and legally embedded across different jurisdictions.

At the national level, there is also an array of initiatives to facilitate data exchange and processing between trading parties. An example in Singapore and covered in the research conducted for this study is SGTraDex.

**TABLE 12: SGTraDex OVERVIEW**

| INITIATIVE NAME | SGTraDex (SINGAPORE) |
|---|---|
| Ownership | Public-private partnership |
| Focus Segment | Trade and logistics |
| Key Dates | Launched in 2023 |
| Data Exchange Architecture | Centralized |
| Monetization of Data Exchange | Not known |
| Key Metrics | Not launched |

**SGTraDex, or Singapore Trade Data Exchange, is a digital platform designed to streamline information flows across a fragmented global supply chain.** It was first introduced in November 2020 as a pilot project aimed at improving data efficiencies in container flow and financial processes.[71] The platform is managed by the Alliance for Action (AfA), a

69 ICC Digital Standards Initiative. (n.d.). Homepage. Retrieved January 2024, from https://www.dsi.iccwbo.org/

70 Ledger Insights. (2023, November 1). Blockchain trade finance network Contour to shutter. https://www.ledgerinsights.com/contour-blockchain-trade-finance-network-shutter/

71 Yu, E. (2022, June 2). Singapore officially launches digital platform to ease supply chain data flow. ZDNet. https://www.zdnet.com/article/

public-private partnership established by the Singaporean government. Its goal is to create a common data highway for Singapore's supply chain ecosystem, channeling information from disparate sources via a central digital infrastructure.[72] The platform leverages the TradeTrust framework and distributed ledger technology to authenticate documents, offering users verified proof of document origins and authenticity on SGTraDex. TradeTrust, built on blockchain, serves as a shared infrastructure that securely facilitates the exchange of digital documents among trading partners, encompassing both government entities and private companies. The platform's main function is to enable the exchange of timely data between shipping lines, haulers, and terminal operators to alleviate congestion in ports and other transportation nodes. It also aims to ease data exchange between shipping lines, haulers, and port operators to improve planning and increase asset utilization.

**The platform is new and the usage levels are not publicly available, suggesting a slow adoption of the platform in its early stages.** SGTraDex was founded by 11 organizations, including the Infocomm Media Development Authority, PSA, OCBC Bank, and Oiltanking. In terms of operations, SGTraDex went live in June 2022 with more than 70 participants, including large multinationals, local banks, and small and medium Singapore enterprises such as local haulers and logistics firms.[73] SGTraDex is composed of two companies: a consumer-facing services arm, which is a joint venture between industry and the Singaporean government, and a separate company that operates the platform's technology.

For now, SGTraDex has developed proofs of concept for financial services, though the potential for scale and application to inclusive finance are unclear. The examples we found include several product launches and successful transactions:

1. **Fraud Prevention:** Initially, a primary application of the platform will focus on fraud prevention by identifying instances where companies might try to secure financing twice using the same cargo or forged documents. Rather than depending only on documents provided by a client in trade transactions, banks will be able to access original trade data directly.

2. **Export Financing Transactions:** A successful export financing transaction was completed using SGTraDex in August 2023, involving digital document exchanges. The transaction featured Unipec Singapore, Vopak Singapore, and OCBC, where digital bills of lading (BLs) were exchanged over SGTraDex's data highway. This process provided OCBC, the financing bank, with clear visibility on the delivery to the buyer. Traditionally, these documents were paper-based, leading to potential fraud and delays. The BL exchange was authenticated by TradeTrust, ensuring the documents were genuine and unaltered.

singapore-officially-launches-digital-platform-to-ease-supply-chain-data-flow/

72 PwC Global. (n.d.). Supporting international trade for the digital age: Solving real-world problems to build transparency and trust. Retrieved January 2024, from https://www.pwc.com/gx/en/issues/risk-regulation/case-study-sgtradex.html

73 PwC Global (n.d.)

3. **Green Financing:** In one instance, SGTraDex has been used by Equatorial Marine Fuel and Carbon Management Solutions to exchange carbon credits and proof of sustainability certificates for a bunker fuel transaction.

## 3.5 OTHER INITIATIVES

**It is important to take note of initiatives to support future decentralized or distributed data ecosystems.** A key architectural challenge of almost all the preceding initiatives concerns how to maintain trust and integrity while not unduly limiting access and scalability. The most prominent high-value data sharing arrangements in financial services have tended to use controlled, centralized hub-and-spoke models to instill trust and align incentives between data providers and users. Consequently, these data platforms are by design exclusionary rather than inclusive in nature. The intent is partly to ensure that the data provided is trusted and that access by users can be controlled in efforts to avoid misuse of data beyond the contractually agreed terms and conditions.

The continued expansion of the internet and its perceived dominance by a handful of large "gatekeeper"-type companies has given new impetus to the development of decentralized architectures through which to exchange and manage data while still addressing the need to trust the authenticity, provenance, or content of data. The rise of Bitcoin and related DLT initiatives, such as Ethereum, as well as initiatives to "fix the internet" by rebalancing control towards consumers, have highlighted the role of identity, protocols, data servers, standards, and the notion of self-sovereign identity and data within the broader discussion about data and the digital economy.[74]

There are some distinct developments that may become important foundations for trust and interoperability of data sharing within distributed ecosystems. These may warrant further engagement and research as follow-ups to this study. A brief overview of these is provided below.

### 3.5.1 LEIF and Verifiable LEIs

**The Global Legal Entity Identifier Foundation (GLEIF) was established after the 2008–2009 financial crisis to enhance transparency and compliance with AML and CFT legislation.** It was initiated by the BIS-hosted Financial Stability Board (FSB) and is overseen by a regulatory oversight committee composed of a broad cross-section of mostly financial services authorities from around the world. Its primary mandate is to maintain a standard and network for interoperable legal entity identifiers (LEIs) that build upon, rather than duplicate, national standards and networks for legal entity registration.

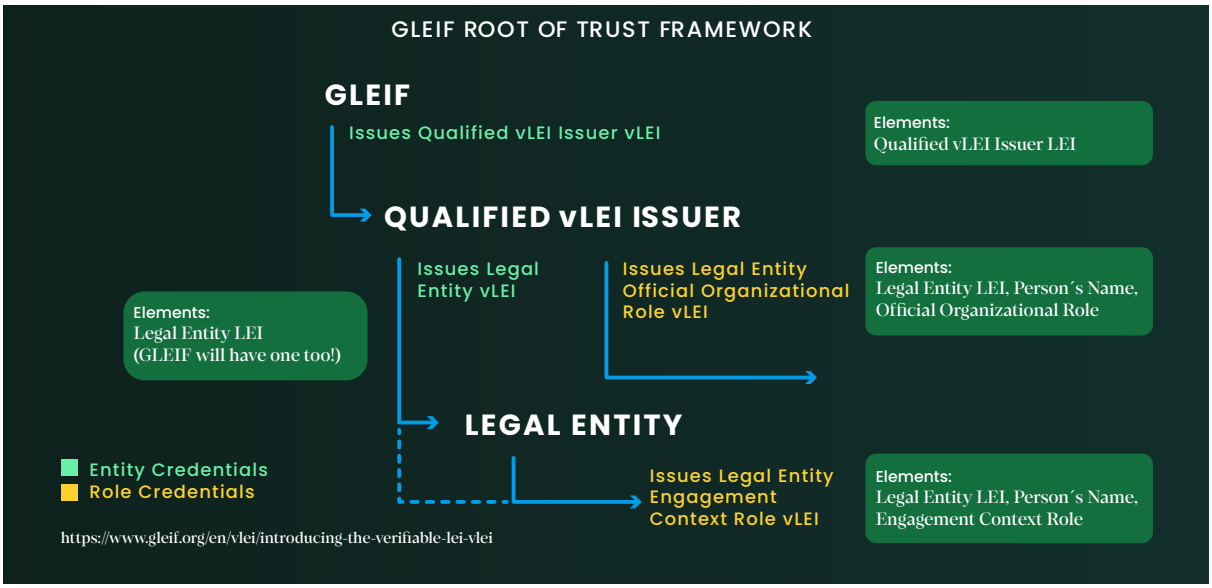
**Starting in 2023, GLEIF also introduced a verifiable credential version of the LEI (vLEI).** A derivative of this is the role credential, which can be used by company officers to verify the authenticity of data signed and transmitted by company officers. This vLEI provides a decentralized mechanism for trading partners to check the authenticity and provenance of underlying data exchanged between them without recourse to a central registry or intermediary. The verifications of identity

74 See initiatives of Tim Berners-Lee, as referred to here: Reuters. (2021, January 12). Father of the Web Tim Berners-Lee prepares 'do-over.' https://www.reuters.com/article/idUSKBN29H1IR/

and the role of officers can be verified based on the anchor of trust provided by the GLEIF governance and operation framework that establishes trust in the underlying identity of entities.

**The relevance of decentralized digital identity is in enabling trusted peer-to-peer data sharing.** A unique and trusted identity enables counterparts to trace the provenance of data and clearly assign data attributes to common subjects without recourse to an authorized third-party aggregator or intermediary. In centralized or federated systems, identification of data subjects is dependent on their records being held and verified with a closed or proprietary network. Moreover, the meaning and accuracy of data is also dependent on the network and therefore not fungible outside of it unless through specific agreement and additional due diligence. Decentralized identity can enable data to be exchanged more readily via a peer-to-peer model without the dependency on a closed, centralized, or delegated system of authority and "source of truth."

FIGURE 16: OVERVIEW OF THE vLEI CHAIN OF TRUST




Adapted from GLEIF

The vLEI is now being integrated within a pilot project sponsored by the MAS, UNDP, and GLEIF that will develop the concept of Universal Trusted Credentials (UTCs).[75] This concept aims to not only support digital signature equivalents for trade documentation but to also develop standardized data records for verifiable credentials that can be used, for instance, to harness sales and purchase history from disparate platforms and use them in credit assessments. Further information about the blueprint for this program can be made available on request.

### 3.5.2 Agricultural Data Exchange (Varda)

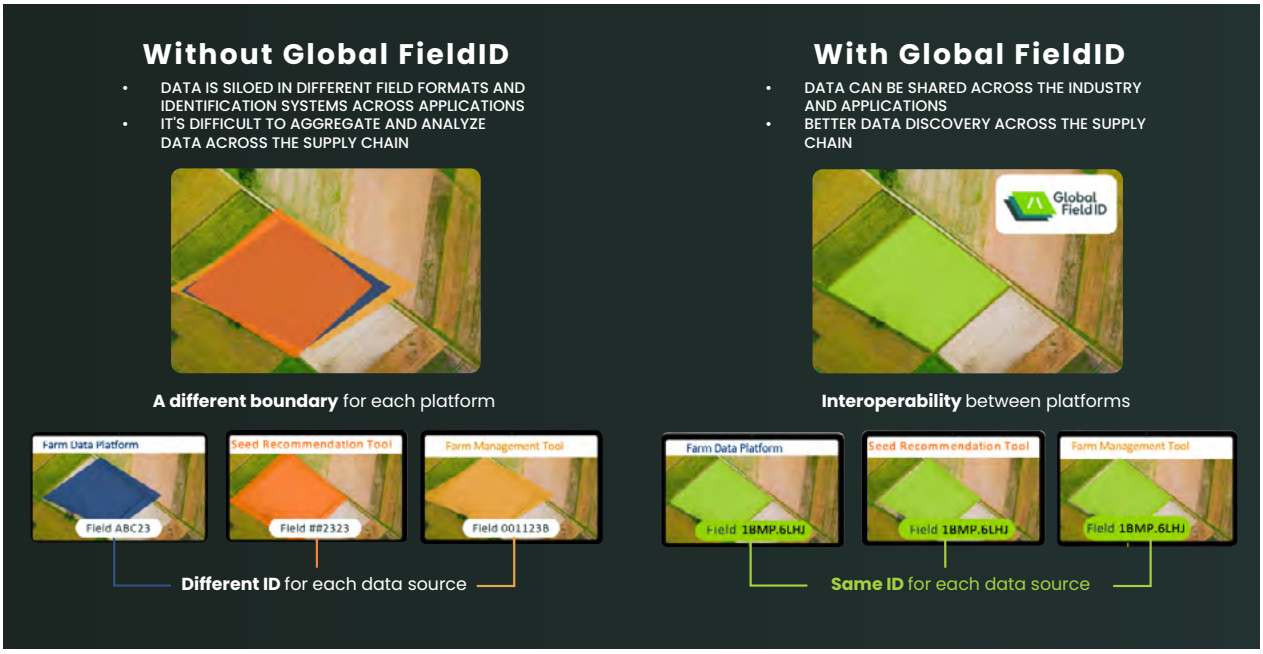
75 United Nations Development Programme. (2023). White Paper on Universal Trusted Credentials (UTC): Transforming Access to Finance for MSMEs and Beyond. https://www.undp.org/sites/g/files/zskgke326/files/2023-11/white_paper_on_universal_trusted_credentials.pdf

**Varda was established by Yara International as a corporate spinout with the mission to enable global agricultural data sharing.** Its purpose is to help accelerate the transition towards a more sustainable and transparent food system by enhancing farm- and field-centric data sharing and processing across jurisdictions and corporate silos.

One of their two main products is the Global FieldID. This assigns a unique identifier to land parcels and disseminates them via an API. A complementary product, Soil Hive, is a platform to store and exchange soil information, collecting data from existing public sources and enabling the "donation" of data from private sources. Both products are intended to become digital public goods that enhance livelihoods and efficiency of the farming community by enabling more reliable and comprehensive data about fields and farming to be shared between various stakeholders and with the participation of the farmers that cultivate the land. The key underlying hypothesis is that to make measurement and reporting of regenerative farming practices scalable and efficient, it is essential to have a universal naming system for land parcels in place, and to simplify the collection and distribution of certain data layers — such as soil data — that otherwise remain enormously fragmented (and mostly invisible).

**Varda is being transformed into a social enterprise or nonprofit with broader governance.** This will align its governance with its intended role as an independent and neutral provider and manager of digital public goods. Similar functions are being developed in the national context of projects reviewed above, such as Agri Stack. Varda aims to develop an approach that helps further agricultural business development at an international level within the context of multilateral trade.

FIGURE 17: VARDA GLOBAL FIELDID CONCEPT




Adapted from Varda

### 3.5.3 Self-Sovereign Data Initiatives and Personal Data Servers

**Various initiatives try to provide an alternative to storing data and having it controlled by a centralized third-party platform.** Many self-sovereign (SS) data initiatives depend on distributed ledger technology and local storage of off-chain data. "Personal data servers" (PDS) is a broad term that refers to an arrangement in which individuals (primarily natural legal persons) legally and operationally hold control of their data and enter into agreements to access it, without recourse to a custodian or third-party holder of the data separating the supply of the data from the use of the data. They involve equipping users with a device — potentially remote or local — that is dedicated to a user's personal data. An equivalent can operate for legal entities.[76]

The motivation behind SS and PDS initiatives is to alleviate the dependency, or obligation, for individuals to interact with their own data through intermediaries that legally hold and administer their data. They seek the equivalent control that users have over bearer instruments such as cash (or its digital equivalent) versus the dependency they have on banks or other intermediaries if they wish to make digital transactions in scriptural money held with fiduciary institutions. The intent is to enable peer-to-peer autonomous control by individuals over their data and both legal and operational control to be able to share access to it or transmit it to other parties.

The data architecture PDS programs separate the storage of the data (as self-sovereign) and the array of services that would use the data that are often bundled together as a package and that would have resulted in the lock-in of the data. The functional service that anchors a client to a service provider and creates market power is the storage of data. If this can be legally held separate from the wallet apps used to interface with it, consumers can not only exercise direct legal control over data sharing but also in principle incite greater competition between service providers.[77]

To illustrate, a PDS distinguishes between: data wallets; data storage devices; the underlying data assets; and "apps" that can be used to interact with data assets and discover and interact with other parties. A PDS arrangement provides the data storage but enables consumers to choose among different compatible providers for the other services that enable them to interact with, analyze, and share their data. So, for example, in contrast to a PDS, a Google Cloud service might integrate all these services under one bundled contract, under which clients use the Google Drive interface to interact with and manage their data; the data is technically stored in hardware that is owned and operated by Google, not in the legal name of the end client. In contrast, under a PDS arrangement, the data assets can themselves be created and altered by the end user without the permission of Google and managed, shared, and analyzed using an array of third-party applications of their choice (which could potentially but not necessarily include apps owned by Google). This means a PDS enables greater contestability and interoperability.

76 Jannsen, H., Cobbe, J., Norval, C., & Singh, J. (2020). Decentralized data processing: personal data stores and the GDPR. International Data Privacy Law, 10(4), 356-384. https://academic.oup.com/idpl/article-abstract/10/4/356/6054280

77 Another analogy with financial services would be in regard to dematerialized listed securities, which can be moved from one custodian to another without impairing the underlying asset.

Personal data server providers are at an early stage of supporting decentralized data and distributed ecosystems.[78] One pertinent deployment project concerns supermarkets' consumer data and attempts to operationalize a right embedded in the U.K. Data Act for consumers to request and obtain their data records — in this case, concerning purchase history — in an operationally reusable form. This campaign by Databonds would enable customers of large supermarkets to share their purchase history (and other) data directly with product providers such as Unilever or Nestle, possibly in return for monetary or, more likely, incentive-based benefits that might otherwise disproportionately benefit the supermarket chains.[79] Such examples hold interesting potential for broader application to building inclusive and distributed data ecosystems of multiple apps and consumers.

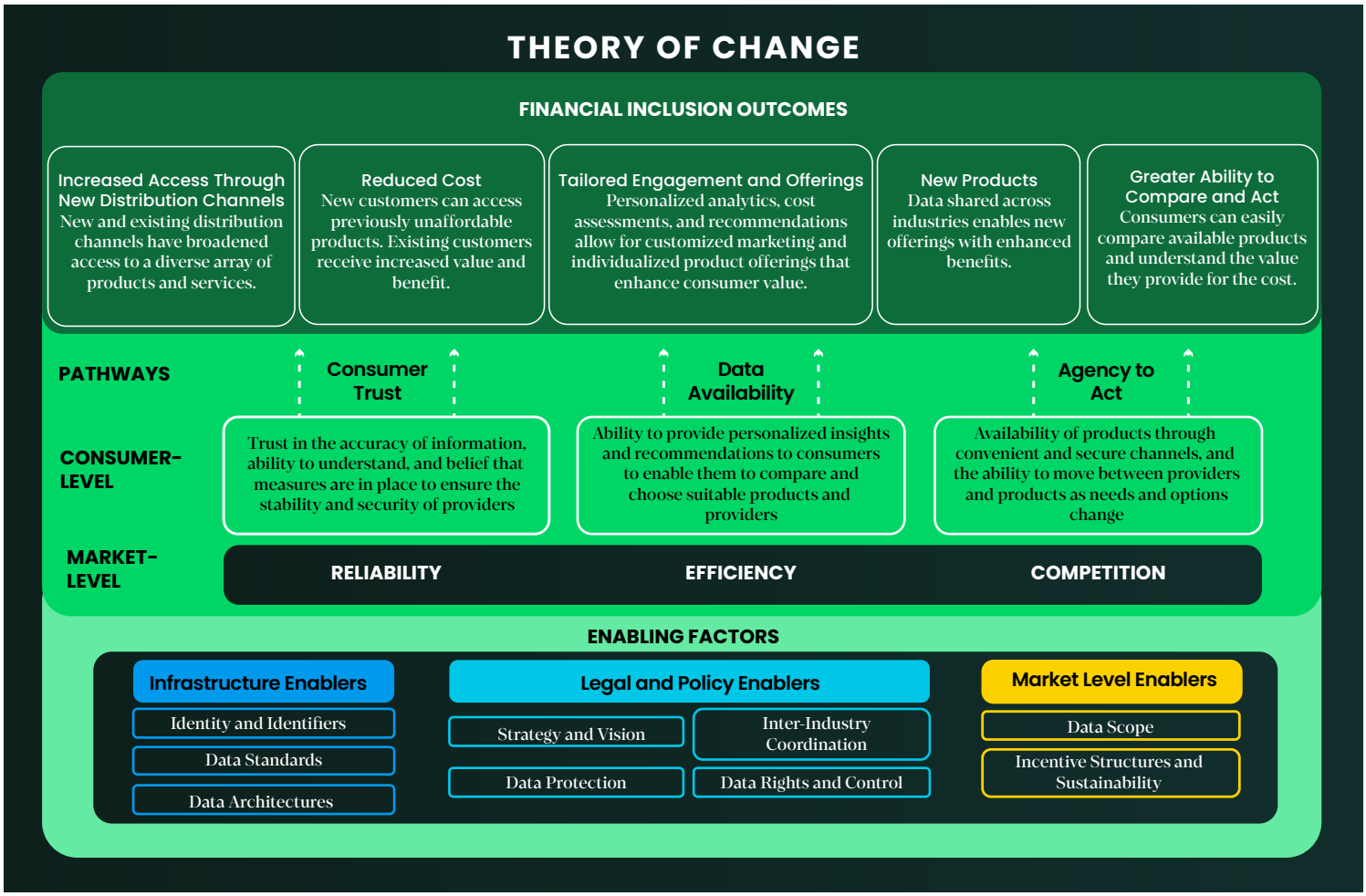
78 Firms operating in this market niche include Dataswyft and Truzzt.
79 Databonds. (n.d.). Homepage. Retrieved January 2024, from https://databonds.co.uk

# 04 Inclusive Finance Outcomes, Enablers, and Markets

This section draws on the preceding empirical analysis and considers implications for markets and data sharing arrangements that enhance financial inclusion. It uses as reference a theory of change presented below which outlines enablers and market development pathways through which data sharing arrangements can facilitate inclusive finance outcomes.

**How can novel data sharing arrangements impact inclusive finance?** We consider two broad pathways through which data may affect development outcomes of relevance to this study: (i) data may be employed to enhance access to or the nature of financial services targeting marginalized or underserved households and businesses; and (ii) it may enable individuals or businesses themselves to improve their financial or commercial behaviors in a way that improves their welfare, usage, and eligibility for financial services. The theory of change highlights features of markets and cross-sectoral enablers that allow data sharing arrangements to enhance financial inclusion through efficiency, reliability, and competition.

FIGURE 18: DATA AND FINANCIAL INCLUSION - THEORY OF CHANGE




There are several cross-cutting features of (mostly digital) market infrastructure and institutions that must be addressed to support various data sharing arrangements. Drawing on the theory of change framework and the empirical review, we highlight the main enablers of the innovative data sharing arrangements analyzed. These include legal and policy enablers, infrastructure enablers, and market enablers.

## 4.1 INFRASTRUCTURE ENABLERS

### 4.1.1 Identity and Identifiers: The Cornerstone of Trusted Data Ecosystems

**Trust in the identity of data provenance and data subjects is critical to the effective use of data.** If data's origins cannot be clearly traced back to a reliable source, it will not be trusted, and data attributed to a subject that cannot be reliably identified by the user of that data will also suffer from a lack of trust. In some areas of the economy, low assurance levels of data and its subjects might still be used, such as for marketing, with consequently low or irregular

success. But more important and valuable data about finance, transactions, or business operations needs to have higher levels of assurance. Additionally, to prevent misuse, the users or consumers of data also need to be identified before consent is provided to them. All cases studied incorporate important mechanisms to control access and usage through identification of various participants and users.

**Beneficiaries of financial inclusion efforts are the least likely to have trusted identity credentials.** Financial inclusion efforts focus on individuals at the margins, who often do not have identity credentials, especially not digital ones. The provision of reliable digitally usable national identity is underdeveloped in many, if not most, low-income economies. Many such economies also have minorities and migrant populations who are even less likely to have digital IDs. Similarly, most enterprises are informal in nature and therefore, even if it were available, are unlikely to have any official status as a legal entity. In India, initiatives for agriculture data exchange such as Krushak Odisha were enabled by their interaction with Aadhaar for farmers' identification (see Section 6.5). Small businesses, however, often lack identifiers, and hence cannot have access to innovative data sharing arrangements. The financing program under ONDC, for example, will solely focus on individual traders due to the lack of legal entity identifiers with sufficient penetration in the MSME sector.

**Digital identities in new data sharing architectures are often meant to substitute for proprietary closed network identifiers.** For instance, data held on an ecommerce platform by a bank is linked to a customer ID established by a corporation. If that data is to be shared beyond that network, the recipients may not be able to map the customer ID to another identifier nor place much confidence in the identity confirmation measures taken by the network. In many open banking arrangements, counterparts such as TPPs rely substantially on the integrity of banks' own identity due diligence functions. In the corporate world, national business registries or tax ID numbers may be used to assign data to a specific data subject and to verify their identity. However, in the context of informal companies or cross-border operations, these identifiers may not be valid.

### 4.1.2 Data Standards: Enabling Interoperability Between Ecosystems and Users

Data has value when it can be interpreted in a reliable meaningful way, transformed into actionable information. Sharing and exchanging meaningful data requires some degree of standardization. This is even more important for processes that are highly automated and driven by machines, even if the advent of AI may alleviate the need for standardization. The level of standardization of data varies across operational domains, sectors, and areas of economy and, in most cases, is still evolving. The extent to which data ecosystems can be meaningful is dependent on the interoperability of data and the additional costs that must be incurred by actors to clean, augment, and render it useful for commercial purposes.

Existing data sharing ecosystems say a lot about the status and impact of standardization. Open banking initiatives have generally started with data sets that are

already highly standardized (e.g., account and payment data) or read-only data that has less need to be actionable and machine readable without manual intervention (e.g., ATM locations and some product offerings). The uptake and reliability of open banking has also been better in markets such as the U.K. and South Korea, where data catalogues and standards have been clearly and uniquely defined as well as imposed upon participants. However, standards on their own are not sufficient. According to our interviews, compliance with data standards continues to be limited in India and Brazil, where fintechs and other ecosystem participants have found difficulties accessing the data despite the use of standardized APIs. Despite investment in devising and rolling out standard APIs, our interviews suggest that the biggest challenges in implementing SGFinDex were the banks' struggles to adapt their legacy systems.

There are important implications for financial inclusion. Market-wide and industry-led initiatives may not automatically focus their efforts on data of more relevance to the financially excluded. And even where they do, levels of data integrity, standardization, and interoperability across platforms may be limited. Additional efforts may be needed to make data applicable to commercial processes, and more perennial arrangements may be needed to keep standards in sync between users as the market evolves. ISO standards, for instance, are not static but living arrangements that are proactively managed by a representative community of stakeholders. The LEI standard established is another important example in this regard. GLEIF developed it; the LEI is now an ISO standard and GLEIF and its community are the bodies responsible for its evolution under the ISO system.

### 4.1.3 Data Sharing Architectures

Different architectures and types of intermediaries are used to facilitate the matching of latent demand and supply for data. Our findings have focused on various implementations around three main archetypes: federated permission-based programs, centralized programs, and decentralized peer-to-peer programs.

1. **Federated models** are typical in open banking and finance initiatives (e.g., in Brazil, India, and the EU). In these contexts, a new set of access rights and institutions are accredited to gain permission- or consent-based access to information held with a core set of data holders. In other words, financial institutions, the trusted holders of data, are obliged to comply with instructions from their clients to share data with a limited set of accredited data intermediaries or users.

2. **Centralized programs** are more often government-led and aim to make government-produced, -sourced, or -curated data available as a public good to a wider audience. Elements of the agricultural data projects surveyed draw heavily on this kind of model. They are appropriate to the single source and controlled nature of the data, but they may hinder further ecosystem development if all further processing and sharing is reliant on the central data controller for admission, verification, or permissions to process data.

3. **Decentralized or peer-to-peer arrangements** aim to reduce bottlenecks of centralized systems and dependence on third-party intermediaries or aggregators. Peer-to-peer data exchange in the digital world tries to mirror the way most data can be directly shared by a subject to a user in the offline world. For instance, an individual can share a printed bank statement directly with a lender without having to rely on a third-party intermediary. The lender conducts their own verifications of the link between the bank and the data subject as well as the authenticity of the physical statement.

**Each of these stylized architectures can be useful for promoting financial inclusion.** But the circumstance in which they are used, the prerequisites in terms of market maturity and enablers, and the sequencing of developments all need to be carefully considered. Table 13 outlines preliminary high-level illustrations of the contexts in which each stylized architecture may be appropriate.

TABLE 13: DATA SHARING ARCHITECTURES

| | DATA ARCHITECTURES | | |
|---|---|---|---|
| | CENTRALIZED | FEDERATED | DECENTRALIZED |
| EXAMPLE | Credit bureau | Open banking | vLEI |
| Appropriate Circumstances | Narrow or unique source of sensitive data access needs to be restricted and assurance levels high | Building extensions of access to common core of high-trust data where new intermediaries can be well regulated | Disparate array of parties not joined by existing infrastructure that need to use common verifiable data points |
| Pros | Delivers high control, trust, and integrity | Extends access to trusted data ecosystem to additional layer of intermediaries using existing industry standards | Minimizes bottlenecks to growing a network and centralized concentration of power and overheads |
| Cons | Not scalable, exclusionary by design unless related to open public data | Requires new regulation and governance to license and supervise | Requires sophisticated decentralized governance and can take time to reach critical mass of users |
| Prerequisites | Either monopoly provider of data (e.g., govt. tax ID) or a homogenous user group with common data standards | Some degree of policy or regulatory-induced adherence and control | Anchor program owners with motivation to foster open networks |

## 4.2 LEGAL AND POLICY ENABLERS

### 4.2.1 Strategy and Vision

**Government strategies for the data economy can play an important role in setting a vision and achieving coordination among different industries and markets.** In the four exemplar markets analyzed, governments have taken proactive steps to cultivate their data and digital economies through coordinated strategies. Each market embarked on a unique path, orchestrating efforts across various facets of the digital economy, including regulators, consumers, and interest groups, to ensure a cohesive approach. Brazil's Digital

Transformation Strategy[80] was developed through extensive public consultations by an interministerial working group consisting of nine government bodies, with additional input from representatives of over 30 federal government entities interacting with the core group. The European Union's Data Strategy[81] involved wide consultations among experts and industry groups, emphasizing areas of digital skills, securing digital environments, and promoting innovation, all while prioritizing data protection through the General Data Protection Regulation (GDPR) to defend individuals' privacy. In Singapore, the leadership of the Infocomm Media Development Authority highlights the nation's commitment to advancing digital literacy and infrastructure, fostering projects that integrate digital technology into daily life, enhancing living standards and productivity. The MAS played a key role in the development of API guidance for the industry.

**Coordination is particularly important in the context of cross-industry data sharing.** The EU's vision for the European data spaces is centered on creating a seamless, secure, and efficient digital environment that fosters the free flow of data, breaking down data silos and enabling the sharing and pooling of data across various sectors. In India, the coordination of data exchange between industries is still not determined, but early initiatives in ecommerce and agriculture rely on close integration with the existing digital public infrastructure.

**A real economy-centric vision is vital for maximizing the benefits of non-financial data in financial inclusion.** As discussions evolve around the role of non-financial data in enhancing financial inclusion, it is crucial to adopt a perspective centered on the real economy rather than a finance-centric approach. For instance, data derived from mobility platforms should primarily aim to improve real-world outcomes like vehicle ownership and working capital for drivers, rather than just advancing financial services per se. Similarly, health data should be leveraged not merely to broaden insurance penetration but to use insurance as a tool for increasing health coverage. While this perspective may seem self-evident, it is fundamental when establishing the goals, metrics, and KPIs intended to measure success in the open data economy. This shift in focus ensures that financial services become a means to an end — enhancing the tangible aspects of the economy and the well-being of individuals — rather than an end in themselves.

### 4.2.2 Data Protection

The landscape of data protection globally has seen significant advancements with the adoption of data protection laws across all four exemplar markets. While there are variations in the specifics of these laws, the influence of the General Data Protection Regulation (GDPR) is evident across markets. The timing of these adoptions, however, varies significantly across regions, impacting the implementation and evolution of data sharing frameworks. In

80 Ministry of Science, Technology, Innovation and Communications of Brazil. (2018). Brazilian Digital Transformation Strategy: E-Digital. https://www.gov.br/mcti/pt-br/centrais-de-conteudo/comunicados-mcti/estrategia-digital-brasileira/digitalstrategy.pdf

81 European Commission. (n.d.). European Data Strategy. Retrieved January 2024, from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

the EU, GDPR served as the cornerstone for the development of a comprehensive data strategy, setting standards for data privacy, consent, and cross-border data flows. Conversely, in India, the adoption of the Data Protection Bill (DPDP) occurred only recently, following the substantial deployment and scaling of the digital public infrastructure. This sequencing means that significant elements of India's digital infrastructure, including aspects related to financial data sharing, were developed in a regulatory environment that was still evolving. This is the reason why India's approach is often defined as "techno-legal."[82] The timing and manner of adopting data protection laws have broader implications for open banking and data sharing at large. Effective data protection frameworks are crucial for building trust among consumers, who are increasingly concerned about privacy and the security of their personal information.

Data protection fragmentation poses a significant challenge for cross-border data sharing, particularly affecting categories such as migrant workers and those linked to international trade flows. The presence of data protection laws alone is insufficient; enforcement capacity is equally critical. Enforcement acts as a safety backstop, ensuring that the legal frameworks in place are more than just theoretical safeguards but are actively upheld to protect individual privacy and secure data sharing practices.

### 4.2.3 Interindustry Coordination

Data and digital markets are forcing policymakers to confront policy, legal, and market issues that cut across national jurisdictions and ministerial responsibilities. All the countries surveyed expose the need for significant national coordination between a wide array of authorities, covering data protection, digital economy, finance, and competition as well as government services responsible for operationalization of functions such as citizen and corporate registries or statistical services. Also, the digital economy is increasing the ease with which social and economic interaction can span multiple national boundaries, with it pulling and pushing data flows beyond the intended limits of national legislation. In markets where open banking is relatively more mature, such as the EU and U.K., key industry bodies have emphasized the need for a regulatory approach that goes beyond financial data, aiming for a more cohesive and horizontal regulation that spans multiple sectors.[83]

The journey towards cross-sectoral data interoperability is marked by enthusiasm but limited by the infancy of tangible applications. While there is increasing interest and dynamism globally, particularly following the Data Governance Act and initiatives propelled by Gaia-X and common data spaces, practical examples of successful implementation remain scarce. Initiatives like Agri Stack, ONDC, and SGTraDex are still in their infancy and have not yet achieved a meaningful scale. The absence of concrete outcomes from these initiatives suggests that the journey towards robust cross-sectoral data interoperability is

82 Tiwari, S., Packer, F., & Matthan, R. (2023). Data by People, for People. International Monetary Fund. https://www.imf.org/en/Publications/fandd/issues/2023/03/data-by-people-for-people-tiwari-packer-matthan

83 Open Banking Exchange. (2023). A Perspective on Open Finance Delivery in Europe. https://www.konsentus.com/wp-content/uploads/OBE-A-Perspective-on-Open-Finance-Delivery-in-Europe.pdf

ongoing. With many challenges yet to be addressed, it will take time to assess the efficacy and practical impact of these efforts in the realm of data exchange and management across different industries. Despite the current lack of practical examples, there is widespread consensus and a converging view across markets on the need for intersectoral data interoperability, which is seen as crucial to amplifying the impact for consumers with limited digital trails.

This has significant implications for financial inclusion. Many fragile communities for which inclusive finance is important operate at the economic and national fault lines of the modern economy. Migrants and refugees will not be helped by predominantly national open finance initiatives, centered around existing account holders with data mostly in one jurisdiction. Nor will informal businesses or sole traders have much data in the banking system — they will have more alternative data records held with digital platforms or suppliers and business partners. Data sharing and exchange initiatives that span across sectors and borders are therefore likely to have greater impact for financially excluded or underserved communities.

### 4.2.4 Data Rights and Control

"Unleashing" market forces to harness untapped value of data requires clarity on who has the rights to hold, share, access, or use data. Whether data is efficiently employed in the economy depends in part on who controls access to it and what incentives they have to use it. However, availability of data does not automatically lead to more inclusion. Data needs to be of practical value to someone, especially a consumer or a service provider, to have a material impact on inclusion. The policies and data sharing arrangements reviewed in this report are all, to some extent, motivated by the belief that current structures and the interest of private firms may not lead to an efficient outcome for consumers and the economy. Control over new and emerging data is often concentrated with digital platforms and other private companies at the expense of consumers who are not only the data subjects but also, indirectly through their activity, the producers of this data. Who should have which rights is a work in progress and there may not be one single answer. Rather than being principle-led, some of the evidence to date suggests that the answer to this question may vary depending on the governance and economic and market circumstances.

Evidence so far supports the hypothesis that legacy market arrangements did (and still do) curtail productive use of data. A variety of business models and providers have availed themselves of new data access rights and services. They have taken advantage of cost-effective means to access data to improve product design, marketing, and risk management, as well as to enable new businesses and services. Continued use of screen-scraping and bespoke API services suggest that the potential demand for data sharing continues to exceed the scope of regulated minimum services.

New data arrangements incorporate mechanisms to rebalance access and control. Initiatives reviewed in this report aim to ensure that data holders do not misuse their control over users' (or other) data to further their own interests at the

expense of consumers. While it may be both legitimate and beneficial for firms to use customer data to improve their own products, services, and economics, they should not be able to do so in a way that enables them to exploit or further expand market power to the detriment of consumers and the economy. Open banking and finance initiatives require banks to give consumers effective access to their own data and more autonomy to share that with third parties.

The impact of data sharing on financial inclusion will depend on how data control is reshaped to make sure that parties with appropriate capacity and incentives can use it. There is no single optimal architecture of data rights and control, but it does seem clear from the evidence that experimentation with new, especially decentralized market and exchange mechanisms is warranted, even if legacy centralized and federated systems will continue to play an important role.

## 4.3 MARKET-LEVEL ENABLERS

Practical data sharing and exchange arrangements need to be tailored to market scope and maturity and should be adjusted both over time as markets mature and in accordance with the depth, dynamism, and sophistication of an economy. As per our theory of change framework, we draw on the empirical analysis and consider implications for: (i) data and market scope; (ii) how market design can match supply and demand; (iii) specific microeconomic design choices, for instance regarding pricing and the role of intermediaries; and (iv) how authorities and firms should approach implementation.

### 4.3.1 Data Scope: Exploiting

### Network Effects From Data Aggregation and Integration

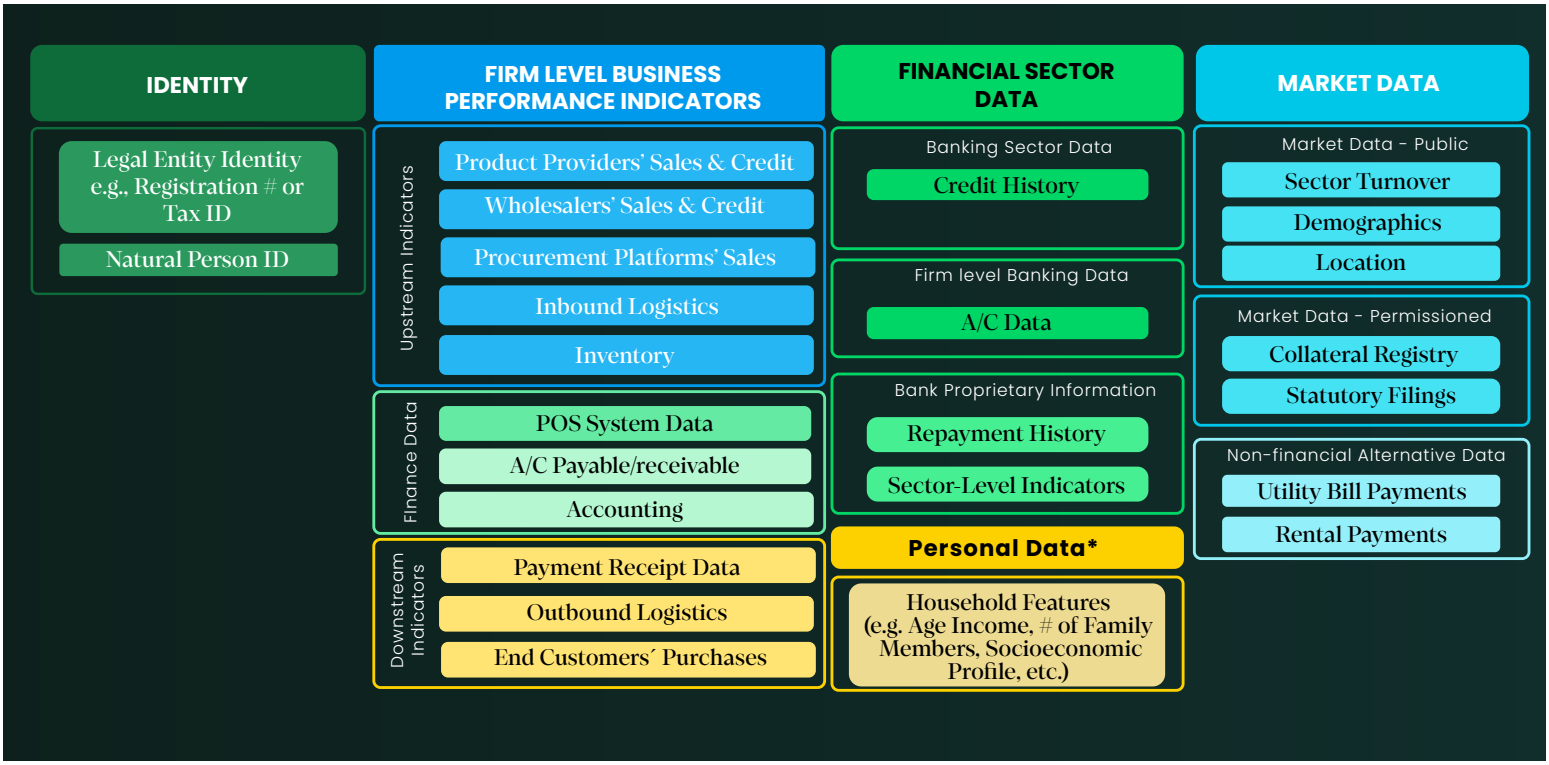
There is also a growing consensus that the scope of data both in terms of sectoral focus and depth will need to expand. Limits on mandatory data sharing are often arbitrary, albeit based on practical considerations. There is also a recognition that benefits from data sharing are characterized by network effects; in other words, the value of a given data set will tend to be enhanced by availability of complementary data sets as well as the coverage of it (in terms of population or sector). But implementing cross-sectoral and deep data sharing arrangements encounters numerous practical challenges, including the mandates of authorities (often fragmented by sector), fragmented industry associations, stakeholders, and commercial interests and the varying levels of data standardization.

The value of data is highly dependent on

substitutes and complements. Enhancing financial inclusion — as well as broader use cases — needs to take careful account of the interdependence between data sets and analytics. While enhanced access to some data points, such as account balance or transactions, can be helpful, their use may be limited if access to related data, such as repayment history, location, or credit history, is not available. Policymakers behind existing data sharing initiatives recognize that the scope of data covered by such arrangements needs to expand. More recently developed programs, such as those in Brazil that are at an early stage, have incorporated a wide scope of data. In Australia, a cross-sectoral approach has been taken from the outset. Currently, the EU is implementing a broader data market strategy that aims to facilitate cross-sectoral data exchange in addition to deepening and widening financial data sharing. As outlined in Figure 19, data elements from multiple platforms and organizations may be needed in order to support alternative credit provision services.

Inclusive financial ecosystems may require targeted effort to expand the array of data to be shared or the scope of participants. Open banking initiatives by definition address those with a bank (or other financial) account, but marginalized households and businesses may have much more meaningful data held on social and ecommerce platforms, with utilities, or with specialized corporate networks such as suppliers (e.g., of FMCG or agricultural inputs) or customers. Arrangements are needed to help tap into and share data from these types of sources and data.

FIGURE 19: OVERVIEW OF DATA TYPES



### 4.3.2 Incentives Structures

**At early stages of development, incentives need to be aligned to encourage adoption and overcome resistance from data holders**, such as incumbent banks, that may legitimately fail to see any short-term benefits from facilitating data sharing. Beyond mandated APIs, financial institutions should have the flexibility to commercialize API offerings; current data sharing ecosystems could increase their dynamism and maintain a financial inclusion focus by allowing financial institutions more leeway in commercializing their API offerings. While the standardization of APIs is essential for uniformity and basic service guarantees, the ability to develop and monetize premium APIs — offering additional functionalities beyond the mandated services — could spur innovation and enhance the overall value proposition. This approach would not only address the issue of limited incentives for expanding open banking services but also provide a much-needed impetus for account servicing payment service providers (ASPSPs) to invest in and improve their API capabilities. By striking a balance between regulated service provision and commercial innovation, financial institutions can better meet user demands while fostering a more dynamic and financially viable open banking environment.

In some cases, policymakers and authorities have designed data sharing architectures around preconceived ideas of what use cases will be of value. In markets including Singapore and Korea, an incremental and closely controlled expansion of access to banking data has been orchestrated, limiting risk but also use cases. In other markets, notably the EU and India, there have been fewer proscribed use cases and more effort to encourage experimentation on top of principle-based access and usage rights. Some assumptions, such as usage of data for thin-file enhancement or automating cash management, have been borne out. But in other areas, policy-led assumptions have not been supported, such as in the effect of open banking on account switching in the U.K..

**Different approaches have been taken to address the lack of incentives for incumbent banks to facilitate data sharing.** Many banks seem to view client data as an asset that, if shared, can erode their market power. Markets like Singapore have chosen to engage with banks through multiple interventions to encourage API adoption, rather than impose an obligation upon them. Other markets have chosen to require banks to open APIs for consumers, but still struggle with enforcement mechanisms, especially if they do not have an operational role in API management through which to implement controls.

### 4.3.3 Financial Sustainability of Ecosystem Participants

**Enabling adjacent services and economic viability for third-party providers (TPPs) is critical.** Regulatory frameworks must balance market dynamics with viable revenue models for TPPs and consider the contribution of further downstream data aggregation analysis services. The success of data exchange initiatives often hinges on the competitive landscape and the dynamism among licensed TPPs. In the EU, a recent flattening in the growth curve of TPPs suggests a potential saturation in the sector, prompting regulators to reconsider revenue

models in upcoming frameworks like PSD3 and FIDA. Unlike the current PSD2, which prohibits fees for data exchange, these new regulations may allow for such charges. This shift recognizes the need for sustainable revenue streams to encourage active participation and innovation among TPPs. In India, account aggregators operate within a framework that limits both use cases and revenue potential, primarily relying on income from API pulls. However, these revenues are modest and necessitate high volumes for sustainability. Despite growth in the sector, it has yet to reach the volume necessary to attract significant investment and innovation. Experts predict a consolidation trend, possibly reducing the aggregators to a third of their current number; this would be contingent on evolving regulations, particularly with the formalization of consent managers.

**Open questions remain about the financial viability of intermediaries as stand-alone businesses focused solely on consent management or data transmission.** By design, open and transparent markets for intermediaries (e.g., AISPs in Europe) keep entry barriers low and market access high. Hence, it would not be surprising if such a market structure did not immediately foster development of large-scale and highly profitable firms. This in turn might limit investments in the sector. There have been significant investments by incumbent firms as well as venture capital funds in a variety of business models. And some acquisitions and minority investments, such as the Visa acquisition of Tink or partnerships with Brankas in Southeast Asia, demonstrate that there is economic interest. But outside of the U.S. — where there is no market-wide regulatory-led structure to enhance competition and access — there are still no large-scale firms with high valuations that rely principally on data intermediation.[84]

**The role of intermediaries, however, is likely to decrease as the market matures, characterized by enhanced standards, increased capacity, and well-defined governance.** Consideration should be given to the changing — and, in many ways, one could say maturing — market context of data sharing and how it influences where and how policymakers may need to intervene. For instance, intermediaries such as account aggregators, third parties, or account information service providers may, at early stages, have an important role to play in helping banks (and other players) to implement common technical standards, processes, and practices. This is to create a new market standard or set of practices in a still immature market. Laws may be needed to force reticent actors to publish data. But these initial investments do not need to be constantly repeated. Once in place, maintaining standards can be performed with less effort, and customer expectations may motivate banks or other data holders to maintain data sharing arrangements. Data access and portability may become a "hygiene factor" similar to other functions in banking, such as the provision of payment cards or mobile apps.

**The roles of intermediaries and their revenue sources should be expected to evolve.** While they are potentially an important catalyst in data sharing, their size, profitability, or scale are not the objectives

84 PLAID has emerged as the largest firm by valuation focused primarily on open finance, API integrations, and related services.

of development. Like in payment programs, efficient data sharing arrangements should seek to maximize traffic while minimizing the portion of value expended in transaction costs or accrued by other intermediaries. Trade-offs may exist between the reach and volume of data sharing and the revenues of intermediaries, but decentralized networks aim to minimize, if not do away with, the need for intermediaries altogether. To what extent this is really feasible is still an open question. There will always be a need for some actors to secure the trust of participants and support interactions even between self-sovereign data holders. But this may not look like the current role fulfilled by the classic API integrators that characterize open banking today.

## 4.4 KEY USE CASES EMERGING FROM INNOVATIVE DATA SHARING ARRANGEMENTS

**The review supports arguments that data can be harnessed to deliver welfare-enhancing financial and business services.** Open banking and finance arrangements as well as more nascent sector-level initiatives have clearly led to investments by new services providers and commercialization of services that can be inclusive. In other cases, the results are yet to be shown, but operational planning by ecosystem participants point the way. A few chosen use case examples help to illustrate the ways in which data sharing fosters financial inclusion as well as some of the further challenges and open questions to address.

However, as will be illustrated, as data exchange services often develop within broader and more affluent areas of the economy, market-driven incentives may be insufficient or inappropriate to address the interests of low-income, marginalized communities, small businesses, and less-developed economies. Even less clear is the full array of use cases and market contexts in which efficient access to data can foster sustainable gains in economic and social welfare.

**End use cases are diverse, even if volumes currently are concentrated in a smaller number of services.** Uptake has been significant in some markets in payment initiation, which, although not strictly a data sharing service, often requires data APIs as complements to payments. Other prominent use cases we identified are largely aligned with those identified by CGAP in the context of open banking.[85] Of relevance to financial inclusion, we identified the integration with ERP and accounting systems to facilitate better cash forecasting and short-term finance, thin credit file enhancements, and many tools to help consumers better manage finances and gain access to competing service offerings. Additional use cases are emerging from the integration of open banking with data sharing in other sectors, particularly agriculture, ecommerce, and trade. These, however, are still at a very early stage of development.

### 4.4.1 Personal Financial Management

Diverse, specialized companies are now part of ecosystems. For instance, the U.K., the EU, Brazil, and Australia are using payments and account data to help consumers better manage their finances. These include companies that help consumers analyze and manage spending habits (e.g., Gimi AB), track and manage subscriptions to

85 Staschen, S., & Plaitakis, A. (2020). Open Banking: 7 Ways Data-Sharing Can Advance Financial Inclusion. CGAP. https://www.cgap.org/blog/open-banking-7-ways-data-sharing-can-advance-financial-inclusion

online services (e.g., Dyme B.V.), automate savings (e.g., Chip Financial), compare prices between different vendors including utilities and lenders (e.g., Compare the Market), and monetize consumer loyalty points and offers (e.g., Trilo). In Singapore, the SGFinDex was developed and deployed by the Monetary Authority of Singapore (MAS) with the explicit use case of personal financial management by allowing consumers to pull data on deposits, credit cards, pensions, and insurance and gain a comprehensive snapshot of their financial lives.

These companies often sift through payments and transaction records of consumers to identify spending patterns, assess liquidity, identify savings potential from changing subscriptions, and present clients with easy ways to view and even automate some transactions, such as for savings account "sweeps" and incremental investments. Without reliable, cost-effective means to integrate with customers' bank data to capture data and initiate payments, these services would probably be less trusted and would often not be as scalable across different financial institutions and markets.

These services are, however, still at early stages of development and have unproven business models. Their revenues often derive from very small margins or fees from intermediating alternative offers. Some of these companies are already partly owned by incumbent institutions for which these are ancillary services to target specific market segments. They also often rely on having a relatively diverse and competitive array of digital product providers from which consumers can choose. Whether these businesses are sufficiently scalable


and profitable to attract investors in smaller markets and address financial inclusion efforts is unclear. Additionally, the value addition of personal financial management hinges on the consumers' relevant data being housed within financial institutions and the assumption that it is digitized. For many consumers in emerging markets, those conditions may not hold.

### 4.4.2 Thin-File Enhancement and Credit Analysis

Several specialist firms have been set up using AISP licenses under PSD2 to provide consumers with means to enhance their credit file records and improve their ability to access finance. These include firms such as Forteil in Germany and CreditLadder Ltd. and Friendly Score in the U.K.. They make use of a range of data sources, including those derived from open banking data, to help both lenders and consumers improve their assessments of creditworthiness. While it should be noted that no counterfactual studies are readily available to assess actual impact, the range

of firms set up with AISP licenses in this area is significant and suggests that open banking is a contributor to the broader growth in the use of alternative data for credit scoring. The benefits of incorporating a wider range of data sources has also been demonstrated with Brazil's Positive Credit Registry, which has seen notable increases in coverage of the population by incorporating telecommunications and utility data. This has enabled providers who utilize this data to extend credit to a wider range of customers without increasing their risk exposure.

In terms of the further challenges this business model may face, it is important to note that many of these firms in Europe are ultimately owned by established credit reporting companies such as TransUnion, CRIF, Schufa, and Experian. This suggests that there are economies of scope with existing business models of consumer credit bureaus and emphasizes that it is important to reflect carefully on any restrictions that may be imposed on the other activities that such intermediaries are permitted to undertake.

### 4.4.3 Accounting and Enterprise Resource Planning Integration

Open banking has been a boon for accounting and enterprise resource planning (ERP) integrations. Even before the standardization of APIs and regulatory frameworks, larger accounting and business platform managers had made efforts to integrate their platforms with bigger banks and for larger-scale corporate clients. Open banking has made this kind of bespoke integration for cash management and treasury more readily available to SMEs as well as for use with smaller banks that may not have tailored commercial agreements with large software platform operators.

In Europe, this has been beneficial not only to incumbent players such as Sage, Xero, and Wolters Kluwers, but also relatively new players in local markets, such as Receipt Bank, Consents, and Ember Ltd. in the U.K.. Some banking groups, such as the Volksbank in Germany, also provide services to their SME clients through dedicated subsidiaries for accounting and have also integrated PSD2 services into their offerings. Equivalent developments are anticipated in India, but for smaller companies using platforms like Khatabook, the maturity of the firm's own operations and accounting practices may be an important prerequisite for this type of market innovation to be effective for financial inclusion.

More broadly in this category are a range of SME financial management specialists that are helping companies better track and analyze their finances and to introduce them to money saving, cash managing, lending, and treasury products. Some of these firms are startup techs, others are owned at least partially by incumbent banks, and others are associated with networks of independent accountants.

MSMEs make up more than 50 percent of the labor force in some markets and are one of the biggest engines behind economic growth.[86] Despite many innovations in digital financial services for MSMEs, ERP tools enabled by novel data sharing arrangements would still likely leave many behind. Research conducted during

86 World Bank. (n.d.). Small and Medium Enterprises (SMEs) Finance. Retrieved January 2024, from https://www.worldbank.org/en/topic/smefinance

COVID-19 in Nigeria, Colombia, Indonesia, and India found uneven usage of digital tools and many barriers for the transition from "low-stakes" digital tools, like those for communicating and marketing, to "high-stakes" digital tools that require formal business registration and financial transactions.[87]

### 4.4.4 Ecommerce and Trade Finance

The combination of open banking and ecommerce or trade platform data sharing can extend the benefits enjoyed by large firms to smaller businesses that have important financial inclusion implications.

Trading environments are only now gradually integrating with more open data sharing arrangements. The lessons learned from closed global networks such as Amazon and Alibaba as well as smaller platforms such as Power2SME and GlobalLinker in India point to the important role that reliable trade, purchase, and product data play in assessing the risks of short-term lending to trading sellers. ONDC is an important example of efforts to enable SMEs to take more control over the data trails they leave on ecommerce platforms and then direct how they are used or shared with potential lenders. The principle is a first step toward: (i) shifting data control from platforms to users; and (ii) facilitating interoperability and integration of sales and other business credentials between ecommerce platforms.

While closed, large-scale ecommerce networks can make sustainable deals with larger banks, small firms, small ecommerce platforms, and smaller banks will generally find it more difficult to reap gains from bilateral collaborations. Costs of integration can be high, especially for small banks with limited capacity to integrate using common embedded finance models. Smaller ecommerce platforms may also only have a portion of the business that users conduct, diminishing the predictive nature or timeliness of the data. Small, informal businesses and sole traders are also likely to be unattractive clients to the larger banks and specialized financial institutions most commonly engaging in bilateral relationships.

ONDC plans, in further development, to enable data to be shared across networks as well as with specific lenders. The results of this next phase of development will provide valuable, interesting inputs to the potential for replication and improvement of such arrangements in other markets.

### 4.4.5 Agricultural Finance

While government-led and multilateral agri-data platforms are still in very early stages of development, the scale of investments suggests there are significant gains to be derived from better data sharing arrangements in this sector. These initiatives should also be closely monitored and supported given their high potential to have an impact on smallholder farmers and related populations that are often a focus of effort to enhance financial ecosystems.

Agri-platforms are partly inspired by efforts of a range of tech platforms that often partner with input suppliers, off-takers, or global anchor firms to improve visibility, reduce risk, and help farmers achieve more productive outcomes. They include firms like Farmforce, Cropin, Vertify, and Varda

87 Modi, S. (2022). Digital Adoption of MSMEs During COVID-19. Center for Financial Inclusion.

https://www.centerforfinancialinclusion.org/wp-content/uploads/2024/02/Digital-adoption-of-Msmes-During-covid19-1.pdf

that collect, analyze, and share farm-level data about crops, weather and soil conditions, commodity offtake, and input prices, among others, to achieve efficiency gains for a range of actors within the supply chain. These firms are in large part information intermediaries that bridge gaps and support interoperability within vertical supply chains.

Efforts to share publicly sourced data, establish common identifiers, and enhance control that farmers have over their own land and crop data should in theory help to incite more competition or contestability and even reduce repetitive sunk costs incurred by competing agri-firms in non-rival goods such as mapping, weather, or other data that can be readily used by other parties without reducing consumption of another party.

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