

ASSESSING THE POTENTIAL OF GLOBAL PAYMENTS CARD MARKET

30th October 2025

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EXECUTIVE SUMMARY

Favorable Macro Drivers driving business growth

- **Robust economic growth:** India is expected to maintain the highest growth rate among the largest world economies and its GDP is expected to continue growing at > 6% per annum.
- **Increasing working age population:** Drives the issuance of credit and debit cards through higher disposable incomes, a shift towards financial independence, urbanization, access to credit, targeted banking services and financial inclusion initiatives. With India adding 12 million individuals to the working population each year, the share of the working-age population is predicted to rise from 66.77 % in CY 2018 to 68.25% in 2024 and 68.94% by CY 2030.
- **Rising middle class population:** In the decade ahead, India's middle-class population will continue to grow, boosting consumer demand and spending. By CY 2030, the upper and lower middle classes are estimated to account for 43.5% and 34.2% of the population, respectively.
- **Rising income levels:** India is expected to more than double its annual disposable income per capita from USD 1,920 in 2020 to USD 4,400 in 2030. Rising income levels directly impact consumer spending patterns by increasing individuals' purchasing power and disposable income.
- Rising middle class and increasing working age population drives the issuance of credit and debit cards through higher disposable incomes, access to credit and targeted banking services.

Robust Cards Issuance Market in India

- The total cards issuance market (including debit, credit, prepaid and government / smart ID cards) in India was 265.7 million units in FY2020 and is expected to reach 564.6 million units by FY2030 growing at a CAGR of 11.4% in the FY2025-2030 period. The corresponding market size for cards issuance market in FY2019 was INR 9,866 million and is expected to grow to INR 68,902 million by FY2030 growing at a CAGR of 19.3% in the FY2025-2030 period driven by higher realization of metal cards and strong issuance growth for credit cards
- Metal cards issuance to grow from 0.1 million cards in FY2020 to 11.8 million card in FY2030 growing at a CAGR of 51.8% in the FY2025-2030 period. The corresponding market size to reach INR 23,411 million by FY2030 growing at a CAGR of 50.3% in the FY2025-2030 period driven by high realization
- Credit cards issuance to grow from 26 million cards in FY2020 to 145 million cards in FY2030 growing at a CAGR of 29.4% in the FY2025-2030 period. The corresponding market size to reach INR 26,194 million by FY2030 growing at a CAGR of 38.5% in the FY2025-2030 period driven by rising penetration.
- Debit cards issuance to grow from 184 million cards in FY2020 to 316 million cards in FY2030 growing at a CAGR of 6.4% in the FY2025-2030 period. The corresponding market size to reach INR 31,126 million by FY2030 growing at a CAGR of 10.2% in the FY2025-2030 period driven by strong renewables on a relatively higher base. Further, factors like favorable demographics and increasing working age population bodes well for new issuances.
- Prepaid Payment Cards (PPIs) issuance to grow from 48 million cards in FY2020 to 58 million cards in FY2030 growing at a CAGR of 13.6% in the FY2025-2030 period. The corresponding market size to reach INR 4,364 million by FY2030 growing at a CAGR of 18.8% in the FY2025-2030 period

- Smart cards / government ID issuance to grow from 8.4 million cards in FY2020 to 45.7 million cards in FY2030 growing at a CAGR of 11.4% in the FY2025-2030 period. The corresponding market size to reach INR 7218 million by FY2030 growing at a CAGR of 24.9% in the FY2025-2030

Outstanding Cards in India

- The total cards outstanding in the market (including debit, credit, prepaid and government / smart ID cards) in India was 1,111 million units in FY2020 and is expected to reach 2,546 million units by FY2030 growing at a CAGR of 9.6% in the FY2025-2030 period
- Credit cards in circulation / outstanding to grow from 58 million cards in FY2020 to 330 million cards in FY2030 growing at a CAGR of 24.6% in the FY2025-2030 period.
- Debit cards in circulation / outstanding to grow from 829 million cards in FY2020 to 1,266 million cards in FY2030 growing at a CAGR of 5.0% in the FY2025-2030 period.
- Prepaid Payment Cards (PPIs) in circulation / outstanding to grow from 196 million cards in FY2020 to 629 million cards in FY2030 growing at a CAGR of 11% in the FY2025-2030 period.
- Smart cards / government ID in circulation / outstanding to grow from 28 million cards in FY2020 to 321 million cards in FY2030 growing at a CAGR of 18.5% in the FY2025-2030 period.

Under Penetrated Payments Card Market

- Payments card (debit cards and credit cards) per capita in India is significantly low at 1 (population aged 15+) as compared to regions like USA, China and Europe which has penetration of 7.2, 8 and 2.3 respectively. Low payments card penetration in India bodes well for payment cards manufacturers, as both credit and debit, is on the rise, buoyed by government initiatives and financial inclusion.

Robust Banking Infrastructure

- Significant expansion of branch networks: The number of branches for public sector banks increased by about 80% in the FY2005 – FY23 period, while the same for private sector banks stood at 533%.
- The penetration of commercial banks increased from 8.89 (per 1,00,000 adults) in FY2005 to 14.6 in FY2019, and 24.64 branches by FY22
- Corresponding growth in number CASA which increased from 1724 million in FY19 to 2265 million accounts by FY23 growing at a CAGR of 7.1%
- Robust increase in new savings accounts led by PM JanDhan accounts as manifested by its growing share in overall number of savings accounts which increased steadily from 13% in FY15 to 21% in FY19 and 23% in FY23. Per latest data, only about 69% of the JanDhan accounts possess Rupay debit cards. A significant proportion of JanDhan accounts do not have debit cards issued to them yet, which presents an opportunity for both banks and card manufacturers
- Bank credit, comprising loans and advances extended by banks to various sectors of the economy, has been growing at a healthy pace in India, growing from USD 1,599 bn in FY2017 to USD 2,162.5 bn as of June 27, 2025. This growth is driven by increasing demand for credit from sectors such as retail, housing, agriculture, MSMEs (Micro, Small & Medium Enterprises), and infrastructure.
- Further, banks in India have been witnessing a decline in Non-Performing Assets (NPAs). The PSU banks witnessed the NPAs decline from 15.5% in FY18 to 3.1% in FY24, while the same for private sector banks stood at 4% in FY18 and 1.9% in FY24. The overall Gross Non-Performing Asset (NPA) ratio for the Indian banking sector as of March 31, 2025, was 2.3%. This marks a multi-decadal

low level, reflecting improvements in the sector's financial health, compared to 8.66% as of March 31, 2020, and 11.85% as of March 31, 2018.

Growth in Unsecured Personal Loans and Credit Card Receivables

- Unsecured personal loans grew at a CAGR of 20.9% during March 2017 and March 2023 driven by factors such as demographic changes, the formalization of the economy, increased purchasing power, the prevalence of FinTech companies and widespread availability of Internet and feature phones
- Credit card receivables, which have a share of 16% (FY2024) in the overall unsecured personal loans portfolio has been on an uptrend and has increased from INR 0.57 trillion in August, 2017 to INR 2.57 trillion in March, 2024

Robust Growth in Cards based payments and higher ticket size for Debit Cards and Credit Cards

- Credit card transactions amounted to USD 220.7 Bn in value in FY24, growing at a CAGR of 24.8% in the FY19-24 period, driven by use in predominantly higher-value transactions. The average ticket size (ATS) for credit cards for H2,CY24 declined to INR 4,436 from INR 5280 in H2,CY23. This drop is attributed to a significant increase in the number of credit card transactions.
- Debit cards witnessed a transaction value of USD 88 Bn in FY23 up from USD 73 Bn in FY19. Although there is competitive pressure from UPI, especially for smaller transactions, debit cards continue to be a significant player with usage more pronounced in direct bank account debits and for users who are more comfortable with the direct withdrawal of funds. The average ticket size (ATS) for debit card transactions rose from INR 2,636 in H2,CY23 to INR 3,113 in H2, CY24. Despite the rise in ATS, the total number of debit card transactions decreased year-over-year, indicating that while fewer transactions occurred, they were of higher value.

UPI continues to proliferate with low ticket transactions

- Replacing cash and has captured a vast range of primarily low ticket transactions
- The ATS for UPI was INR 1396 in H2, CY24 further declining from INR 1515 in H2'23. Declining Average ticket size (ATS) indicating UPIs growing use of smaller everyday purchases
- Low Ticket Size of UPI is indicative of UPI's widespread use for smaller, everyday transactions, demonstrating its deep penetration across various consumer segments.
- Although UPI was initially launched with no MDR to encourage adoption, NPCI is introducing MDR fees for certain payments, affecting large merchants in the future.

Key Drivers of Growth for Debit & Credit Cards in India

- Increasing banking coverage / penetration and more accounts per head leading to new debit / credit cards being issued
- Issuance of debit cards under PMJDY Scheme - Per latest data, there are now a total of 552.2 million JanDhan accounts as on March 2025, while only 380.7 million, or 69%, possess Rupay debit cards. A significant proportion of JanDhan accounts do not have debit cards issued to them yet, which presents an opportunity for both banks and card manufacturers.
- Use cases like NCMC will aid demand for debit cards in the country.

- Demographic dividend as a key driver for payment cards – Rising middle class and increasing working age population drives the issuance of credit and debit cards through higher disposable incomes, access to credit and targeted banking services.
- Industry Widening the Net with Co-Branding Credit Card Partnerships
- Under penetrated credit cards market in India
- Fraud protection and lower transaction failure rates
- Access to credit and improvement in card accepting payments infrastructure

Global Markets / Export Opportunity

- The total payment cards in circulation were 18.6 billion in FY23 and is expected to reach 21.6 billion by FY29, growing at a CAGR of approximately 2.5% between FY23-29.
- In FY23, debit cards in circulation were 15.2 billion units and is expected to increase to 17.7 billion in FY29, growing at a CAGR of 2.6% between FY23-29, driven by ease of obtaining debit cards with new bank accounts, the rise in online and in-store shopping, and the general shift away from cash
- The global credit cards market had 3.3 billion units in circulation in FY23, and it is expected to reach 3.7 billion units in FY29, growing at a CAGR of 1.8% from FY2023 to FY2029, driven by growth in consumer spending, growing e-commerce platforms, and the expansion of global travel. Credit cards are also popular due to the associated benefits such as reward points, cashback offers, and the ability to build a credit history.
- The global prepaid cards market had 0.14 billion units in circulation in FY23, and it is expected to reach 0.16 billion units in FY29, at a CAGR of 2.7% from FY2023 to FY2029. The growth of prepaid cards is primarily fueled by their versatility and convenience, making them a preferred choice for budget management and for consumers without traditional banking access. They are widely used for specific purposes like gift cards, travel expense cards.
- Countries like USA (~2027 million payment cards), Japan (~774 million payment cards), Brazil (~498 million payment cards), Russia (~418 million payment cards) and UK (~161 million payment cards) presents good export opportunities for card manufacturers in India
- Engaging with neo-banks and fintechs could act as a good market entry strategy for card manufacturers looking to tap into the exports market.

Identification, Anti-counterfeiting Authentication & Tracking Technologies

- The global RFID market, valued at approximately INR 1,196.2 billion in 2023, is projected to grow at a 11.9% CAGR and reach INR 2,631.1 billion by 2030.
- The RFID market in North America is expected to grow from INR 431.8 billion in FY23 to INR 839.3 billion in FY30 growing at a CAGR of 10%, while in Europe it is expected to grow from INR 317 billion in FY23 to INR 726.2 billion in FY30 growing at a CAGR of 12.6%. The APAC market is expected to grow from INR 292.9 billion in FY23 to INR 749.6 billion in FY30 growing at a CAGR of 14.4% while in India the market is expected to grow from INR 42.1 billion in FY23 to INR 102.9 billion in FY30 growing at a CAGR of 13.6%. Finally, the Middle East & Africa market is expected to grow from INR 112.4 billion in FY23 to INR 213.1 billion in FY30 growing at a CAGR of 9.6%.
- The global RFID tag market is primarily divided into active and passive RFID tags, both of which serve distinct roles across various industries. Passive RFID tags dominated the market in FY2023 with a share of about 79.7% and it is expected that it will continue to dominate the market in FY2030 with a share of about 81.2%.

- India has one of the largest excise stamp program worldwide. The country represents one of the world's largest market for liquor tax stamps, with 27 states together consuming on the order of 30-35 billion excise stamps annually. India's alcoholic-drinks market is vast and still accelerating and as volumes formalise, state excise "tax-stamp" demand will further grow

Critical Success Factors (CSF) for Card Manufacturers

- Pricing is crucial for maintaining cost competitiveness (lower production costs through economies of scale and advanced manufacturing techniques), positioning the brand, acquiring and retaining customers, ensuring sustainable profit margins, adapting to market changes, complying with regulations and certifications costs, and managing global market dynamics (including managing currency fluctuations and adapting to regional pricing strategies)
- Location and proximity to customers is crucial as a strategic location enhances logistics and distribution efficiency, reduces turnaround time, improves customer service, strengthens supply chain management and fosters collaboration among others
- Data security as it builds customer trust, ensures regulatory compliance, prevents financial loss, maintains operational integrity, and meets audit requirements. Robust data security measures and related certifications are a big MOAT for long-term success and sustainability in this industry
- Certifications as it builds trust and credibility, ensures market access and competitiveness, helps meet compliance, improves customer satisfaction, and boosts investor and stakeholder confidence.
- End to end solutioning with logistics and other value-added services to provide a seamless and hassle-free experience for their customers and banks.

Competition Landscape

- Thales, Idemia, G+D, CPI Card Group, Austria Card, Goldpac, Eastcompeace, Hengbao, Tianyu Inform Industry, XH Smart Tech, Manipal Payments and Identity Solutions Ltd. etc. are some of the top ranked payment card manufacturers globally as per Nilson report, (Issue 1272 published October, 2024).
- Manipal Payments and Identity Solutions Ltd. is one of the largest manufacturers of payment cards globally and in India in FY2024. As per Nilson report, (Issue 1272 published October, 2024), Manipal Payments and Identity Solutions Ltd. is the highest ranked Indian company (and ranked 14th globally) in terms of shipment of payment cards (ones with chips and magstripe both) in CY2023. For shipment of payment cards with chips alone, the company is ranked 11th globally. As per the same report, the company is ranked 10th globally excluding vendors from China. As per the same report, Manipal Payments and Identity Solutions Ltd. is also among the top 10 card manufacturers in Visa & Mastercard issuances globally in CY2023. Besides, the company is also ranked 2nd, only behind XH Smart Tech, in the list of High-security cards (which includes cards such as American Express, Diners, Discover, JCB, Elo, RuPay, Mir and ATM and PIN-based debit). Further, the company is one of the largest suppliers of payment cards to Sri Lanka and Nepal in FY2024.

GLOBAL MACROECONOMIC VARIABLES

1.1. Global Macroeconomic Outlook

The macroeconomic forecast for the world is, for the most part, a reflection of the progress and resilience of nations everywhere.

2024 was a year of stabilization amidst persistent headwinds. The global economy in **2024** showed **modest but steady growth**, with **global GDP expanding by 3.3%**, according to the **IMF's October 2025 World Economic Outlook update**. This marked a slight downtick from 2023 and remained below the 2000–2019 average of 3.7%.

Key themes shaping 2024 included:

- **Persistently High Interest Rates:** Central banks, particularly the U.S. Federal Reserve and the European Central Bank, maintained higher interest rates for longer to tame inflation, which began to recede, and as a result the US fed cut rates thrice in calendar year 2024, however inflation remained above target in many economies.
- **Disinflation Progress:** Inflation declined globally, with headline rates easing in major economies due to cooling energy prices and normalized supply chains. However, **core inflation** (excluding food and energy) remained sticky in several regions.

Key highlights:

- **United States:** The U.S. economy remained resilient, supported by strong consumer spending and fiscal measures. GDP growth was at 2.8% for the year.
- **Euro Area:** Growth in the eurozone was around 0.9%, mainly due to energy price pressures, weak consumer sentiment, and monetary tightening from the ECB. Germany, in particular, faced challenges due to industrial stagnation and soft external demand.
- **China:** Growth decelerated to around **5% in 2024**, as structural issues such as the property sector crisis, local government debt burdens, and demographic shifts weighed heavily. Despite policy stimulus, investor confidence remained weak.
- **Emerging Markets:** Performance varied. India continued to post strong numbers (~6.5% growth), supported by robust domestic demand, while other EMs, especially those reliant on commodity exports, struggled due to softening prices and global demand.

1.2. GDP Growth of Key Select Economies, 2015-2025

According to the IMF, global GDP growth was 3.3% in 2024 and is projected to slightly decline to 3.2% in 2025.

Exhibit 1: Global GDP Growth, CY 2015-26 (in %)



Note: Advanced economies include regions such as United States, Germany, France, Italy, Spain, Japan, United Kingdom

Emerging economies include regions such as China, India, ASEAN-5, Russia, Brazil, Mexico, Saudi Arabia, Nigeria, South Africa

Source: IMF, World Economic Outlook (WEO), October 2025

2025 Outlook: Slow-but-Resilient Growth, With Risks Re-shaped

The IMF's October 2025 World Economic Outlook (WEO) now puts global growth at 3.2% in 2025 (3.1% in 2026), a "soft-landing" baseline with growth below pre-pandemic averages but more resilient than feared earlier in the year. Advanced economies are seen around 1.5%, while Emerging Market and Developing Economies (EMDEs) a little above 4%, as disinflation progresses unevenly and policy rates edge toward neutral in some markets. This update also flags that new and prospective tariffs, tighter tech/trade restrictions, and lingering shipping disruptions remain key downside risks not fully embedded in the baseline.

Advanced Economies

Growth in advanced economies is set to hover near 1.5% in 2025, with consumption normalizing as real incomes recover and policy supports fade. The IMF notes the baseline does not fully price in additional trade barriers; any widening of tariff actions would trim growth and complicate disinflation via higher import costs. Europe's medium-term lift depends on structural reforms to productivity, energy costs, and capital-market depth.

Emerging Markets & Developing Economies (EMDEs)

EMDE growth remains just above 4% in 2025, led by Asia. But the risk mix has shifted: tighter global financial conditions are less acute, while geoeconomic fragmentation, tariff spillovers, and supply-chain rerouting weigh on trade-exposed economies. Policy credibility and targeted fiscal consolidation remain essential to anchor inflation expectations and capital inflows.

China & Wider Asia

- **China:** IMF's latest mapping shows 4.8% in 2025, easing to 4.2% in 2026 as property-sector adjustment, demographics, and U.S.–China trade/tech frictions cap external and investment momentum. Policy support helps avoid a hard landing, but medium-term potential growth keeps drifting down.
- **India:** Momentum stays strong; the IMF raises its FY2025/26 forecast to 6.6%, citing robust domestic demand and public capex, despite potential export headwinds from higher U.S. tariffs. India remains the fastest-growing major economy in the 2025 baseline.
- **Japan:** After a weak 2024, growth improves to 1.1% in 2025, then eases to 0.6% in 2026 as real wages underpin consumption and the BoJ's gradual normalization proceeds. Key risks are softer external demand and trade policy uncertainty.
- **Indonesia:** Solid domestic demand keeps growth around 4.9% in 2025–26; authorities look to exports and green/industrial policy to safeguard the outlook amid softer global trade.

Middle East & Central Asia (ME&CA)

Regional growth picks up in 2025–26, but below what was envisaged a year ago, reflecting extended oil production cuts, conflict spillovers, trade rerouting, and policy uncertainty. The IMF highlights MENA's uplift as oil output normalizes and non-oil activity stays firm, while the Caucasus & Central Asia moderates to a more sustainable pace after a robust run.

Saudi Arabia

The IMF upgrades Saudi Arabia's growth to 4.0% in 2025 (and 4.0% in 2026) on a faster-than-expected unwinding of oil cuts, with non-oil momentum (investment, services, tourism) still central to Vision 2030 execution. The profile implies a 2024 trough (due to extended production restraint) and a 2025 rebound as hydrocarbon output normalizes—while diversification continues to reduce volatility over the medium term.

Per recent IMF Publication (October 2025)

- **Growth level:** The global 2025 call is now 3.2% (not 3.3%) with 3.1% in 2026, and the IMF stresses the baseline is sensitive to new tariffs and tech/trade restrictions that could lower trade volumes and kink disinflation.
- **Risk mix:** Financial-stability fears have eased versus 2023, but geoeconomic fragmentation risks have intensified (tariffs, critical minerals/rare earths exposure, dual-use tech restrictions). These are highlighted as material downside risks to 2025.

- **Regional nuance (ME&CA):** The pace of recovery in MENA is still upward in 2025–26 but slower vs. Oct-2024 expectations, with the IMF explicitly citing extended oil cuts, conflicts, and trade disruptions; Saudi Arabia’s 2025 upgrade to 4% reflects a steeper output normalization path.
- **Country specifics:**
 - India upgraded to 6.6% FY25/26 (resilient domestic demand offsets tariff headwinds).
 - China around 4.8% in 2025, slowing thereafter as structural drags persist.
 - Japan ~1.1% in 2025 with gradual BoJ normalization.
 - Indonesia ~4.9% in 2025–26, steady on domestic fundamentals.

Impact of Emerging Technologies on the World Economy

Emerging technologies are significantly reshaping the world economy by driving productivity, transforming industries, creating new markets, and influencing labor dynamics. The IMF highlights that emerging technologies are becoming a central driver of global economic transformation, influencing productivity, trade, labor markets, and investment patterns. Advances in AI, automation, and digital platforms are significantly improving efficiency across industries, reducing costs, and creating new markets. Generative AI and advanced analytics are reshaping services and knowledge work, while blockchain, fintech innovations, and digital payments are accelerating the shift toward cashless economies and improving financial inclusion.

In manufacturing and trade, automation, robotics, and 3D printing are transforming global value chains by reducing dependence on low-cost labor markets and promoting regionalized production. Meanwhile, green technologies, including renewable energy, electric vehicles, and energy storage solutions, are driving sustainable investment and reshaping energy markets in response to climate imperatives.

Labor markets are undergoing profound changes as automation displaces routine tasks while creating demand for high-skill digital roles, particularly in emerging economies integrating into the global digital economy. This is fueling a need for widespread reskilling initiatives to prevent widening inequality between digitally advanced economies and those lagging behind.

Furthermore, technological leadership has become a geopolitical determinant, with competition in AI, semiconductors, and green tech influencing trade flows and investment priorities, particularly between the U.S. and China. While emerging technologies are projected to add over \$15 trillion to global GDP by 2030, the benefits remain unevenly distributed, emphasizing the importance of digital infrastructure investment, policy support, and international cooperation to ensure inclusive growth in this rapidly evolving landscape.

Some of the key areas where the emerging technologies impact the world are :

Boosting Productivity and Efficiency : AI and Automation streamline manufacturing, logistics, and services, reducing costs and increasing efficiency across sectors. Generative AI is transforming knowledge work (finance, healthcare, legal services), boosting output while reducing routine tasks.

Driving Innovation and New Markets: Technologies like blockchain, quantum computing, and IoT are creating new industries (e.g., Web3, autonomous logistics) and revenue streams. Digital platforms have

enabled global e-commerce, fintech, and decentralized finance, broadening access to financial and business services.

Labor Market Transformation: AI-driven automation is displacing routine jobs but creating demand for high-skill roles in tech development, cybersecurity, and data science. There is an increased focus on reskilling and upskilling, especially in emerging economies integrating into the digital economy.

Impact on Trade and Global Value Chains: Advanced manufacturing (3D printing, robotics) reduces reliance on low-cost labor markets, reshaping global supply chains. Digital trade and cross-border data flows are now key components of international trade, making technology a driver of globalization.

Financial Sector and Digital Payments: Fintech, CBDCs (Central Bank Digital Currencies), and blockchain-based systems are redefining payment infrastructure and improving financial inclusion. This shift accelerates the transition toward cashless economies, impacting monetary policy and regulatory frameworks.

Geopolitical and Economic Competition: Technological leadership has become a strategic driver of geopolitical power, with U.S.-China competition in AI, semiconductors, and green tech influencing global trade and investment patterns.

Sustainability and Green Technology: Renewable energy technologies, EVs, and energy storage are reshaping energy markets, reducing fossil fuel dependence, and driving climate-related investment. Climate tech is projected to be a multi-trillion-dollar sector by 2030, aligning sustainability goals with economic growth.

*Note: Advanced economies include regions such as United States, Germany, France, Italy, Spain, Japan, United Kingdom
Emerging economies include regions such as China, India, ASEAN-5, Russia, Brazil, Mexico, Saudi Arabia, Nigeria, South Africa
Source: IMF, World Economic Outlook (WEO), April 2024*

1.3. Key Macroeconomic Growth Drivers for Global Economy

Working Age Population:

An estimated 50% of the global population is in the working age bracket of 25-64 years.

Exhibit 1: Global Population Age Structure, CY 1950-2030, In Billion

	1950	1980	2000	2010	2022	2024	2030
0 - 5 Years	0.34	0.55	0.62	0.66	0.66	0.65	0.65
5 - 14 Years	0.53	1.02	1.24	1.23	1.35	1.37	1.31
15 - 24 Years	0.45	0.85	1.09	1.22	1.24	1.27	1.34
25 - 64 Years	1.05	1.77	2.78	3.34	3.95	4.04	4.26
65+ Years	0.13	0.26	0.42	0.53	0.78	0.83	1.01
Global Population	2.50	4.45	6.15	6.98	7.98	8.16	8.57

Source: Frost & Sullivan Analysis

According to United Nations, there are approximately 1.27 billion people globally aged 15-24 years old (CY2024), representing roughly 15.6% of the total population. An estimated 40% of the global population falls under the age of 25, highlighting the significant size of the younger generation. Due to income limits, the growing population of young people has a tendency towards financial restraint.

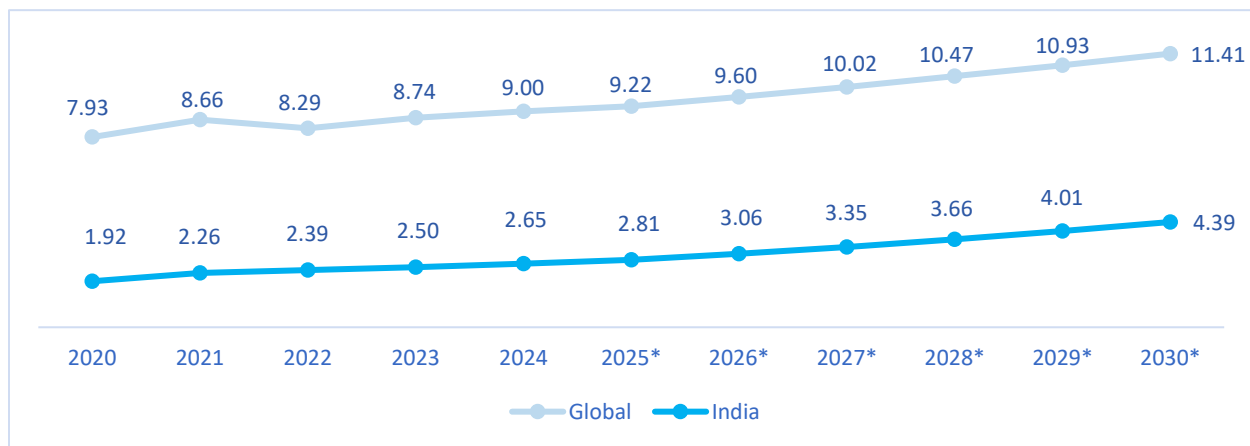
However, estimates show that by 2030, both its sizable population and per capita spending are expected to experience significant rise. With 1.2 billion members worldwide, the youth demographic is the largest generation in history and offers prospects for both labour supply and consumer demand.

The increasing working-age population drives the issuance of credit and debit cards through higher disposable incomes, a shift towards financial independence, urbanization, digital savviness, access to credit, targeted banking services, economic growth, and financial inclusion initiatives. This demographic shift supports the expanding market for payment cards, enhancing financial access and convenience.

Growing Disposable Income:

Global annual disposable income has significantly increased consumer demand, especially in emerging economies.

Exhibit 2: Worldwide & India annual disposable income - per capita. (In thousands USD)



* Forecasted

Source: Statista Market Insights, World Bank, OECD, Eurostat, World Bank PovcalNet, WID - World Inequality Database

The information illustrates a steady rise in global annual disposable income between 2020 and 2030, climbing from USD 7.93 thousand to 11.41 thousand. Disposable income significantly influences the extent to which individuals and households allocate funds for different buckets of expenses. Increase in global per capita income growth has significantly increased consumer demand, especially in emerging economies.

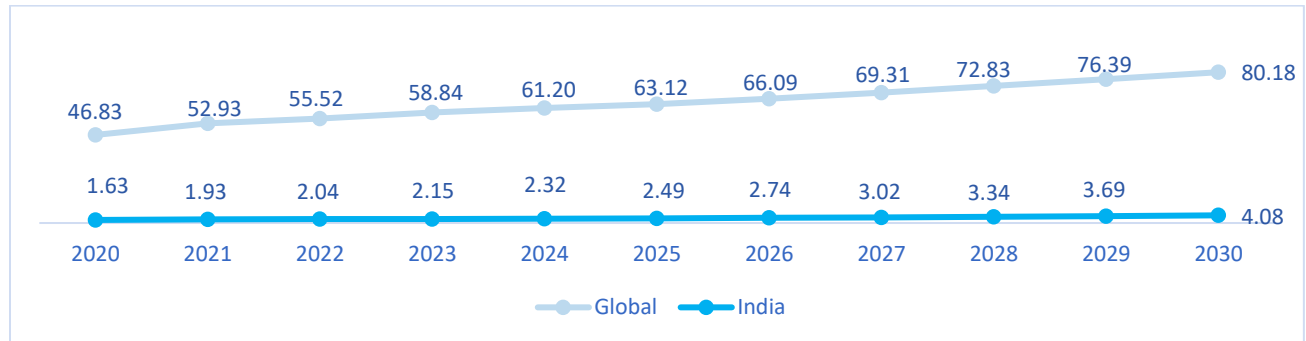
India's per-capita disposable income more than doubles from US\$ 1.9k in 2020 to US\$ 4.4k by 2030—implying 8–9% CAGR in USD terms. The gap with the global average remains wide (global US\$ 11.4k by 2030), but India's growth slope is steeper, signaling strong consumption tailwinds and a rapidly expanding middle class if inflation stays contained and job creation holds up.

Increase in Discretionary Spending: Since discretionary expenditure is essential to boosting consumer spending, which accounts for around 40% of the world economy, it makes a significant contribution to economic growth. Global discretionary spending seems to be rising recently, despite concerns about inflation and rising interest rates. Furthermore, customers are using their savings to cover the costs of services they neglected during the pandemic.

Growing Global Consumer Spend

Worldwide Consumer Spending has witnessed an increasing trend from USD 61.2 trillion in 2024 to reach USD 80.18 trillion in 2030. India's share of global spend climbs from 3.5% to 5.1% by 2030 and contributes 7% of the world's incremental consumption over the decade. India offers outside growth versus global averages, reflecting deepening middle-class demand and a widening addressable market.

Exhibit 4: Global & India Consumer Spending across select economies, CY 2020-30, USD Trillion



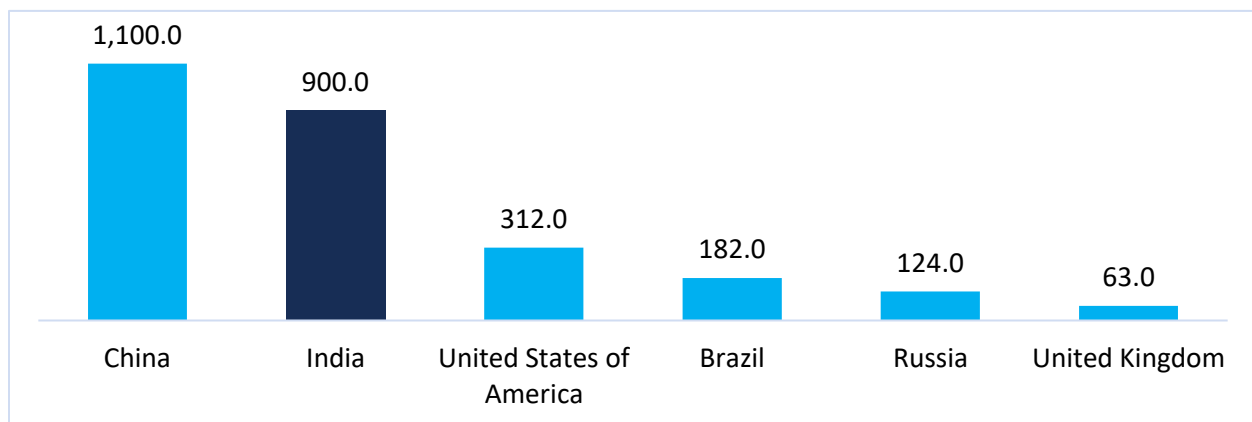
Source: Statista Market Insights, World Bank, IMF, UN, Eurostat

Consumer spending is a significant driver of economic growth. As consumer confidence rises and household incomes increase, individuals are more likely to spend on goods and services, stimulating demand and driving economic activity across various sectors.

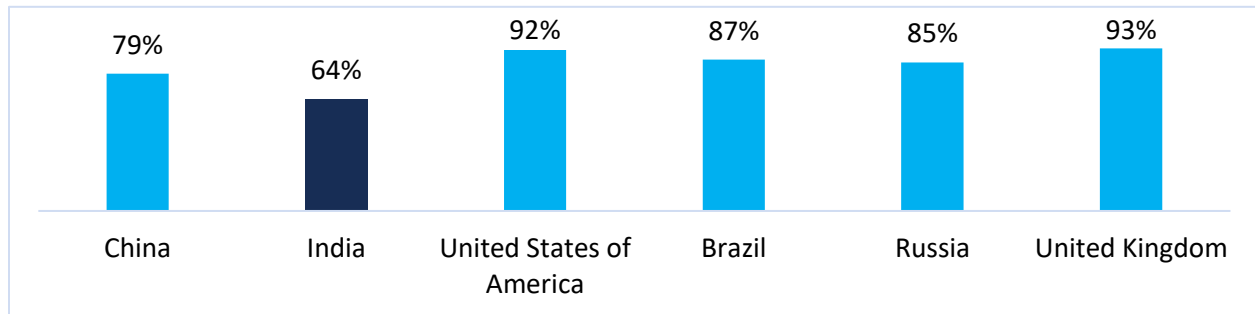
1.4. Increasing Internet Access – Comparison with Other Countries

China still leads the global countries in terms of the number of internet users with over a billion users. India follows closely with around 900 million internet users, owing to the penetration of high speed and low-cost internet services, particularly in the rural areas. The penetration rate of internet users in India stands at 64% as of January 2025.

Exhibit 5: Number of Internet Users across select economies (in Millions), 2025



Source: Frost & Sullivan, Secondary Sources

Exhibit 6: Internet Penetration across select economies (in %), 2025

Source: Frost & Sullivan, Secondary Sources

1.5. Geopolitical challenges pose significant hurdles for global growth

Various geopolitical challenges pose significant hurdles for global economies, encompassing the enduring Russia-Ukraine conflict, the Israel-Palestine dispute, heightened tensions between India and Pakistan and also China and Taiwan, climate-induced catastrophes, and the rise of unpredictable and progressively protectionist trade measures. These strains reverberate across economies, manifested through inflationary pressures leading to subsequent interest rate adjustments, disruptions in supply chains, spikes in energy prices, and a buoyant labor market.

The course of the Russia-Ukraine conflict will influence Russia's capacity to engage in trade with NATO nations and the accessibility of affordable Russian gas to various regions globally. Escalating international tensions and trade disputes may impede progress toward greater international collaboration and trade expansion. Any disturbance in the trade dynamics between the United States and China, for instance, will have widespread repercussions.

In the Middle East, the Israel-Palestine conflict has surfaced underlying tensions between Iran and its allies, pitted against the U.S. and Israel, sparking fears of a potential escalation of violence in the region. This occurs amid ongoing uranium enrichment by Iran, with limited opposition from Sunni Arab states thus far, which could empower Tehran and elevate risks for commodity prices and trade routes. Consequently, these dynamics are expected to sustain volatility in oil and gas prices and lead to disruptions in crucial trade channels.

Recent U.S. Trade Tariff

In 2025, the U.S. government instituted sweeping trade tariff hikes affecting a wide spectrum of trading partners—most notably Canada, China, Mexico, India, Brazil, and Switzerland.

- Tariff levels surged—from a baseline of approximately 2.5% in early 2025 to nearly 20% on average across all imports.
- Specific tariffs reached up to 50%, targeting goods such as cars, clothing, coffee, and toys.
- Additional hikes included tariffs of 35% on Canadian goods, 39% on imports from Switzerland, and a staged rise to 50% on Indian goods by late August.

- A special 25% tariff was imposed in March as part of Executive Order 14245, targeting goods from any country importing Venezuelan oil.
- The “Liberation Day” tariff rollout in early April prompted immediate market turbulence, signaling real economic and investor anxiety.

These measures mark the highest average U.S. tariff rates in decades and reflect an aggressive trade policy shift. Key impacts of these Tariff Hikes

- **Inflation and Consumer Prices:** Despite the high tariff rates (averaging ~18.6%), overall inflation has remained moderate, with headline inflation around 2.7%, though core inflation—excluding volatile food and energy—has climbed to 3.1%, the highest in several years. Tariff hikes are already causing noticeable price increases in consumer essentials—leather goods (+39%), clothing (+37%), and new car prices rising by up to 12%.
The average American household is estimated to face an annual financial burden of roughly \$2,400 due to these tariffs.
- **Market Reactions and Retail Behavior:** The April tariff announcements triggered a sharp global stock market crash—one of the largest since the pandemic era—though markets rebounded after temporary suspensions. Businesses responded by front-loading imports ahead of tariff implementation—spiking cargo volumes in early 2025, though projections now indicate declines later in the year.
- **Strategic Adjustments and Legal Challenges:** Certain tariffs were paused or scaled back amidst high-level negotiations, including an agreement keeping U.S.–China tariffs at around 30%, averting even higher increases set to exceed 100%. Legal challenges are mounting: a federal court ruled that some tariffs (“Liberation Day” measures) exceed presidential authority, issuing a permanent injunction against their enforcement.

Recent U.S. trade policy has undergone a dramatic shift, with tariff rates increasing sharply across industries and trade partners. While headline inflation remains contained, consumer prices for many goods are rising. Financial markets reacted with volatility, and legal and diplomatic responses are already in motion.

Impact of US Trade Tariffs on India's BFSI Sector

Overall Impact on the BFSI Sector

The United States has recently imposed steep trade tariffs on Indian exports, raising the effective tariff rate to 50%. This escalation has stoked concerns, but India’s economy is largely domestic-driven, which buffers the broader BFSI (banking, financial services, insurance) sector from severe direct shocks. Even if high tariffs persist, analysts estimate the drag on India’s GDP growth would be modest (around 0.4–0.8 percentage points over a year). Nevertheless, prolonged tariffs could dampen business sentiment and credit growth somewhat, warranting vigilance in the financial sector.

Impact on the Banking Sector

- **Limited Direct Exposure:** Indian banks have minimal direct exposure to U.S. tariffs, as their business is predominantly domestic and major export sectors (like IT services and pharmaceuticals) are largely exempt from the new duties. Accordingly, it's expected that there will only be a limited impact on banks given India's domestic demand-driven economy.
- **Indirect Risks:** The bigger concern is indirect. Steep tariffs can hurt export-focused industries (e.g. textiles and gems & jewellery), potentially softening credit demand and straining loan repayments in those sectors. Lenders are closely monitoring these vulnerable portfolios in sectors with high U.S. exposure to detect early stress.
- **Mitigation Measures:** To mitigate stress on exporters, banks have offered relief like temporary interest rate cuts, fee waivers, and extra working capital to ease cash flows. They are also guiding clients to diversify into alternative markets and hedge currency volatility to reduce reliance on U.S. trade.
- **Potential Upside:** The trade rift may even carry a silver lining for banks. As global manufacturers relocate production to India to bypass U.S. tariffs, banks anticipate new **financing opportunities** to support these investments and supply-chain shifts.

Impact on the Insurance Sector

- **Higher Premiums & Claims:** Marine cargo and trade credit insurers face higher exposure, as a 50% tariff inflates shipment values and raises the insured value per policy. This translates to costlier coverage (higher premiums) and potentially larger claims if goods are damaged or buyers default.
- **Profitability Pressures:** Property and auto insurers may also feel strain if export-reliant firms incur losses, which could force premium hikes or stricter coverage terms. Meanwhile, market volatility from the trade dispute could erode insurers' investment income, creating a dual impact on profitability – higher claims exposure alongside lower returns.

Impact on NBFCs

- **Domestic-Focused NBFCs:** Non-bank financial companies serving the domestic market are expected to be largely insulated from U.S. tariffs, as India's robust internal demand continues to drive growth. NBFCs focused on retail loans or purely local industries should see little direct effect from the trade measures.

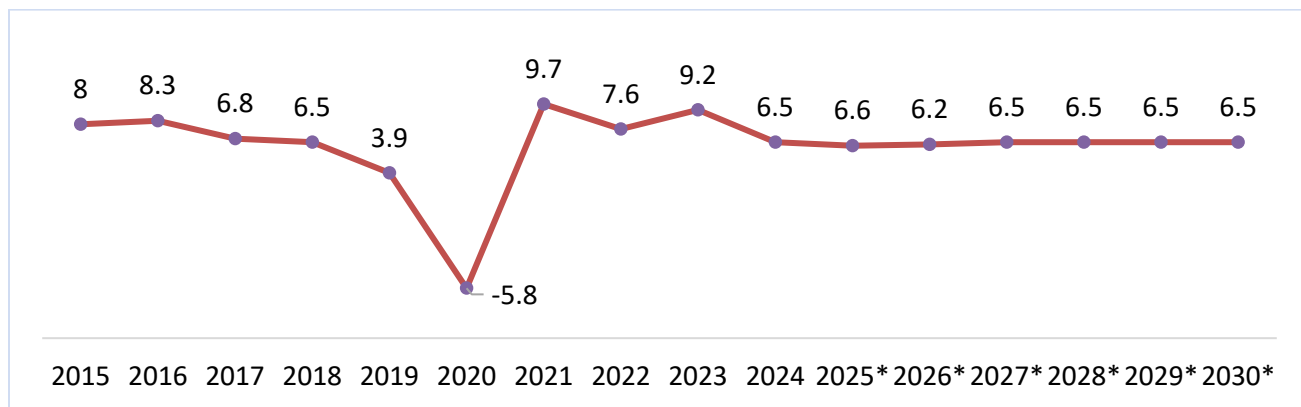
- Export-Focused NBFCs:** However, NBFCs that finance export-oriented small/mid-sized firms could face headwinds. With tariff-hit sectors seeing reduced orders and thinner margins, these lenders may experience slower loan growth and rising default risks in their portfolios. Analysts caution that trade-exposed NBFCs might see deteriorating asset quality until U.S.-India trade tensions ease.

1.6. India Macroeconomic Overview

India's economy is poised to become the world's third-largest economy by 2027, surpassing heavyweights like Germany. To achieve this ambitious goal, India is expected to maintain a growth rate of approximately 6.5% until 2027. The aspiration extends further; by 2047, the aim is for India to stand tall as a developed economy, necessitating even more robust growth rates around 10%. The backbone of India's growth story is the robust domestic demand characterized by a burgeoning consumer base, rising incomes, and the aspirations of its large youth population. Additionally, the Micro, Small, or Medium Enterprises (MSME) sector promises to play a pivotal role. As they regain their momentum post-pandemic, MSMEs are poised to generate income, foster innovation, and create jobs, especially in rural areas, ensuring broad-based growth.

Despite the optimistic forecast, India is not without its challenges. A prominent concern arises from the geopolitical realm. India's growing alignment with Western powers through the Quad alliance (alongside the U.S., Japan, and Australia) has further complicated its relations with China. On the global stage, India's position on issues such as Russia's invasion of Ukraine has also drawn scrutiny, as it seeks to balance its historical ties with Russia and its growing partnerships with Western nations. Upheavals in the Middle East, especially the conflicts involving major oil-producing nations, such as Iran have heightened concerns about the security of oil supplies. The escalating tension between Iran-Israel can lead to oil price surge posing significant threats. Given that India imports over 80% of its oil, fluctuations in prices can adversely impact its trade and fiscal deficits, potentially leading to increased inflation and decelerated growth.

Exhibit 7: Indian Real GDP Growth (%) (2015 – 2029F)



* Forecasted

Source: IMF, October 2025

1.7 Demographic trends in India - Rising Middle Class Income Levels/Increase in Working age population

(a) Demographic trends in India - Rising Middle Class Income Levels

In the decade ahead, India's middle-class population will continue to grow, boosting consumer demand and spending. By CY 2030, the upper and lower middle classes are estimated to account for 43.5% and 34.2% of the population, respectively. Discretionary spending will rise as disposable income rises, resulting in an increase in transactions, cash volume etc.

Exhibit 8: Share of Households by income Group, India, CY 2005, CY 2018, and CY 2030

	2005	2018	2030
Annual Income and Income Grouping	219 million households	293 million households	386 million households
Above \$40,000 (Rs. 3.3 million) Upper middle income	High 0.5%	High 2.7%	High 7.5%
\$8,500-\$40,000 (Rs. 705.5 thousand - Rs. 3.3 million) Upper middle income	Upper Mid 7.5%	Upper Mid 20.8%	Upper Mid 43.5%
\$4,000-\$8,500 (Rs. 332 - Rs. 595.5 thousand) Upper middle income	Lower Mid 23.3%	Lower Mid 33.1%	Lower Mid 34.2%
Below \$4,000 (Rs. 332 thousand) Low income	Low 68.9%	Low 43.3%	Low 14.8%

Note: The exchange rate is 1 US Dollar = 83 INR Rupees

Source: Frost & Sullivan, Secondary Sources

(b) Increase in Working-Age Population

In contrast to China's decline, India's working-age population is predicted to rise between CY 2018 and CY 2030. India is during a demographic shift, with youth accounting for a sizable portion of the population. With India adding 12 million individuals to the working population each year, the share of the working-age population is predicted to rise from 66.77 % in CY 2018 to 68.25% in 2024 and 68.94% by CY 2030. India benefits from a substantial pool of skilled technology graduates, with approximately 500,000 new engineers joining the workforce annually, totaling over 800,000 when including other technical skills.

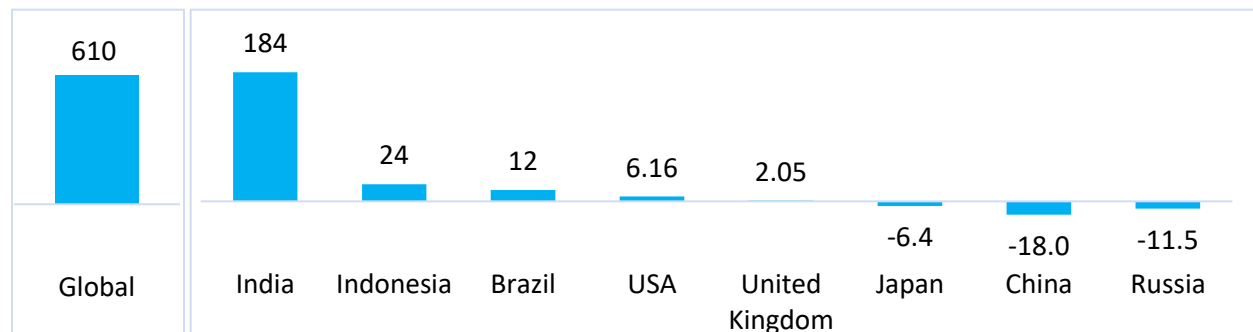
Exhibit 9: Population age structure analysis, India, CY 2005-2030 (%)

	2005	2018	2024	2030
0–14 Years of Age (Children)	32.73%	27.05%	24.62%	22.42%
15–64 Years of Age (Working Age)	62.53%	66.77%	68.25%	68.94%
65 and Above (Elderly)	4.74%	6.18%	7.13%	8.64%
Country Population (in Billion)	1.15	1.37	1.45	1.53

Source: Frost & Sullivan, Secondary Sources

India's working-age population share, and size is expected to grow between 2015 and 2030, in contrast to China's contraction. Within the 15–64-year age group, in India, between 2015 and 2030, the 25–64 year age group will witness an increase in its share, while the other groups will contract. A growing working-age population share, and size implies more savings and tax revenues that can help fund investments across the country. The growing elderly population share highlights the need to boost senior-living estates and geriatric care in the country. There is a stark senior-living real estate supply shortage at present, along with shortages in geriatric care units and professionals.

Exhibit 10: Addition to working age population (25 years – 64 years) in millions, Global and across select economies, 2015 – 2030



Source: IMF, World Bank

India has the highest addition in the working age population segment with an estimated 183.9 million people to be added between 2015 and 2030. India is currently at a stage of demographic transition with a substantial percentage of the youth population. The proportion of the working-age population is expected to increase by about 610 million globally. India is adding 12 million people to the working population each year

(c) Rising Income Levels:

Rising income levels in India directly impact consumer spending patterns by increasing individuals' purchasing power and disposable income. The correlation between rising income levels and consumer spending underscores the importance of income growth in fuelling economic activity and driving demand in India's consumer-driven economy. India is expected to double its annual disposable income per capita from USD 1,900 in 2020 to USD 4,400 in 2030.

Exhibit 11: India annual disposable income - per capita. (In thousands USD)



Source: Statista Market Insights, World Bank, OECD, Eurostat, World Bank PovcalNet, WID - World Inequality Database; Trading economics

Viksit Bharat scheme

Viksit Bharat Scheme is the Government of India's visionary initiative aimed at transforming the nation into a fully developed country by the centenary of its independence in 2047. This comprehensive roadmap encompasses various facets of development, including economic growth, social advancement, environmental sustainability, and effective governance.

Launched as a strategic national mission, Viksit Bharat@2047 seeks to position India as a global leader by focusing on:

- **Economic Prosperity:** Enhancing manufacturing and services sectors to boost exports and encourage startups.
- **Social Advancement:** Improving education, healthcare, and social equity to uplift all sections of society.
- **Environmental Sustainability:** Committing to net-zero emissions by 2070 and promoting renewable energy sources.
- **Effective Governance:** Implementing transparent and efficient administrative systems to ensure citizen-centric services.

Key Pillars of the Initiative

1. **Robust Economic Growth:** Fostering a strong economy through increased industrial output, innovation, and job creation.
2. **World-Class Education:** Providing affordable and quality education with modern infrastructure and skilled educators.
3. **Universal Healthcare Access:** Ensuring affordable and quality healthcare services across urban and rural areas.
4. **Technological Advancement:** Integrating cutting-edge technologies to enhance various sectors and improve quality of life.
5. **Environmental Conservation:** Promoting sustainable practices to preserve natural resources and biodiversity.
6. **Women Empowerment:** Encouraging active participation of women in all sectors by providing equal opportunities.
7. **Entrepreneurship and Innovation:** Supporting startups and businesses to drive economic growth and self-reliance.

Youth Engagement: Mera Yuva Bharat (MY Bharat)

Recognizing the pivotal role of youth in nation-building, the government launched **Mera Yuva Bharat (MY Bharat)**, an autonomous body under the Ministry of Youth Affairs & Sports. This platform empowers young individuals by providing them with opportunities to contribute to the Viksit Bharat vision through skill development, volunteerism, and active participation in governance.

Implementation Strategy

The realization of Viksit Bharat@2047 involves:

- **Policy Reforms:** Enacting policies that facilitate ease of doing business, innovation, and inclusive growth.
- **Infrastructure Development:** Investing in modern infrastructure to support economic activities and connectivity.
- **Digital Transformation:** Leveraging technology to enhance public service delivery and governance.
- **Public Participation:** Encouraging citizens to actively engage in developmental initiatives and decision-making processes.

Viksit Bharat@2047 represents a collective aspiration to elevate India to new heights of development and global prominence. Through concerted efforts across various sectors and active citizen participation, the vision aims to create a prosperous, inclusive, and sustainable future for all Indians.

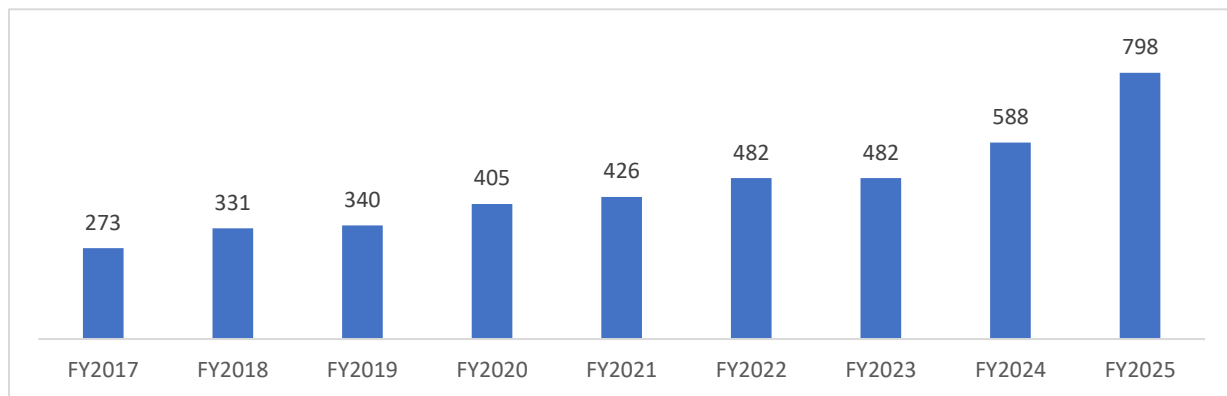
FINANCIAL SERVICES MARKET IN INDIA

1.8. Indian Financial Services Market

The Indian Financial Services Market has undergone remarkable growth, propelled by diverse factors. The sector, encompassing mutual funds, wealth management, stock markets, insurance, and banking, has thrived due to increasing wealth, digital innovation, and supportive government policies. The mutual funds industry, for instance, has seen its assets under management more than double in recent years, from USD 273 Bn in FY2017 to USD 588 Bn in FY2024, signalling robust growth.

As of March 31, 2025, India's mutual fund industry achieved a record-high AUM of **\$797.9 billion**. This marks a substantial increase from March 2020, reflecting around 2-fold growth over five years.

Exhibit 12: Mutual Funds Assets under Management (AUM) (USD Bn), India, FY2017-2025

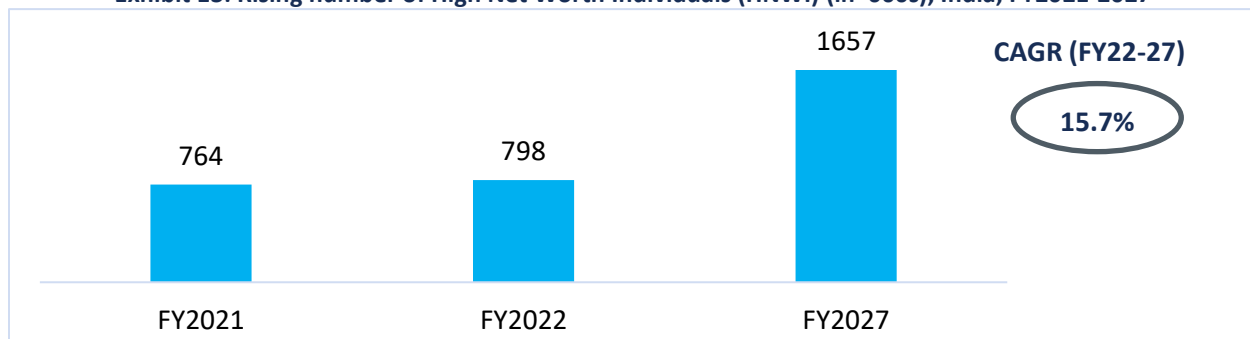


, FY2025 data as of March 2024, with USD rate as INR 82.5

Source: Association of Mutual Funds - AMFI

Similarly, wealth management market in India is experiencing robust growth, driven by rising affluence, increasing wealth creation, and evolving investor preferences. The number of high-net-worth individuals (HNWIs) in India reached 763,674 by the end of FY 2021. The same is expected to grow to 1.66 million HNWIs in 2027. HNWIs are those who have a net worth of US\$1 million or more. Advisory asset management and tax planning rank among the most sought-after wealth management services among High-Net-Worth Individuals (HNWIs).

Exhibit 13: Rising number of High Net Worth Individuals (HNWI) (in '000s), India, FY2021-2027

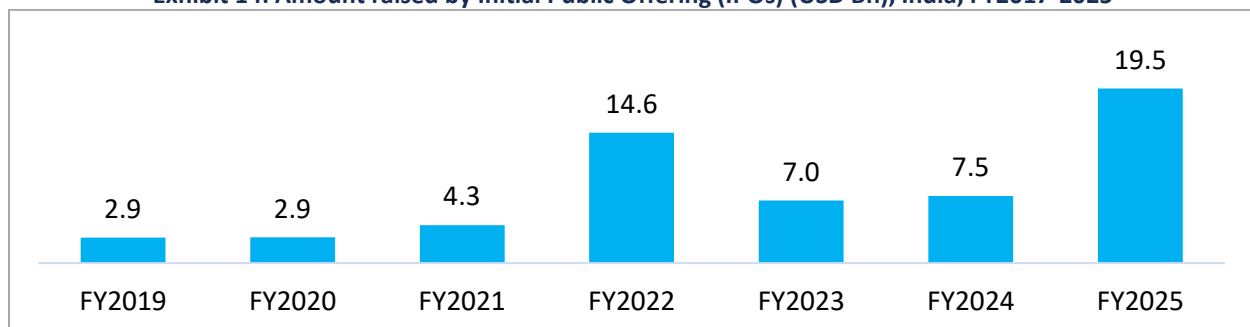


Source: Knight Frank Wealth Report

Despite challenges, such as regulatory complexities and intense competition, the industry presents significant opportunities for firms that can innovate and adapt to changing market dynamics. With the right strategies in place, wealth managers can capitalize on India's burgeoning wealth management market and deliver value to their clients.

Additionally, the equity market has expanded significantly, with a notable rise in the number of companies raising capital and going public. In FY25, 78 companies raised approximately \$19.5 billion USD, marking a substantial increase from FY24. This figure represents more than a 2.5-fold increase compared to FY24, where 76 IPOs collectively raised \$ 7.5 billion.

Exhibit 14: Amount raised by Initial Public Offering (IPOs) (USD Bn), India, FY2017-2025



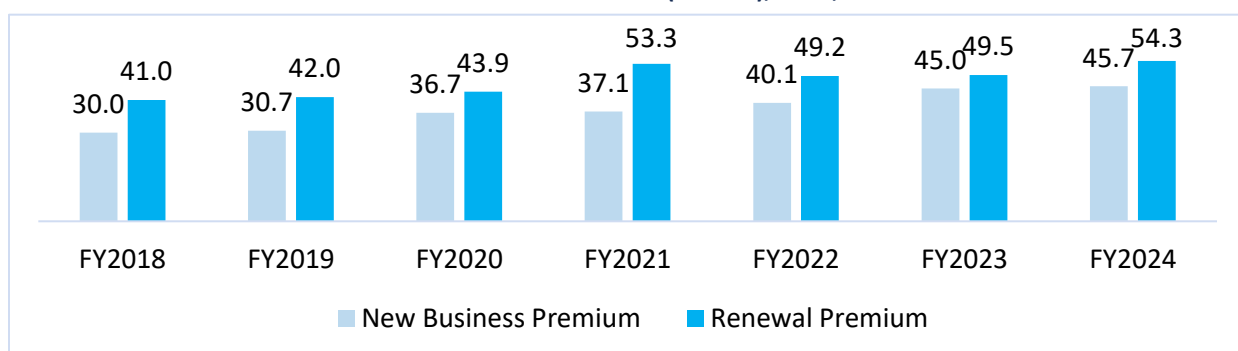
Source: NSE / BSE, Secondary Sources

Further, the country's Insurance industry has grown significantly in recent years. The sector has witnessed robust growth in recent years, fuelled by rising awareness about financial protection, increasing disposable incomes, and favourable demographics. With a large population and low insurance penetration levels compared to global standards, India presents substantial growth opportunities for insurers.

New business premiums have been growing at a steady pace from US\$ 30.1 billion in FY18 to US\$ 45.7 billion in FY24 and US\$ 46.5 billion in FY25. On a similar trend, renewable premiums have shown a modest growth as well. It stood at US\$ 54.3 billion in FY24, rising from US\$ 41.0 billion in FY18.

In FY24, India's life insurance industry collected gross premiums totaling approximately USD 100 billion. Of this total, renewal premiums accounted for 54.4%, amounting to approximately USD 54.3 billion.

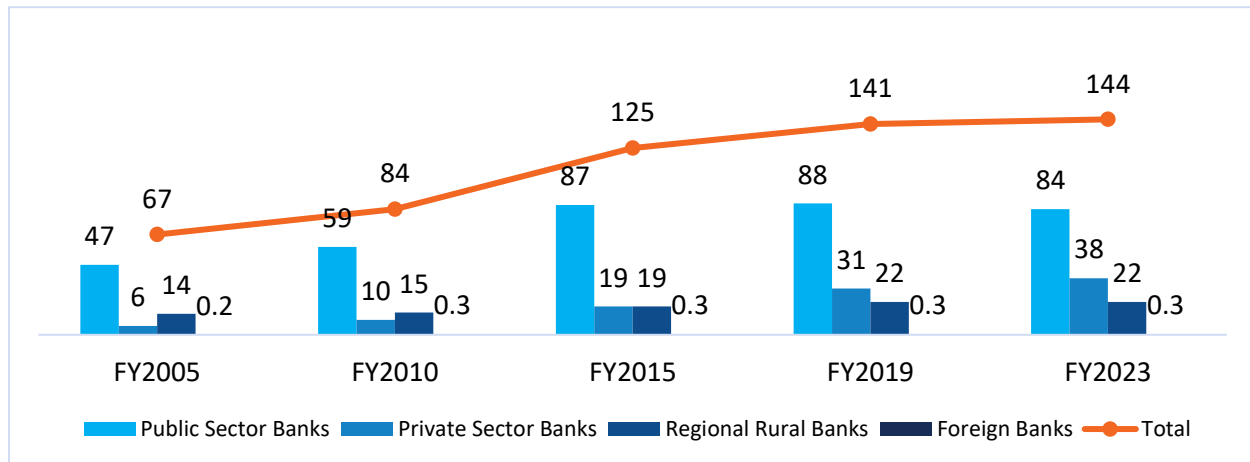
Exhibit 15: Life Insurance Premium (USD Bn), India, FY2018-2024



Source: IRDA, IBEF Report, Secondary Sources

Similarly, India's banking industry has experienced rapid expansion, driven by robust economic growth, urbanization, and increasing financial inclusion initiatives. With a large population and a growing middle class, there is a burgeoning demand for banking services, including savings accounts, loans, investments, and digital payment solutions.

Exhibit 16: Rising number of Bank Branches in India (in 000's), FY2005-FY2023

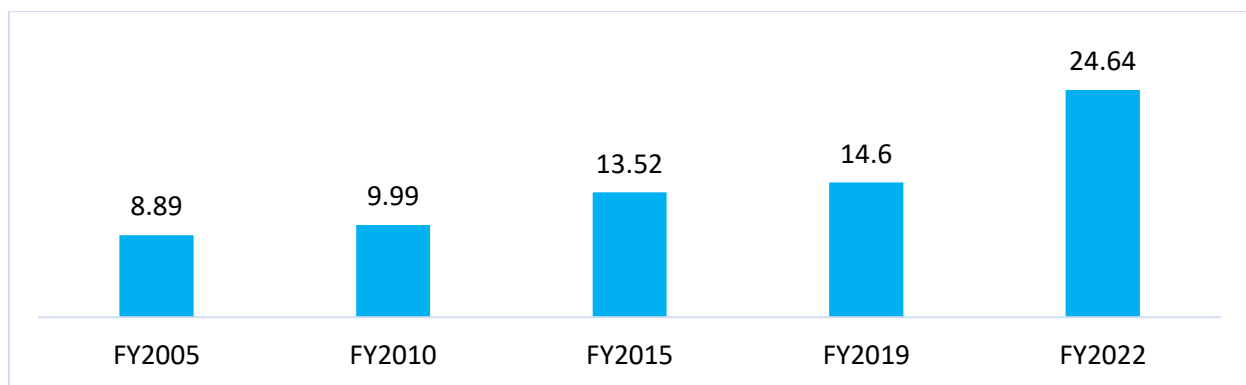


Source: RBI, Secondary sources

Both public and private sector banks have significantly expanded their branch networks and digital presence to cater to the diverse needs of customers across urban and rural areas. While the number of branches for public sector banks have increased by about 80% in the FY2005 – FY 2023 period, the same for private sector banks stands at 533%. Moreover, the emergence of new banking models, such as payments banks and small finance banks, has further diversified the banking landscape, enhancing competition and innovation. While the number of commercial banks steadily increased from 8.89 (per 1,00,000 adults) in FY2005 to 14.6 in FY2019, it witnessed a steep increase post pandemic reaching 24.64 branches.

Public sector banks (PSBs) had 85,116 branches in September 2024. In India, the total number of bank branches, including both public and private sector banks, increased from 1,17,990 in March 2014 to 1,60,501 by September 2024.

Exhibit 17: Number of commercial bank branches in India, from 2005 to 2022 (per 100,000 adults)



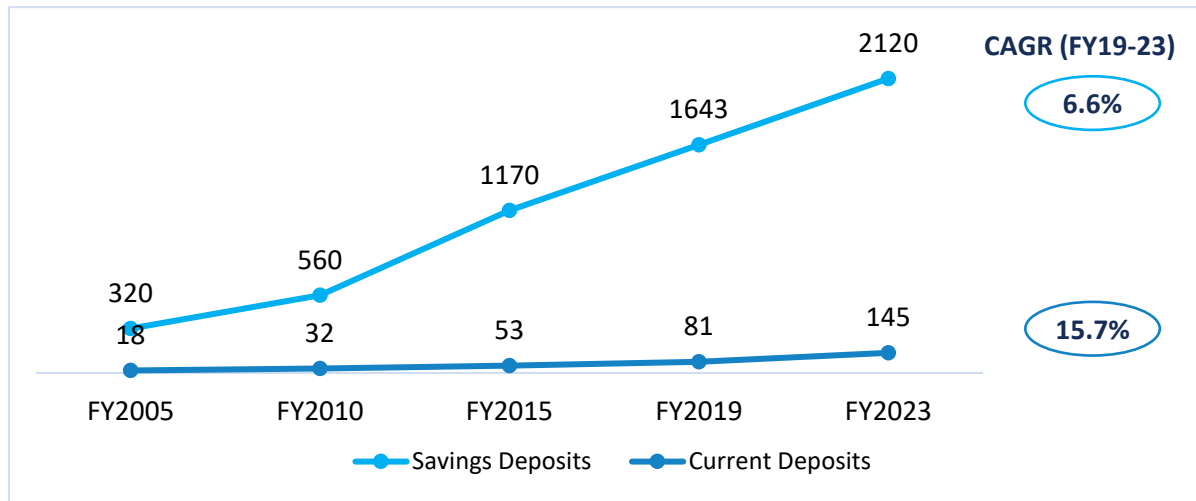
Source(s): World Bank

Corresponding Growth in Current Accounts / Savings Accounts

There was a corresponding growth in number of savings and current accounts (CASA) which increased from 1724 million in FY2019 to 2265 million accounts by FY2023. Current accounts witnessed a higher CAGR at 15.7% albeit on a lower base while savings accounts grew at a CAGR of 6.6% in the same period accounting for 94% of the total CASA accounts.

Increase in number of savings and current account will result in growth of debit cards being issued by the banks.

Exhibit 18: Number of accounts in India, FY2005 to FY2023 (Mn)

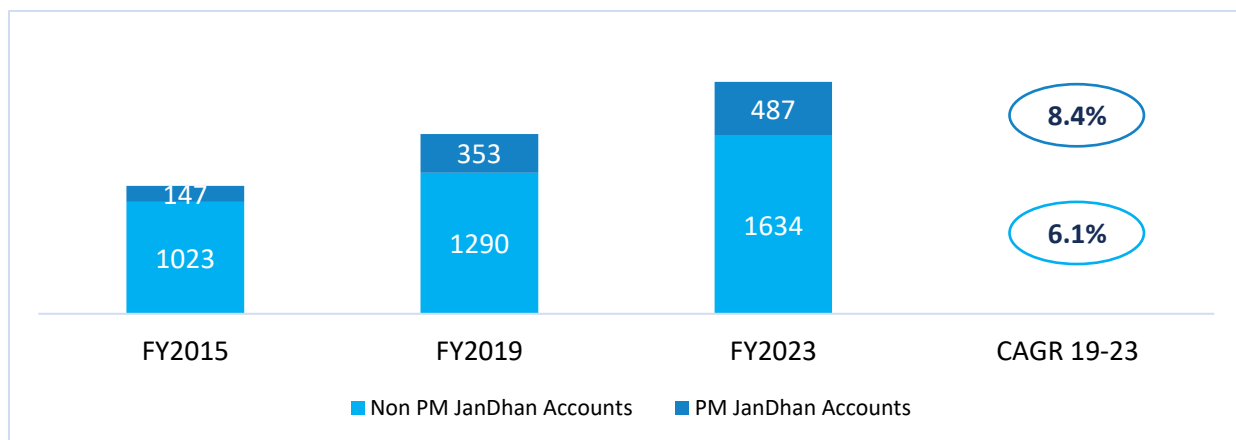


Data pertains to scheduled commercial banks and excludes interbank deposits

Source: RBI; Secondary Sources

Growth in Jan Dhan Accounts

Exhibit 19: Savings Accounts in India: Split by JanDhan and Non-JanDhan, FY2015-23 (Mn)



Source: RBI; Secondary research

The share of JanDhan accounts in overall number of savings accounts has increased steadily from 13% in FY15 to 21% in FY19 and 23% in FY23. A significant proportion of JanDhan accounts do not have debit cards issued to them yet, which presents an opportunity for both banks and card manufacturers.

With increase in usage of JanDhan accounts, there will be an increasing demand for JanDhan accounts linked debit cards.

A total of 552.2 million Jan-Dhan accounts have been opened till March 2025, while only 380.7 million (69%) possess Rupay debit cards.

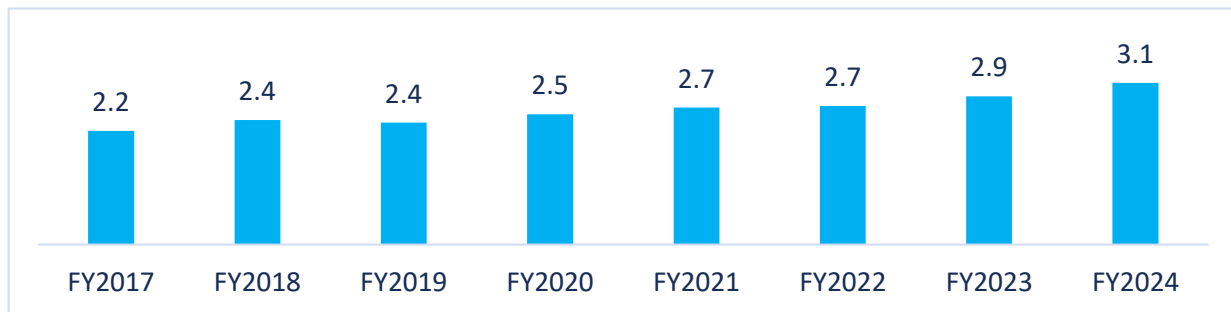
As of March 2025, a total of 552.2 million Jan-Dhan accounts have been opened. However, 171.5 million of these accounts — approximately 31% still do not have RuPay debit cards.

Growth in Bank Assets, Credit and Deposits in India

The growth of bank assets, credit, and deposits underscores the resilience and dynamism of the Indian banking sector. Driven by economic growth, regulatory reforms, and technological advancements, banks in India are playing a pivotal role in facilitating financial inclusion, promoting investment, and driving economic development. Bank assets in India have been expanding steadily, from USD 2.2 trillion in FY2017 to USD 2.9 trillion in FY2023, reflecting the overall growth of the economy and the increasing financial intermediation role played by banks. In 2024, total assets in Indian banking sectors were US\$ 3.13 trillion.

Rising bank assets, deposits and credit in India

Exhibit 20: Bank assets, FY2017-FY2024 (USD Tn)



Source: India Brand Equity Foundation; Indian Banks' Association; Reserve Bank of India, IBEF

Exhibit 21: Bank Deposits, FY2017-FY2024 (USD Bn)

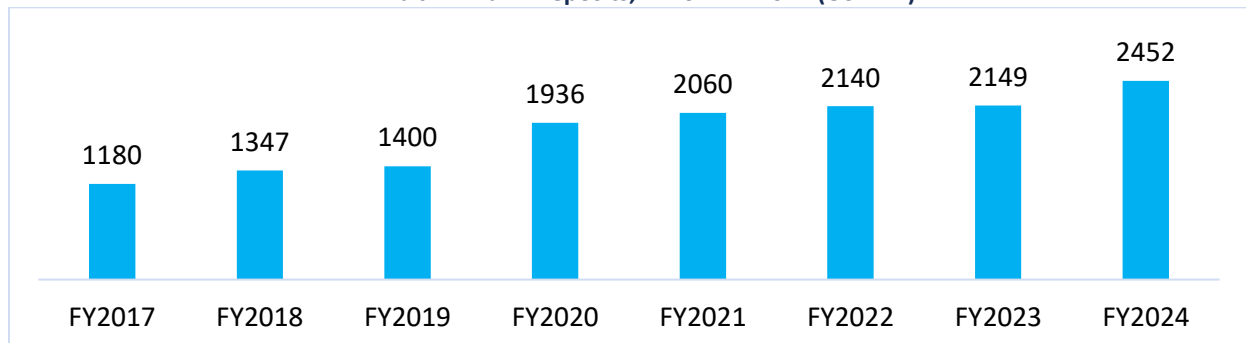
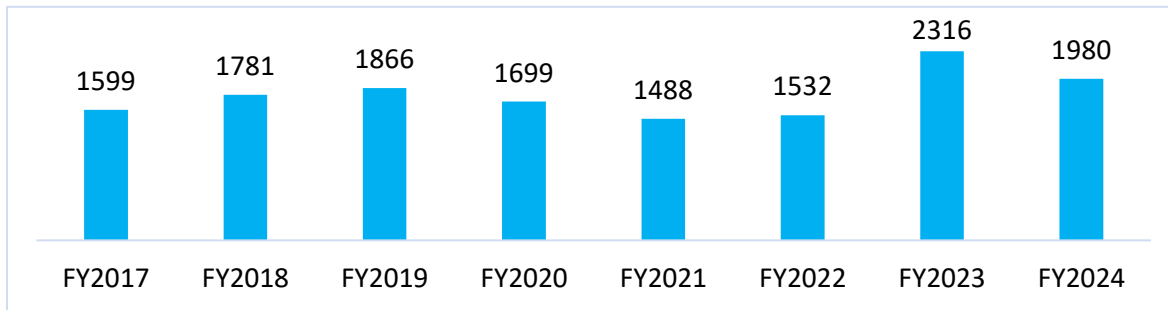


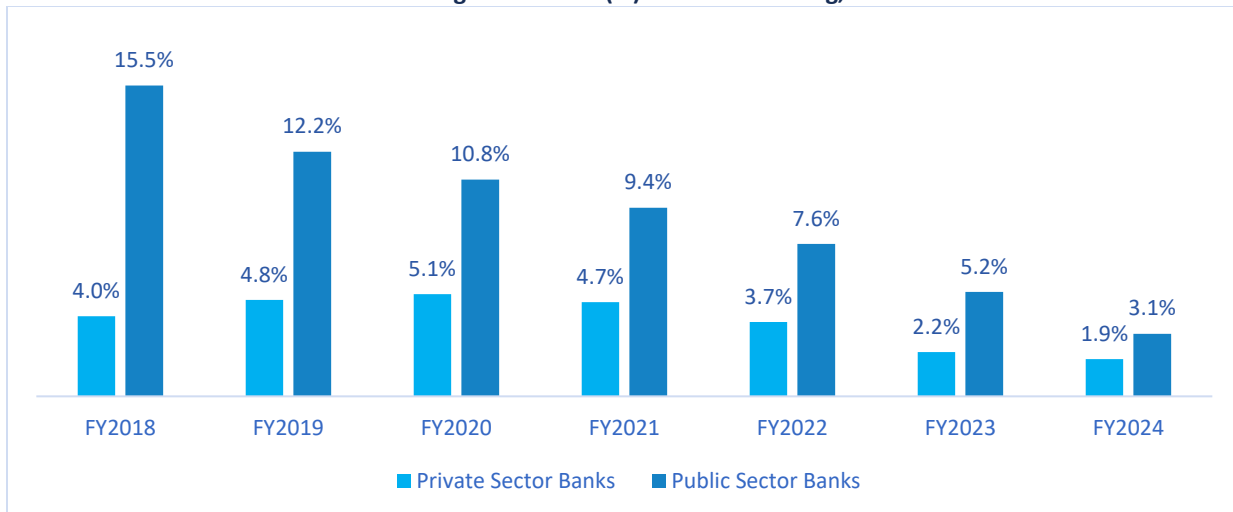
Exhibit 22: Bank Credit (USD Bn)

Source: RBI Documents, Invest India, News Articles, Indian Banks Association

Bank deposits, including savings deposits, fixed deposits, and current deposits, have witnessed significant growth in India, increasing from USD 1,180 bn in FY2017 to USD 2,452 bn in FY2024 and to USD 2,783 bn in FY2025. Factors driving this growth include increasing financial awareness, rising income levels, and the perceived safety and liquidity offered by bank deposits. As per IBEF, bank deposits grew 10.12% YoY to Rs. 2,38,20,044 crore (USD 2,722.60 billion) by July 11, 2025, marking steady improvement.

Bank credit, comprising loans and advances extended by banks to various sectors of the economy, has been growing at a healthy pace in India, growing from USD 1599 bn in FY2017 to USD 1980 bn (INR 164.3 trillion converted at USD rate of INR 83) in FY2024. This growth is driven by increasing demand for credit from sectors such as retail, housing, agriculture, MSMEs (Micro, Small & Medium Enterprises), and infrastructure. As per IBEF, credit as of June 27, 2025, rose 9.5% to Rs. 1,84,83,097 crore (US\$ 2,162.52 billion), reflecting strong economic momentum and sustained lending activity in India's financial sector.

Further, banks in India have been witnessing a decline in Non-Performing Assets (NPAs). NPAs have been a significant concern for the banking sector, impacting financial stability and profitability. However, recent trends indicate a notable decline in NPAs, signalling positive developments for Indian banks.

Exhibit 23: Declining Gross NPAs (%) in Indian Banking, FY2018-FY2024

Note: For FY2024, NPA for Public Sector Banks is for September 2024.

Source: RBI, PIB, Secondary sources.

The overall Gross Non-Performing Asset (NPA) ratio for the Indian banking sector as of March 31, 2025, was 2.3%. This marks a multi-decadal low level, reflecting improvements in the sector's financial health,

compared to 8.66% as of March 31, 2020, and 11.85% as of March 31, 2018. It is worth noting that a majority of the NPAs and stressed assets were related to corporate loans. However, there has been a considerable improvement in the quality of these banking assets, despite their proportion within the overall banking assets diminishing significantly.

Regarding the capital position of banks, there has been a marked improvement over the past three years. Private sector banks have bolstered their capitalization levels through equity capital raises, anticipating potential losses during the Covid-19 pandemic. They were further supported by internal accruals. Public sector banks, on the other hand, received infusion from the Government of India (GoI) as well as raised equity capital from capital markets, alongside the accretion of profits.

Moreover, digital transactions and mobile wallets have experienced substantial growth, indicating a shift towards a more digitally inclusive financial landscape. Government initiatives have played a crucial role promoting financial inclusion, especially in rural areas. These efforts have not only spurred growth in traditional financial services but have also paved the way for innovation and global collaboration, setting the stage for continued expansion and evolution of the sector.

Financial services companies will continue to operate wherever there is a chance for market expansion in the future. To serve a broad range of clients, more modular insurance plans and smaller loans will be made available. For instance, mobile payments have facilitated Indian consumers' access to and use of financial services. More ecosystems will be developed in the future, and financial service providers will be essential to achieving this goal.

1.9. Penetration of financial products / services

1.9.1. ATM Penetration in India

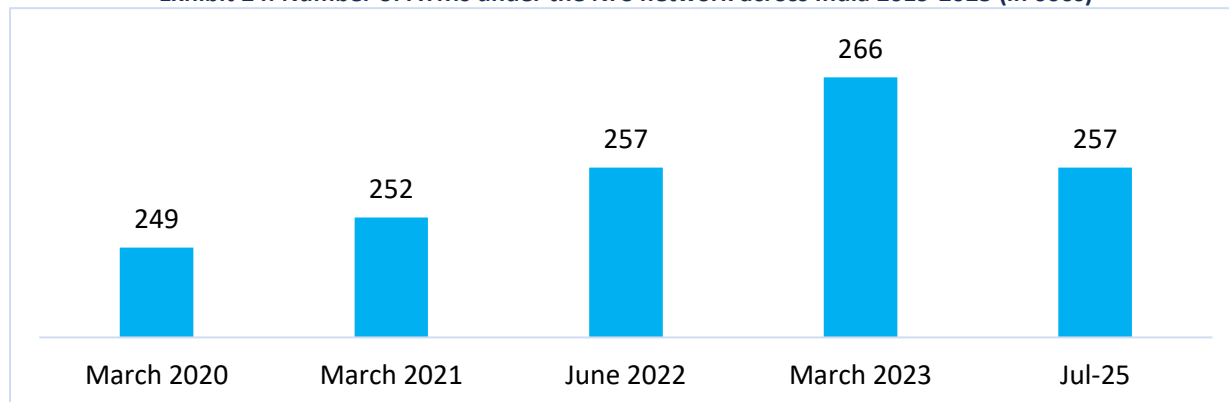
Since 2016, India's ATM market has been stagnant, following a period of significant yearly growth of 20 percent between 2011 and 2016. Since FY2016 until FY2021, the growth slowed down to a 3% CAGR (reaching 252,000 ATMs). Since the November 2016 demonetization of high-value currencies, many million people have entered the banking system by opening new accounts. The government's decision to direct welfare payments to people's accounts has boosted the number of new bank accounts. India remains one of the countries with the lowest ATM penetration. There is one ATM for every ten villages in India, even though the country has 650,000 villages.

As on July 2025, there were 2,57,000 ATM (including cash deposit machines/recyclers) in India.

ATM Transaction Overview India (2025)

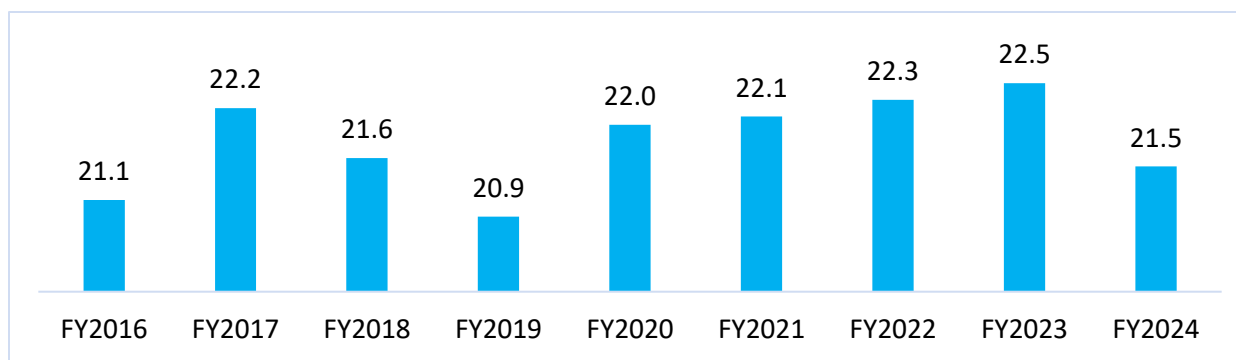
In April 2025, there were approximately 700 million ATM transactions across India. This translates to an average of about 23 million ATM transactions per day. Out of this, cash withdrawals accounted for approximately 88% of total ATM transactions while non-financial transactions such as balance inquiries and mini statements, made up the remaining 12%.

As of FY2025, the average ticket size for ATM cash withdrawals in India rose to INR 5,658, marking a 3% year-on-year increase. Further, select months like October 2024, January 2025, February 2025, and March 2025 witnessed a higher growth in ticket size at 4-6%.

Exhibit 24: Number of ATMs under the NFS network across India 2019-2025 (in 000s)

Source: NPCI, Secondary Sources

As of FY2024, India had approximately **21.5 ATMs per 100,000 adults**, according to data from the International Monetary Fund. In contrast, the penetration rate for Brazil is 92.7 and that of China is 81.4 per 1,00,000 individuals as of as of FY2024. Considering the growing population, the ATM penetration is very low as compared to other developing countries and presents itself as a potentially huge driver for the growth of the financial services sector in India.

Exhibit 25: ATM Density per 100,000 people, India, 2016 - 2024

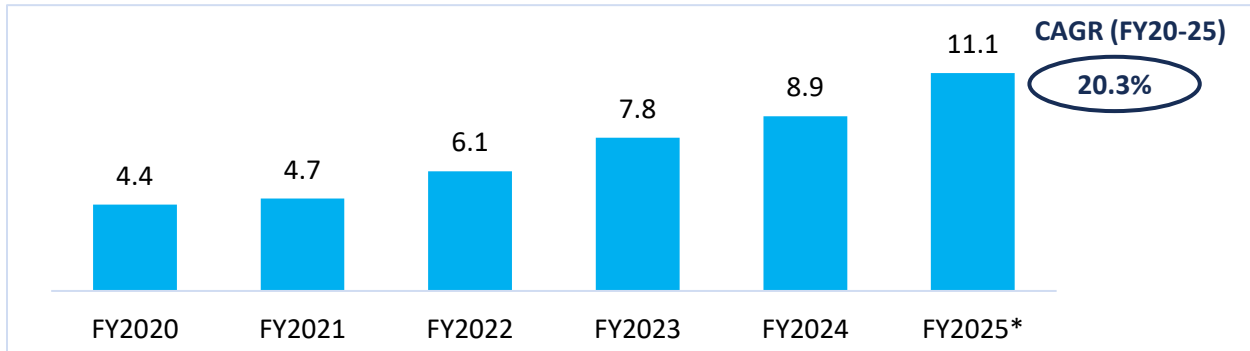
Source: Frost & Sullivan, Secondary Sources

1.9.2. POS Penetration in India

The number of POS terminals in India has increased from 4.4 million in FY20 to 11 million in FY2025 growing at a CAGR of 20.3%.

The increase in Point of Sale (POS) terminals is a significant development in the country's digital payment ecosystem. The expansion of POS terminals, which facilitate card-based transactions, has enabled merchants across urban and rural areas to accept digital payments, thereby reducing reliance on cash. Advancements in financial technology have made POS systems more accessible and affordable for small and medium-sized businesses, further accelerating adoption.

Exhibit 26: Number of POS Terminals in India (Mn), FY2020 – 2025



Source: Frost & Sullivan, Secondary Sources; FY2025 data for deployments until March 26th, 2025

POS Transaction Overview India

In H2 2024, 2.27 billion POS transactions were done in India with transaction value of INR 5.83 trillion. The ATS (for all cards) was INR 2,645 during this period.

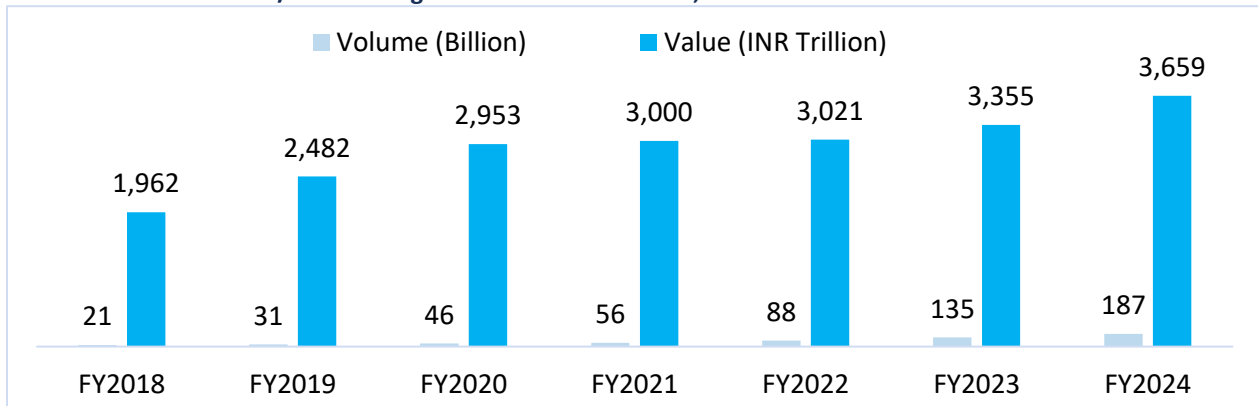
INDIA PAYMENTS LANDSCAPE

2.1. Digital Payments Landscape in India

2.1.1. Total volume / value of digital transactions in India

The exponential growth of digital transactions in India has become a defining feature of the nation's economic landscape in recent years. A confluence of factors has fuelled this remarkable transformation. Government-led initiatives, such as the "Digital India" campaign, have created a robust digital infrastructure, making digital transactions more accessible to a wider population. The introduction of Aadhaar, a biometric-based identification system, has streamlined authentication processes, enhancing security and ease of use.

Exhibit 27: Total Volume/Value of Digital Transactions in India, FY2018-FY2024



Note: Digital payment tools included Real Time Gross Settlement (RTGS), Unified Payments Interface (UPI), National Electronic Fund Transfer (NEFT), Immediate Payment Service (IMPS), Credit and Debit cards, Prepaid Payment Instruments, National Automated Clearing House (NACH), Aadhaar enabled Payment Service (AePS) (Fund Transfers), BHIM Aadhaar Pay, and National Electronic Toll Collection (NETC) (linked to bank account)

Source: RBI, Frost & Sullivan; pib.gov.in/PressReleasePage.aspx?PRID=2057013

The Government of India is dedicated to expanding digital transactions within the Indian economy, aiming to strengthen the financial sector and improve the quality of life for its citizens. This concerted effort, involving all stakeholders, has led to a significant increase in digital payment transactions, rising from 21 billion transactions in FY 2017-18 to an impressive 135 billion transactions in FY 2022-23 and **185 billion** in FY2023-24, growing at a CAGR of 44.2 per cent from FY 18 to FY 24. During the same period, the value of transactions has grown to **INR 3,658 trillion**.

Over the past five years, various user-friendly digital payment methods such as Bharat Interface for Money-Unified Payments Interface (BHIM-UPI), Immediate Payment Service (IMPS), and National Electronic Toll Collection (NETC) have witnessed substantial growth. These modes of payment have revolutionized the digital payment ecosystem, facilitating both person-to-person (P2P) and person-to-merchant (P2M) transactions. Likewise, the National Electronic Funds Transfer (NEFT) and Real Time Gross Settlement (RTGS) systems have played a pivotal role in reshaping the digital payment scene within the nation. Over the past decade (2014-2023), NEFT and RTGS systems have experienced a remarkable surge, with NEFT witnessing a 700% increase in volume and a 670% increase in value, while RTGS has witnessed a 200% increase in volume and a 104% increase in value. Online card transactions have also been witnessing an upsurge. In FY 20204, the overall value of online purchases via card transactions in India reached approximately **₹14.4 trillion**. . The value of credit card transactions in 1H 2024 reached INR 3.58 trillion, reflecting a 21% increase from 1H 2023. This surge in credit card spending is attributed to increased consumption of high-value goods and services.

2.1.2. Alternative modes of payment technologies

Alternative modes of payment include mobile based tools which co-exist with payment cards. There are three broad alternatives to payment cards of which one is India specific.

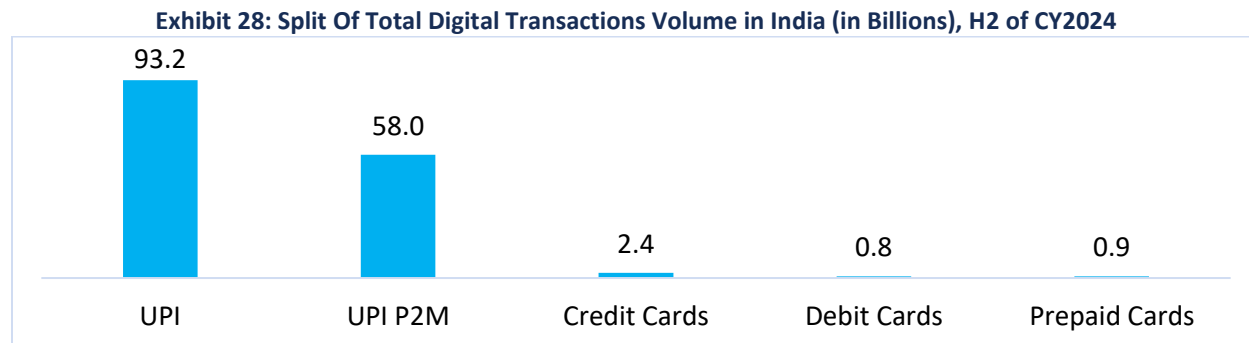
- (a) NFC based mobile payment wallets
- (b) Virtual cards
- (c) UPI

NFC-based mobile payment wallets refer to the likes of Apple Pay and Samsung Pay which use Host Card Emulation technology to emulate payment cards within mobile wallets. Despite Apple Pay's launch in the U.S. in 2014, its usage remains low.

Virtual cards, which are digital cards in mobile apps of banks are issued before physical cards reach customers, and have existed for years. Despite this, the issuance of physical cards continues to grow.

UPI revolutionized Indian payments by eliminating the need for costly POS machines and MDR fees, allowing merchants to use mobile phones and QR codes for transactions. Although UPI was initially launched with no MDR to encourage adoption, NPCI is introducing MDR fees for certain payments, affecting large merchants in the future.

2.1.3. Split Of Total Transactions Volume in India



Note: Data is for July-Dec 2024

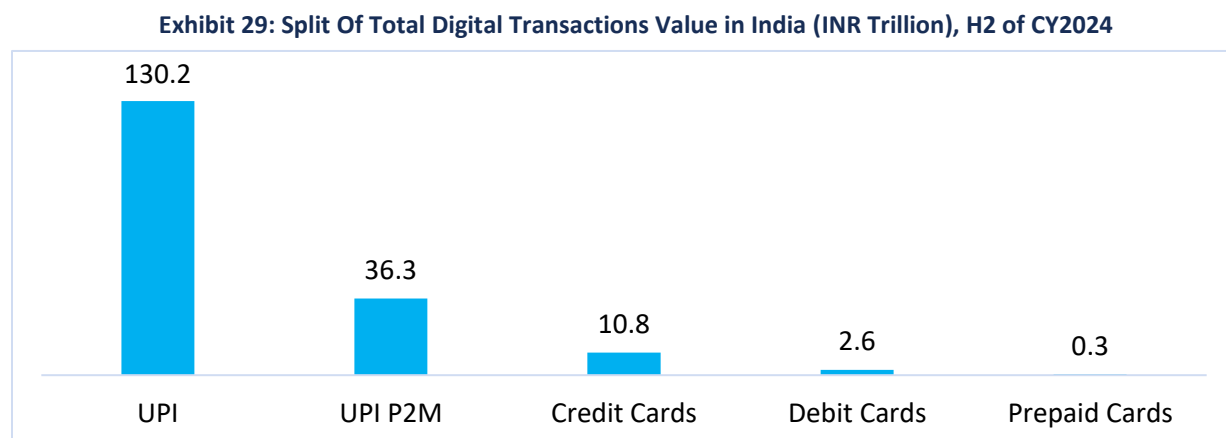
Source: RBI, Frost & Sullivan, Worldline Report on digital Payments, Secondary Sources

UPI witnessed a transaction volume of 93.2 billion in H2 CY2024. UPI P2M transactions experienced an increase as well with 58.0 billion transactions, an increase of about 50% over H2'CY23 (38.73 Bn). This growth in P2M transactions highlights the expanding merchant acceptance of UPI, with more businesses integrating UPI as a preferred payment method.

Credit card transactions registered a notable growth, reflecting a growing preference for credit-based digital payments. reaching 2.4 billion, a 36%% increase from H2'CY23 (1.78 Bn). This growth reflects a growing consumer preference for credit cards, particularly for high-value purchases. Credit cards are increasingly being used in diverse sectors like e-commerce, travel, and high-end retail, driven by factors like reward programs, EMI options, and enhanced security features.

Debit card transactions stood at 0.8 billion in H2,CY24 witnessing a 28.5% decline from 1.15 billion transactions in H2,CY23, while the average transaction size (ATS) increased by a strong 18% to INR 3113 in H2,CY24 as compared to H2,CY23 indicating a significant usage of debit cards for higher value transactions. Despite facing competition from UPI, particularly for lower-value transactions, debit cards continue to be a staple in the digital payment landscape. They are widely used across various consumer segments, especially for direct bank account debits, reflecting their reliability and widespread issuance by banks.

2.1.4. Split Of Total Transactions Value



Source: RBI, Frost & Sullivan, Worldline Digital Payments Report, Secondary Sources

Note: Data is for July-Dec 2024

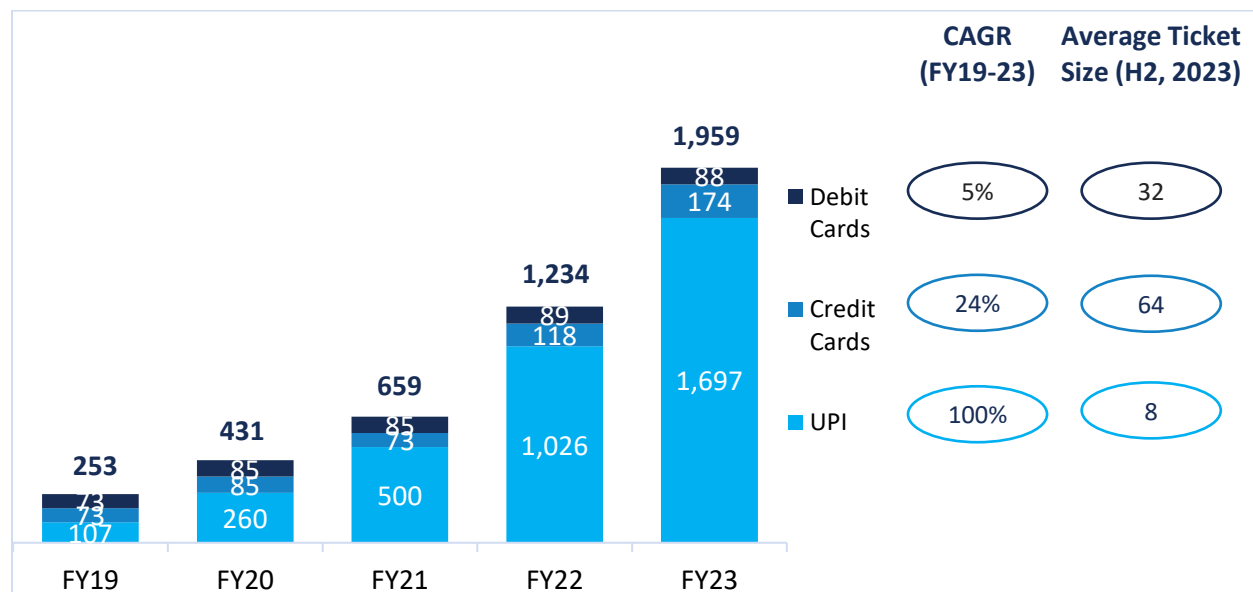
UPI continued to lead India's digital payment landscape, solidifying its position as the most preferred digital payment method. The total transaction value for UPI reached INR 130.2 trillion in H2,CY24. This staggering figure underscores UPI's versatility and efficiency in managing a vast range of primarily small ticket transactions from small everyday purchases to even large-scale business transfers.

The transaction value for UPI P2M was INR 36.3 trillion in H2,CY24. The increase in P2M transaction value signifies the expanding role of UPI in retail and service-based transactions, facilitating a cashless and digital economy.

Credit card transactions amounted to INR 10.8 trillion in value in H2,CY24. Credit card transactions reflected a growing trend of consumers leveraging credit for high-value purchases and rewards. This substantial figure is indicative of credit cards being used predominantly for higher-value transactions, including in sectors like travel, luxury retail, and electronics. The robust transaction value reflects consumer confidence in using credit cards for significant purchases, benefiting from aspects like credit availability, reward points, and EMI options.

Debit cards saw a transaction value of INR 2.6 trillion in H2, CY24 alone. Debit card transactions saw a decline, indicating a shift in consumer preference towards UPI and credit-based payments. Although there is a competitive pressure from UPI, especially for smaller transactions, debit cards continue to be a significant player in the digital payments landscape. Their use is particularly pronounced in direct bank account debits and for users who are more comfortable with the direct withdrawal of funds.

Exhibit 30: Total Transaction Value (USD Bn) and Average Transaction Ticket Size (ATS) for Payment Instruments in India (USD), FY2019-23



Source: RBI, NPCI, Worldline India Digital Payments Report, other secondary sources, Frost & Sullivan analysis

UPI for primarily small ticket transactions: The total transaction value for UPI reached USD 2,408 trillion USD Bn in FY24 (INR 199.89 trillion). This staggering figure underscores UPI's versatility and efficiency in

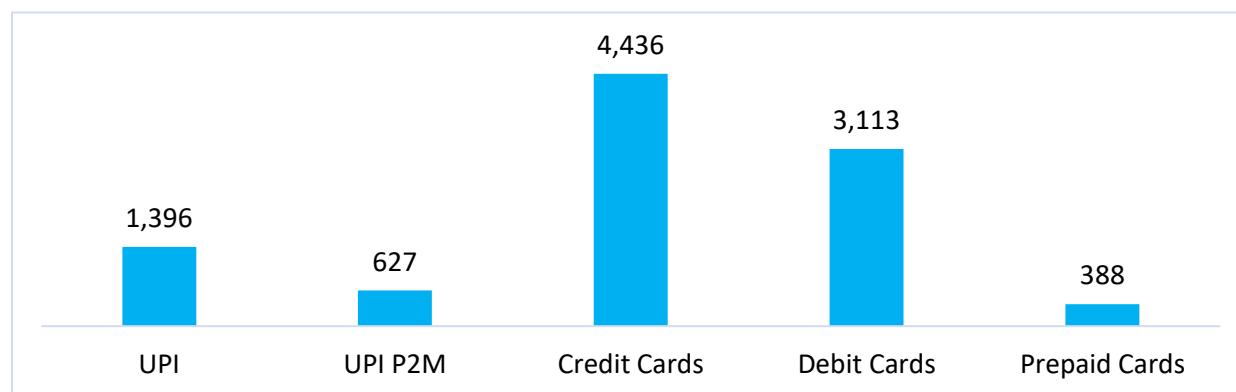
managing a vast range of **primarily small ticket transactions** from small everyday purchases to even large-scale business transfers.

The increase in P2M transaction value signifies the expanding role of UPI in retail and service-based transactions, facilitating a cashless and digital economy.

Robust growth for credit cards: Credit card transactions amounted to USD 220.7 Bn in value in FY24. This substantial figure is indicative of credit cards being used predominantly for higher-value transactions, including in sectors like travel, luxury retail, and electronics. The robust transaction value reflects consumer confidence in using credit cards for significant purchases, benefiting from aspects like credit availability, reward points, and EMI options.

Debit Cards witnessed growth in transaction value since FY19: Debit cards witnessed a transaction value of USD 88 Bn in FY23 up from USD 73 Bn in FY19. Although there is a competitive pressure from UPI, especially for smaller transactions, debit cards continue to be a significant player with usage more pronounced in direct bank account debits and for users who are more comfortable with the direct withdrawal of funds.

Exhibit 31: Average Ticket Size (ATS) for Payment Instruments in India (in INR), H2 of CY2024



Source: RBI, Frost & Sullivan, worldline.com, Secondary Sources,

The ATS for UPI was INR 1396 in H2, CY24 further declining from INR 1515 in H2'23, indicating a growing trend towards smaller-value transactions. This relatively low ticket size is indicative of UPI's widespread use for smaller, everyday transactions, demonstrating its deep penetration across various consumer segments. The convenience and ease of use of UPI have made it a popular choice for a wide range of transaction sizes, but its dominance in smaller transactions is particularly noteworthy.

The ATS for UPI P2M stood at INR 627 in H2,CY24, highlighting its increasing use for micro-transactions. This trend is significant for UPI P2M, as it shows growing merchant acceptance and consumer preference for using UPI even for small-value purchases, reflecting its convenience and efficiency.

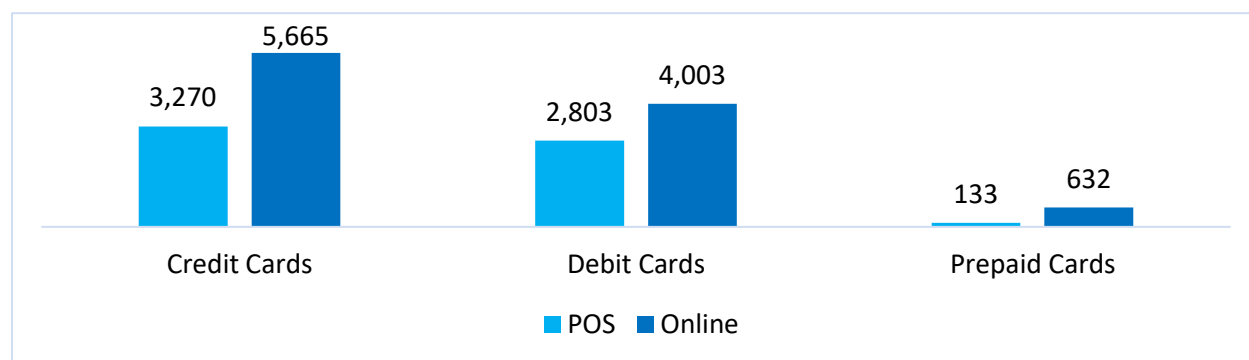
The ATS for credit cards for H2,CY24 declined to INR 4,436 from INR 5280 in H2,CY23. This drop is attributed to a significant increase in the number of credit card transactions.

These trends indicate a shift in consumer behavior, with credit cards being increasingly used for a broader range of purchases, including everyday transactions. The surge in transaction volume, especially in the latter half of the year, suggests greater adoption and reliance on credit cards for diverse spending needs.

The average ticket size for debit card transactions rose from INR 2,636 in H2, CY23 to INR 3,113 in H2, CY24. Despite the rise in ATS, the total number of debit card transactions decreased year-over-year, indicating that while fewer transactions occurred, they were of higher value. The increase in ATS suggests a trend where consumers are using debit cards for higher-value purchases, possibly reserving them for specific types of transactions.

UPI and payment cards will continue to coexist in India, each catering to distinct consumer needs and transaction scenarios. While UPI offers a seamless, instant payment solution ideal for peer-to-peer and small merchant transactions, payment cards—both debit and credit—provide critical benefits such as global acceptance, credit access, and rewards programs. Together, they form a complementary ecosystem that supports the diverse and evolving payment preferences of India's burgeoning digital economy.

Exhibit 32: Average Ticket Size (ATS) for POS / Online in India (in INR), H2 of CY2024



Source: RBI, Frost & Sullivan, Worldline Digital Payment Reports, Secondary Sources

2.1.5. Share of Cards on POS payments and its movement over years, Loyalty & rewards points market driving credit and debit cards

In 2019, cards were the primary mode for POS transactions in India. However, by 2024, UPI has emerged as the dominant player, accounting for more than 80% of the country's digital payment volume, up from 30-35% in 2019. This sharp rise in UPI adoption is largely driven by its widespread use for smaller ticket-size transactions, such as peer-to-merchant payments, daily retail purchases, and micro-spends. As a result, UPI has significantly eroded the share of card-based payments at POS terminals, which traditionally served these low-value transactions.

In H2, CY24, total card transactions volume on POS terminals was 2.27 billion, a 4% YoY increase. During the same period, credit card transactions were 1.245 billion, (a 34% rise) while debit card transactions were 607.5 million, (a 27% fall). The Prepaid card transactions were 422 million transactions, decrease 3% YoY.

Despite the decline in POS share, credit and debit cards continue to play a vital role in the payment ecosystem, bolstered by robust loyalty and rewards programs. India's loyalty programs market is projected to grow by 18.3% annually, reaching US\$3.58 billion in 2025. Also most banks like HDFC and South Indian Bank offer reward points on card transactions, redeemable for various benefits such as shopping vouchers and travel discounts. These programs incentivize consumers to continue using cards, especially for high-value purchases, by offering tangible rewards and cashback options.

While UPI has revolutionized small-ticket transactions and become the preferred mode for everyday payments, credit and debit cards maintain their relevance through attractive loyalty and rewards programs. These incentives not only encourage continued card usage but also cater to specific consumer segments seeking value-added benefits.

2.1.6. Surge in Number of UPI Transactions but Decreasing Ticket Size

The average ticket size (ATS) for UPI transactions has been decreasing, indicating its growing use for smaller, everyday purchases. For instance, the ATS for UPI P2M transactions decreased from INR 839 to INR 659 (H1'23), a 21% reduction. It further reduced to INR 656 & to INR 627 in H2'23 & H2 2024 respectively. In June 2023, a significant 57.46% of all UPI transactions were peer-to-merchant (P2M), and a substantial 83.92% of these transactions were for amounts between INR 0 and INR 500. This reduction suggests a deeper embedding of UPI for smaller or micro-transactions, primarily driven by growth in person-to-merchant (P2M) transactions.

Additionally, the year-on-year growth rate of UPI transactions shows signs of market saturation. While the growth rate stood at 117.2% in FY 2021-22, it slumped to 78.5% in FY 2022-23 and 56.5% in FY 2023-24. While UPI's transaction volume is increasing significantly, there is a notable trend towards smaller ticket transactions, which might be seen as a limitation in its overall utility for larger transactions.

2.1.7. UPI replacing small ticket transactions by showcasing the decreasing usage of cash for retail transactions

UPI has gained immense popularity for small-ticket transactions, which were previously dominated by cash. The platform has made it easier for consumers to make quick, low-value payments without needing physical currency. UPI is quick, accessible, and doesn't require the user to have physical cash or cards on hand. Payments can be made directly from a linked bank account to the merchant via mobile apps. Further UPI transactions are cost-effective, often offering free or minimal charges, making it ideal for small-value payments while these transactions are settled in real-time, reducing the need for cash handling and enabling quicker transaction processing.

The use of cash in retail transactions has been steadily declining, largely due to the convenience of UPI. For example, small-ticket retail payments, such as purchasing groceries, snacks, or transit tickets, have seen a shift from cash to digital payments. UPI's acceptance has soared, especially in small retail outlets, street vendors, and public transport, where cash was previously the dominant form of payment. By FY2024, UPI transactions reached billions of transactions, with a major percentage of them being low-value transactions, further showcasing its role in replacing cash.

Evidently, share of cash share in consumer expenditure decreased from 80.6% in 2021 to 51.9% in Q1 2024, indicating a substantial shift towards digital payments. The average value of retail digital payments dropped by 48% from INR 8,769 in March 2021 to INR 4,560 in March 2024, reflecting increased use of digital modes for small-value transactions, especially UPI.

With government initiatives like **Digital India**, the push for cashless transactions has accelerated. UPI is central to this push, encouraging **financial inclusion** and reducing cash dependency. As UPI becomes the go-to option for **small-ticket retail transactions**, cash usage continues to shrink, especially in urban areas.

2.1.8. Credit Cards Average Ticket Size for Transactions At 3-4 Times That of UPI

In 2023, India's digital payment landscape witnessed a significant divergence in transaction patterns between credit cards and Unified Payments Interface (UPI). According to the Reserve Bank of India's (RBI) bulletin, the average ticket size of credit card transactions was three times larger than those made through UPI in May 2023. This statistic not only reflects the robustness of credit cards in handling larger transactions but also underscores their significant role in India's financial ecosystem.

Credit cards have become synonymous with enhanced purchasing power and financial flexibility. In May 2023, the average transaction size for credit cards stood at Rs. 4,968, dwarfing UPI's average of Rs. 1,582. The gap widened further, as in H2'23, the average transaction size for credit cards stood at Rs. 5,276, while the same for UPI was Rs. 1,515. This substantial difference is indicative of the higher trust and reliance consumers place on credit cards for significant transactions. Unlike UPI, credit cards offer a blend of security, reward programs, and the flexibility of deferred payments, making them ideal for more substantial and considered purchases.

CY2023 witnessed a remarkable increase in credit card transactions over the previous year, a testament to the growing confidence and preference for credit cards among Indian consumers. This trend is further bolstered by the significant growth in credit card transactions at Point of Sale (PoS) terminals, underscoring the card's role in driving consumer spending and economic activity.

While UPI dominates in transaction volume, credit cards excel in average transaction size, reflecting their pivotal role in larger economic transactions. The intrinsic benefits of credit cards, including the grace period for payments, instalment options, and reward programs, offer a financial leverage that UPI cannot match. Moreover, the recent surge in credit card spends to Rs 1.4 trillion in May 2023 signifies a landmark in consumer spending behaviour, emphasizing the card's superiority in handling high value transactions.

2.1.9. Key enablers for digital transactions in India

1) Structural enablers for growth in the digital payments:

- **Rapid Growth and Transformation:** India's digital payments have seen significant growth, notably 48 billion transactions in 2020, transitioning from a cash-based to a cashless economy.
- **Government and Big Tech Initiatives:** NPCI's various programs, government initiatives like the JAM trinity (initiative to link JanDhan accounts, mobile numbers and Aadhaar cards), along with the entry of big tech players, have enhanced the services and reach of digital payments.

2) Expansion of payment acceptance infrastructure:

- **Payment Infrastructure Development Fund (PIDF):** Aims to subsidize the deployment of payment infrastructure in Tier-3 to Tier-6 centers. It includes creating 3 million new touchpoints annually for digital payments.
- **Subsidy and Support for Payment Devices:** The RBI offers varying subsidies for the deployment of various payment acceptance devices, including physical and digital PoS.

3) Credit cards and other digital payment services fuel the e-commerce:

- **Boost from Smartphone and Internet Penetration:** The increase in smartphone users and internet accessibility, aligned with the Digital India movement, has significantly contributed to the expansion of e-commerce.
- **Diversity of Payment Methods:** The availability of various payment methods like credit cards, UPI, e-wallets, etc., has made online transactions more convenient, thereby boosting e-commerce.
- **Security and Consumer Trust:** Security measures like PCI DSS compliance, encryption, OTPs, etc., ensure safe transactions, encouraging repeat business and higher spending.

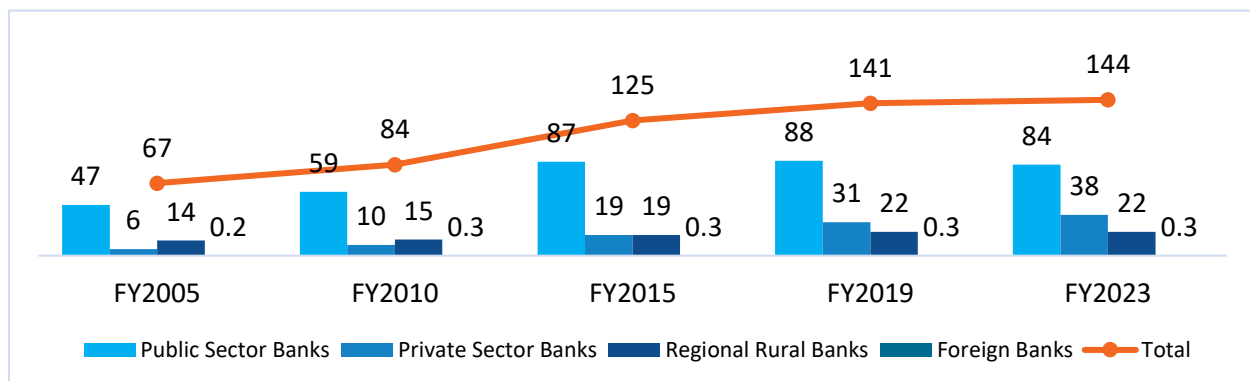
4) Govt initiatives:

- **Digital Payment Growth:** Government efforts have led to a substantial increase in digital transactions.
- **Features and Benefits:** Instant transfer features, enhanced financial inclusion, increased government system transparency, and improved speed of transactions are some of the key benefits of these initiatives.
- **Specific Programs:** NETC for highway toll payments, BBPS for bill payments, and initiatives to enhance credit access and security have further bolstered digital transactions in India.

2.2. India Payments Card Landscape

2.2.1. Rising Number of Bank Branches in India

Exhibit 33: Rising number of Bank Branches in India (in 1000's), FY2005-FY2023



Source: RBI, Secondary sources

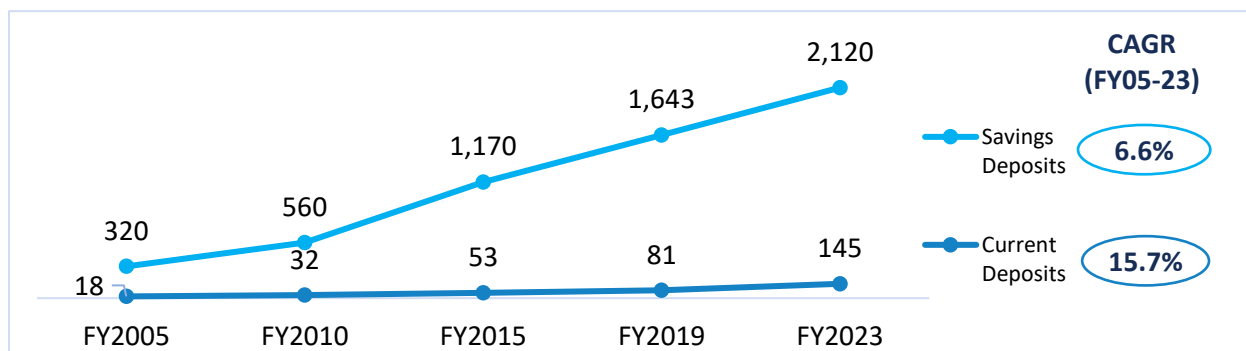
Both public and private sector banks have significantly expanded their branch networks and digital presence to cater to the diverse needs of customers across urban and rural areas. While the number of branches for public sector banks have increased by about 80% in the FY2005 – FY 2023 period, the same for private sector banks stands at 533%. Moreover, the emergence of new banking models, such as payments banks and small finance banks, has further diversified the banking landscape, enhancing competition and innovation. While the number of commercial banks steadily increased from 8.89 (per 1,00,000 adults) in FY2005 to 14.6 in FY2019, it witnessed a steep increase post pandemic reaching 24.64 branches.

2.2.2. Corresponding Growth in Current Accounts / Savings Accounts

There was a corresponding growth in number of savings and current accounts (CASA) which increased from 1724 million in FY2019 to 2265 million accounts by FY2023. Current accounts witnessed a higher CAGR at 15.7% albeit on a lower base while savings accounts grew at a CAGR of 6.6% in the same period accounting for 94% of the total CASA accounts.

Increase in number of savings and current account will result in growth of debit cards being issued by the banks.

Exhibit 34: Number of Current Accounts Savings Accounts (CASA) in India, FY2005 to FY2023 (Mn)

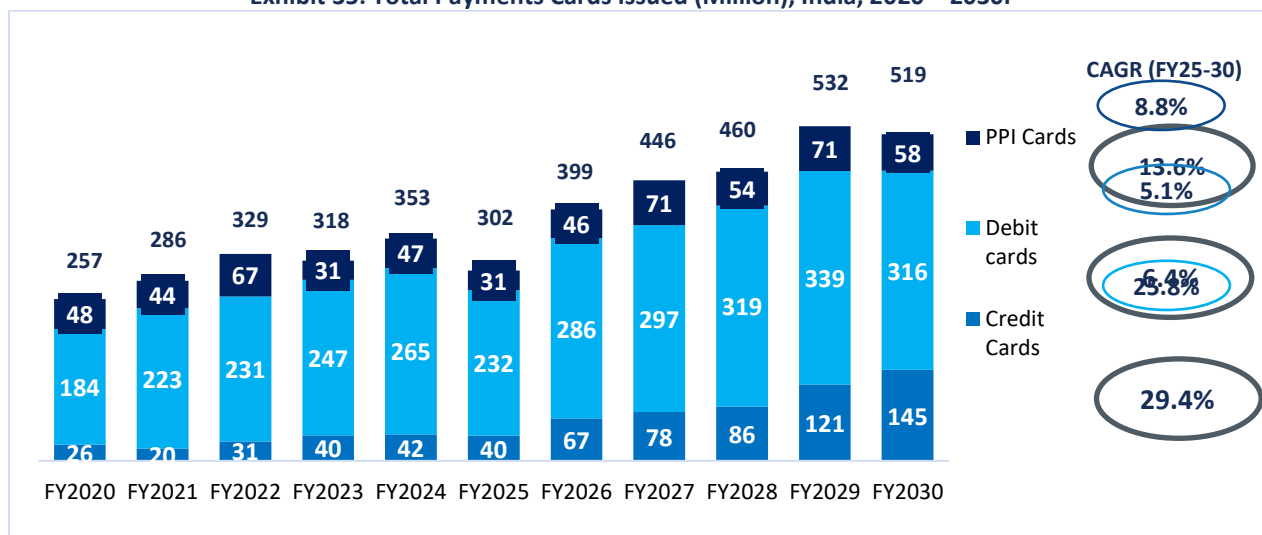


Source: RBI; Secondary Sources

Data pertains to scheduled commercial banks and excludes interbank deposits.

2.2.3. Rising number of Payments Cards Issued in India

Exhibit 35: Total Payments Cards Issued (Million), India, 2020 – 2030F



Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

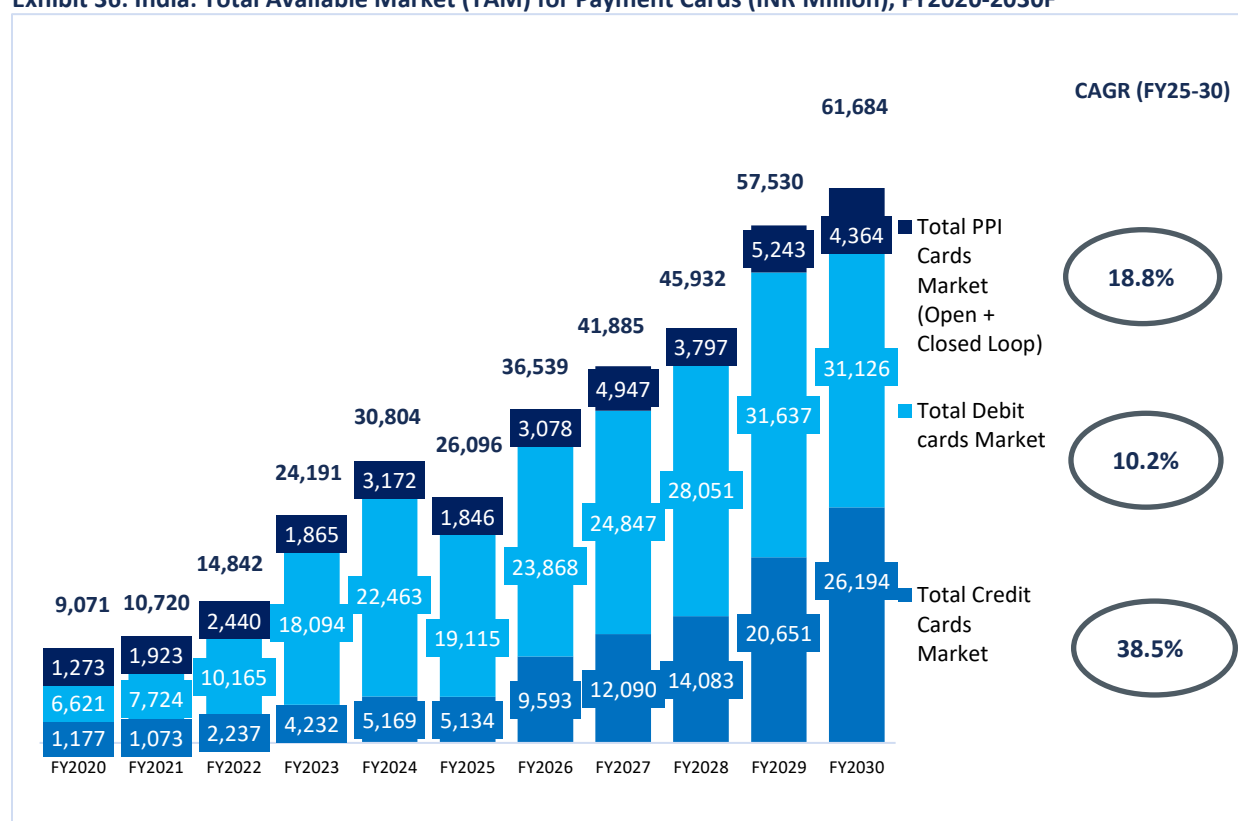
The total payment cards being issued in India, inclusive of credit cards, debit cards, prepaid payments instrument (PPI) was 257 million units in 2020, and reached a total of 318 million units being issued in

2023. This number grew to 302 million units in 2025 and is projected to reach 519 million units by 2030, with an expected compound annual growth rate (CAGR) of 11.4% from FY2025 to FY2030.

Credit, debit, and PPI card issuance in India slowed in FY2025 for a mix of regulatory and behavioral reasons. On credit cards, the RBI's Nov-2023 25-ppt risk-weight hike made unsecured portfolios more capital-intensive, prompting tighter underwriting; supervisory curbs further cooled approvals. For PPIs, earlier RBI restrictions that prohibit loading wallets/cards via credit lines, combined with stricter KYC requirements and compliance scrutiny, kept growth subdued.

2.2.4. Total Payments Card Market Size in India

Exhibit 36: India: Total Available Market (TAM) for Payment Cards (INR Million), FY2020-2030F



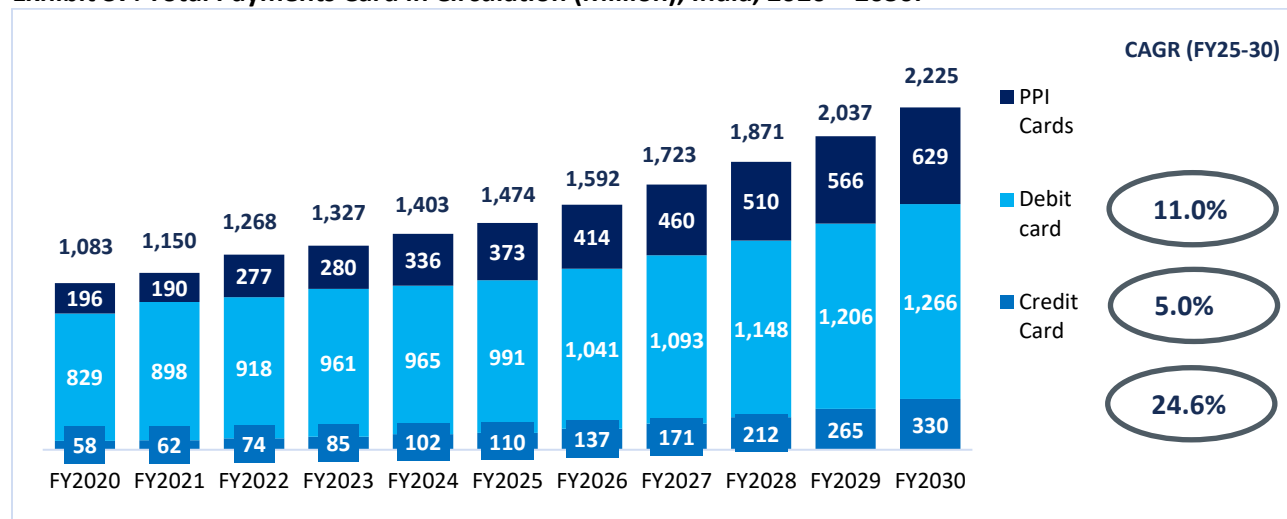
Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

In 2020, the total market for payment cards in India, which includes credit cards, debit cards, and prepaid payment instruments (PPI), was valued at INR 9,071 million. By 2025, this market had expanded to INR 26,096 million, and it is projected to reach INR 61,684 million by 2030, growing at a compound annual growth rate (CAGR) of 18.8% during the FY2025-30 period. This market size highlights the potential for card manufacturers in India.

2.2.5. Total Payments Card in Circulation in India

Exhibit 37: Total Payments Card in Circulation (Million), India, 2020 – 2030F



Source: Frost & Sullivan

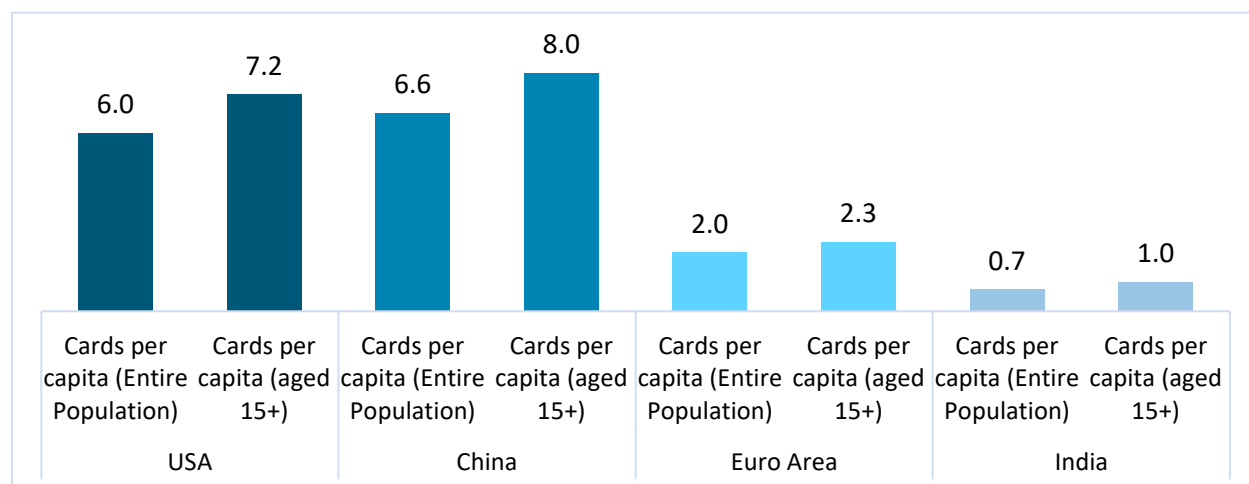
Note: FY2025-2030 is Forecasted

The total number of payment cards in circulation in India, encompassing credit cards, debit cards, and PPIs, stood at 1,083 million units in 2020. By 2025, this figure had increased to 1,474 million units and is anticipated to grow to 2,225 million units by 2030, with an expected CAGR of 8.6% from 2025 to 2030.

Among the various segments, credit cards are expected to experience the highest growth, with a projected CAGR of 24.6% in the FY25-30 period. Prepaid payment instruments (PPI) are expected to follow, with a CAGR of 11% in the same period of FY25-30.

2.2.6. Low Payments Card Penetration in India

Exhibit 38: Cards Per Capita, CY2023



Source: Secondary Sources; Frost & Sullivan analysis

In CY 2024, on average, each individual in India possesses nearly 0.88 payment cards, with debit cards being the most prevalent. For aged 15+, this was 1.27.

Payment cards penetration varies significantly across the USA, Europe, China, and India due to differences in economic development, financial infrastructure, and consumer behavior. In the USA, cards usage is widespread, with a high penetration rate of 7.2 for population aged 15+, driven by established financial systems and a culture of credit reliance. Euro area also exhibits significant card penetration at 2.3 (population aged 15+), though there is a notable preference for debit cards over credit cards, particularly in countries like Germany and the Netherlands where debt aversion is stronger. In China, the cards penetration is very high at 8 (population aged 15+) driven by debit cards. India's card penetration, both credit and debit, is on the rise, buoyed by government initiatives and financial inclusion.

2.2.7. Transit Cards / National Common Mobility Card (NCMC) Cards to aid demand for debit cards

The NCMC Rupay Debit Cards have the provision of storing money on the card which can be used to initiate contactless wallet payments (offline payments) across various use cases like toll, metro, railways, transit, parking etc.

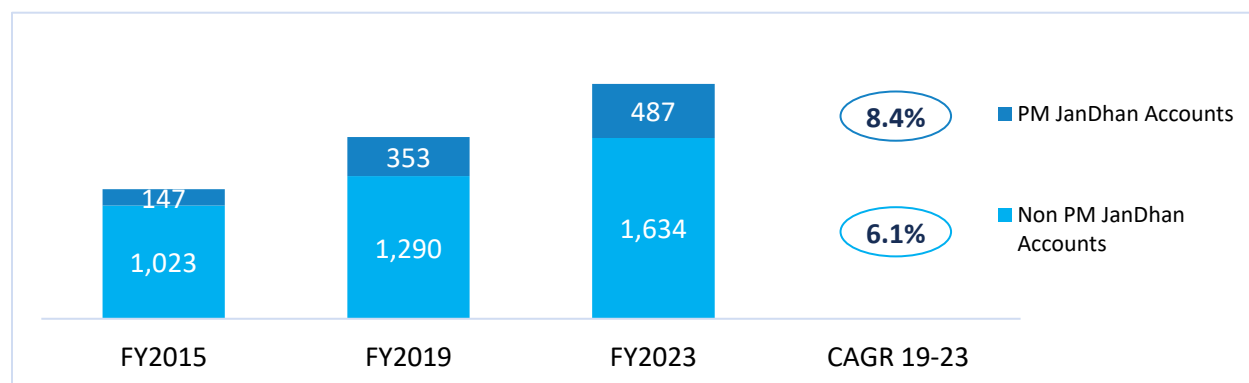
Use cases like Transit cards / NCMC will aid demand for debit cards in the country.

2.2.8. Demographic dividend as a key driver for payment cards

The demographic dividend, characterized by a growing working-age population, is poised to significantly drive the growth of debit and credit card issuance. As more young adults enter the workforce, their financial independence and purchasing power increase, leading to a higher demand for banking services, including debit and credit cards. This growth is fueled by higher consumer spending, urbanization, digital adoption, financial inclusion efforts, access to credit, and financial innovation, collectively fostering a robust market for card-based transactions.

2.2.9. Jan Dhan Accounts as a key driver for debit cards

Exhibit 39: Savings Accounts in India: Split by JanDhan and Non-JanDhan (in Mn), FY2015-23



Source: RBI; Secondary research

The share of JanDhan accounts in overall number of savings accounts has increased steadily from 13% in FY15 to 21% in FY19 and 23% in FY23. A significant proportion of JanDhan accounts do not have debit cards issued to them yet, which presents an opportunity for both banks and card manufacturers.

With increase in usage of JanDhan accounts, there will be an increasing demand for JanDhan accounts linked debit cards. Per latest data, there are now a total of 522.5 million JanDhan accounts as on 15th May 2024, while only 355.5 million, or 68%, possess Rupay debit cards.

2.2.10. Industry Widening the Net with Co-Branding Credit Card Partnerships

The co-branding credit card partnership industry is rapidly expanding, witnessed through strategic collaborations between various industry players and financial institutions. India has seen a surge in this trend, with companies like Amazon, Airtel, Flipkart, Myntra and Swiggy partnering with prominent banks to introduce co-branded credit cards, transforming the way customers make payments.

Co-branded credit cards, which combine the branding of a credit card issuer and a partner company, offer benefits to both sides. Banks gain access to the partner company's customer base, leading to increased card applications and usage. Simultaneously, partner companies foster customer loyalty by offering card-related rewards and benefits.

This growth in co-branded credit cards in India reflects a shift from a primarily debit card market to increased reliance on credit cards. Factors such as the surge in online shopping and attractive rewards from financial institutions have contributed to this shift. Approximately 6.2% of India's population now uses credit cards, with major banks like HDFC, SBI, ICICI, and Axis Bank dominating the market. HDFC Bank, for instance, has been actively forming partnerships to expand its portfolio of co-branded credit cards. Similarly, ICICI Bank has collaborated with entities like Amazon and MakeMyTrip to offer unique co-branded credit cards.

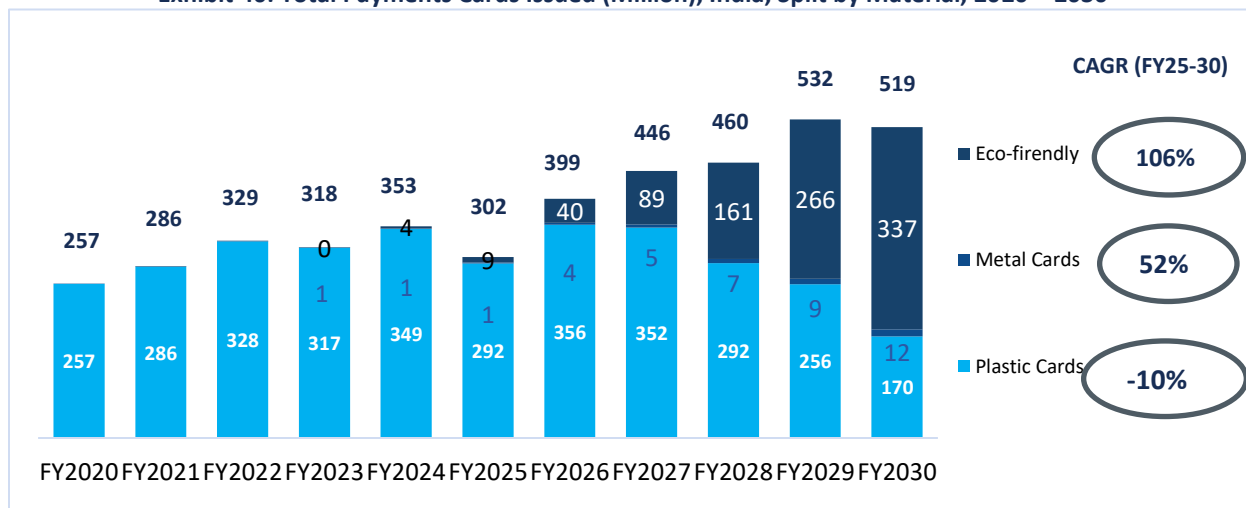
While the exact market share of co-branded credit cards in India remains low (<30%), this figure is expected to rise as banks continue to collaborate with various sectors. Notably, Indian banks are also partnering with FinTech companies as a strategic response to emerging competition from new-age payment banks like Paytm and Airtel Payments Bank.

On a global scale, the co-branding credit card market is evolving, especially in the United States, where co-branded credit cards are gaining popularity among travellers. Originally starting with a partnership between Continental Airlines and a bank in 1986, co-branded cards now play a significant role in fostering customer brand loyalty. Brands beyond the travel industry, such as Amazon, are entering this space, offering enticing rewards and experiences to cardholders.

Key trends in the global co-brand card market include higher charge-offs, rising rewards costs, and evolving financial partnerships that focus on profit-sharing. Moreover, the traditional payment and banking landscape is undergoing substantial changes, emphasizing digitization and big data, which lead to more personalized customer experiences and collaborative management strategies between card issuers and merchants.

2.2.11. Product Mix

Exhibit 40: Total Payments Cards Issued (Million), India, Split by Material, 2020 – 2030



Source: Frost & Sullivan

While plastic cards are expected to witness a declining growth at -10.2%, metal cards and eco-friendly cards are expected to grow at a CAGR of 51.8% and 106.1% in the FY25-30 period.

The banking industry is moving towards sustainability looking to foster positive environmental change. Mastercard has committed to phasing out PVC plastics from its payment cards by 2028, moving to recycled or bio-based materials. Similarly, Triodos Bank provides biodegradable debit and credit cards in selected countries, and Deutsche Bank intends to use only recycled PVC for its cards by the end of 2024.

In India, Airtel Payments Bank has embraced the eco-friendly initiative by launching debit cards made from recycled PVC.

As the industry moves towards driving positive environmental change, the switch to recycled materials augurs well for cards manufacturing vendors as they stand to gain due to higher realization.

2.3. Metal Cards

Metal cards are premium products offered to affluent and aspirational customers by banks and fintechs, and there are also a few start-ups like OneCard solely offering metal cards to their customers. The emergence of metal payment cards marks a significant milestone in the evolution of financial transaction tools. Initially perceived as a status symbol, these cards have transcended their elite roots to become a broader symbol of financial sophistication and security. Metal cards serve as an effective tool for companies to strengthen their relationship with high-value customers and to make their brand stand out.

2.3.1. Origin of Metal Cards

The genesis of metal payment cards can be traced back to the early 21st century, with American Express leading the charge in 1999 through the introduction of the Centurion Card, often referred to as the "Black Card." This card set a precedent in the industry, not just for its metallic composition but for the exclusive services and status it conferred upon its holders. It was a tangible symbol of affluence, targeting high-net-worth individuals who sought both luxury and distinction in their financial instruments.

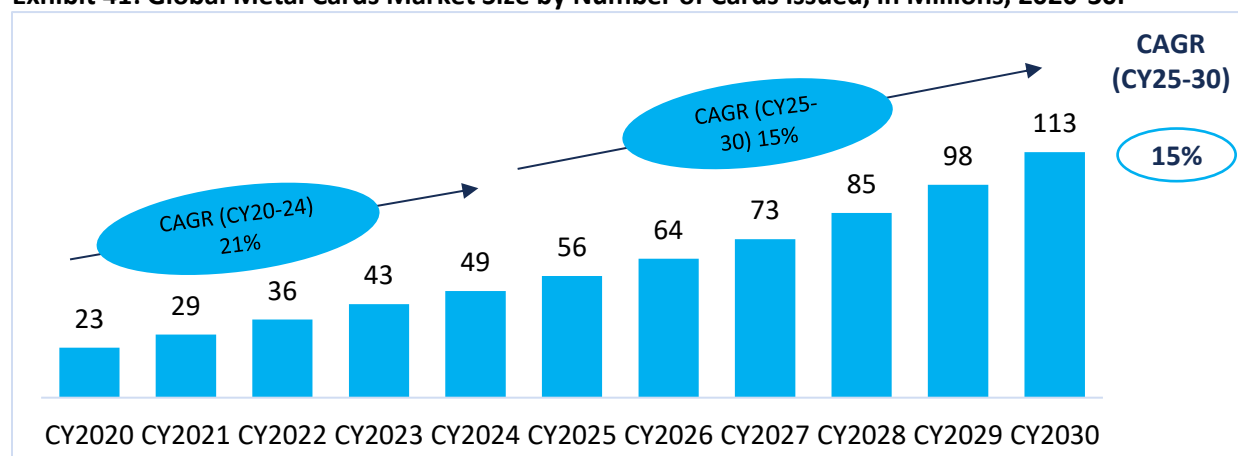
Initially, these cards were exclusive to the wealthy due to the cost-intensive nature of metal manufacturing. However, advancements in technology and production methods have made metal cards more accessible. The typical metal card is crafted from stainless steel, brass, copper, or titanium, offering a distinctive heft and durability that plastic cards cannot match. This evolution in material and design reflects a shift in consumer preferences towards products that offer both aesthetic appeal and functional durability.

2.3.2. Metal Cards Market Outlook

The audience for metal payment cards has significantly expanded from its high-net-worth beginnings. Initially targeted at the affluent, these cards now cater to a wider demographic, including the mass-affluent, millennials, and Gen Z consumers. This shift is attributed to the changing perceptions of value, where consumers are increasingly associating metal cards with enhanced security, durability, and a sophisticated payment experience. Perceived as a status symbol, metal cards act as a key differentiated offering to the marquee customers of various banks.

2.3.3. Global Metal Cards Market Size and Growth Outlook

Exhibit 41: Global Metal Cards Market Size by Number of Cards Issued, in Millions, 2020-30F



Source: Frost & Sullivan, Secondary Sources

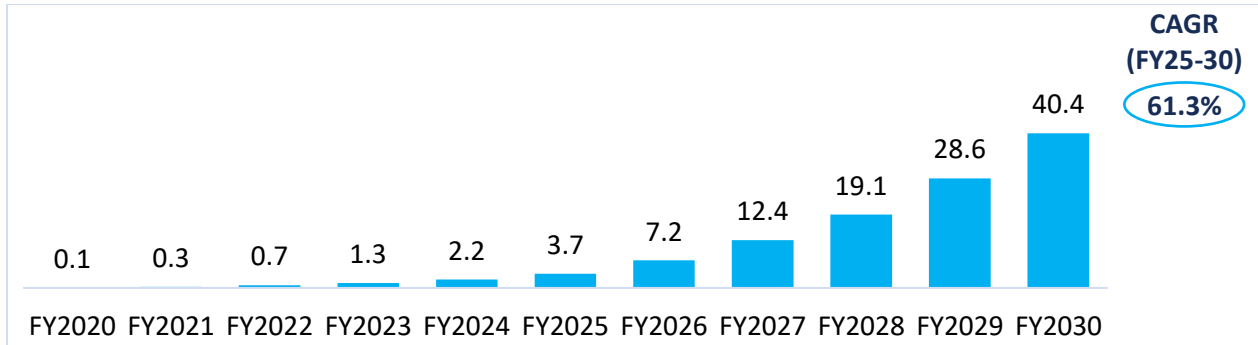
Note: CY2025-2030 is Forecasted

Source: Frost & Sullivan, Secondary Sources

The global metal cards market is expected to grow from 23 million units in 2020 and 49 million units in 2024 to 113 million units in 2030 at a CAGR of 15% (2025-30). This robust growth is anticipated to be fuelled by a combination of factors. As consumer demand for premium payment cards rises, financial institutions are increasingly adopting metal cards to differentiate their offerings and cater to customer preferences for durable and distinctive products. The market expansion is also likely to be driven by the broadening appeal of metal cards among various consumer segments, including tech-savvy millennials and Gen Z who value the blend of functionality and luxury. Furthermore, advancements in technology that enhance the security and convenience of metal cards, such as contactless payment and biometric verification, are expected to contribute to the market's growth.

2.3.4. India Metal Cards Market Size and Growth Outlook

Exhibit 42: Total India Metal Cards, Size by number of cards in Force, (Million), 2020 – 2030F

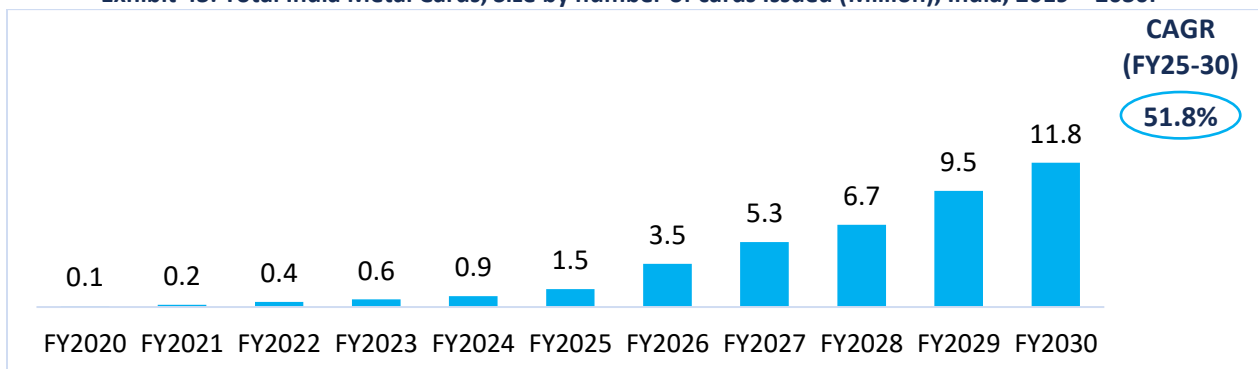


Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

The total metal cards in circulation in India is expected to grow from 3.7 million units in 2025 to 40.4 million units in 2030 growing at a CAGR of 61.3% between FY2025 - 2030.

Exhibit 43: Total India Metal Cards, Size by number of cards Issued (Million), India, 2019 – 2030F

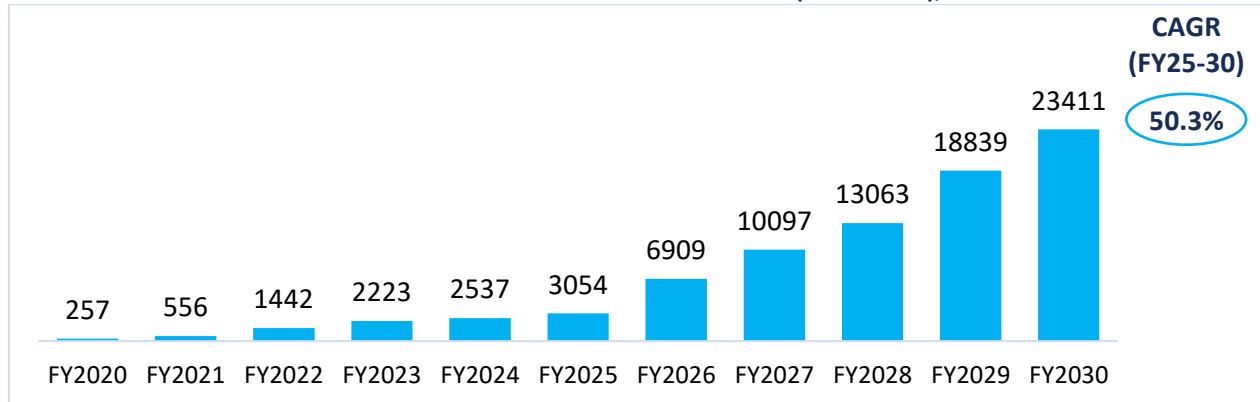


Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

The distribution of metal cards in India is projected to expand significantly, rising from 0.1 million units in 2020 to 11.8 million units by 2030, with an impressive compound annual growth rate (CAGR) of 51.8% between fiscal years 2025 and 2030.

Metal credit have become sought-after status symbols globally, particularly among younger demographics and emerging markets like India. There's a strong preference for metal cards particularly among new age consumers. Consumers are willing to use their metal cards more frequently than others. Gen Z and millennials increasingly prefer metal cards as it represents status and aspiration for younger demographics in vibrant payment markets like India. Banks leverage metal cards as marketing assets to enhance customer relationships and appeal to high-value and trend-driven consumers. These cards offer unique design possibilities, from etching to high-definition coloring techniques, making them both functional and fashionable accessories.

Exhibit 44: Total India Metal Cards Issuance Market Size (INR Million), 2019 – 2030F

Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

The Indian metal cards market grew from INR 257 million in FY2020 to INR 3054 million in FY2025 and is expected to grow to INR 23,411 million in FY2030 growing at a CAGR of 50.3% between FY2025 - 2030.

The market size represents the opportunity for metal card manufacturers who take end to end responsibility of cards disbursement to the consumer from the moment a consumer is signed up to get a card and the KYC (Know Your Customer) is completed.

Prioritizing Metal cards Globally

As governments worldwide prioritize secure and efficient identification systems, the adoption of metal ID cards is poised to increase. In India, the integration of metal cards into government programs could enhance security, reduce fraud, and improve user experience. Globally, the trend towards digitalization and secure identification will likely drive further innovation and adoption in the metal card industry.

India

- **Employee Access Badges:** Organizations in India are implementing access control badges for their employees to enhance security and streamline identification processes.

Global Examples

- **United States:**
 - **Government ID and Access Management:** The U.S. General Services Administration (GSA) offers federal credentialing services to manage employee identity, credentials, and access securely and efficiently.
- **Portugal:**

- **e-ID Citizen Cards:** The Portuguese government selected Gemalto to provide their national e-ID Citizen Card, which serves as the national ID document for all Portuguese citizens.
- **Germany:**
 - **e-Healthcare Cards:** Gemalto delivered 35 million e-health insurance cards for German citizens, containing emergency data and e-prescriptions, enhancing healthcare services' efficiency and security.
- **Mexico:**
 - **e-Driver's Licenses:** Mexico's licensing authority used Gemalto's smart card platform to issue e-driver's licenses, incorporating advanced security features.
- **United Kingdom:**
 - **Digital ID System Proposal:** There is growing public support in the UK for the introduction of universal digital ID cards, with proponents citing benefits such as enhanced public sector efficiency and reduced fraud.

2.3.5. Projected Growth in Digital Merchant Payments

India's digital payments market is expected to reach \$10 trillion by 2026. Within this, digital merchant payments are projected to grow significantly, reaching between \$2.5 to \$2.7 trillion, indicating a substantial shift towards digital transactions among merchants. Some of the key drivers of merchant digitization will be:

1. **Unified Payments Interface (UPI) Expansion:** UPI continues to be a significant driver, with initiatives like UPI Lite and UPI Tap & Pay enhancing microtransaction capabilities.
2. **Open Network for Digital Commerce (ONDC):** ONDC aims to democratize digital commerce, enabling small and medium enterprises (SMEs) to access broader markets through digital platforms.
3. **Integration of Central Bank Digital Currency (CBDC):** The introduction of the e-rupee is set to provide merchants with a secure and efficient digital payment alternative, further promoting digitization.
4. **Advancements in Payment Technologies:** The adoption of AI-powered fraud detection, contactless payments, and QR code-based transactions is enhancing the digital payment experience for both merchants and consumers.

The trajectory of merchant digitization in India suggests a continued decline in cash transactions, with digital payments becoming increasingly prevalent. Government policies, technological innovations, and consumer demand are expected to further accelerate this shift, positioning India as a global leader in digital commerce.

SMART CARD / GOVERNMENT ID MARKET IN INDIA

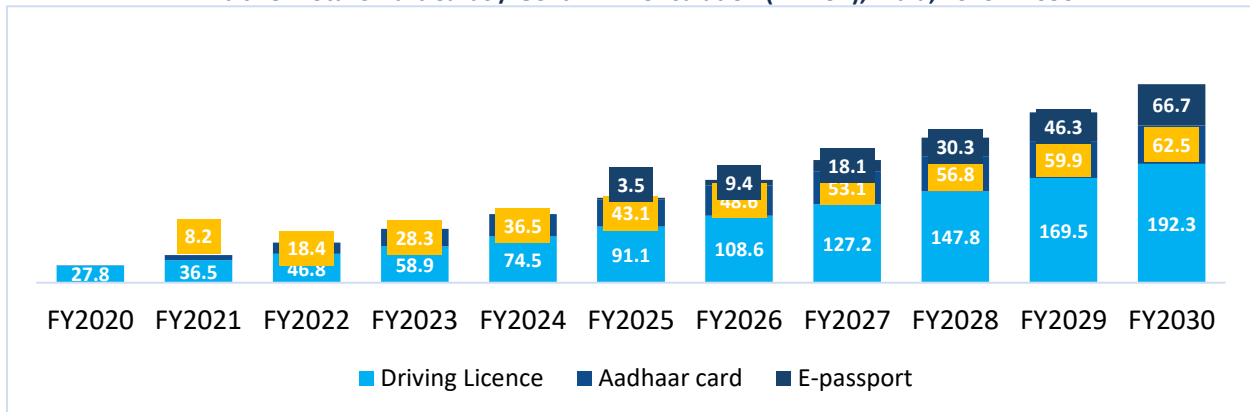
In recent years, the Indian government has unveiled a PVC-based Aadhaar Card, which has garnered popularity for its durability and resilience compared to the traditional paper version. This new iteration offers enhanced sturdiness, ease of carrying, security, and environmental sustainability due to its recyclable plastic construction.

The smart cards for government ID in India comprises of driving licenses, aadhaar cards and e-passport. Smart card driving licenses have been in circulation since sometime now and totaled 27.8 million in circulation in 2020, and is expected to reach a total of 192.3 million units in circulation by 2030.

Smart cards for aadhaar were rolled out in 2021 when the total units in circulation were 8.2 million. The same is expected to reach 43.1 million units in 2025 and further grow to 62.5 million units in circulation by 2030. Similarly, smart cards for e-passport is expected to be rolled out in 2025 and is expected to have around 3.5 million units in circulation. The same is expected to grow to 66.7 million units by 2030 growing at a CAGR of 80% over the FY2025-30 period.

3.1. Smart Cards / Govt. ID in Circulation

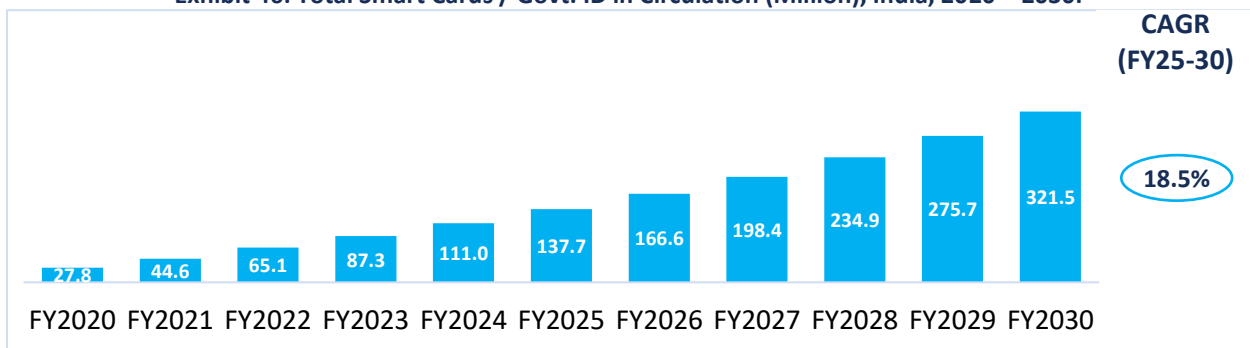
Exhibit 45: Total Smart Cards / Govt. ID in Circulation (Million), India, 2020 – 2030F



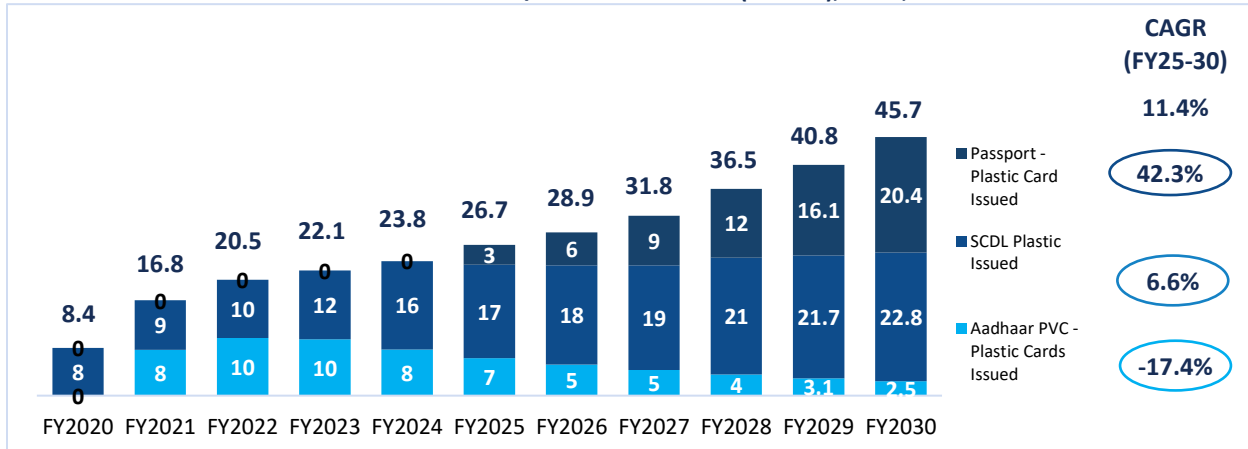
Source: Frost & Sullivan

The total smart cards in circulation in India was 27.8 Mn in 2020, which grew to 111.0 million cards by 2024 and 137.7 million in 2025, and is expected to reach 321.5 million by 2030.

Exhibit 46: Total Smart Cards / Govt. ID in Circulation (Million), India, 2020 – 2030F



Source: Frost & Sullivan

Exhibit 47: Total Smart Cards / Govt. ID Issuance (Million), India, 2020 – 2030F

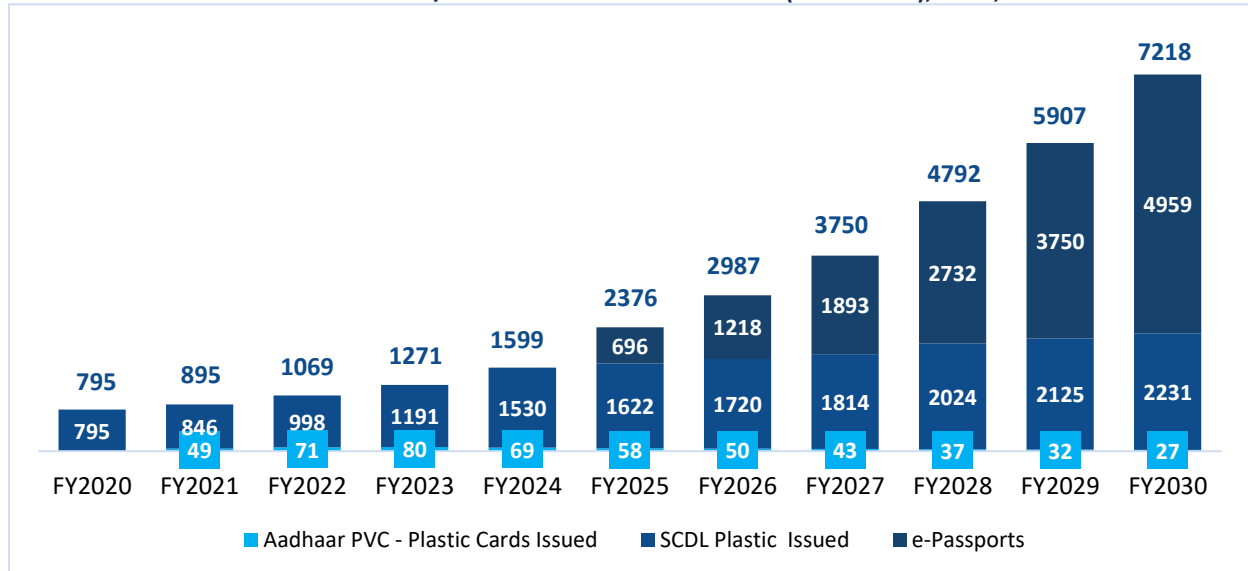
Source: Frost & Sullivan

While the cards in circulation continues to grow, its critical to understand the total units being issued each year to highlight the traction the segment is gaining year on year.

The total smart cards being issued for government ID inclusive of aadhaar card, driving licenses and e-passport was 8.4 million units in 2020, and reached a total of 26.7 units being issued in 2025. The same is expected to reach 45.7 million units by 2030.

Smart cards for aadhaar cards were introduced only in 2021 while for e-passports its expected to debut by 2025.

Smart cards for driving license is expected to grow at a CAGR of 6.6% in the 2025-2030 period.

Exhibit 48: Total Smart Cards / Govt. ID Issuance Market Size (INR Million), India, 2020 – 2030F

Source: Frost & Sullivan

The Indian smart cards for government ID market, inclusive of aadhaar card, driving licenses and e-passport is expected to grow from INR 795 million in 2020 to INR 2,376 million in 2025 and reach INR 7218 million in 2030 growing at a CAGR of 24.9% between 2025 - 2030.

The market size represents the opportunity for card manufacturers who take end to end responsibility of cards disbursement to the consumer from the moment a consumer is signed up to get a card.

Smart cards for aadhaar cards were introduced only in 2021 while for e-passports it's expected to debut by 2025.

Smart cards market size for driving licenses is expected to grow from INR 795 million in 2020 to INR 1622 million in 2025 and reach INR 2231 million by 2030 growing at a CAGR of 6.6% in the 2025-2030 period.

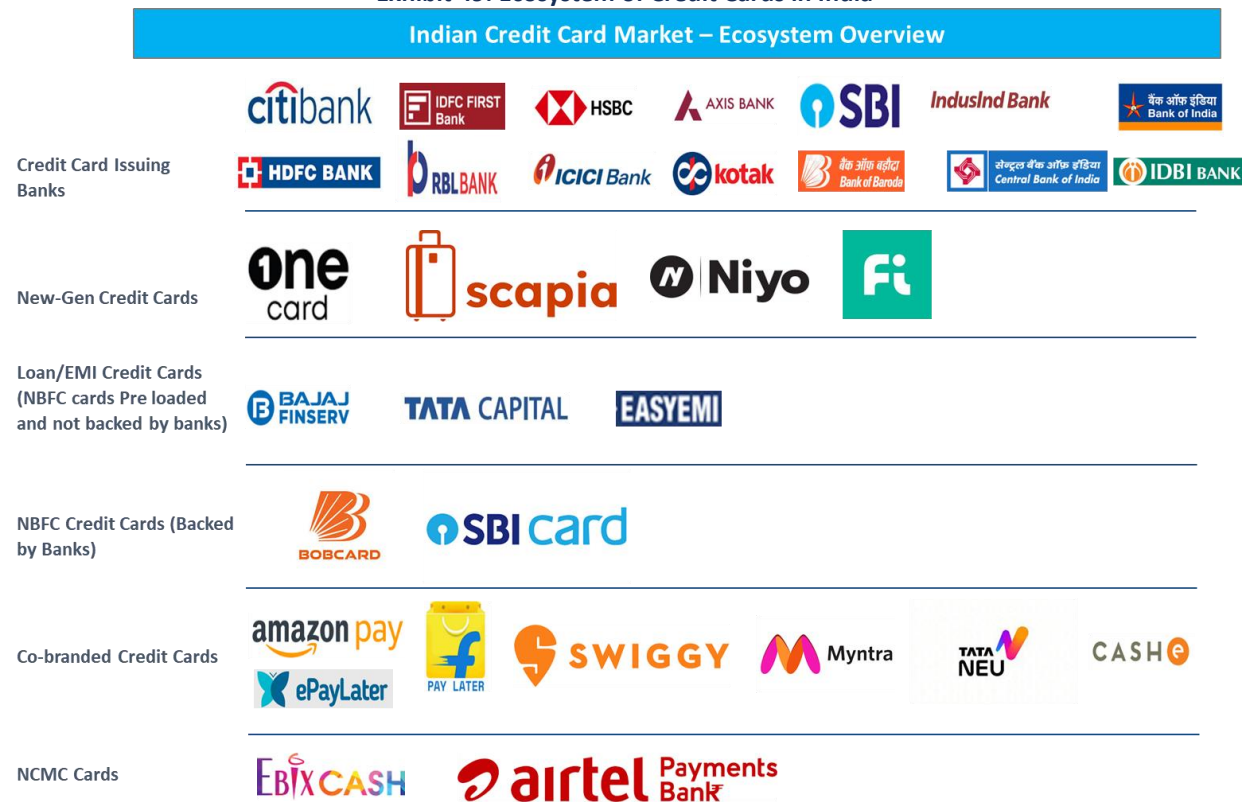
Smart cards market size for e-passports is expected to grow from INR 696 million in 2025 to INR 4959 million in 2030 growing at a CAGR of 48.1% in the 2025-2030 period.

CREDIT / DEBIT CARDS MARKET IN INDIA

4.1. Overview of Credit Card Ecosystem in India

Traditionally, major Indian banks like HDFC, SBI, ICICI, and Axis have dominated the credit card industry. However, the emergence of FinTech companies like OneCard, Scapia, Niyo and Fi could transform the banking landscape by revolutionizing the way banks operate by introducing digital innovations across various sectors. Cards are extremely important for FinTech companies as in most cases cards are the only physical touch-points that they have with their customers. In recent years, the credit industry has witnessed the introduction of popular offerings from neobanks globally.

Exhibit 49: Ecosystem of Credit Cards in India



Source: Frost& Sullivan, Secondary Sources

Competition among these credit card issuers in India centers around several factors, including user-friendly interfaces, streamlined Know Your Customer (KYC) processes, effective advertising, a wide range of investment options, EMI and loan facilities, and low transaction fees. A crucial competitive element is ensuring secure transactions, offering rewards and cashback incentives to attract users, facilitating hassle-free payments without the need for OTPs, maintaining transparency, and diversifying services, such as offering digital wallets and using virtual credit cards for transactions instead of traditional fiat currency.

In the coming years, international credit card issuers are keen on gaining a foothold in the Indian credit card market, either through independent operations or co-branding partnerships. Credit card industry in India holds significant potential for expansion across the country if its challenges can be swiftly addressed, paving the way for widespread adoption of credit cards.

4.2. Emergence of fintech players in the market

The fintech revolution in India, particularly in the payment cards market, is a testament to the country's rapid digital transformation. This evolution is not just about the technology itself but also reflects a deeper change in consumer behaviour, regulatory landscapes, and the financial ecosystem at large.

The fintech sector in India has seen substantial investment, signifying investor confidence in its growth potential. The rapid influx of capital into the sector has enabled fintech companies to innovate, scale, and diversify their offerings. This growth trajectory is expected to parallel the success stories of fintech ecosystems in other emerging economies, like Brazil, indicating a potential market capitalization that could redefine the financial landscape in India.

The surge in digital payments can be attributed to the increasing acceptance and implementation of innovative fintech solutions. Payment Service Providers (PSPs) have established a stronghold in domestic payments, with a focus on real-time account-to-account payments, payment gateways, and POS providers. These entities are expanding beyond payment acceptance to offer comprehensive merchant solutions. The fintech landscape in India is also diversifying into other areas like lending, wealthtech, insurtech, and fintech infrastructure, including banking as a service (BaaS) and neobanking.

Fintech investment and deal activity in India have been robust, with the sector witnessing record investments. This influx of funding has enabled fintechs to focus on customer retention and engagement by introducing new revenue streams and cross-selling related services and products. Successful fintech unicorns in India have relied on a customer-centric approach, scaling customer acquisition through significant marketing investments, and gradually expanding into full-service ecosystems and super-apps across broader financial services categories.

The emergence of fintech players in the Indian payments market is a narrative of innovation, resilience, and adaptability. It is a journey from being mere payment service providers to becoming integral players in the financial ecosystem, offering a wide array of services that cater to the evolving needs of a diverse and growing customer base.

4.3. Evolution In Credit Cards Business Model

There are multiple business models within the credit card segment which reflect the evolving landscape of the credit card market in India, showcasing innovation, partnership, and adaptation to changing regulatory environments.

Conventional Credit Card Model: Issuers in India design stand-alone credit card products without collaborating with other parties to split revenue. For services like platform development, which the issuers themselves own and manage, they frequently work with technological partners. For a period of three to five years, these technology partners may also modify, deploy, and oversee these systems. This model's emphasis on issuers building internal capabilities—from client acquisition to servicing—is a key component. It has a strong emphasis on digital transformation, which includes customer journey optimization, technology advancements, digital acquisition tactics, and mobile applications. Because the revenue and profit are not split with outside parties, this model offers significant returns even though it necessitates a sizable initial investment and time.

Co-branded Partnerships Model: In this model, issuers collaborate with another brand to develop a specific credit card product, and they split the profits from interest, fees, and subventions. Under this

framework, issuers must develop infrastructure for many channels, such as digital onboarding, customer support, and rewards management, which is akin to standalone credit cards. The co-branding partner mostly concentrates on finding and promoting new clients, even though the bank oversees the consumer directly. Because the partner brand is marketing the product, this technique makes acquiring customers easy. After the customer is on boarded, there are also chances for cross-selling further products. But new Reserve Bank of India (RBI) regulations have made data sharing more difficult, which influences partner brands' ability to cross-sell.

The Bank Identification Number (BIN) Sharing Model: BIN is shared by credit card issuers with partners, who utilize it to issue credit cards, according to the BIN-sharing business model. Through a fee-per-card arrangement or the sharing of interchange fees, both parties profit from consumer transactions. Under this arrangement, the primary issuing bank functions in the background while the partnered company serves as the conduit that interacts with customers. The partners contribute to the co-creation of the product, underwriting, and other essential elements needed for the credit card industry. This model has become well-known for its use of technology to draw clients, and it has issued a sizable quantity of credit cards in India. It makes it possible for issuing institutions to swiftly expand their issuance and easily create a revenue stream. The new RBI regulations on data sharing, however, may influence this business model since partnering firms will have to rethink and modify their strategies to remain competitive.

4.3.1. Personalization and Certification

Personalization

A personalization bureau handles the physical and electronic encoding of end-user data, including tasks such as PIN printing, embossing, indenting variable data, automated affixing, packaging, and assembling all components of debit and credit cards. Additionally, some bureaus offer services that enable customers to customize the appearance of their cards. Card personalization involves handling sensitive data that is printed on the card's surface. This requires a dedicated process, complete infrastructure, organization, equipment, and trained staff.

Personalization is also used as a tool to enhance brand recognition. This can be achieved by allowing banks to co-design cards with their customers, enabling them to establish a strong brand identity and make each card unique. The idea is to create instant recognition and connection between the card and the brand.

It's critical for payments card manufacturers to strategically decide on the location of such personalization bureaus. Proximity to customers is crucial as a strategic location enhances logistics and distribution efficiency, reduces turnaround time, improves customer service, strengthens supply chain management and fosters collaboration among others.

Certification

Certification is crucial for the acceptance and usability of cards. This certification is essential for the cards to be used globally and accepted across various payment platforms. The certification process ensures that the cards meet all necessary security and operational standards, making them reliable and secure for transactions.

For all payment cards, it's essential to be fully certified by all major payment schemes. This ensures that the cards are accepted universally across different platforms and by various card brands. Such certification

is a testament to the card's compliance with security and operational standards set by each payment scheme.

4.3.2. Metal Cards Delivering Higher Margins for Manufacturing Entities

Metal payment cards have not only redefined the aesthetic and tactile experience of financial transactions for consumers but have also carved out a lucrative niche for manufacturers in the payment card industry. The substantial margins associated with these premium cards offer a compelling case for manufacturers to innovate and expand their production capabilities.

As the metal cards market globally is expected to grow at a CAGR of 15% from 2025 until 2030, it represents a golden opportunity for manufacturers, as the production of metal cards, while more complex and costly than traditional plastic cards, commands higher prices and larger profit margins. These cards are included in over 100 card programs globally and are backed by some of the top issuers in the United States, indicating their widespread acceptance and the scale of demand.

Brand Differentiation and Value Proposition

Manufacturers benefit from brands' pursuit of delivering luxury experiences to consumers. Key players have aligned with prominent brands, leveraging the allure of metal cards to enhance the perceived value of customer offerings. For example, collaborations with companies such as Disney and American Express to create exclusive metal card designs offer substantial potential for additional charges, thanks to the distinctive aesthetics of the cards and their limited availability.

Innovations Driving Demand

The demand for metal cards is further amplified by technological advancements that manufacturers are incorporating into their products. Innovations such as dynamic CVV technology, LED-lit cards, and multifunctional cards with secure authentication capabilities not only offer enhanced security features but also provide a unique selling proposition that can command a premium in the market.

Sustainability as a Competitive Edge

Moreover, the industry's move towards sustainability provides an additional avenue for manufacturers to create value. By utilizing recycled materials, companies can attract a growing segment of environmentally conscious consumers, potentially justifying a higher price point for the sustainable production of these cards.

4.4. Factors Contributing to The Growth of Credit Cards in India

The growth of credit cards in India, an increasingly important financial trend, is shaped by several key factors. This phenomenon reflects broader shifts in the country's economic, technological, and consumer landscapes. While the credit cards penetration in the country has increased, we also have consumers who carry multiple cards.

- **Increased Digitalization:** Digitalization has played a crucial role in the rise of credit card usage in India. As the country witnesses a rapid increase in smartphone and internet access, digital payments have become prevalent leading to an increase in the usage of cards-based payments. The ease of obtaining credit cards, combined with the growing awareness and co-branded card offerings, has led to their

increased popularity. The trend is evident in partnerships like Flipkart and Axis Bank's co-branded credit card, which offers cashback and other benefits, making it an attractive option for online shoppers.

- **Under-Penetrated Credit Card Market:** In 2022, the credit and charge card (Similar to credit cards but with the key difference that the entire outstanding balance must be paid off in full each billing cycle) penetration were only 6.3 cards per 100 individuals, compared to 71.7 for debit cards. Yet, credit and charge cards accounted for a significant 63.2% of card payments by value. This low penetration rate, in contrast to the higher per capita credit card spend, indicates significant growth potential in the credit card market. The Reserve Bank of India's efforts, such as the establishment of the Payments Infrastructure Development Fund (PIDF), have also supported this growth by expanding payment infrastructure, particularly in smaller cities.
- **Increasing Organized Retail Penetration** E-commerce has seen explosive growth in India, with the online retail market estimated to have reached around \$40 billion in 2021. This growth is fuelled by the increasing number of online shoppers, particularly in smaller cities. The expansion of categories like fashion, general merchandise, and groceries in e-retail has made it more accessible and attractive to a broader audience. The growth in the online shopper base, including the addition of 40-50 million new shoppers in 2022 alone, is a testament to this trend.
- **Continuous Improvements in Payments Infrastructure:** Government initiatives have been crucial in enhancing the payments infrastructure. Notable steps include the abolition of merchant service fees on RuPay cards thus encouraging merchants to accept cards, and also setting up of 'Payments Infrastructure Development Fund' (PIDF) aimed at expanding payments infrastructure by offering subsidies to merchants on installation of POS terminals and QR codes. These developments make it easier for merchants, particularly in less urbanized areas, to accept card payments, thereby broadening the scope and convenience of using credit cards.
- **Credit Access:** Credit cards provide users with a line of credit, enabling them to make purchases even when they do not have sufficient funds in their bank accounts. This access to credit can be essential for managing cash flow and unexpected expenses.
- **Co-branded cards with additional perks:** Co-branded credit cards often come with additional perks like airport lounge access, exclusive event access, and discounts on dining, shopping, and travel, enriching the lifestyle of cardholders.
- **Fraud Protection:** Credit cards often come with robust fraud protection measures. Cardholders are typically not liable for unauthorized transactions, providing peace of mind and added security for online and offline purchases.
- **Transaction failure rates:** While credit card transactions generally benefit from a more mature and reliable infrastructure, the failure rates in other digital transactions can be higher due to dependence on network conditions, rapid scaling, and the complexity of involving multiple stakeholders.

4.5. Factors Contributing to The Growth of Debit Cards in India

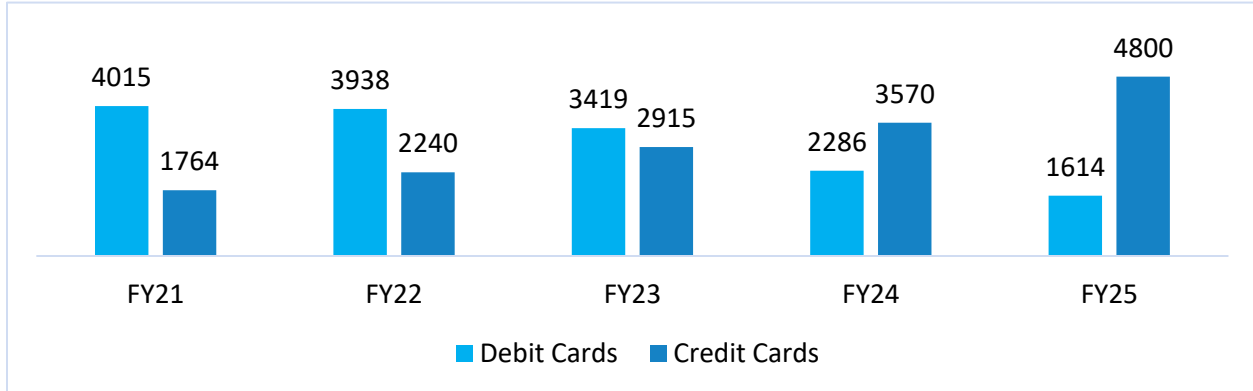
The growth of debit cards in India is a multifaceted phenomenon, driven by several factors including increased banking coverage, government initiatives, and specific schemes like the Pradhan Mantri Jan Dhan Yojana (PMJDY).

- **Increasing Banking Coverage / Penetration and More Accounts per Head:** The number of debit cards in India saw a significant increase, growing from 771.6 million to over 961.3 million in the past six years. This increase has been supported by the issue of 296 million RuPay debit cards to Basic Savings Bank Deposit (BSBD) account holders, demonstrating the impact of expanding banking coverage and financial inclusion.
- **Issuance of Debit Cards under PMJDY Scheme:** The Pradhan Mantri Jan Dhan Yojana (PMJDY) has been a key driver in debit card growth. As of 2022, 319.4 million RuPay debit cards have been issued to PMJDY account holders, significantly contributing to the total number of debit cards in circulation. This scheme has been instrumental in extending financial services to marginalized and socio-economically neglected classes, thereby boosting debit card issuance and usage.
- **Government Initiatives:** The Indian government's initiatives have played a significant role in promoting digital payments and debit card usage. For instance, the government's USD 170 million plan to promote RuPay debit cards aimed to increase their use among marginalized populations. As of November 2021, over 600 million RuPay debit cards had been issued. The overall digital payments in India, which include debit card transactions, have witnessed a compound annual growth rate (CAGR) of 61% in volume and 19% in value over the past five years, indicating a steep shift towards digital payments
- **Transit Cards / National Common Mobility Card (NCMC) will aid demand for debit cards:** The NCMC RuPay Debit Cards have the provision of storing money on the card which can be used to initiate contactless wallet payments (offline payments) across various use cases like toll, metro, railways, transit, parking etc. Use cases like Transit cards / NCMC will aid the demand of debit cards in the country.
- **Card Expiry – A Built-in Market:** Cards typically expire within three to seven years. This built-in obsolescence ensures a continuous market for card manufacturers, as banks and financial institutions must routinely issue new cards to maintain customer service and compliance.
- **Demographic dividend as a key driver for payment cards** – Rising middle class and increasing working age population drives the issuance of credit and debit cards through higher disposable incomes, access to credit and targeted banking services.
- **Premiumization of cards:** Premiumization of existing cards presents opportunities for card manufacturers as existing card holders upgrade their debit cards. This trend is driven by the increasing demand for enhanced features, lucrative offers and personalized services through strategic partnerships. This proactive approach not only enhances customer satisfaction but also drives growth and competitiveness in the dynamic financial sector.

4.6. Growth of Debit & Credit Cards in India

4.6.1. Debit Card Transactions by Volume

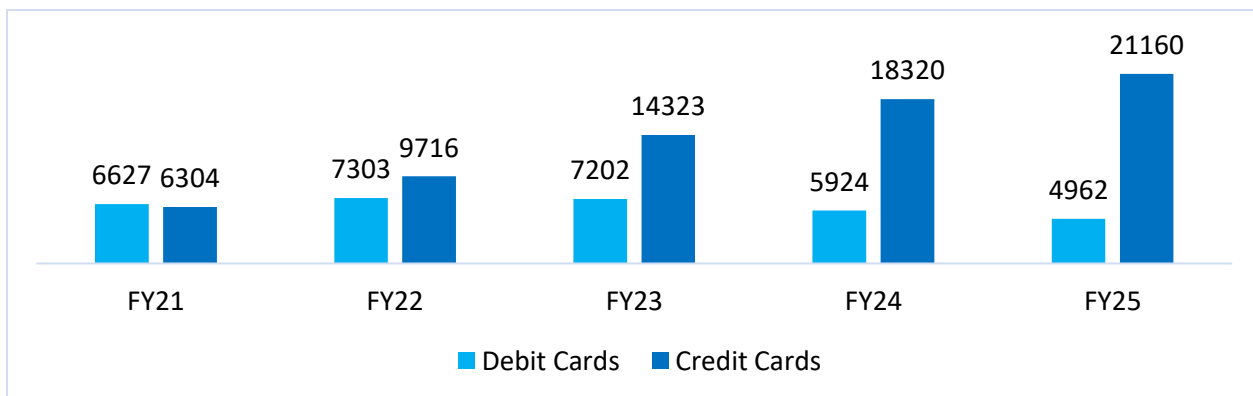
Exhibit 50: Debit and Credit Card Transactions by Volume (in Million), India, FY 2021-25



Source: RBI, Frost & Sullivan, PwC Indian Payment Handbook 2025, Secondary Sources

FY25 Credit Card volumes are F&S estimates

Exhibit 51: Debit and Credit Card Transactions by Value (in INR Billion), India, FY 2021-25



Source: RBI, Frost & Sullivan, PwC Indian Payment Handbook 2025, Secondary Sources

Both total number of transactions as well as value for debit card has fallen in the FY 2021-25 period, with the value falling from INR 6,626.7 billion in FY 2020-21 to INR 4,962 billion in FY 2021-25. This degrowth can be attributed to the inclination towards UPI due to ease of use and small to medium merchants pushing for UPI. e.

This indicates a significant drop in debit card usage, particularly for routine, low-value purchases. However, this decline is not solely due to reduced consumer spending—it reflects a behavioral shift wherein smaller ticket-size payments are increasingly being routed through UPI. As a result, debit cards are now being used less frequently but for relatively higher ticket-size transactions such as e-commerce purchases, travel bookings, and utility payments etc.

The trajectory for credit card transactions by volume indicates a robust expansion, as it has risen from 1,764 million in FY 2020-21 to 4,800 million in FY 2024-25, marking an impressive CAGR of approximately 28.4% over the four-year period from FY21-25.

Fuelling this surge is a combination of heightened consumer confidence, an uptick in e-commerce, and increased rewards programs that incentivize credit card usage. Additionally, financial institutions are constantly innovating with features that cater to a tech-savvy population, while security enhancements make credit transactions more secure, further contributing to this growth trend.

The value of credit card transactions has also risen from INR 6,304.1 billion in FY 2020-21 to an estimated INR 21,160 billion by FY 2024-25, with a CAGR of 35.4% during this period. This growth is influenced by the growing middle class and their increasing purchasing power. The convenience and efficiency of credit cards in facilitating digital transactions, along with the expansion of the online retail sector, are key growth stimulants. Enhanced security measures and lucrative rewards programs further bolster the appeal of credit cards.

4.7. Card Expiry and Renewal - Additional market potential

In the world of finance, debit and credit cards have become indispensable. As these cards come with an expiration date, their renewal cycles create significant opportunities for manufacturers.

Opportunities:

- **Card Expiry – A Built-in Market:** Cards typically expire within three to seven years. This built-in obsolescence ensures a continuous market for card manufacturers, as banks and financial institutions must routinely issue new cards to maintain customer service and compliance.
- **Technology Upgrades:** Card renewal cycles coincide with technological advancements. Features like EMV chips, contactless payments, and biometric security are constantly evolving. Each renewal cycle is an opportunity for manufacturers to upgrade the technology, enhancing security and user experience.
- **Customization and Branding:** Renewal periods offer a chance for financial institutions to refresh their branding. Manufacturers can capitalize on this by offering innovative designs, personalized cards, and co-branded partnerships, turning the humble card into a branding tool.

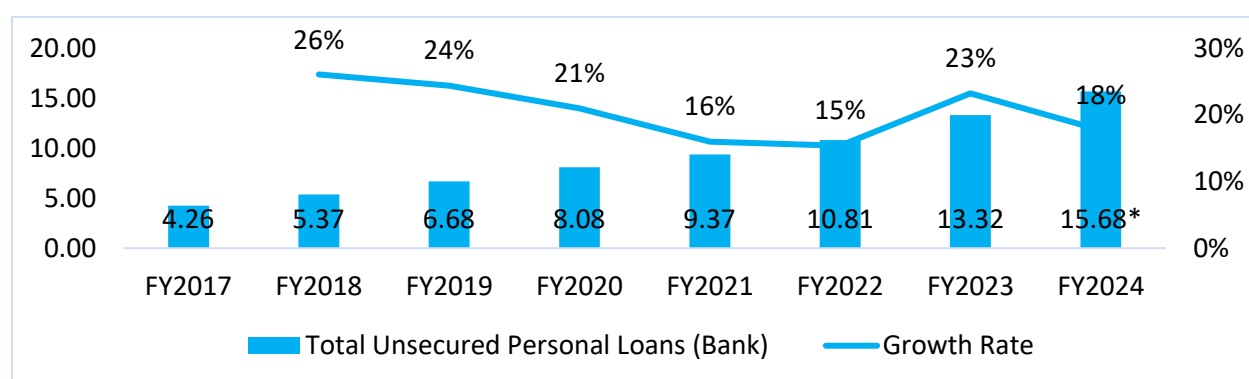
Trends Influencing the Card Manufacturing Sector

- **Sustainability Push:** The trend towards eco-friendly materials is growing. Biodegradable plastics and metal cards are gaining traction, opening new avenues for manufacturers in sustainable card production.
- **Digital Integration:** With digital wallets and virtual cards on the rise, physical cards are integrating with digital services. Manufacturers are exploring ways to make physical cards a seamless part of the digital payment ecosystem.
- **Security Enhancements:** As fraud techniques evolve, so does card security. Manufacturers are investing in advanced encryption, dynamic CVV codes, and integrated fingerprint sensors to stay ahead of threats.
- **Customization Surge:** Personalization is key in the current market. Customers seek unique designs, and manufacturers are responding with customizable card options, including DIY design interfaces and a variety of materials and finishes.

4.8. Growth In Unsecured Retail Loans – Share of Credit Cards as Part of Unsecured Loans Market

The expansion of unsecured personal loans, encompassing credit card receivables, consumer durable loans, and other personal loans, in banks between March 2017 and March 2024, recorded a Compound Annual Growth Rate (CAGR) of 20.9% growing from INR 4.26 trillion in March 2017 to INR 13.32 trillion by March 2023. This surpassed the growth rate of personal loans, which demonstrated a CAGR of 14.5% over the same period (growing from INR 18.6 trillion in FY 2017 to INR 41.83 trillion by FY 2023). Unsecured personal loans now constitute nearly one-third of the total personal loan portfolio of banks (which amounts to approximately Rs. 53.31 trillion as of March 31, 2024).

Exhibit 52: Rising Unsecured Personal Loans (INR Trillion), India, FY2017-FY2024



Source: RBI, Secondary Sources;

*Frost & Sullivan Estimate

Numerous factors have contributed to the significant surge in unsecured personal loans. These include demographic changes, the formalization of the economy, increased purchasing power, the prevalence of FinTech companies, widespread availability of the Internet and feature phones, the uptake of digital payment platforms, among others.

Exhibit 53: Unsecured Personal Loans Split, India, FY2023-FY2024

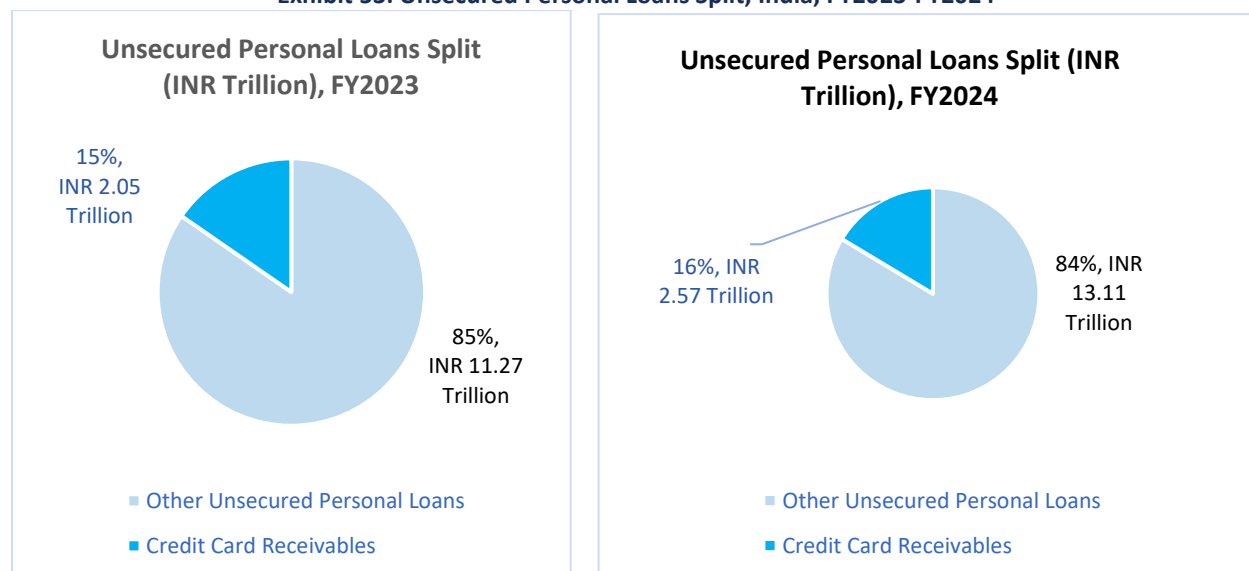


Exhibit 54: Rising Credit Card Receivables (INR Trillion), India, 2017 - 2024

Source: RBI

There has been a significant rise in credit card usage, accompanied by a corresponding increase in outstanding receivables. Credit card receivables have been on an uptrend and has increased from INR 0.57 trillion in August, 2017 to INR 2.57 trillion in March, 2024. The surge in credit card outstanding receivables in India reflects evolving consumer preferences, and increased access to credit. The total credit card portfolio stood at INR 2.87 trillion as of February, 2025. Credit card debt accumulates when consumers choose to switch from making a single, lump-sum payment to an instalment payment plan (EMI), in which they pay the minimum amount owed and either roll over or revolve their payment, or they take out credit card loans. In a quieter climate for corporate lending, banks' growing emphasis on retail loans has resulted in increased expansion of credit card and other unsecured retail lending.

The rapid expansion of credit cards within India's unsecured loans market can be attributed to several key factors. Recent data reveals a notable surge in credit card spending in India, significantly contributing to the growth of the unsecured credit sector.

This surge in credit card usage can be linked to several drivers. One crucial factor is the proliferation of digital and information-driven lending, which has propelled the expansion of retail credit, particularly in unsecured consumption-oriented products. TransUnion CIBIL reported a compounded annual growth rate (CAGR) of 47% in this segment from March 2021 to March 2023¹. This growth is fuelled by the widespread adoption of digital payment methods and the increased availability of credit through online platforms, making it more convenient for consumers to access and utilize credit cards.

There's a growing preference among consumers for credit card usage as opposed to other forms of borrowing. Notably, the heightened credit card spending also elevates the risk of defaults, which banks are closely monitoring.

4.9. Regulatory Interventions in The Credit Cards Industry

- 1) New Guidelines on Credit Card Issuance:** In April 2022, the Reserve Bank of India (RBI) introduced fresh directives regarding credit and debit card issuance. These directives encompassed various aspects, such as the closure of credit cards, billing practices, and obtaining customer consent. Lenders were mandated to secure customer consent on multiple fronts, furnish essential fact statements during the application process, and bolster their mechanisms for addressing grievances. Additionally,

¹ TransUnion CIBIL

these guidelines sought to ensure transparency regarding the reasons for credit card application rejections and mandated compensation for unsolicited credit card issuances.

- 2) **Enhancing Risk Weights and Strengthening Credit Standards:** Building on these measures, further regulatory actions were implemented in November 2023, with a specific focus on consumer credit and bank credit provided to non-banking financial companies (NBFCs). These measures included an augmentation of risk weights for consumer credit exposure by commercial banks and NBFCs, as well as for credit card receivables. Banks were encouraged to review their sector-specific exposure limits for consumer credit and establish Board-approved limits for various sub-segments, with the overarching aim of reinforcing prudent risk management practices.

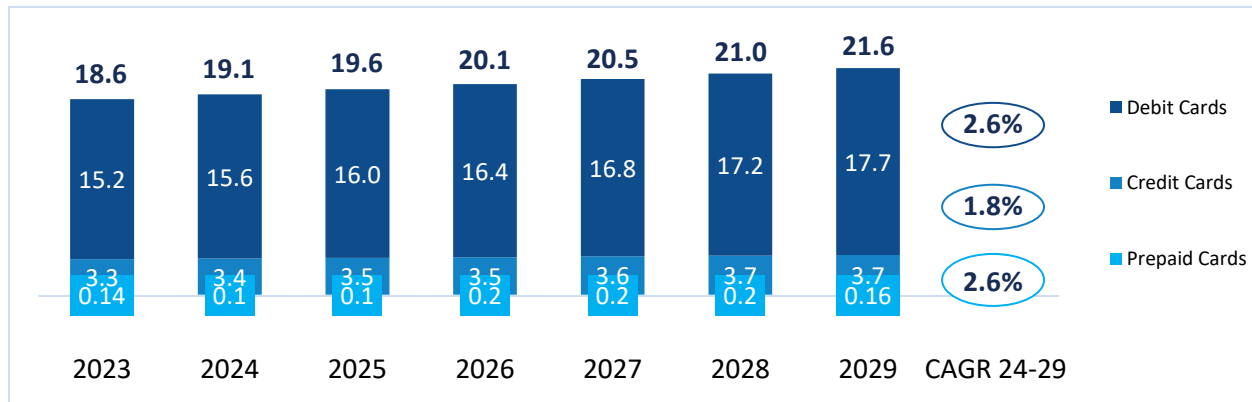
The RBI's guidelines also targeted several areas to enhance transparency and safeguard customer interests:

- **Billing Cycle and Promotional Offers:** Card issuers were made accountable for any delays or non-delivery of cashbacks, discounts, or other offers promoted by co-branding partners.
 - **Reporting and Penal Charges:** The rules stipulated that only credit card accounts labelled 'past due' for more than three days could be reported as overdue, while penal interest charges were to be computed based on the outstanding balance from the payment due date.
 - **Prompt Billing Statements:** Card issuers were obligated to ensure the timely delivery of bills/statements, providing consumers with at least a fortnight for payment before incurring interest.
 - **Disputed Transactions:** Charging disputed transactions labelled as fraud was prohibited until the issue was resolved.
 - **Flexibility in Billing Cycle:** Cardholders were granted a one-time option to modify their credit card's billing cycle to better suit their needs.
- 3) **Recent RBI regulations impacting fintech companies issuing credit cards:** The regulations underscore RBI's commitment to ensuring consumer protection, data privacy, and fair practices in the fintech and banking sectors. By restricting the issuance of credit cards to regulated entities and enhancing transparency, the RBI aims to foster a more secure and customer-friendly financial environment
- **Issuance of Credit Cards:** Only banks / NBFCs are authorized to issue credit cards. Fintech companies must collaborate with these entities to offer credit cards. This move ensures that only regulated financial institutions with adequate risk management frameworks are involved in issuing credit cards.
 - **Data privacy and sharing:** The RBI has prohibited co-branding partners from accessing customer data post-issuance of credit cards. This regulation ensures that customer data remains secure and is not misused by third parties.

CREDIT / DEBIT CARDS MARKET IN SELECT GLOBAL MARKETS

5.1. Total Number of Payment Cards Globally

Exhibit 55: Total Payment Cards in Circulation, Global, in Billions, 2024-29



Source: Frost & Sullivan, Secondary Sources

The total payment cards in circulation were 19.1 billion in 2024 and is expected to reach 21.6 billion by 2029, growing at a CAGR of approximately 2.5% between 2024-29. This segment's growth is driven by a global shift towards digitized transactions including card based payments, a trend accelerated by the COVID-19 pandemic. The convenience of contactless payments, robust security protocols, and growing consumer trust in digital transaction methods (including card based payments) are key factors fueling this growth. Furthermore, government initiatives promoting financial inclusion and modernization of payment infrastructures in emerging economies contribute significantly to the expansion of the total payment cards market.

In 2024, debit cards in circulation were 15.6 billion units expected to increase to 17.7 billion in 2029, with a CAGR of 2.6% between 2024-29. The growth in debit card usage is attributed to factors such as the ease of obtaining them with new bank accounts, the rise in online and in-store shopping, and the general shift away from cash. Debit cards also offer enhanced security features and are increasingly integrated with digital wallets and contactless payment technologies.

The credit cards market had 3.4 billion units in circulation in 2024, and it is expected to reach 3.7 billion units in 2029, at a CAGR of 1.8% from 2024 to 2029. The growth in credit card usage is driven by an increase in consumer spending, growing e-commerce platforms, and the expansion of global travel. Credit cards are also popular due to the associated benefits such as reward points, cashback offers, and the ability to build a credit history. Additionally, financial institutions are constantly innovating credit card features, such as introducing co-branded cards and increasing security measures, to attract a broader customer base.

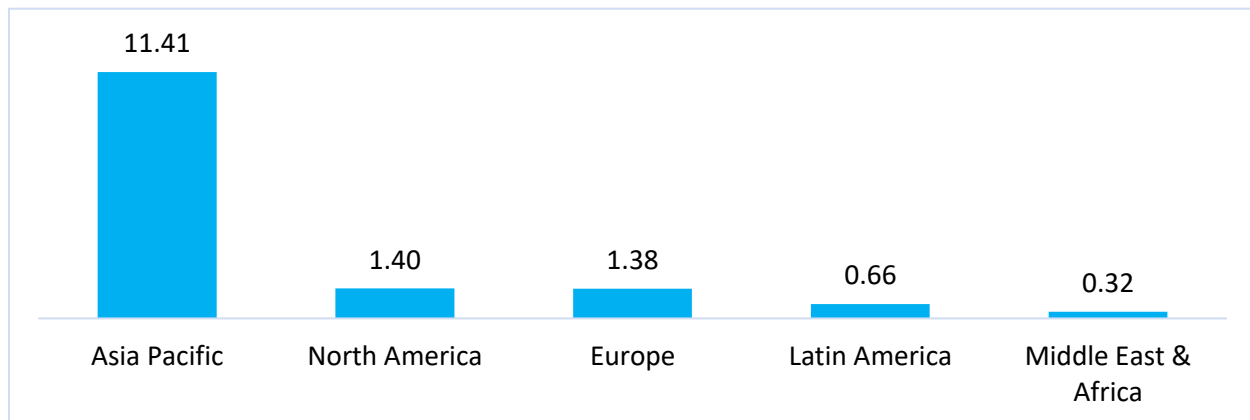
The prepaid cards market had 0.1 billion units in circulation in 2024, and it is expected to reach 0.16 billion units in 2029, at a CAGR of 2.6% from 2024 to 2029. The growth of prepaid cards is primarily fueled by their versatility and convenience, making them a preferred choice for budget management and for consumers without traditional banking access. They are widely used for specific purposes like gift cards, travel expense cards. The increasing adoption of digital and mobile-first solutions, particularly in emerging economies, is also boosting the market growth of prepaid cards.

India is uniquely positioned to emerge as a global leader in the manufacturing and export of payment cards, driven by a compelling combination of cost advantage, technological capability, and a mature manufacturing ecosystem. Indian manufacturers benefit from significantly lower production and labor costs, enabling them to offer high-quality, EMV-compliant cards at competitive prices. The country also boasts end-to-end capabilities—from chip module assembly and card lamination to personalization and secure fulfillment—supported by certifications from global payment networks like Visa, Mastercard, and RuPay. With a strong domestic demand anchoring economies of scale, and government initiatives such as “Make in India” and production-linked incentives, Indian players are well-equipped to meet international demand efficiently. Additionally, India’s expertise in secure IT infrastructure, data processing, and fintech services enhances its value proposition as a one-stop solution provider. These advantages make India an ideal partner for global card issuers seeking scalable, secure, and cost-effective solutions.

5.2. Total Debit / Credit Cards By Regions

The Asia Pacific region emerges as a dominant force with a staggering 11.41 billion debit cards, reflecting a robust growth trajectory. Key drivers of this surge include the region's rapid economic development, burgeoning middle-class populations, and the proliferation of digital financial services. Governments and financial institutions across the region have actively promoted financial inclusion, resulting in a substantial increase in the number of individuals gaining access to debit cards, thereby fueling the overall growth in the region.

Exhibit 56: Total Debit Cards by Region, 2024 (Billion)



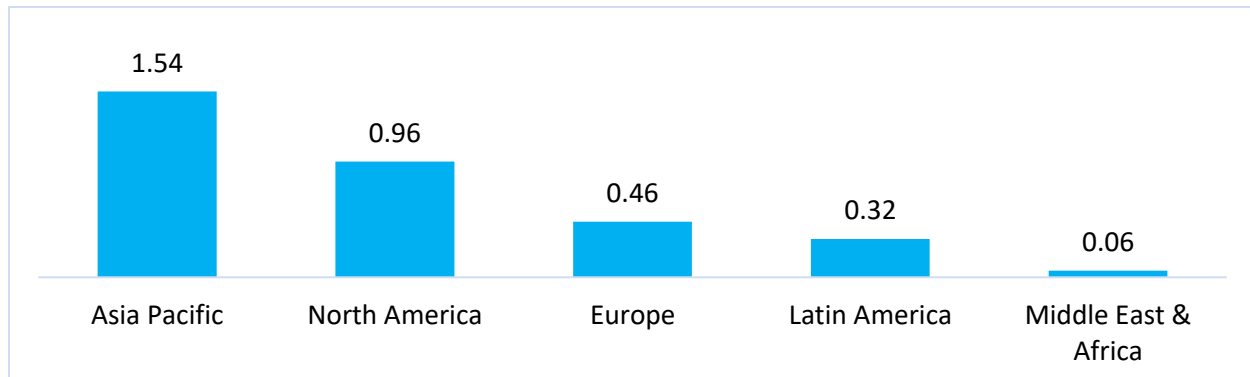
Source: World Bank, Frost & Sullivan Analysis

In North America and Europe, the total number of debit cards stands at 1.4 billion and 1.38 billion, respectively. These mature markets exhibit steady growth, propelled by technological advancements, a strong emphasis on financial literacy, and evolving consumer preferences. The ongoing transition towards a cashless society and the convenience offered by debit cards in online and offline transactions contribute to their continued prominence in these regions.

Latin America, with 663 million debit cards, is witnessing a gradual but steady increase in card usage. Factors such as increasing internet penetration, a growing middle class, and efforts to formalize the economy have contributed to the rise in debit card adoption. Governments in the region are actively working to promote electronic payments and financial inclusion, presenting opportunities for further expansion. In the Middle East & Africa, where the total number of debit cards is 315 million, initiatives

focused on enhancing financial infrastructure and expanding banking services are driving the adoption of debit cards, opening up new avenues for growth and development.

Exhibit 57: Total Credit Cards By Region, 2023 (Billion)



Source: World Bank, Frost & Sullivan Analysis

Again the APAC leads the pack with 1.54 billion cards in circulation followed by North America with 961 million credit cards. North America's mature financial infrastructure, coupled with a culture of consumer spending, has been a significant driver of growth in the region for credit cards growth. The convenience and flexibility offered by credit cards, along with attractive rewards and loyalty programs, have contributed to their popularity among consumers in North America, fueling the continuous expansion of the market.

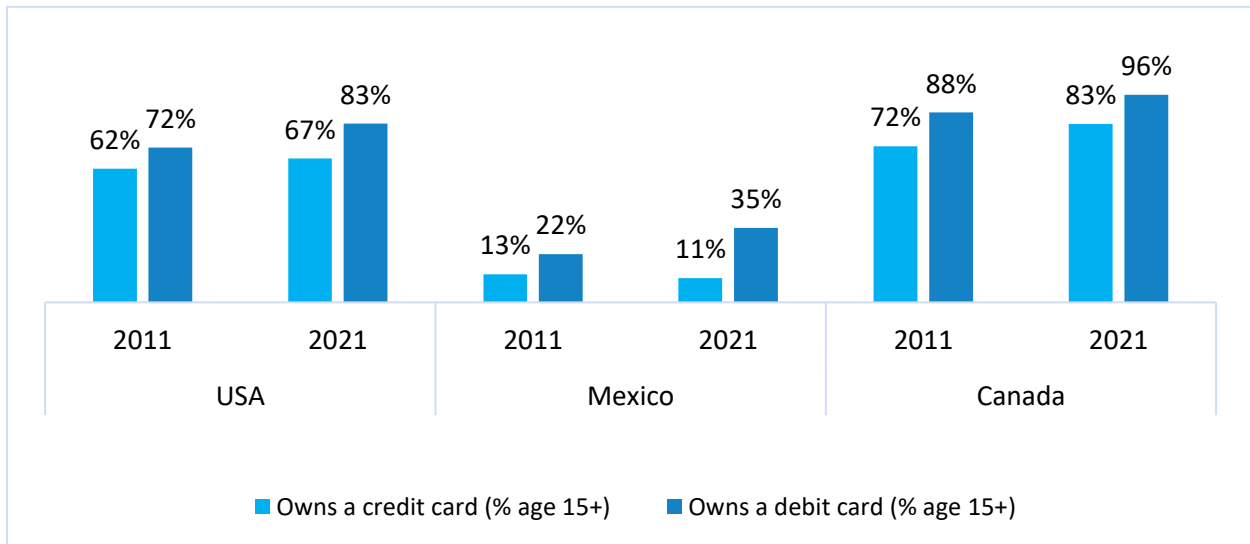
Europe follows with 461 million credit cards, reflecting a significant presence in the region's financial landscape. Factors such as increasing disposable income, rising consumer confidence, and the convenience of credit card transactions have propelled their adoption. Moreover, regulatory initiatives such as the Payment Services Directive (PSD2) have stimulated competition and innovation in the European payments market, presenting opportunities for fintech startups and traditional financial institutions to offer innovative credit card products and services.

As the global landscape of financial transactions evolves, new developments and opportunities are emerging. The integration of advanced technologies like blockchain, artificial intelligence, and biometrics is reshaping the debit card ecosystem, enhancing security, and providing innovative functionalities. Cross-industry collaborations, regulatory advancements, and the ongoing digitalization of economies present opportunities for stakeholders to capitalize on the growing demand for secure and convenient payment solutions, ensuring the continued growth and relevance of debit cards on a global scale.

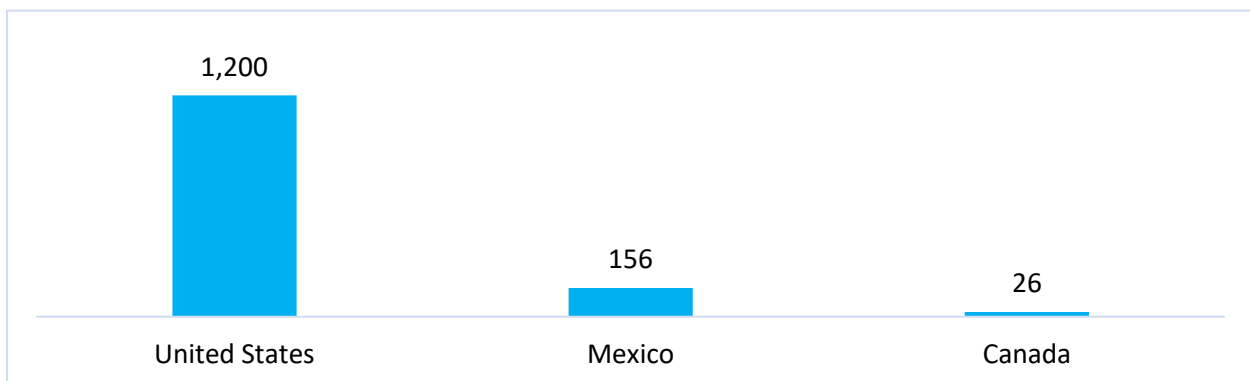
5.3. Benchmarking Debit and Credit Cards Issued across Countries

North America

The penetration of credit cards and debit cards continue to rise in North America. For USA, the penetration of credit cards has risen from 62% in 2011 to 67% in 2021, whereas the same for debit cards has risen from 72% in 2011 to 83% in 2021. For Mexico, the penetration of credit cards has fallen slightly from 13% in 2011 to 11% in 2021, whereas the same for debit cards has risen from 22% in 2011 to 35% in 2021. For Canada, the penetration levels are pretty high as for credit cards it has risen from 72% in 2011 to 83% in 2021, whereas the same for debit cards has risen from 88% in 2011 to 96% in 2021.

Exhibit 58: North America Credit & Debit Card Penetration (%), 2011-2021

Penetration based on proportion of populace aged 15+
 Source: World Bank, Frost & Sullivan Analysis

Exhibit 59: North America Debit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

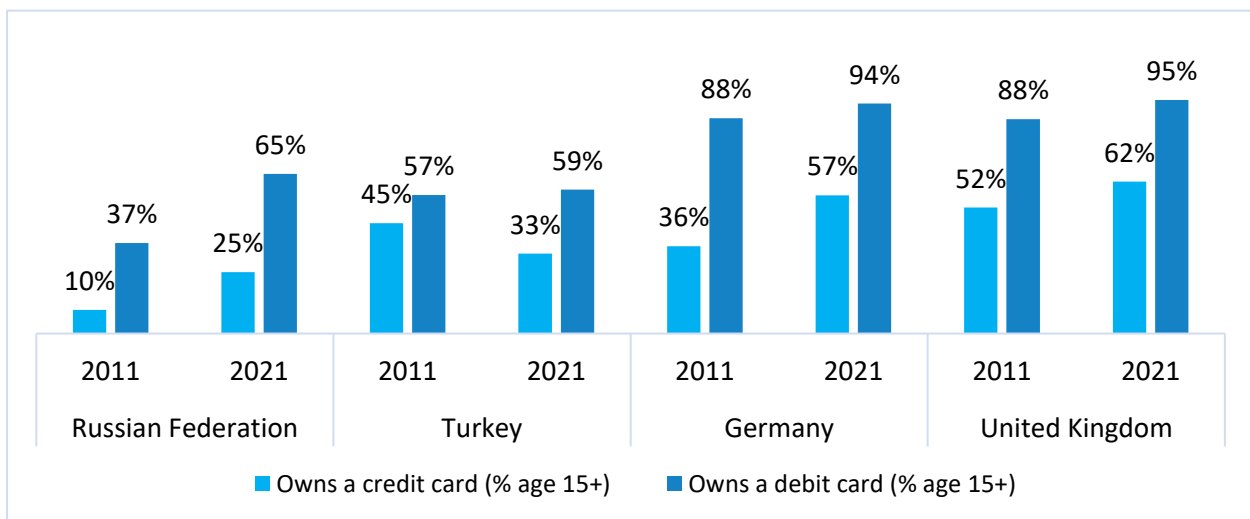
In North America, the United States leads with a staggering 1200 million debit cards and 827 million credit cards. Factors such as a mature financial infrastructure, widespread access to banking services, and a culture of consumer spending contribute to the growth of debit and credit cards usage in the U.S. Similarly, in Canada, the credit and debit cards penetration rate is high owing to availability of advanced banking facilities and a tech-savvy population.

Exhibit 60: North America Credit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

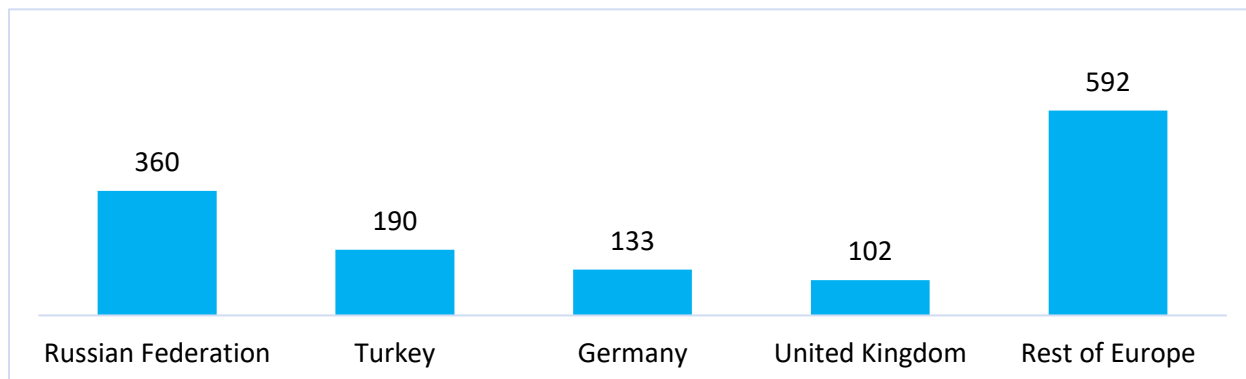
Europe

The penetration rates for credit cards and debit cards are high across most of countries in Europe. For UK, the penetration of credit cards has risen from 52% in 2011 to 62% in 2021, whereas the same for debit cards has risen from 88% in 2011 to 95% in 2021. For Germany, the penetration of credit cards has risen from 36% in 2011 to 57% in 2021, whereas the same for debit cards has risen from 88% in 2011 to 94% in 2021.

Exhibit 61: Europe Credit & Debit Card Penetration (%), 2011-2021

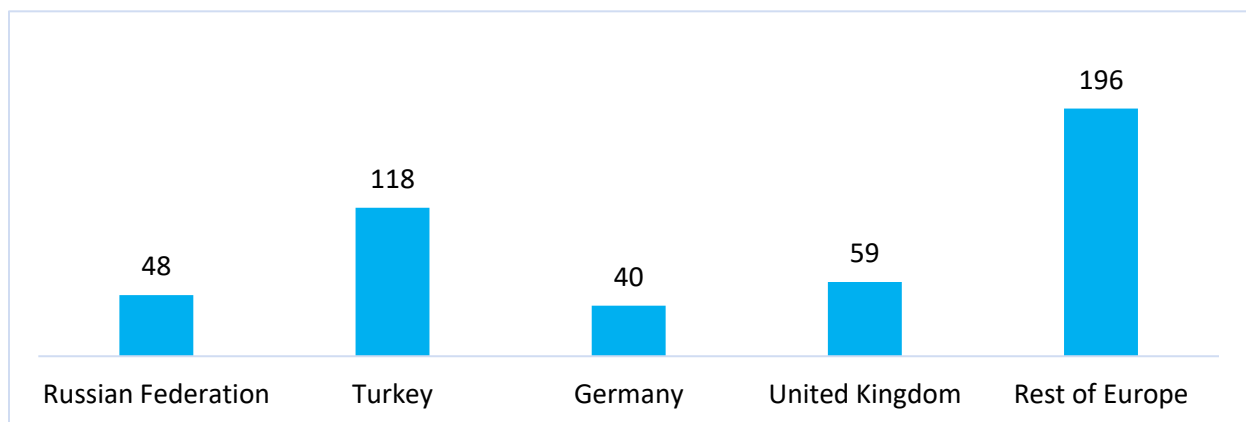
Penetration based on proportion of populace aged 15+

Source: World Bank, Frost & Sullivan Analysis

Exhibit 62: Europe Debit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

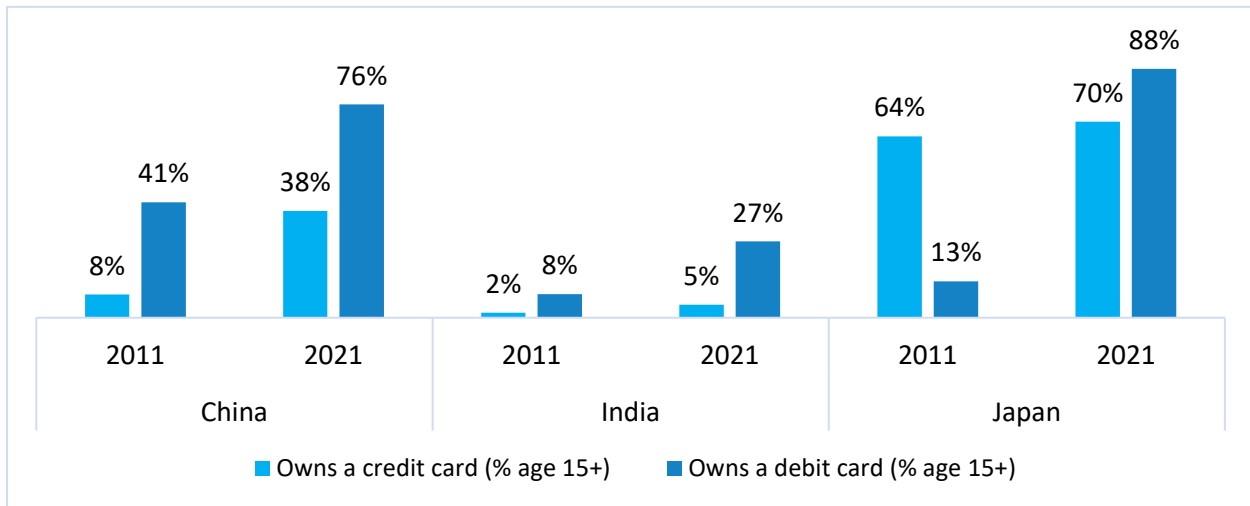
In Europe, countries like the United Kingdom, Germany, France, and Italy demonstrate robust credit and debit cards adoption rates. These nations benefit from well-established banking systems, strong consumer protection regulations, and a preference for cashless transactions. The rise of digital banking platforms and the integration of contactless payment technology have further accelerated the growth of debit card usage in these countries. Additionally, initiatives aimed at promoting financial literacy and enhancing digital infrastructure present opportunities for further expansion in the European market.

Exhibit 63: Europe Credit Cards (Million) By Country, 2023

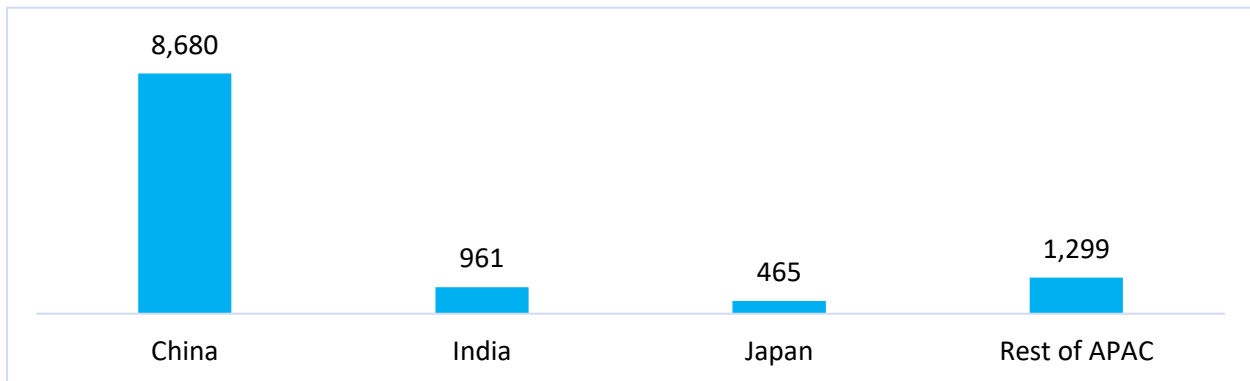
Source: World Bank, Frost & Sullivan Analysis

Asia Pacific

The penetration rates for credit cards and debit cards are moderate across most of countries in APAC. For Japan, the penetration of credit cards has risen from 64% in 2011 to 70% in 2021, whereas the same for debit cards has risen from 13% in 2011 to 88% in 2021. For India, the penetration of credit cards has risen from 2% in 2011 to 5% in 2021, whereas the same for debit cards has risen from 8% in 2011 to 27% in 2021. The low to moderate penetration rates signify huge upside potential for such cards in some of these regions.

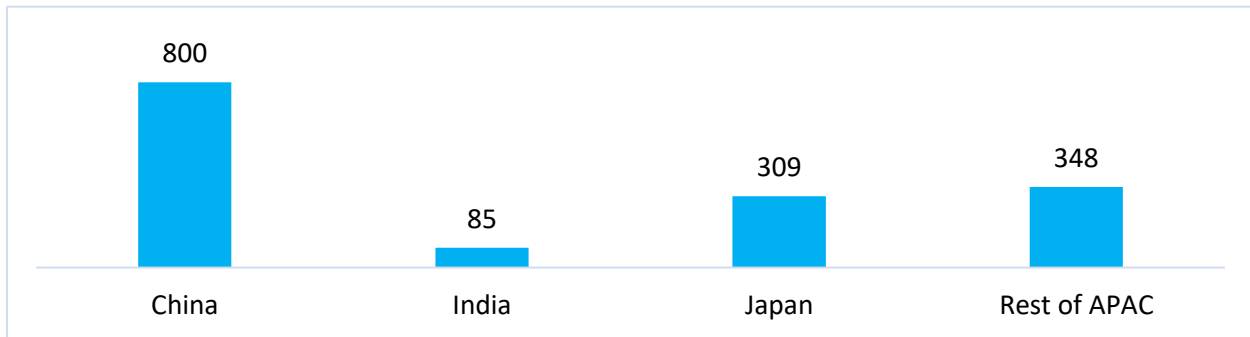
Exhibit 64: Asia Pacific Credit & Debit Card Penetration (%), 2011-2021

Penetration based on proportion of populace aged 15+
 Source: World Bank, Frost & Sullivan Analysis

Exhibit 65: Asia Pacific Debit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

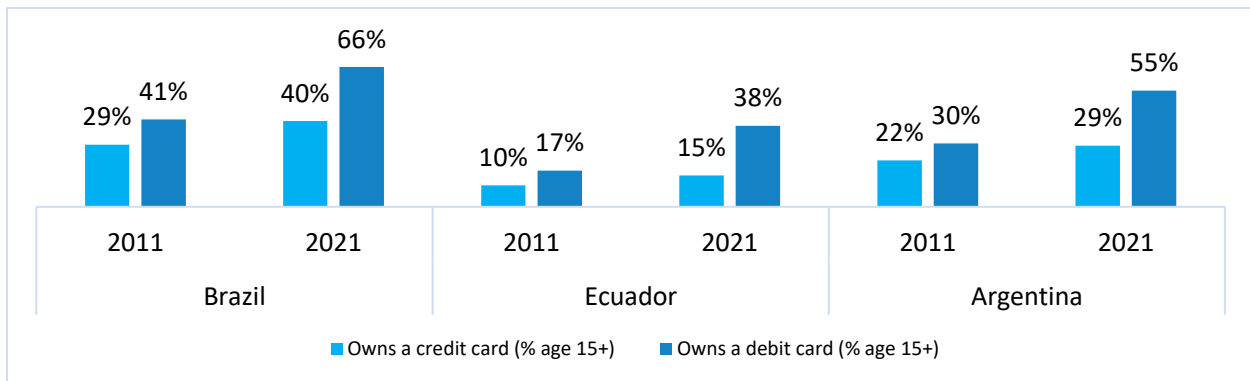
In the Asia Pacific region, China emerges as a dominant player with 8,680 million debit cards and 800.0 million credit cards. The country's rapid economic growth, urbanization, and government-led initiatives to promote financial inclusion contribute to the widespread adoption of debit cards. Similarly, in Japan the advanced banking infrastructure and a tech-savvy population drive the popularity of debit cards for both online and offline transactions. Opportunities for growth remain significant in countries like India and Indonesia, where penetration rates are comparatively lower but are gradually increasing due to expanding access to banking services and rising smartphone penetration.

Exhibit 66: Asia Pacific Credit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

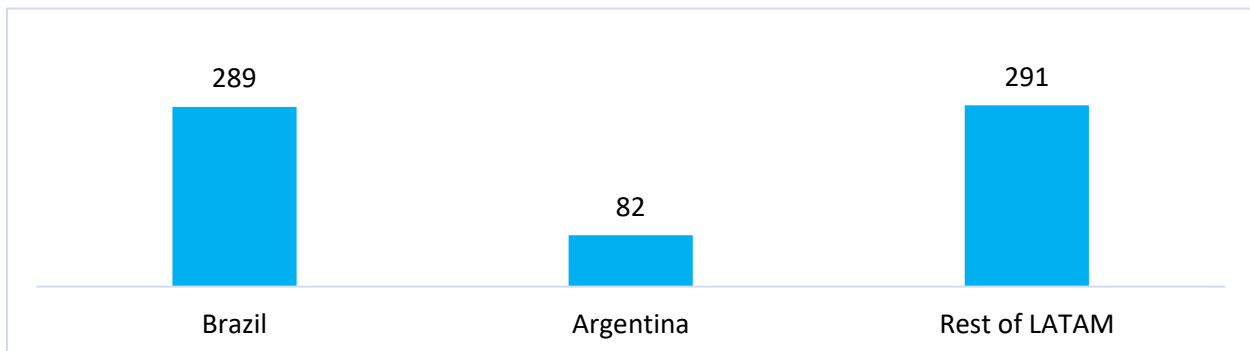
Latin America

The penetration rates for credit cards and debit cards are moderate across most of countries in LATAM. For Brazil, the penetration of credit cards has risen from 29% in 2011 to 40% in 2021, whereas the same for debit cards has risen from 41% in 2011 to 66% in 2021. For Argentina, the penetration of credit cards has risen from 22% in 2011 to 29% in 2021, whereas the same for debit cards has risen from 30% in 2011 to 55% in 2021.

Exhibit 67: Latin America Credit & Debit Card Penetration (%), 2011-2021

Penetration based on proportion of populace aged 15+

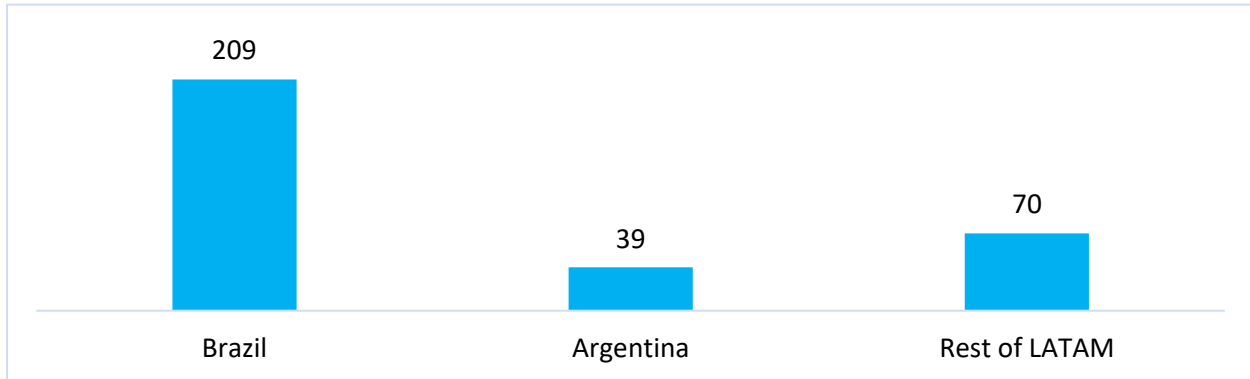
Source: World Bank, Frost & Sullivan Analysis

Exhibit 68: Latin America Debit Cards (Million) by Country, 2023

Source: World Bank, Frost & Sullivan Analysis

In Latin America region, Brazil is a significant debit and credit cards market with 289 million and 209 million cards respectively in circulation. Factors such as improving financial infrastructure, government initiatives to promote digital payments, and a growing middle class contribute to the growth of debit card usage in these regions.

Exhibit 69: Latin America Credit Cards (Million) By Country, 2023

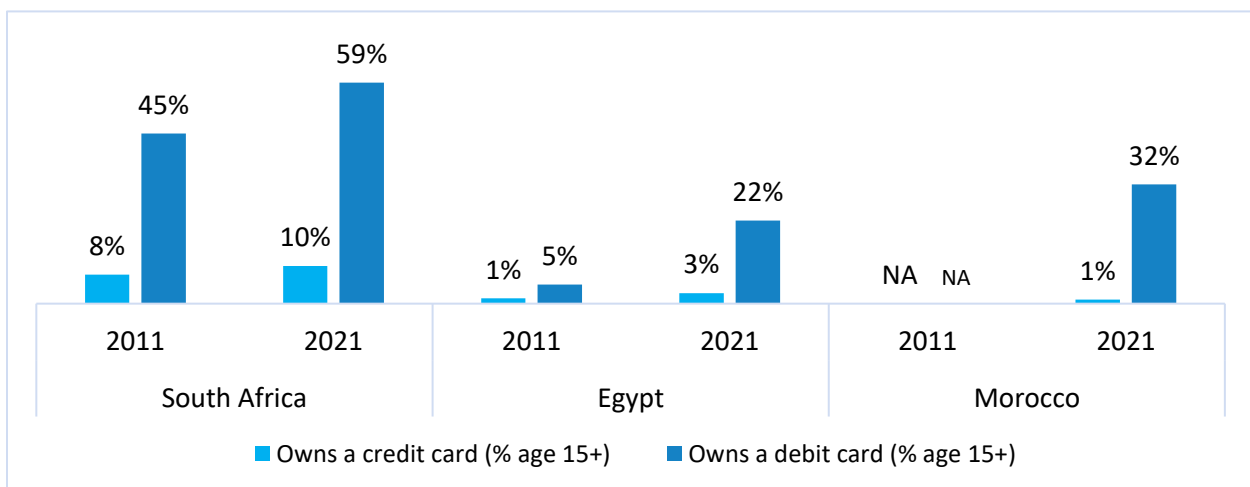


Source: World Bank, Frost & Sullivan Analysis

Middle East & Africa (MEA)

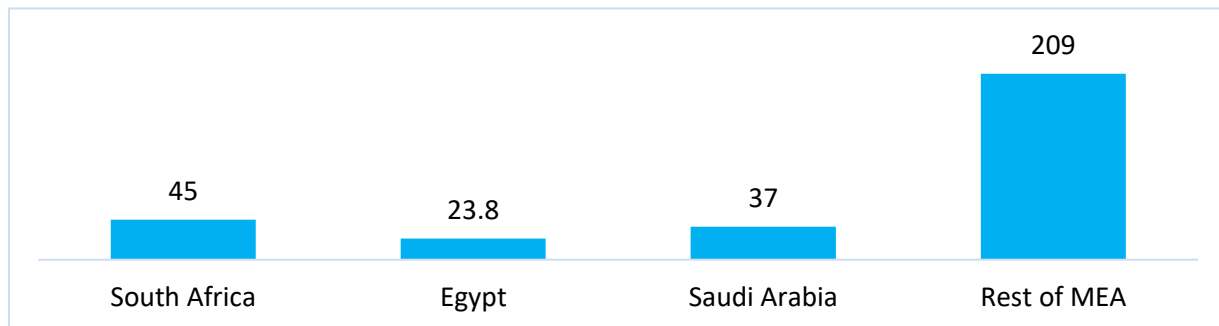
The penetration rates for credit cards and debit cards vary across countries in Middle East & Africa. For South Africa, the penetration of credit cards has risen from 8% in 2011 to 10% in 2021, whereas the same for debit cards has risen from 45% in 2011 to 59% in 2021. For Egypt, the penetration of credit cards has risen from 1% in 2011 to 3% in 2021, whereas the same for debit cards has risen from 5% in 2011 to 22% in 2021. The low penetration rates signify huge upside potential for such cards in some of these regions.

Exhibit 70: Middle East Credit & Debit Card Penetration (%), 2011-2021



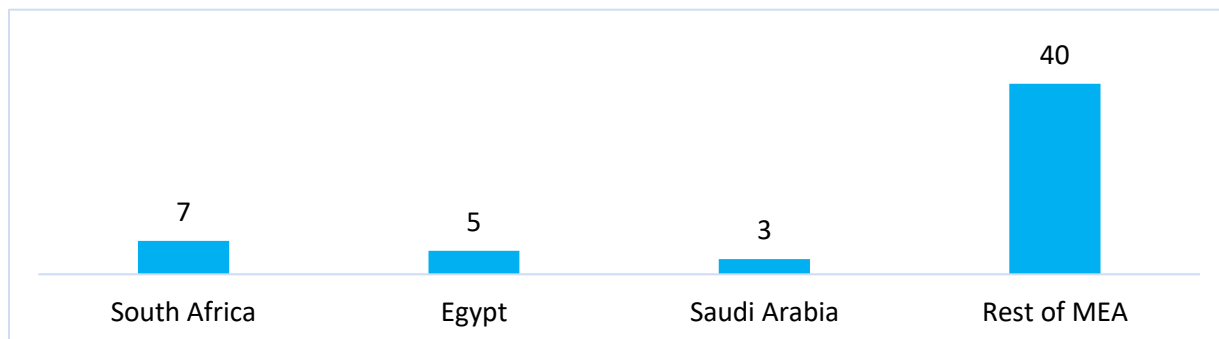
Penetration based on proportion of populace aged 15+

Source: World Bank, Frost & Sullivan Analysis

Exhibit 71: MEA Debit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

Within the MEA region, South Africa is one of the most significant markets for payment cards with 45 million debit cards in circulation. Challenges persist, including low levels of financial literacy and restricted access to banking services, hindering widespread adoption in the region. However, initiatives aimed at overcoming these obstacles and leveraging the increasing demand for digital payments provide stakeholders with opportunities to enhance their foothold in these markets and stimulate additional growth in both debit and credit card utilization.

Exhibit 72: MEA Credit Cards (Million) By Country, 2023

Source: World Bank, Frost & Sullivan Analysis

5.4. Growth Drivers, Challenges, Trends and Opportunities for Debit Cards

Growth Drivers:

- **Increasing Digital Transactions:** The growth of e-commerce and the general shift towards online services have significantly boosted the use of debit cards for digital transactions. The convenience and speed of using debit cards for online purchases, coupled with enhanced security features like two-factor authentication, make them an appealing choice for consumers. For instance, the rise in mobile commerce, where users prefer to use debit cards linked to their mobile wallets, exemplifies this trend.
- **Financial Inclusion Initiatives:** In many developing countries, efforts to increase access to banking services have resulted in a higher issuance of debit cards. For example, India's Jan Dhan Yojana initiative, which aims to provide affordable access to banking services, has led to millions of new debit

cardholders. Such programs are crucial in transitioning a large segment of the population from cash-based to digital economies.

- **Convenience and Security:** Debit cards offer a balance of convenience and security that is hard to match. They allow for easy tracking of expenses and provide immediate access to funds. The added layer of security through PINs and chip technology makes them safer than carrying cash. Banks are continuously enhancing security measures to combat fraud, making debit cards increasingly secure.

Challenges:

- **Regulatory Compliance:** Keeping up with changing and often stringent regulatory requirements, such as those related to anti-money laundering (AML) and know your customer (KYC) norms, poses a significant challenge for issuers. Compliance demands continuous updates to systems and procedures, often requiring substantial investment.
- **Competition from Alternative Payment Methods:** Debit cards face stiff competition from newer payment technologies like digital wallets, cryptocurrencies, and peer-to-peer payment apps. For example, services like PayPal and Venmo offer convenience and speed that are attracting users away from traditional card-based transactions.
- **Maintaining Operational Efficiency:** As transaction volumes grow, maintaining operational efficiency becomes a challenge. This includes ensuring smooth transaction processing, managing customer queries effectively, and keeping system downtimes to a minimum.
- **Consumer Behavior Changes:** The payments market is dynamic, with rapid changes in consumer preferences. Debit card issuers need to continuously innovate and adapt to these changes, such as the increasing preference for contactless and mobile payments, to remain relevant and competitive.

Trends:

- **Growth in E-Commerce:** The surge in online shopping has led to a proportional increase in the use of debit cards for online payments. Retailers and e-commerce platforms often encourage the use of debit cards through cashback offers and other incentives.
- **Payments Uptake:** There is a growing trend towards contactless debit cards, which allow for faster transactions and convenience. In many countries, including the UK and Canada, contactless payments have become the norm, with a significant portion of small-value transactions being made through this method.
- **Integration with Mobile Technology:** The integration of debit cards with mobile technology is a significant trend. This includes not only mobile wallets but also banking apps that allow for easy management of debit card settings, such as spending limits and transaction alerts.
- **Biometric Authentication:** Incorporating biometrics, such as fingerprint and facial recognition, for debit card transactions enhances security and user experience. This technology is becoming more prevalent, as seen in certain banking apps and in some cases, even on the cards themselves.
- **Sustainability Initiatives:** The environmental impact of card production is being addressed by some issuers through the introduction of eco-friendly debit cards. These cards are made from sustainable materials, reducing the carbon footprint associated with traditional plastic cards.

Opportunities:

- **Expanding into Emerging Markets:** Emerging markets present significant growth opportunities for debit card issuers, especially in regions with large unbanked populations. Expanding into these markets often involves tailored financial products that suit the local needs and economic conditions.
- **Leveraging Data Analytics:** Utilizing data analytics allows issuers to offer personalized services and improve fraud detection. This could involve analyzing spending patterns to offer targeted rewards or identifying unusual transactions that might indicate fraud.
- **Partnerships with Fintechs:** Collaborations with fintech companies can lead to innovative solutions and expanded services for card manufacturers. Niyo has partnered with various banks, including Equitas Small Finance Bank, to offer the Niyo Global Card, a debit card that provides zero forex markup, making it highly beneficial for international travelers.

5.5. Growth Drivers, Challenges, Trends and Opportunities for Credit Cards**Growth Drivers:**

- **Increasing Global Adoption:** The global credit card holder base has expanded significantly, reaching 1.25 billion in 2023. This growth is driven by the high adoption rates in countries like Canada and the United States, where a large percentage of adults possess credit cards. The increase reflects a global trend towards financial inclusion and the mainstreaming of credit card usage.
- **Rising Digital Transactions:** The decline in cash usage has been accompanied by a surge in credit card transactions, particularly in digital settings. This growth is fueled by the convenience of contactless payments and mobile wallets, making credit cards the go-to choice for online shopping and digital services.
- **Consumer Debt Trends:** Despite concerns about credit card debt, a large proportion of cardholders carry balances, suggesting a dependency on credit for financial management. This trend, along with rising interest rates, indicates a continued reliance on credit cards, underscoring the need for financial literacy and responsible credit use.
- **Merchant Acceptance:** The widespread acceptance of credit cards by millions of merchants worldwide is a testament to their utility. Large chains and small businesses alike accept credit cards, highlighting their role as a convenient and recognized payment method, integral to modern commerce.
- **Convenience and Security:** Credit cards offer unmatched convenience for both in-person and online transactions. Their wide acceptance, combined with security features like fraud protection, makes them an essential tool in modern consumer life. This convenience is bolstered by continuous improvements in security measures, enhancing consumer confidence.
- **Co-branded Cards:** Cobranded cards are emerging as a key trend in the credit card market, driven by strategic partnerships between financial institutions and popular brands across various industries such as retail, travel, and entertainment. These cards offer unique benefits tailored to the brand's customer base, including exclusive discounts, loyalty points, and specialized rewards that enhance the user experience. The synergy between the issuing bank and the partner brand not only attracts a broader customer segment but also fosters brand loyalty and repeat usage. As consumers seek more

value and personalized incentives from their financial products, cobranded cards are becoming an increasingly attractive option, fueling their growth and prominence in the credit card market.

Challenges:

- **Security Concerns and Data Breaches:** As credit card usage grows, so do concerns about security and the risk of data breaches. Credit card companies must invest in advanced security measures to protect user data, a critical factor in maintaining consumer trust and market credibility.
- **Regulatory Changes:** The credit card market is heavily influenced by regulatory environments, which can vary greatly between regions. Navigating these changing regulations, especially those related to consumer protection and financial practices, remains a significant challenge for credit card issuers.
- **Economic Fluctuations:** The credit card industry is sensitive to economic changes, such as inflation and shifts in consumer spending. These factors can influence credit card usage patterns and the ability of consumers to manage credit card debt effectively.

Trends:

- **Product Diversification:** To cater to diverse consumer needs, issuers are expanding their product ranges. This diversification is akin to the automotive industry, where a variety of models target different consumer segments. The broadening of product suites reflects more sophisticated market segmentation strategies.
- **Preference Shift from Points to Cashback:** There has been a significant shift in consumer preferences from points-based rewards to cashback incentives. This shift is evident in the increasing marketing and response rates for cashback offers, indicating a strategic pivot by issuers to cater to evolving consumer demands.
- **Integration with Mobile Payments:** Credit cards are increasingly integrated into mobile payment platforms, reflecting a broader trend towards digital payments. This integration allows for a seamless user experience, combining the security and reliability of credit cards with the convenience of mobile technology.
- **Focus on Delinquencies:** Credit card issuers are closely monitoring delinquency rates. While these rates remain low, issuers are vigilant about potential indicators of financial distress among consumers, which could impact the market's stability.
- **Growth in Cashless Transactions:** The global move towards cashless transactions has been a boon for the credit card industry. This trend is particularly pronounced in regions like Asia Pacific, where digital payments are rapidly replacing traditional cash transactions.
- **Co-branded Cards:** Cobranded cards are emerging as a key trend in the credit card market, driven by strategic partnerships between financial institutions and popular brands across various industries such as retail, travel, and entertainment. These cards offer unique benefits tailored to the brand's customer base, including exclusive discounts, loyalty points, and specialized rewards that enhance the user experience. The synergy between the issuing bank and the partner brand not only attracts a broader customer segment but also fosters brand loyalty and repeat usage. As consumers seek more value and personalized incentives from their financial products, cobranded cards are becoming an increasingly attractive option, fueling their growth and prominence in the credit card market.

- **Fintech:** Fintech are a transformative force in the credit card market, driving innovation and reshaping consumer experiences. By leveraging advanced technologies, fintech companies are introducing more user-friendly, personalized, and efficient credit solutions. These innovations include instant approvals, seamless integration with digital wallets, enhanced security features, and sophisticated spending analytics. Fintech also cater to underserved demographics, offering credit products to individuals with limited or no credit history. As a result, they are not only broadening access to credit but also setting new standards for convenience and customer-centricity in the financial services industry, making fintech a key trend in the evolving credit card market.
- **Data security increasingly becoming critical:** In an era where digital transactions are ubiquitous, data security is a critical imperative. Ensuring robust security measures protects against rising cyber threats, maintains regulatory compliance, fosters consumer trust, and enhances operational efficiency. As cyber threats evolve, continuous investment in advanced security tools and technologies and practices will remain essential to protecting the integrity of the payment ecosystem.

Opportunities:

- **Technological Innovations:** The credit card industry has numerous opportunities to leverage emerging technologies for enhancing security and user experience. Innovations like blockchain and artificial intelligence can significantly improve transaction security and fraud detection.
- **Emerging Markets:** The credit card market in regions like Asia Pacific is poised for growth due to increasing urbanization, a growing middle class, and a shift towards cashless payments. These markets present significant opportunities for credit card issuers to expand their reach.
- **Reward Program Enhancements:** Enhancing reward programs is a key opportunity for issuers to attract and retain customers. Offering diverse and attractive rewards can help differentiate credit card products in a competitive market.
- **Tapping into New Customer Segments:** The credit card market has potential for growth by reaching new demographics and market segments by tailoring products to meet the specific needs of these segments

ADJACENT MARKET OPPORTUNITY FOR CARD MANUFACTURING ENTITIES

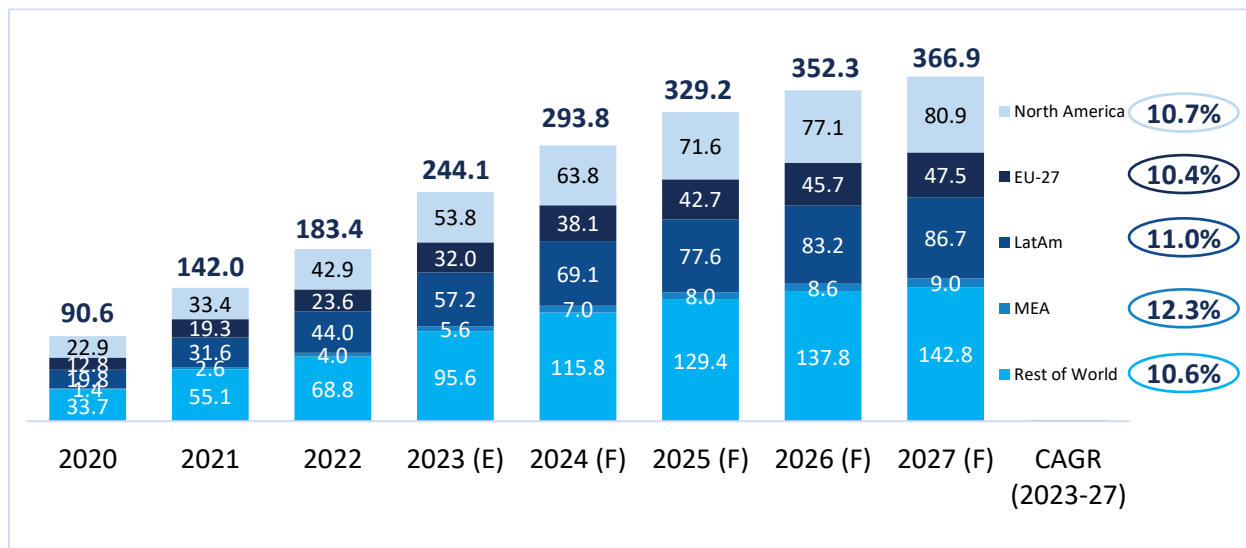
6.1. The Rise of Neobanking

As the financial landscape continues to transform, neobanking is at the forefront, challenging the status quo and offering a compelling alternative to traditional banking. The emergence of neobanking signifies a significant transformation within the financial services sector, characterized by the advent of digital-only, customer-centric, and technology-driven banking platforms. Neobanks, also known as challenger banks or digital banks, have gained popularity for their innovative approach to digital banking. They operate exclusively in the digital realm, primarily through web and mobile applications, providing a wide range of financial products and services. These banks aim to deliver seamless, user-friendly experiences, often with lower fees and quicker transactions, catering to the evolving needs and preferences of consumers in an increasingly digital world.

Furthermore, neobanks leverage innovative technologies such as artificial intelligence, data analytics, and machine learning to personalize financial recommendations, enhance security, and streamline operations. This data-driven approach fosters a deeper understanding of customer behaviours, an accomplishment that traditional banks often struggle to achieve. These digital disruptors are poised to play a significant role in shaping the future of finance as they adapt to evolving consumer expectations and technological advancements.

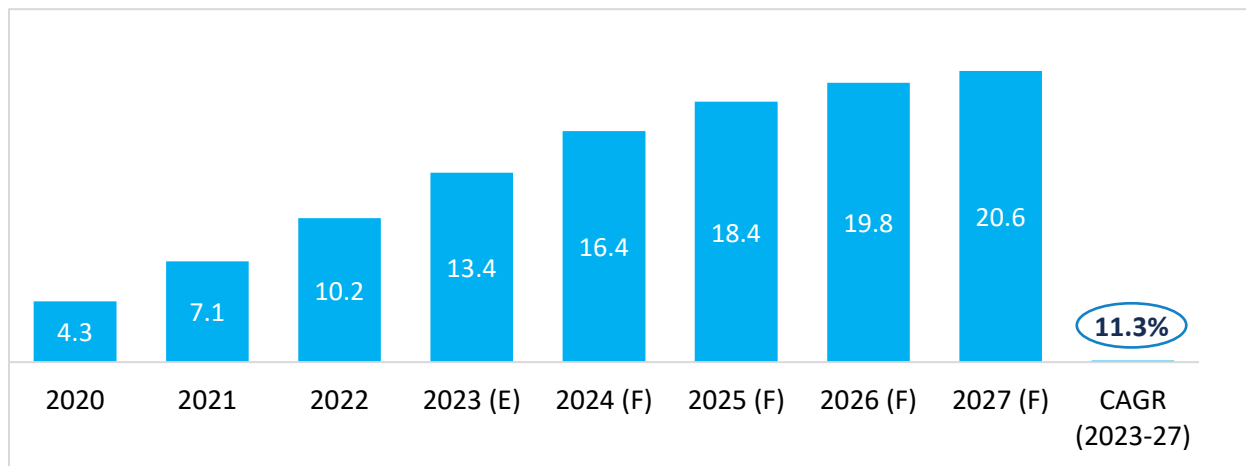
6.1.1. Global Neobanking Total Account Holders – Global and Country View

Neobank users are typically comfortable with digital technology, including smartphones and online platforms. They prefer to conduct their banking activities through mobile apps and websites. While neobank users can span different age groups, they often attract younger consumers, particularly millennials and Generation Z, who are early adopters of technology and open to alternative banking solutions. The rise in Neobank account holders is leading to a significant increase in the issuance of new-age payment cards. These cards offer innovative features, enhanced security, and seamless integration with digital services, catering to the evolving needs of modern consumers.

Exhibit 73: Global Neobanking Users by Region, 2020 – 2027 (Million)

Source: Frost & Sullivan Analysis

The worldwide count of neobanking account holders is estimated to be 244.1 million users in 2023, and it is projected to grow to 366.9 million users by 2027, reflecting a CAGR of 10.7% from 2023 to 2027.

Exhibit 74: India Neobanking Users, 2020 – 2027 (Million)

Source: Frost & Sullivan Analysis

In 2023, India is poised to have 13.4 million neobanking users, and it is set for significant expansion, with an estimated 20.6 million users by 2027, demonstrating a CAGR of 11.3% from 2023 to 2027. Small and medium-sized enterprises (SMEs) and entrepreneurs in the country frequently favour neobanking solutions for their business banking requirements due to their agility and accessibility. Additionally, the surge in mobile payments and digital wallets in India has heightened the demand for digital banking services. Neobanks often integrate with these platforms, offering users a comprehensive financial ecosystem, thereby driving the overall user base of neobanks.

Many neobank users highly value the personalized financial services and recommendations offered by neobanks, which utilize data and artificial intelligence to customize their offerings to individual needs. Neobank users also frequently appreciate the additional benefits derived from partnerships and

integrations with fintech companies, enabling them to access a more extensive array of financial products and services through neobank's platform.

However, there's a significant difference between global neobanking and the neobanking model in India. In many developed nations, financial regulators issue licenses to oversee neobanks. However, in India, neobanks have not yet received specific licenses or regulatory approvals. As a result, Indian neobanks, which are essentially FinTech companies, are not directly regulated by the Reserve Bank of India (RBI). Instead, they collaborate with licensed banks, NBFCs, and other financial institutions to offer financial services via digital platforms. These partnerships with traditional financial institutions are central to the neobanking model in India, distinguishing it from the global approach. Essentially, Indian neobanks operate as a technological layer on top of existing bank infrastructure. This structure significantly influences their capabilities, business models, and unit economics.

Rise in neobank users will significantly boost the issuance of credit cards

As neobanks attract more users, the market for credit cards expands accordingly. These users often seek comprehensive financial services, including credit cards, positioning neobanks as primary financial service providers. Neobanks seamlessly integrate credit cards into their digital platforms, offering easy card management, spending tracking, and mobile payments. This integration encourages users to adopt neobank-issued credit cards for convenience and enhanced user experience.

Neobanks also offer personalized credit card products tailored to individual customer profiles, increasing their appeal through customized rewards, credit limits, and benefits aligned with user spending habits. Known for innovative features like instant virtual cards, dynamic CVVs for added security, and real-time spending notifications, neobanks make their credit cards more attractive to potential users.

Utilizing targeted marketing strategies, neobanks reach potential customers through digital channels. Their accessibility, lower fees, and easier approval processes make it more likely for users to choose neobank credit cards over traditional options.

6.2. The Rise of Wearables Market

The emergence of the wearables market represents a pivotal moment in the tech industry's evolution, wherein technology seamlessly becomes an integral part of people's everyday lives, adopting new forms and functions. These sleek and sophisticated devices, frequently worn as accessories, offer an extensive array of applications that extend well beyond conventional fitness tracking. Wearable technology has experienced a surge in popularity in recent years, driven by advancements in sensors, connectivity, and battery longevity. Within the wearables market, there exists a broad array of devices, including smartwatches, fitness trackers, augmented reality glasses, and smart clothing. These gadgets establish a direct link between users and their digital world, facilitating health monitoring, real-time notifications, and novel interactions with their surroundings.

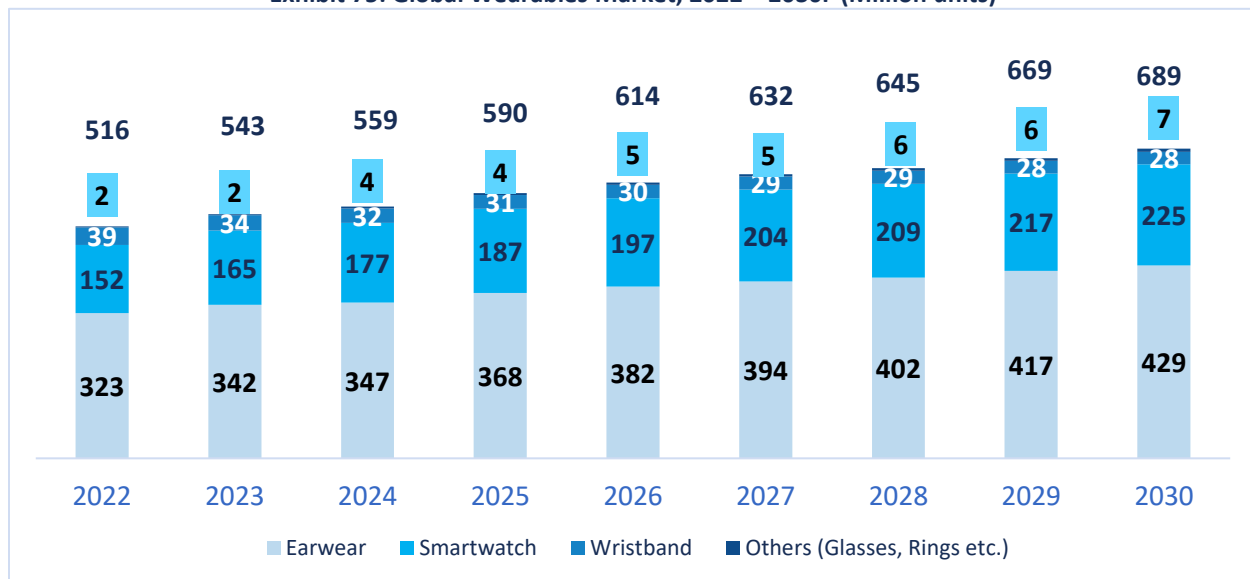
The growing emphasis on health and fitness stands out as a primary catalyst propelling the wearables market's ascent. Smartwatches and fitness trackers have evolved into indispensable tools for tracking physical activity, heart rate, sleep patterns, and more, empowering individuals to take control of their well-being and make informed lifestyle choices. In addition to their health benefits, wearables are

enhancing everyday routines. Smartwatches, for example, enable users to manage schedules, check emails, and control smart home devices directly from their wrists. This seamless integration of technology into people's everyday lives has the potential to streamline daily tasks, boosting overall efficiency.

As the wearables market continues to evolve, we strongly anticipate further advancements in miniaturization, prolonged battery life, and expanded functionality. The integration of AI and ML is expected to play a pivotal role in enhancing wearables, making them smarter and more intuitive. The rise of the wearables market signifies a transition toward a more interconnected and technology-driven future.

6.2.1. Global Wearables Unit Shipment

Exhibit 75: Global Wearables Market, 2022 – 2030F (Million units)



Source: Frost & Sullivan Analysis

The global wearables unit shipment is projected to reach 689 million units by FY2030 growing at a CAGR of 3.2% from 2025 to 2030. This substantial growth is attributed to the rising consumer inclination towards wearable technology. Customers are progressively seeking devices that offer multifunctionality, encompassing features such as fitness tracking, notifications, and the capability to make phone calls.

6.2.2. Decoding Growth Drivers and Trends

Market Drivers

Health and Fitness Focus: The health and fitness sectors play a pivotal role in the growth of the wearables market. Wearable devices, such as fitness trackers and smartwatches, provide users with the ability to monitor their physical activity, heart rate, and sleep patterns. The rising awareness of the importance of a healthy lifestyle and the increasing prevalence of chronic diseases have spurred the demand for wearables. These devices empower individuals to take control of their well-being, make informed lifestyle choices, and achieve their fitness goals. Furthermore, the integration of health-related features such as ECG monitoring, blood pressure measurement, and blood oxygen level tracking has made wearables even more attractive to consumers.

Convenience and Lifestyle Enhancement: Wearables have expanded beyond health and fitness into the broader realm of daily life. They offer features that streamline daily routines and enhance convenience. Smartwatches, for instance, allow users to manage schedules, receive real-time notifications, check emails, control smart home devices, and perform various tasks directly from their wrists. This seamless integration of technology into people's daily lives has the potential to make them more efficient and productive, driving demand for wearables. The convenience they offer for tasks, such as contactless payments, navigation, and hands-free communication, also contributes to their growing popularity.

Enterprise and Industrial Adoption: Wearables have found applications in various industries, including healthcare, manufacturing, logistics, and construction. Augmented reality (AR) glasses and other wearables are improving workplace efficiency by providing workers with real-time information, hands-free guidance, and remote collaboration capabilities. These devices reduce errors, increase productivity, and enhance safety, making them attractive tools for businesses. In healthcare, for example, medical professionals use wearables to access patient information and vital signs in real time, improving patient care and decision-making.

Technological Advancements: Continuous technological advancements in wearables, such as improvements in sensors, connectivity, and battery life, are key drivers of market growth. Wearable devices are becoming more sophisticated, capable of performing complex tasks, and offering a wider range of features. The integration of AI and ML is playing a pivotal role in making wearables smarter and more intuitive, further boosting their adoption.

Customization and Personalization: Wearable devices increasingly offer customization and personalization options, allowing users to tailor their experiences to their specific needs. Many wearables employ data analytics and AI to provide personalized services and recommendations concerning fitness routines, health monitoring, and lifestyle management. The ability to adapt and cater to individual preferences and needs has made wearables more appealing to users, as they can provide a more personalized and valuable user experience.

Contactless payment: Contactless payment technology is a significant driver for the adoption and growth of wearable devices. Wearables such as smartwatches and fitness trackers equipped with NFC (Near Field Communication) capabilities allow users to make quick, secure, and convenient payments with just a tap. This integration enhances the functionality and appeal of wearables, positioning them as not just fitness and health tracking devices, but also as powerful tools for seamless, everyday transactions. The convenience of not needing to carry physical wallets or even smartphones for payments makes wearables an attractive option for consumers seeking efficiency and ease. Additionally, the rising acceptance of contactless payments at retail and transit points further propels the demand for wearable devices, driving innovation and expanding their market presence. As a result, the synergy between contactless payments and wearable technology continues to revolutionize the way people interact with their finances and technology.

Market Trends

Health Monitoring and Medical Integration: Wearables are increasingly shifting their focus towards health monitoring and medical integration. This trend is driven by the growing demand for personalized health management. Wearable devices now offer features such as continuous heart rate monitoring, ECG (electrocardiogram) recording, blood pressure measurement, and blood glucose tracking. Some wearables can even detect early signs of medical conditions, such as irregular heart rhythms. Medical

professionals are using wearables to remotely monitor patients and receive real-time health data. The integration of wearables into telehealth and telemedicine has become a significant trend, especially in the wake of the COVID-19 pandemic, making healthcare more accessible and convenient.

Wearable Ecosystems and App Integration: Wearables are increasingly becoming part of a broader ecosystem, working in tandem with smartphones and other smart devices. This trend has led to seamless integration with various apps and services. Smartwatches, for instance, offer users the ability to access and control third-party apps, receive notifications, and even make payments directly from their wrists. Wearables are being designed to complement and extend the functionality of smartphones, offering a more comprehensive user experience. This ecosystem approach enhances the versatility and value of wearables.

Fashion and Style in Wearables: The aesthetics of wearables are evolving, and manufacturers are placing a stronger emphasis on design and style. Wearables have transitioned from purely functional devices to fashionable accessories. Manufacturers are collaborating with fashion brands and designers to create wearables that cater to diverse consumer preferences. Smartwatches are available in a wide range of styles, materials, and brands, allowing users to choose a device that complements their personal fashion sense. The integration of technology and fashion has made wearables more appealing and suitable for everyday wear.

Sports and Active Lifestyle Applications: Wearables have found a significant niche in sports and active lifestyle applications. Fitness trackers, sports smartwatches, and specialized wearables designed for athletes have gained popularity. These devices offer features such as GPS tracking, performance analysis, and coaching in various sports and physical activities. Wearables help individuals set and achieve fitness goals, monitor their progress, and enhance their sports performance. The data collected by wearables is not only empowering individuals but also providing valuable insights to sports teams and coaches.

Environmental and Sustainability Concerns: There is a growing awareness of the environmental impact of consumer electronics, including wearables. Manufacturers are increasingly focusing on sustainable materials, energy-efficient designs, and recyclability. Eco-friendly materials and production methods are being used to reduce the carbon footprint of wearables. Consumers are showing interest in wearables that align with their sustainability values. Some companies have introduced buyback programs for old wearables, encouraging users to recycle their devices responsibly. This trend reflects the broader shift toward more sustainable and eco-conscious technology.

6.2.3. Wearable Technology: A Growing Payment Opportunity

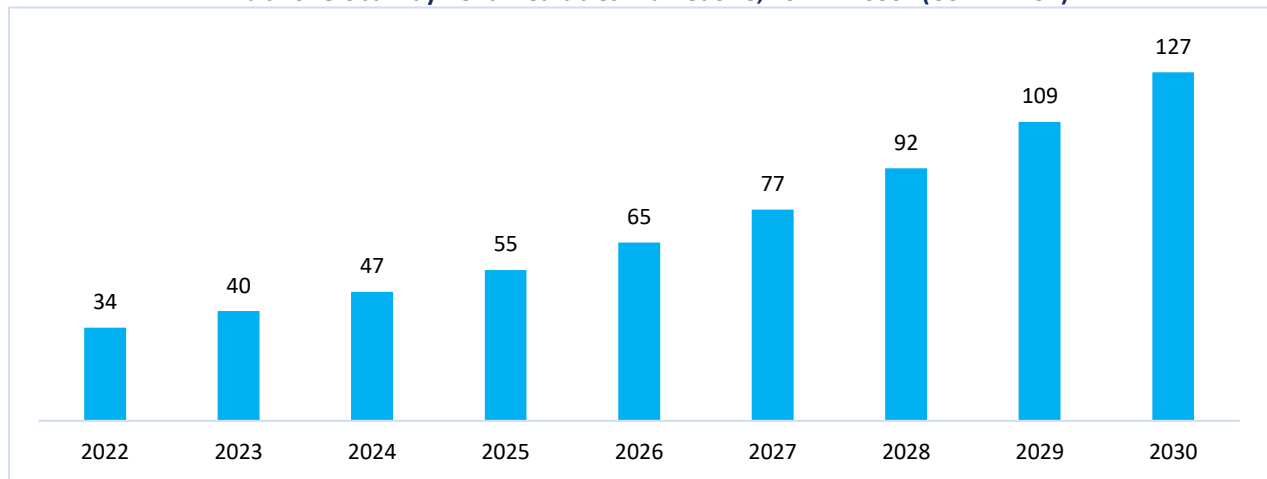
Smart devices like wearables are making contactless payments and checking account balances, eliminating the need to use banking applications.

Wearable payments are contactless transactions that consist of users making purchases with smart devices and accessories that they wear. These devices (smartwatches, belts, rings, fitness trackers) use mobile payment applications to connect with the consumer's bank account and process transactions. To make payments, users link their credit card, debit card, or bank account to the device. Then, the user can tap the device at a payment terminal to make purchases. To enable payments, wearables harness the following technologies: Host card emulation (HCE), Contactless PoS, Barcode, RFID, NFC etc.

Wearable payment devices are unlocking several benefits, like access to extensive user data for banking firms and fintech firms, personalization of customer experience, and an omnichannel user experience.

6.2.4. Global Payment Wearables Market Size

Exhibit 76: Global Payment Wearables Market Size, 2022 – 2030F (USD Million)



Source: Frost & Sullivan Analysis

The global payment wearables market size is projected to reach USD 127 million by FY2030 growing at a CAGR of 18% from FY2025 to FY2030.

Wearable Payment Devices

Smartwatches

Smartwatches use NFC technology to communicate with other NFC-enabled devices, including smartphones or contactless payment devices. To enable contactless payment through smartwatches, users have to link the device to a credit card and bank account, and then tap the device in the payment terminal once it finishes shopping in a store.

Smart Ring

Smart rings are wearable devices that are embedded with sensors or NFC chips that are used for different type of applications like tracking daily activities; digital payments, access control, and more. Connectivity technology is another prerequisite to enable sensors integrated in the smart ring to collect data. For example, Bluetooth is being implemented to synchronize smart rings with smartphone applications. With data collected, users can receive personalized recommendations. Contactless payment ring is a new trend. These smart devices allow customers tap-to-pay transactions over contactless payment terminals

Others

Biometric wearables for connected workplace like Nymi are wearable wristbands that used for secure hands-free authentication. Industries like healthcare, biotech require authentication to access secure systems. Through Contactless credential readers, connected to Bluetooth, contactless authentication is ensured.

In an age characterized by technological innovation, people's everyday life is increasingly intertwined with digital solutions. One such pioneering advancement is wearable technology, which has now become a significant avenue for enhancing convenience and efficiency. Beyond its notable role in promoting health and fitness, wearables are forging a promising path in the realm of digital payments, offering new possibilities to both consumers and enterprises. Wearable technology is increasingly emerging as an expanding frontier for digital payments, presenting users with the advantages of seamless and secure transactions, unparalleled convenience, and integration into burgeoning technological ecosystems.

Facilitating Seamless and Secure Transactions: Wearable technology, encompassing devices such as smartwatches, fitness bands, and even smart clothing, now boasts contactless payment capabilities. These devices empower users to complete transactions with a simple tap or gesture, obviating the need for traditional payment methods such as cash or physical cards. This contactless payment feature not only expedites the checkout process but also augments security through tokenization and encryption, rendering it a safer choice for users.

Embracing the Convenience Factor: The allure of wearables primarily resides in their unparalleled convenience. Payment-enabled wearables eliminate the need for users to reach for their wallets or smartphones, streamlining transactions across various settings, be it a retail store, a coffee shop, or a public transportation terminal. This hands-free and hassle-free approach has garnered immense popularity, especially in scenarios where expeditiousness and efficiency are paramount.

Integration into Expanding Technological Ecosystems: Wearable technology is increasingly becoming an integral component of broader technological ecosystems. These wearable devices are meticulously designed for seamless integration with smartphones and other smart devices, spanning an array of applications, including payment processing. Users are afforded the ability to link their wearables with mobile payment apps, banking applications, and additional financial services, culminating in the creation of a unified and comprehensive financial ecosystem. This further enhances the versatility of wearables, positioning them as centralized hubs for a myriad of digital activities.

Contemplating the Future of Wearable Payments: The future of wearable payments holds immense promise. As technology continues to evolve, there is a prospect of even more sophisticated and versatile wearable devices, which may include AR glasses, smart jewellery, and deeper integration with the Internet of Things (IoT). Wearables are well-poised to revolutionize not only how transactions are conducted but also how individuals interact with their surroundings. The future of payments appears not only more efficient but also increasingly stylish and sophisticated.

Industry Challenges and threats for growth in Payment Wearables

The growth of payments technology in wearables faces several significant threats and challenges.

Technological Challenges

Battery Life: Wearables have limited battery life, and adding payment functionality can drain the battery faster. Ensuring efficient power usage is crucial.

Hardware Limitations: The small size of wearables restricts the integration of powerful hardware, affecting processing power and storage capacity. Designing durable and secure payment components that fit into compact wearable devices is challenging.

Interoperability: Ensuring that wearables are compatible with a wide range of payment systems, point-of-sale (POS) terminals, and banks can be complex. Fragmentation in payment standards and technologies can hinder seamless user experiences.

Data Security: Ensuring robust encryption and security protocols is essential. Storing sensitive payment information securely on wearables is a concern.

Privacy Issues: Continuous tracking and data collection by wearables raise privacy concerns among users. Ensuring user consent and data protection is vital. Users may be wary of sharing payment and personal data through wearables due to fears of misuse.

Regulatory Compliance: Navigating the regulatory landscape for payments technology in different regions can be complex. Compliance with financial regulations and data protection laws is necessary.

Authentication and Verification: Ensuring secure and user-friendly authentication methods (e.g., biometrics, PINs) that comply with regulatory standards is crucial.

POS Terminal Availability: Ensuring a sufficient number of merchants have the necessary POS infrastructure to accept wearable payments is critical. Upgrading existing POS systems to support NFC and other payment technologies used by wearables can be costly and time-consuming.

While payments technology in wearables presents exciting opportunities for convenience and innovation, it also faces significant threats and challenges. Addressing technological limitations, ensuring robust security and privacy, navigating regulatory landscapes, driving consumer adoption, and building a supportive infrastructure are key to overcoming these challenges and fostering the growth of wearable payments.

6.3. India's Aadhaar System: Bringing E-Government to Life

India's Aadhaar system has spearheaded a paradigm shift in e-government, bringing efficiency and transparency into public service delivery. Launched in 2009, Aadhaar is an exclusive identification system that allocates a 12-digit number to residents, connecting biometric and demographic data. This digital identity serves as a gateway to diverse government services, encompassing financial transactions, healthcare, and social welfare.

The Aadhaar system has adeptly streamlined processes by reducing bureaucracy and eliminating redundancies. It facilitates seamless direct benefit transfers, ensuring targeted recipients receive subsidies and entitlements, thereby minimizing leakages and corruption. Through the digitization and centralization of information, Aadhaar has elevated data accuracy, fostering enhanced policy planning. Despite concerns surrounding privacy and security, Aadhaar stands as a compelling exemplar of how technology can reshape governance, rendering services more accessible and responsive to citizens' needs.

As India progressively integrates digital solutions, Aadhaar remains pivotal in its journey towards a more efficient and inclusive e-government ecosystem.

6.3.1. A Trusted Digital Identity

Aadhaar at a Glance

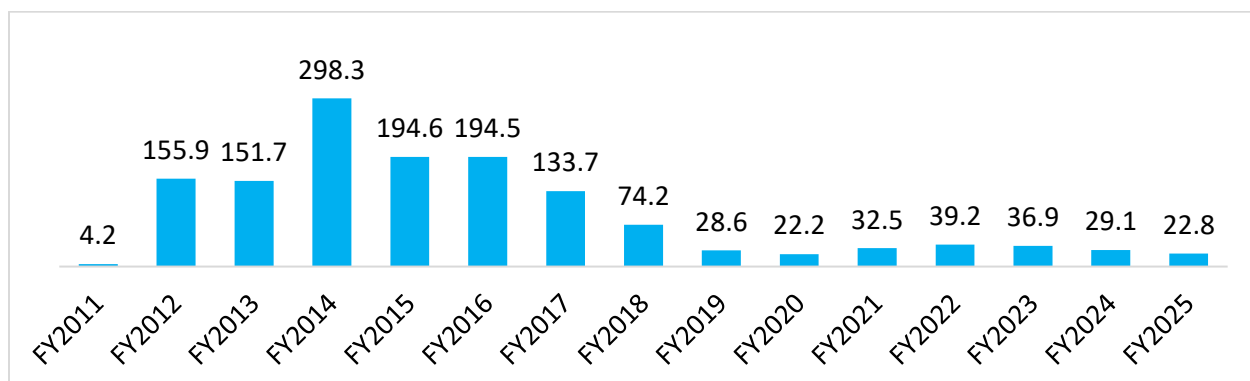
In 2009, when the concept of Aadhaar took shape, it was identified that approximately 400 million individuals in India lacked individual identity documents, and merely 17% of the population held bank accounts. Despite a staggering USD 50 billion expenditure on subsidies, rampant diversion, and leakage, ranging from 10-60% depending on the program, prevailed. India urgently required a secure, reliable method to provide a unique identity to its rapidly growing population, some without any supporting documentation. Allocating Rs 100 crore (USD 13 million), the Indian government initiated the Unique Identification Project, establishing the Unique Identification Database Authority of India (UIDAI). This autonomous entity engaged volunteers with domain expertise to design the Aadhaar system. Fourteen years later, Aadhaar has documented almost 95% of India's population, offering a secure, unforgeable digital identity to each user.

Aadhaar significantly reduced the cost of identity, which granted millions direct access to government subsidies without intermediaries, enabling the first-time access to affordable formal financial services, such as bank accounts, and providing means to validate existence for fundamental rights such as voting, education, and employment. For the Indian government, Aadhaar curtailed costs and leakages in managing the world's largest social subsidy program. The World Bank's Digital Dividend Report estimated potential annual savings of USD 10 billion through Aadhaar usage.

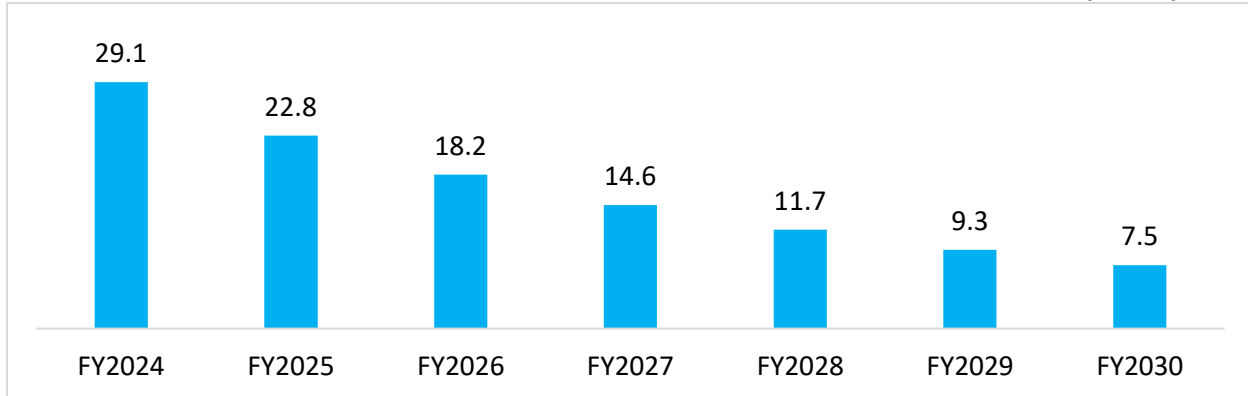
Considering India's diversity, the Aadhaar system strategically leveraged existing government and private agency infrastructure. The project involved ecosystem partners, including enrolling agencies, certification bodies for enrolment officers, and technology providers, fostering innovation such as the Aadhaar payment bridge. This innovation, integral to the Digital Direct Benefit Transfer in India, streamlined government-user transactions, eliminating layers of intermediaries.

6.3.2. Total Aadhaar Cards Generated

Exhibit 77: Total Number of Aadhaar Cards Generated across India from FY 2011 to FY 2025 (Million)



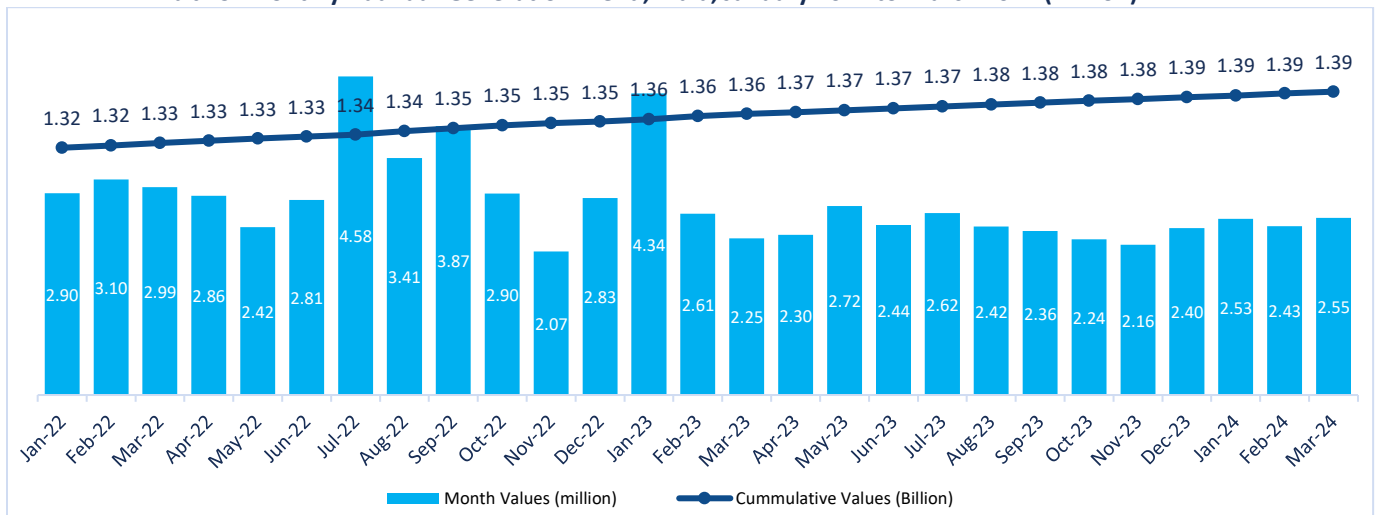
Source: UIDAI, Frost & Sullivan Analysis

Exhibit 78: Total Number of Aadhaar Cards Generated across India from FY2024 to FY2030 (Million)

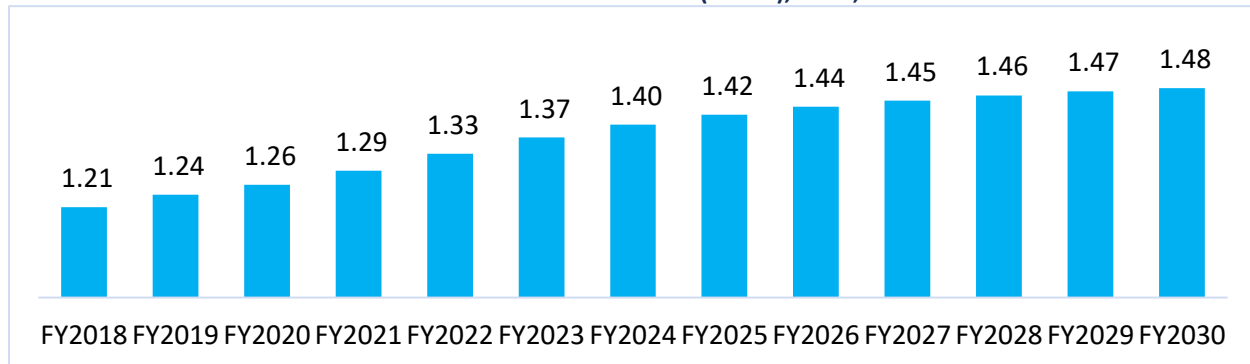
Source: UIDAI, Frost & Sullivan Analysis

In recent years, the number of Aadhaar cards issued annually in India has seen a notable decline. This trend is primarily attributed to the widespread penetration and near-saturation of Aadhaar coverage across the country. In the fiscal year 2024 and 2025, approximately 29.1 and 22.8 million Aadhaar identification cards respectively were generated in India. The highest number of Aadhaar cards were produced in the fiscal year 2014 within the documented timeframe. As of financial year, ending March 2025, a total of approximately 1.42 billion Aadhaar cards have been generated.

6.3.3. Aadhaar Generation Trend – Monthly Values (January 2022 – September 2023)

Exhibit 79: Monthly Aadhaar Generation Trend, India, January 2022 to March 2024 (Million)

Source: UIDAI Annual Report 2023-2024, Frost & Sullivan Analysis

Exhibit 80: Total Aadhaar Cards in Force (billion), India, 2018 – 2030F

Source: Frost & Sullivan analysis

The total number of Aadhaar cards in circulation in India increased from 1.21 billion in 2018 to 1.4 billion in 2024. As per projections this is expected to increase to 1.48 billion by 2030.

Industry Challenges and threats for growth in Aadhaar Cards in India

The growth of Aadhaar cards in India faces several threats and challenges. Here's an analysis of the major threats and challenges:

Privacy Concerns:

- **Data Security:** Breaches or unauthorized access to Aadhaar data can lead to identity theft and misuse of personal information. Ensuring robust cybersecurity measures is essential.
- **Consent and Control:** Concerns over individuals' control over their own data and how it is shared or used by third parties.

Inclusion and Accessibility:

- **Digital Divide:** Limited access to technology in rural and remote areas hinders the enrollment process.
- **Enrollment Errors:** Inaccuracies during the enrollment process, such as errors in data entry or biometric capture, can lead to issues in authentication and usage.

Legal and Regulatory Challenges:

- **Court Rulings:** Judicial scrutiny and rulings can impact the mandatory use of Aadhaar for various services and schemes.
- **Compliance:** Ensuring all entities using Aadhaar for verification adhere to legal and regulatory standards.

Public Perception:

- **Trust and awareness:** Public trust in the system can be eroded by incidents of data breaches or misuse. Further, lack of awareness about the benefits and uses of Aadhaar can affect its adoption.

Operational Challenges:

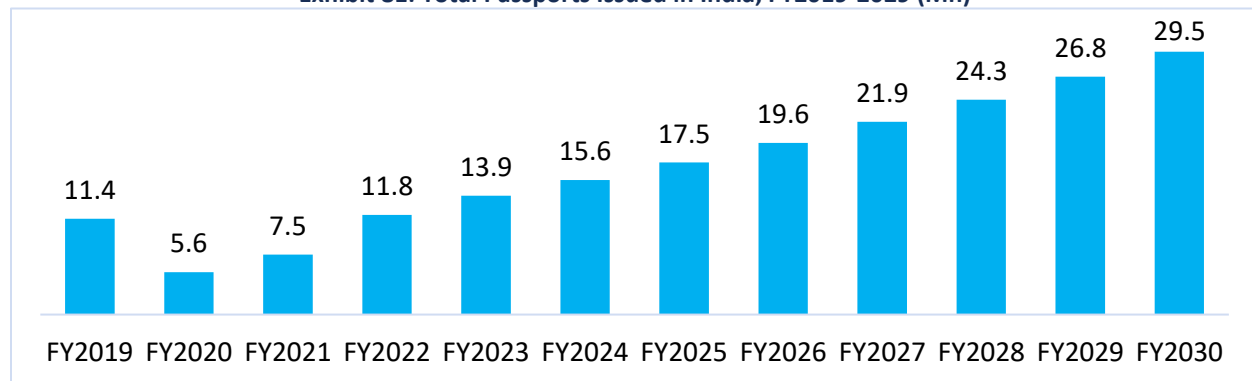
- **Infrastructure:** Maintaining and upgrading the infrastructure required for Aadhaar enrollment and verification.
- **Interoperability:** Ensuring Aadhaar systems work seamlessly with other governmental and private databases.

6.4. Global & India Passport and ePassport Market

In an era marked by increasing globalization, the significance of passports transcends mere travel documents; they have become symbols of mobility, opportunity, and identity. The past few decades have witnessed a remarkable surge in the issuance of passports globally, reflecting shifting geopolitical dynamics, economic aspirations, and technological advancements.

6.4.1. Passport Market in India

Exhibit 81: Total Passports Issued in India, FY2019-2029 (Mn)



Source: Frost & Sullivan

The burgeoning passport issuance market in India underscores the country's integration into the global community and the aspirations of its citizens to explore new horizons. As India takes its place on the world stage, the ability of its people to traverse borders with ease serves as a testament to the nation's dynamism, diversity, and potential for prosperity in an interconnected world. The country witnessed a total of 13.9 and 15.6 million passports being issued in FY23 and FY24, and the same is expected to grow to 29.5 million by 2030.

6.4.2. Decoding growth drivers and trends

The Passport and ePassport market stand at the forefront of global travel document innovation, embodying the evolving landscape of secure identification. As the demand for heightened security and streamlined border control intensifies, traditional passports are undergoing a transformative shift towards electronic passports (ePassports). This market segment encapsulates cutting-edge technologies, including biometric features and secure microchips, ensuring enhanced authentication, and reducing the risk of identity fraud. The surge in international travel, coupled with governmental initiatives for robust identity verification, propels the ePassport market into a pivotal role. Additionally, the standardization of ePassport specifications by international organizations contributes to a more interconnected and interoperable global travel document system.

Market Drivers

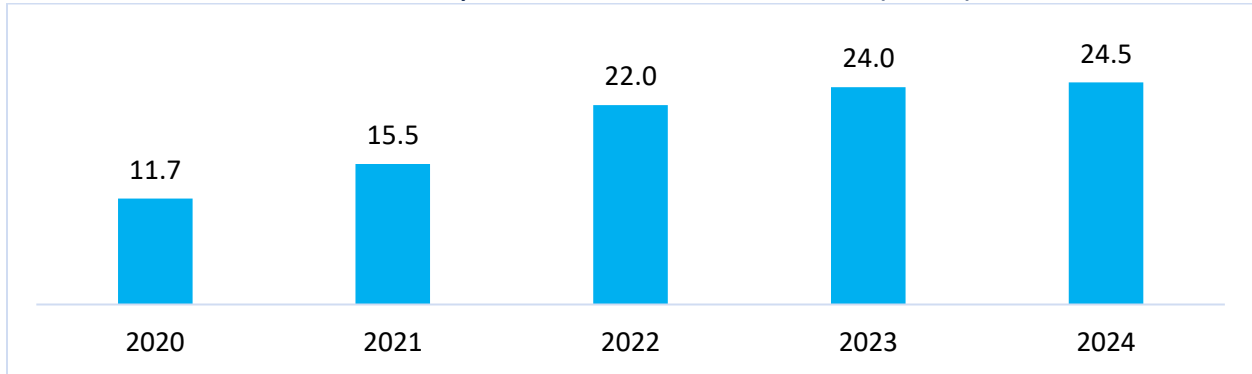
Enhanced Security Features: The primary catalyst for the widespread adoption of ePassports lies in the integration of cutting-edge security measures. In contrast to conventional passports, ePassports come equipped with embedded microchips that store biometric data, including fingerprints and facial recognition information. This technological leap significantly fortifies the authentication process, rendering it more secure and resilient against identity fraud. The utilization of robust encryption adds an extra layer of protection to the stored data, establishing ePassports as a powerful tool for governments aiming to enhance national security and safeguard the integrity of their border control systems.

Global Standardization and Interoperability: The International Civil Aviation Organization (ICAO) has instituted global benchmarks for ePassports, fostering consistency and seamless interoperability. This standardized approach is pivotal as it facilitates smooth communication among different nations' passport systems. It ensures that ePassports from diverse countries conform to shared specifications, thereby streamlining international travel in an efficient and secure manner. The momentum towards a standardized methodology encourages governments to invest in ePassport technology, contributing to its widespread adoption on a global scale.

Streamlined Border Control Processes and Efficiency: ePassports play a crucial role in optimizing border control procedures, enhancing efficiency in immigration processes. Automated systems, exemplified by electronic gates (eGates), expedite identity verification for travellers, resulting in quicker and smoother processing. This acceleration not only improves the overall travel experience for individuals but also tackles the challenges presented by the escalating volume of international travel. Governments, cognizant of the imperative for efficient border control mechanisms, view ePassports as a technological solution to meet this demand, positioning them as a pivotal driver in the modernization of immigration procedures.

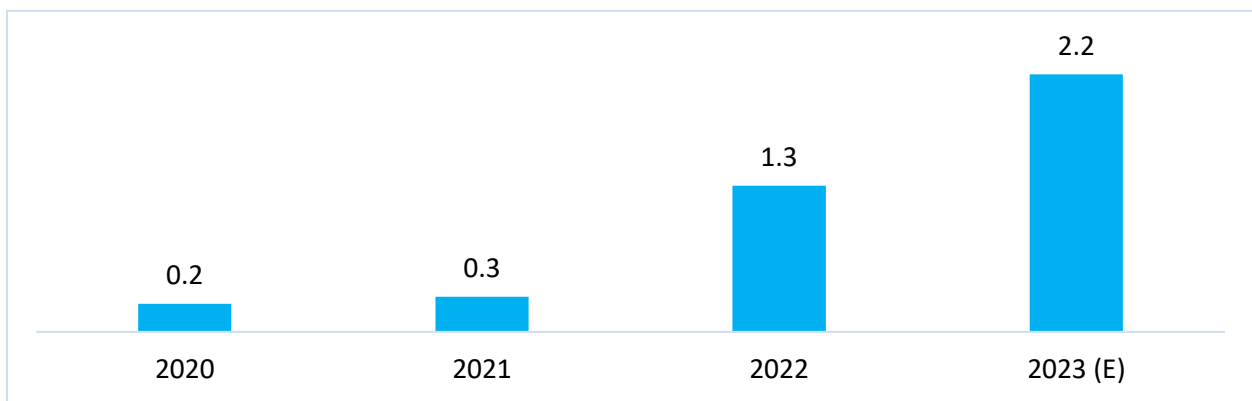
6.4.3. Passport Market Overview

Exhibit 82: Passports Issued in the U.S., 2020 to 2024 (Million)



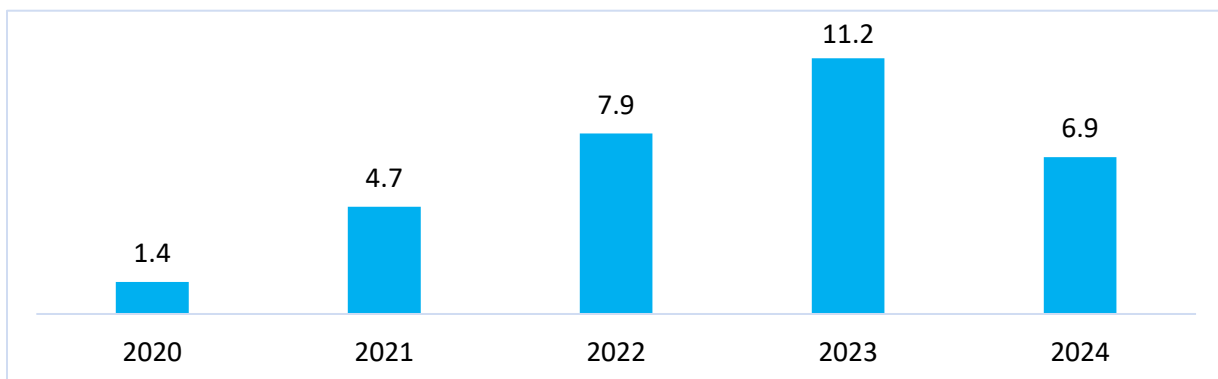
Source: Travel.State.Gov., Frost & Sullivan Analysis

Exhibit 83: Passports Issued in Singapore, 2020 to 2023 (Million)



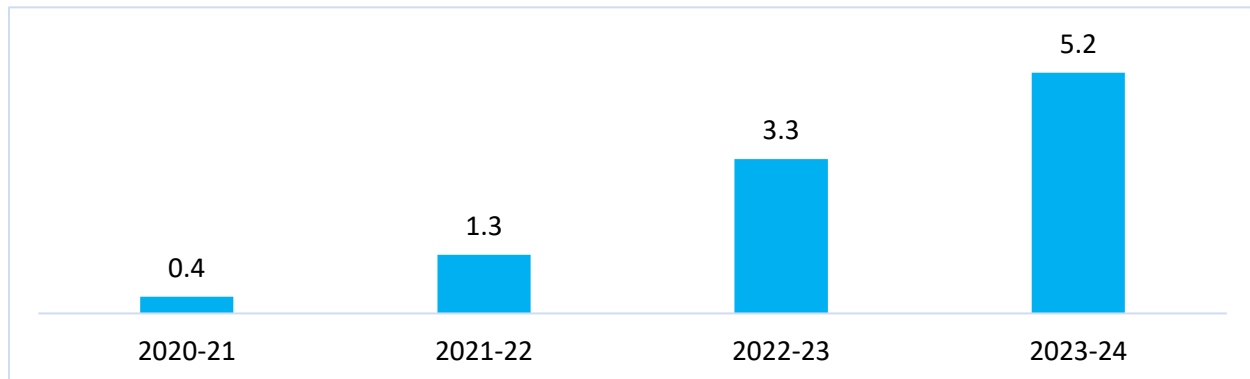
Source: Government of Singapore/ICA, Frost & Sullivan Analysis

Exhibit 84: Passports Issued in UK, 2020 to 2024 (Million)



Source: GOV.UK, Frost & Sullivan Analysis, <https://www.gov.uk/government/publications/passports-and-citizenship-data-q4-2024>

Exhibit 85: Passports Issued in Canada, 2020 to 2024 (Million)



Source: Canada.ca, Frost & Sullivan Analysis

6.4.4. Global e-Passport Market Overview

An ePassport is a blend of traditional paper and electronic passport, featuring an RFID chip and an embedded antenna. This chip stores the personal details and biometric data of the passport holder. The ePassport market is anticipated to grow significantly both globally and in India, driven by enhanced security needs, technological advancements, and proactive government initiatives. As global connectivity increases and security concerns escalate, the demand for ePassports is projected to rise continuously.

Currently, over 140 entities, including states and organizations like the United Nations and the European Union, issue ePassports, with more than 1 billion ePassports in circulation worldwide. In India, the issuance of ePassports is being implemented in phases, with citizens receiving ePassports as their local passport offices become equipped for this technology. The nationwide rollout is expected to take several months.

Decoding Growth Drivers:

Security Concerns: The growing threats of terrorism and identity theft have heightened the need for more secure travel documents. ePassports enhance data integrity by storing information both in printed form and digitally signed in the chip, allowing for secure authentication by immigration officials worldwide. This reduces the risk of forgery and fraudulent activities.

Technological Advancements: Advances in biometric technology and electronic chip capabilities are accelerating the adoption of ePassports.

Government Initiatives: Governments, including India, are actively promoting ePassports to streamline border control processes and enhance security.

Rising International Travel: The increase in global tourism and business travel fuels the demand for secure and efficient travel documents, supporting the growth of ePassports.

Consumer Demand for Convenience: Travelers prefer the convenience and quicker processing times offered by ePassports, which contribute to a smoother travel experience.

6.5. Driving License Market Overview

In India, there has been a noticeable surge in the issuance of driving licenses in recent years, indicative of various societal and economic shifts. One prominent factor contributing to this trend is the country's rapid urbanization, accompanied by an increasing need for personal mobility. As urban centers expand and transportation infrastructure improves, more individuals are opting for driving as a convenient mode of commuting. Additionally, the growing penetration of motor vehicles across different socioeconomic segments has heightened the demand for licensed drivers. Furthermore, government initiatives aimed at promoting road safety and compliance with traffic regulations have spurred individuals to obtain formal driving training and licenses. Moreover, the advent of digital services and online application processes has streamlined the licensing procedure, making it more accessible and efficient for aspiring drivers.

The issuance of driving licenses is also influenced by various demographic factors, including the working-age population and the young population. As more people enter the working age population, there is a higher demand for commuting to work. Many jobs require employees to have a driver's license, especially if the job involves travel or is located in areas with limited public transportation. Further, a larger working-age population can stimulate economic growth, leading to increased disposable income. This can result in more people affording cars and, consequently, needing driving licenses. With India adding 12 million individuals to the working population each year, the share of the working-age population is predicted to rise from 66.77 % in CY 2018 to 68.25% in 2024 and 68.94% by CY2030.

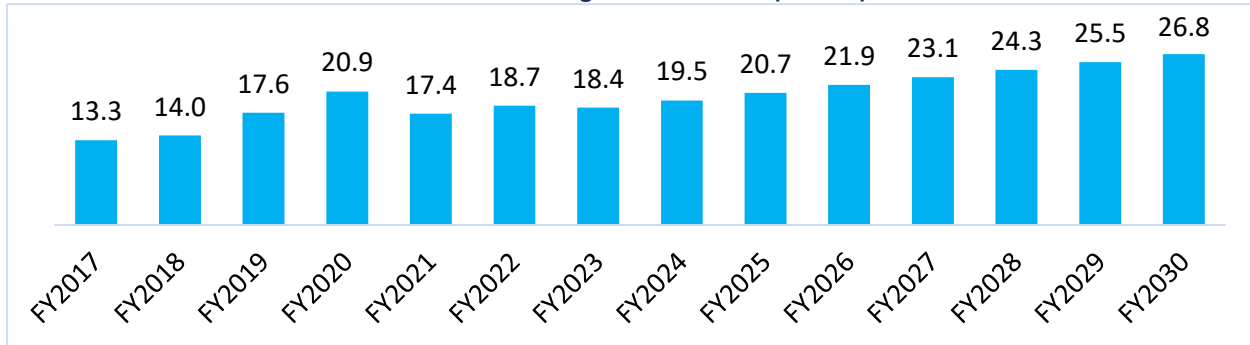
Increase in young population also drives the issuance market, as young people reaching the legal driving age create a natural demand for driving licenses. This demographic is the primary source of first-time drivers. Further, social activities, schooling, and part-time jobs often necessitate driving. The need to participate in these activities drives the younger population to obtain driving licenses.

Polycarbonate cards for Registration Certificate (RC) and driving licence as a key driver

The government recently opted to introduce high-security QR-coded polycarbonate cards for both Registration Certificates (RC) and driving licenses, replacing the current laminated ones. Polycarbonate driving licenses, composed of multiple layers fused together under heat and pressure, offer enhanced security features. These layers are non-delaminable, making any alteration to the document's information or photos extremely difficult without causing irreparable damage. The adoption of polycarbonate cards brings several benefits, such as heightened durability and improved security for identification purposes. Consequently, it reduces the necessity for card re-issuance throughout the validity period, thereby enhancing the overall citizen experience.

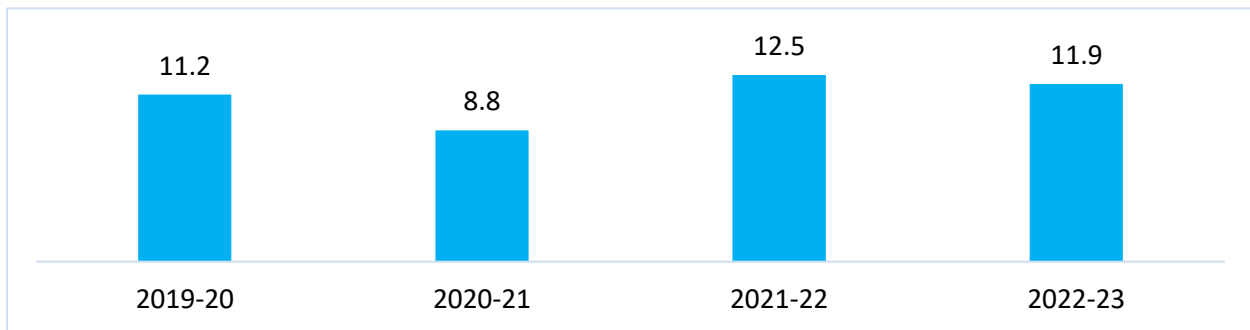
The transition to polycarbonate cards for driving licenses (DL) and registration certificates (RC) not only benefits citizens during initial issuance but also presents an opportunity for card manufacturers during renewal processes.

States like Maharashtra, Chhattisgarh and Kerala in India are actively mulling or are in process of issuing driving licences and registration certificates on polycarbonate-based cards.

Exhibit 86: India: Total Driving Licenses Issued (Million) 2017-2030F

Source: Frost & Sullivan

The country has a total of 18.4 million issued licenses in FY23, and the same is expected to grow to 26.8 million by 2030.

Exhibit 87: New Driving Licenses Issued in UK., Annually from 2020 to 2023 (Million)

Source: GOV.UK, Frost & Sullivan Analysis

Industry Challenges and threats for growth in DLRC in India

The growth of driving license registration certificates in India faces several threats and challenges. Here's an analysis of the major threats and challenges:

Fake Licenses:

- **Fake Licenses:** The existence of counterfeit driving licenses undermines the integrity of the licensing system.

Technological Barriers:

- **Digital Literacy:** Limited digital literacy can affect the adoption of online services for driving license applications and renewals.
- **System Integration:** Ensuring the integration of state-level transport department systems with centralized databases.

Regulatory and Compliance Issues:

- **Standardization:** Variations in procedures and regulations across different states can complicate the process.
- **Legal Enforcement:** Ensuring strict enforcement of traffic laws and penalties for violations.

Infrastructure and Resources:

- **Testing Facilities:** Adequate infrastructure for driving tests and vehicle inspections is necessary for a robust licensing system.
- **Human Resources:** Trained personnel are required for efficient management of the registration and licensing processes.

Public Education:

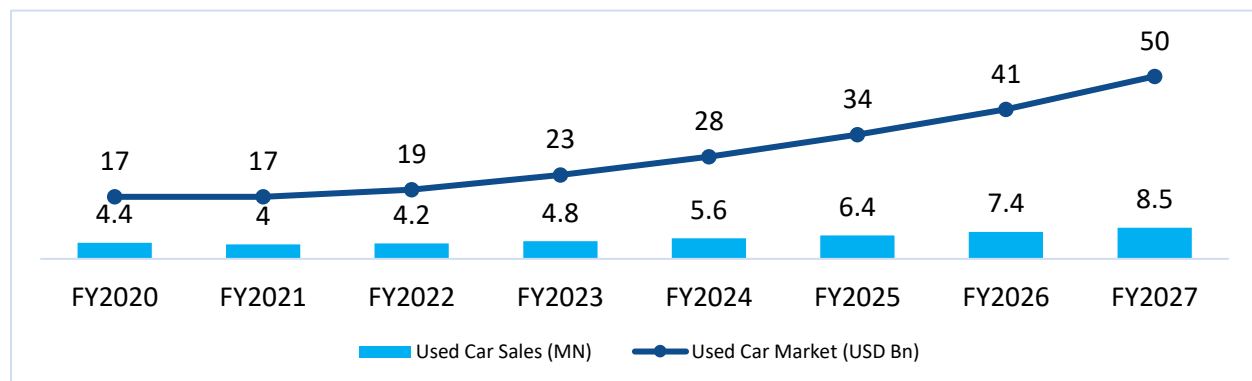
- **Information Dissemination:** Ensuring that applicants are well-informed about the procedures and requirements for obtaining and renewing licenses.

Adoption of New Technologies:

- **E-Licensing:** Transitioning to digital platforms for licensing and vehicle registration requires investment and adaptation to new technologies.

While Aadhaar cards and driving license registration certificates are crucial for identity verification and legal driving, their growth faces significant threats and challenges. Addressing privacy concerns, improving accessibility, ensuring robust legal and regulatory frameworks, combating fraud and corruption, and investing in infrastructure and technology are essential to overcome these challenges and ensure the effective implementation and adoption of these systems.

Exhibit 88: Used Cars sold to inch towards 2x of new cars sold, India, FY2020-27



Source: Frost & Sullivan analysis; Secondary sources

Growth in Automobile Sales as a key driver

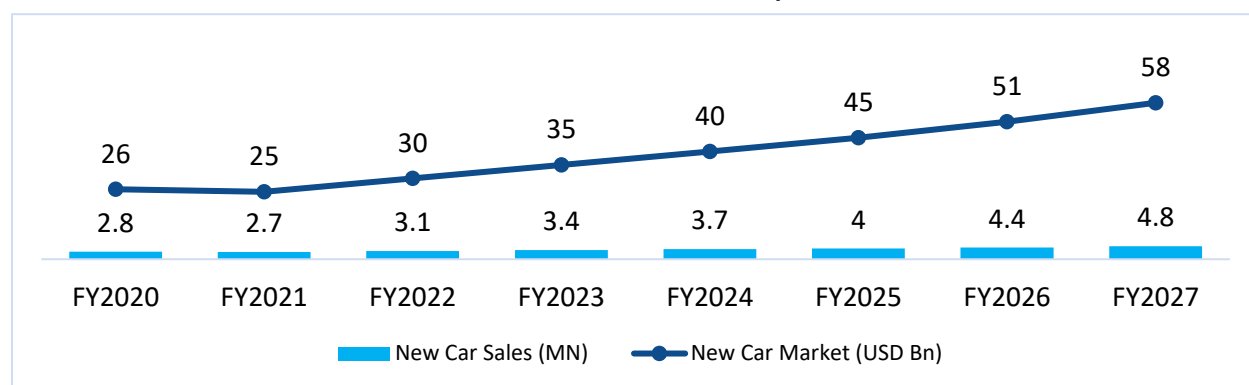
There's a remarkable surge in the market for used cars in India. Over the past few years, this segment has witnessed significant growth, indicating shifting consumer preferences and market dynamics.

Several factors contribute to this remarkable rise. Firstly, the increasing purchasing power of the middle class has expanded the pool of potential buyers for automobiles. However, rather than solely opting for brand new vehicles, many consumers are turning to the second-hand market for cost-effective alternatives.

Furthermore, the proliferation of online platforms dedicated to buying and selling used cars has revolutionized the way transactions occur in this market. These platforms offer transparency, convenience, and a wide selection of vehicles, thereby attracting a growing number of buyers and sellers.

The increasing reliability and durability of modern cars also play a crucial role in driving the demand for used cars. As vehicles become more resilient and require less frequent replacements, consumers are more inclined to invest in pre-owned models with confidence.

Exhibit 89: New Car Market to reach USD 58 bn by FY27, India, FY2020-27



Source: Frost & Sullivan analysis; Secondary sources

The automotive sales in India have been witnessing a notable uptick in recent times, reflecting a combination of factors that are reshaping the market landscape. One significant driver is the country's economic growth, accompanied by a burgeoning middle class with rising disposable incomes. This demographic shift has propelled increased demand for personal transportation, including cars and two-wheelers, as symbols of mobility and status. Furthermore, the expansion of urban centers has led to greater accessibility to automotive financing options and improved infrastructure, making vehicle ownership more feasible for a broader segment of the population. With ongoing advancements in technology, coupled with favorable government policies promoting domestic manufacturing and electric mobility, the automotive sector in India is poised for continued growth and evolution in the years to come.

Since the market for new vehicles as well as used cars are gaining momentum, it bodes well for vendors in the Registration Certificate (RC) market.

6.6. Cheque Books in India

In India, banking cheque books remain an integral part of the financial ecosystem, especially for businesses and government transactions. Despite the surge in digital payment methods, cheque books

continue to hold relevance due to their perceived security and trustworthiness, particularly for high-value transactions. Businesses, institutions, and individuals in rural and semi-urban areas still rely on cheques for their financial dealings. Innovations such as the Cheque Truncation System (CTS) have modernized cheque processing, enhancing efficiency and reducing clearing times. The future of cheque books in India will likely see a continued role, coexisting with the expanding digital payment landscape.

Key Growth Enablers of Bank Cheque Books

The growth drivers of bank cheque books in India are influenced by several factors, despite the increasing prevalence of digital banking. Here are the key drivers:

Continued Relevance of Cheques

- **For secure and high value transactions:** Cheques are considered a secure method for conducting transactions, especially for high-value payments. Unlike cash, which can be lost or stolen, cheques are linked to a bank account and can be tracked, making them a preferred choice for businesses and individuals alike.
- **Documentation and record keeping for business transactions:** Many businesses still rely on cheques for payments, as they provide a formal record of transactions. This is particularly important for large payments, where a cheque serves as documentation that can be useful in disputes or for accounting and legal purposes.
- **Customer Demand and certain demographics:** There remains a significant customer base that prefers using cheques over digital methods, either due to lack of access to technology or personal preference. Further, certain demographics like older generations, may be less comfortable with digital banking, continue to use cheques for their financial transactions. This demographic often prefers the tangible nature of cheques over digital alternatives.
- **Rural Areas:** In many rural regions, where digital literacy and access to technology may be limited, chequebooks remain a popular payment method. Residents often rely on cheques for transactions due to their familiarity and the lack of digital banking infrastructure.

Regulatory Support

- **Banking Regulations:** The Reserve Bank of India (RBI) has established guidelines that encourage banks to provide chequebooks to customers, including provisions for issuing chequebooks with a larger number of leaves upon request. This regulatory support helps maintain the availability and utility of cheques in the banking system and particularly important for segments of the population that may not be fully comfortable with digital banking solutions.
- **Standardization:** The introduction of standardized cheque formats, such as the CTS 2010 standard, enhances the efficiency of cheque clearing processes. This standardization helps banks streamline operations and improve customer satisfaction, thereby promoting the use of cheques.

Integration with Digital Banking

- **Phygital Banking:** The integration of physical cheque usage with digital banking services (phygital banking) allows customers to enjoy the benefits of both worlds. Banks are investing in technology that supports cheque processing while also enhancing digital services, thus appealing to a broader customer base.
- **Financial Inclusion:** Cheques continue to play a role in promoting financial inclusion, especially among underserved segments like small and medium enterprises (SMEs). By providing access to cheque facilities, banks can help these businesses engage in formal financial transactions.

While digital banking is on the rise, the continued use and growth of bank cheque books in India are driven by their security, regulatory support, customer demand, and integration with evolving banking technologies.

Industry Challenges and threats for growth in cheque books as a banking instrument

The growth of bank chequebooks in India faces several challenges and threats due to the rise of digital banking. Here are the key issues impacting their usage:

- **Shift to Digital Payments:** With the advent of digital payment methods like UPI (Unified Payments Interface), mobile wallets, and online banking, consumers are opting for faster and more convenient transaction methods. This shift has led to a decline in the frequency of cheque usage, particularly for everyday transactions.
- **Government Initiatives:** The Indian government's push towards a digital economy, including initiatives like Digital India, promotes cashless transactions, impacting the cheque book market.
- **Younger Generation Preferences:** Younger consumers, who are more tech-savvy, prefer digital solutions for their banking needs. This demographic shift is contributing to a reduced demand for traditional banking tools like cheques, as they favor instant and seamless digital transactions.
- **Reduced Reliance on Cheques:** Some businesses and individuals are moving away from cheques due to the convenience and speed of digital transactions. This trend is particularly noticeable among SMEs, which are increasingly adopting digital payment methods for their operations.
- **Standardization and Security Measures:** The introduction of the CTS 2010 standard by the RBI has led to changes in the format and security features of chequebooks. Banks are required to issue only CTS 2010 compliant chequebooks, which may create logistical challenges and delays in distribution to customers.
- **Potential Invalidation of Non-Compliant Cheques:** The RBI has set deadlines for the adoption of CTS 2010 standards, after which non-compliant chequebooks may be considered invalid or cleared at less frequent intervals. This has led to a need for customers to replace their existing chequebooks, which may not be happening at the desired pace.

In summary, the growth of bank chequebooks in India is threatened by declining demand due to the shift to digital payments, regulatory changes requiring standardization and security upgrades, and operational challenges in the distribution and clearing of chequebooks.

6.7. Other Adjacent Markets

Transit Cards

In an era where the prioritization of seamless and efficient transportation systems is paramount, the transit card market assumes a pivotal role in shaping the trajectory of urban mobility. Transit cards, encompassing contactless smart cards and mobile-based payment solutions, have experienced substantial growth and transformation in recent years. This market revolves around the facilitation of frictionless, cashless transactions for public transportation services. Whether equipped with embedded chips or linked to mobile applications, these cards empower commuters to expeditiously access buses, trains, subways, and various transit modes, seeking to augment transportation system efficiency, alleviate queues, and streamline the overall commuting experience.

The global demand for transit cards has witnessed a significant surge, driven by escalating urbanization and the imperative for more sustainable and efficient transit solutions. Governments and transportation authorities worldwide are increasingly recognizing the advantages of contactless payment systems, leading to widespread adoption. The inherent convenience offered by these cards, coupled with a growing emphasis on mitigating traffic congestion and environmental impact, propels the demand for innovative transit payment solutions.

A noteworthy trend within the transit card market is the integration of advanced technologies. Contactless smart cards, leveraging Near Field Communication (NFC) and Radio-Frequency Identification (RFID), are rapidly becoming ubiquitous. Mobile-based payment solutions, facilitated through smartphones and wearables, are gaining traction, providing commuters with heightened flexibility. Additionally, numerous transit systems are embracing interoperability, enabling commuters to utilize a single transit card seamlessly across various modes of transportation and even in different cities. Notably, there has been an apparent uptick in the adoption of biometric authentication for enhanced security, and the integration of transit cards with smart city initiatives is on the ascendant. As cities strive to achieve greater connectivity and technological sophistication, transit cards assume a pivotal role in shaping the digital landscape of urban mobility.

The transit card market presents compelling opportunities for innovation and collaboration. The integration with emerging technologies such as blockchain and artificial intelligence holds the potential to enhance security and streamline transit operations. Collaborative initiatives involving transit authorities, technology providers, and financial institutions open avenues for creating comprehensive and user-friendly transit ecosystems.

The future outlook for the transit card market is promising, with sustained growth anticipated. As cities persist in investing in smart infrastructure and digital payment solutions, the demand for transit cards is poised to increase. The evolution of these cards from mere payment tools to integral components of smart urban ecosystems positions them as key facilitators in the ongoing transformation of global transportation.

National Common Mobility Card (NCMC): The 'One Nation One Card', an indigenous innovation known as the National Common Mobility Card (NCMC), was introduced in March 2019. Its purpose is to facilitate seamless digital ticketing and travel across various modes of transportation, including Metro, Rail, Bus, water ferries, parking facilities, and other Public Transport Operators (PTOs). Additionally, it can be

utilized for transactions in e-commerce platforms, retail shops, restaurants, ATMs, kiosks, fuel stations, and parking lots, all with a single card.

The NCMC initiative aims to simplify transportation access and promote digital payments nationwide. It is compatible with NCMC-compliant transit systems, such as the Delhi Metro Rail Corporation and Paytm Transit Card.

This innovative card offers numerous benefits, including boosting digital payment adoption, reducing closed-loop card lifecycle management expenses, and lowering operational costs. Furthermore, it provides valuable data insights for operators to enhance business intelligence and improve operational efficiency. The NCMC ecosystem supports the government's objective of digitizing low-value payments and reducing costs across the entire system.

Since its launch, the NCMC has garnered significant interest. According to data from the Delhi Metro Rail Corporation (DMRC), over 4.7 million commuters utilized the NCMC for travel on the Delhi Metro between June and December 12th, 2023. As of March 2024, around 48 banks have issued approximately 200 million NCMC-enabled cards. The recent decision by the Reserve Bank of India (RBI) to allow NCMC issuance without Know Your Customer (KYC) requirements for cards with a limit of Rs 3,000 is expected to further boost adoption and usage.

The expansion and implementation of NCMC in Public Transport Operators (PTOs) nationwide is an ongoing process, with increasing card issuance and terminal deployment every month.

India's metro network, serving over 2.63 billion people annually across 17 major cities, ranks among the world's largest and busiest urban rapid transit systems. As of March 2024, the country boasts 902.4 kilometers (560.7 miles) of operational metro lines in 17 cities, making it the third longest metro network globally, behind the United States and China. Since 2014, the network has nearly tripled in size, with plans for expansion to 27 cities by 2025. The Indian Government intends to introduce metro rail systems in more cities, with 60 projects in 28 cities either operational, under construction, or approved. The "Gati-Sakthi Master Plan" estimates that 75 cities will have metro rail systems, with an estimated investment of INR 3 trillion by 2027. Daily ridership has surpassed 10 million and is projected to exceed 12.5 million in the coming years.

With the rapid growth of India's metro rail network, the adoption of NCMC cards is expected to expand correspondingly.

6.8. Other Adjacent Market Opportunities

Land Records: Land records cards serve as essential documents providing comprehensive information about land ownership and property details. These cards typically include details such as the landowner's name, address, survey number, area, and other relevant data. Land records cards are crucial for legal and administrative purposes, serving as a reference for property ownership verification, taxation, and urban planning. In many jurisdictions, these records are transitioning from traditional paper-based systems to digital platforms, enhancing accessibility, accuracy, and overall efficiency in managing and updating land-related information.

Property / e-Property Cards: The concept of property cards, and their digital counterparts known as eProperty cards, plays a pivotal role in real estate management across various countries, each adapting to its unique legal and technological landscape. In the United States, property cards are part of county-

level land records, offering comprehensive details on ownership, transactions, and property characteristics. India has witnessed a significant shift towards digitization with the introduction of eProperty cards. The demand for eProperty cards in India has grown due to their efficiency in reducing bureaucratic hurdles and the ease they provide in property-related transactions.

Australia's property records are managed by state-based land registries, with a gradual shift towards digital platforms. While terminologies and formats may differ, the global demand for property cards, especially in digital form, is driven by the common goal of enhancing transparency, reducing paperwork, and facilitating efficient property transactions. As technological advancements continue, the adoption of eProperty cards is likely to grow across diverse real estate markets.

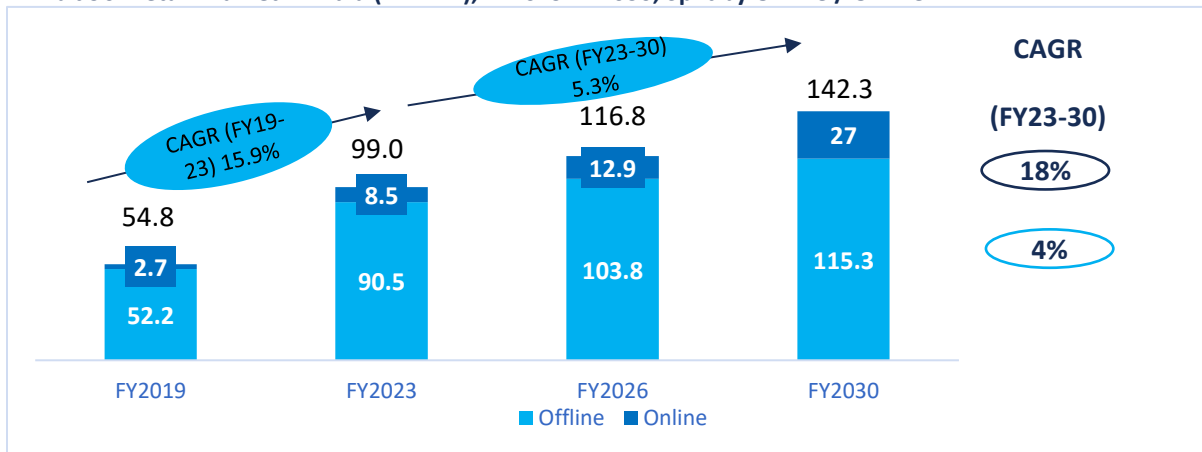
RFID Payment Tags: These tags have witnessed a surge in demand across diverse countries, transforming the landscape of financial transactions with their seamless and secure capabilities. The adoption of RFID technology in payment systems has become a global phenomenon, driven by its efficiency and user-friendly features. In the U.S., RFID payment tags, often integrated into credit and debit cards, have gained popularity for their speed and convenience. European countries, known for their tech-savvy populations, have embraced RFID payment tags with enthusiasm. The contactless payment culture in countries such as the UK has led to widespread adoption, reducing reliance on traditional cash transactions. In Asian markets, particularly in China and Japan, RFID payment tags are integral to the rapidly evolving mobile payment landscape. Mobile wallets and payment apps utilize RFID technology to enable quick and secure transactions. The demand for RFID payment tags transcends borders, with diverse countries recognizing the benefits of this technology in revolutionizing payment systems. As the world increasingly shifts towards contactless and digital transactions, RFID payment tags are poised to play a significant role in shaping the future of global finance.

Fuel Cards: The demand for fuel cards is notably high due to their ability to streamline fuel-related transactions and provide valuable insights into fleet spending. Businesses across various sectors are recognizing the advantages of centralized fuel payments, enhanced reporting capabilities, and the potential for cost savings through better control over fuel expenses. In the U.S., Europe, and Australia, where commercial transportation is a cornerstone of the economy, fuel cards are extensively used to manage fuel expenses. As firms worldwide continue to recognize the benefits of fuel cards, the industry is poised for further expansion, offering opportunities for innovation and strategic partnerships.

OVERVIEW OF INDIAN RETAIL MARKET

The Indian retail market is the fourth largest retail market globally and one of the fastest growing. India's retail industry on track to be worth a staggering INR 142.3 trillion by the year 2030, growing at a CAGR of 5.3% in the FY23-FY30 period.

Exhibit 90: Retail Market in India (INR Trn), FY2019-FY2030, Split by Offline / Online



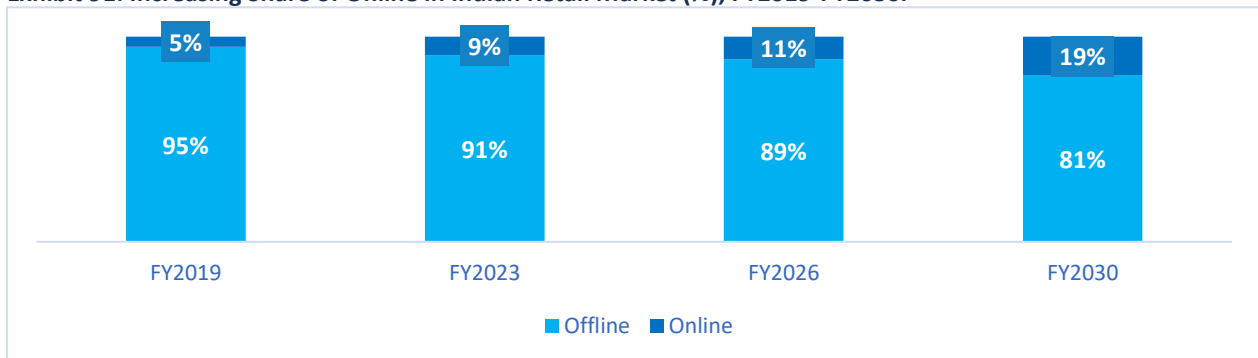
Source: Frost & Sullivan Analysis
 Note: FY2026-2030 is Forecasted

A growing middle class, rising disposable incomes, and an expanding urban population are fueling demand for consumer goods and lifestyle products. Rapid digitization and increased internet penetration have also boosted e-commerce growth, while organized retail is expanding with the entry of global players and the rise of large domestic retail chains. Additionally, the youth population and their preference for convenience, coupled with innovations like quick commerce and digital payments, are transforming the shopping experience and driving retail expansion across the country.

Increasing Share of Online in Indian Retail Market:

The share of online retail in the Indian retail market has been rapidly increasing, driven by factors such as rising internet penetration, the growth of digital payments, and changing consumer preferences toward convenience and speed. With more than 850 million internet users, India's e-commerce sector has seen exponential growth, with online retail projected to account for nearly 19% of total Indian retail sales by 2030, up from 5% in 2019.

Exhibit 91: Increasing Share of Online in Indian Retail Market (%), FY2019-FY2030F



Source: Frost & Sullivan

Note: FY2026-2030 is Projected

The online retail market is projected to grow from INR 8.5 trillion in FY2023 to INR 27 trillion by FY2030, growing at a CAGR of 18% in the FY2023-2030 period.

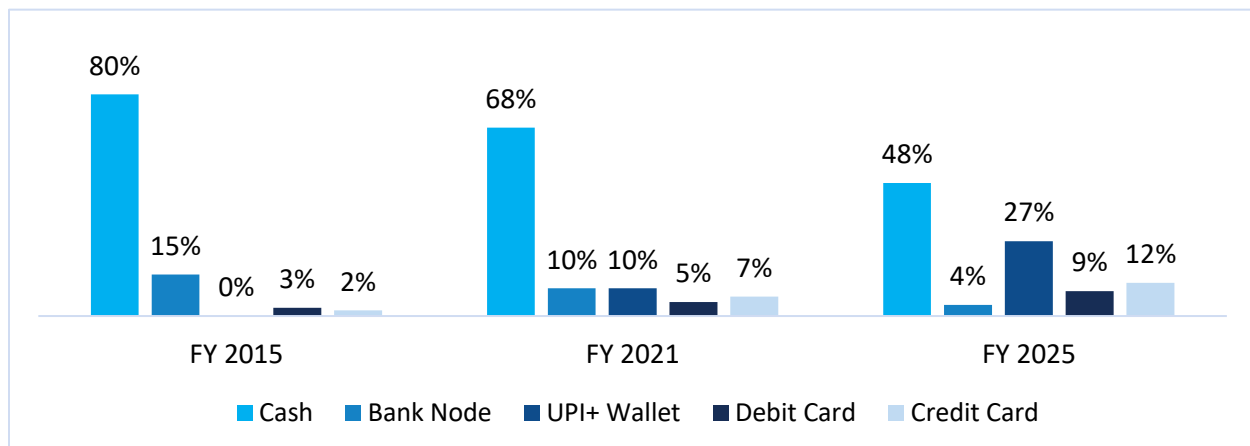
Major e-commerce platforms like Amazon, Flipkart, and Reliance JioMart are playing a key role in expanding online retail, offering consumers access to a wide range of products at competitive prices. The COVID-19 pandemic accelerated this shift, with more consumers opting for online shopping for essentials, fashion, electronics, and groceries.

The rise of quick commerce in India represents a significant shift in the retail landscape, driven by the increasing demand for fast delivery of groceries and everyday essentials. Quick commerce, which focuses on delivering goods to consumers within a very short time frame—often within 30 minutes—has gained traction due to the rapid growth of digital penetration and changing consumer behavior. Prominent players in this space include **Blinkit**, Zepto and Swiggy Instamart. This surge in quick commerce not only reflects the changing preferences for immediate gratification but also signifies the potential for significant growth in the Indian retail market, as businesses adapt to meet the evolving needs of consumers

7.1. Preferred Method of Payment in India

The landscape of payment methods in India has undergone a significant transformation in recent years. While cash was traditionally the cornerstone of all transactions, the advent of digitalization has brought about a notable shift in consumer preferences.

Exhibit 92: Preferred Method of Payments in India, FY 2015, FY 2021, FY 2025 (E)



Source: Frost & Sullivan, Secondary Sources

Parallel to the decline in cash usage, there has been a significant upsurge in the use of debit and credit cards. Factors contributing to this surge include the widespread availability of card-accepting merchants, reward programs, and the ease of transaction tracking. Moreover, the security features associated with card transactions, such as OTP verification and fraud protection, have also boosted consumer confidence.

Looking towards 2025, it is anticipated that digital payment methods will continue to grow in prominence. Debit and credit cards are expected to evolve with enhanced security features and greater integration with international payment systems, making them more appealing for global transactions.

Moreover, the continued push from the government towards a 'Digital India' is expected to further decrease the reliance on cash. This will be supported by the ongoing expansion of internet connectivity and smartphone penetration across the country, even reaching the rural and remote areas.

7.2. Growing significance of cards in India

In the realm of financial transactions, India has traditionally been anchored in cash-based dealings. However, recent years have seen a paradigm shift, with a significant increase in the adoption of card payments, both debit and credit.

(a) Debit Cards: The Foundation of Digital Payments

Debit cards have been the cornerstone of this transition. They have seen consistent growth, led by major banks like the State Bank of India and private players like HDFC Bank. The expansion of the debit card market is indicative of a growing consumer preference for electronic payments, bolstered by government initiatives aimed at financial inclusion and the digitization of the economy.

(b) Credit Cards: A Surge in Popularity

While debit cards have a wider base, credit cards have witnessed a more dynamic growth trajectory. Despite lower penetration, with only 6.3 credit and charge cards per 100 individuals compared to 71.7 for debit cards, credit and charge cards accounted for 63.2% of card payments by value in 2022². This indicates a strong consumer preference for credit-based spending, especially in sectors like travel, accommodation, and dining.

(c) Government Initiatives and Policy Implications

Government policies have played a pivotal role in this shift. The establishment of the Payments Infrastructure Development Fund (PIDF) by the Reserve Bank of India to expand payment infrastructure, especially in smaller towns, and the abolition of merchant service fees on state-owned RuPay cards have significantly promoted card usage³. These initiatives, alongside campaigns like Digital India, have been instrumental in driving the growth of card payments.

(d) Economic and Technological Drivers

Economic recovery post-pandemic and a rise in consumer spending have further fuelled the card payment market. The card payments market in India registered a growth of 26.7% in 2022 and is set to grow by 23.6% in 2023⁴, indicative of a strong revival in the economy and increased consumer confidence in card transactions. Technological advancements, such as the development of secure payment gateways, the proliferation of smartphones, and the availability of easy-to-use mobile banking applications, have also contributed to this surge.

² <https://www.globaldata.com/media/banking/card-payments-india-grow-strong-18-7-cagr-2022-2026-forecasts-globaldata/>

³ <https://www.globaldata.com/media/banking/card-payments-india-grow-strong-18-7-cagr-2022-2026-forecasts-globaldata/>

⁴ <https://www.globaldata.com/media/banking/india-card-payments-market-grow-23-6-2023-forecasts-globaldata/>

PAYMENT CARDS MANUFACTURING MARKET

The manufacturing of payment cards in India, is an integral component of the country's burgeoning digital economy, it reflects a fascinating juxtaposition of domestic capabilities and global dependencies. At the heart of this sector lies the manufacturing of payment cards such as mag-stripe cards, EMV cards, DI Cards, Smart Cards & Government ID cards such as electoral cards, Registration cards, Driving licence and Aadhar cards which is primarily manufactured indigenously. Companies like Manipal Payments and Identity Solutions Limited (MPi) in Manipal stand out as key players in this domain, underscoring India's competence in producing these types of payment cards. The predominance of local manufacturing for payment card & Government ID cards signals a self-sufficient streak in an otherwise globally interlinked industry.

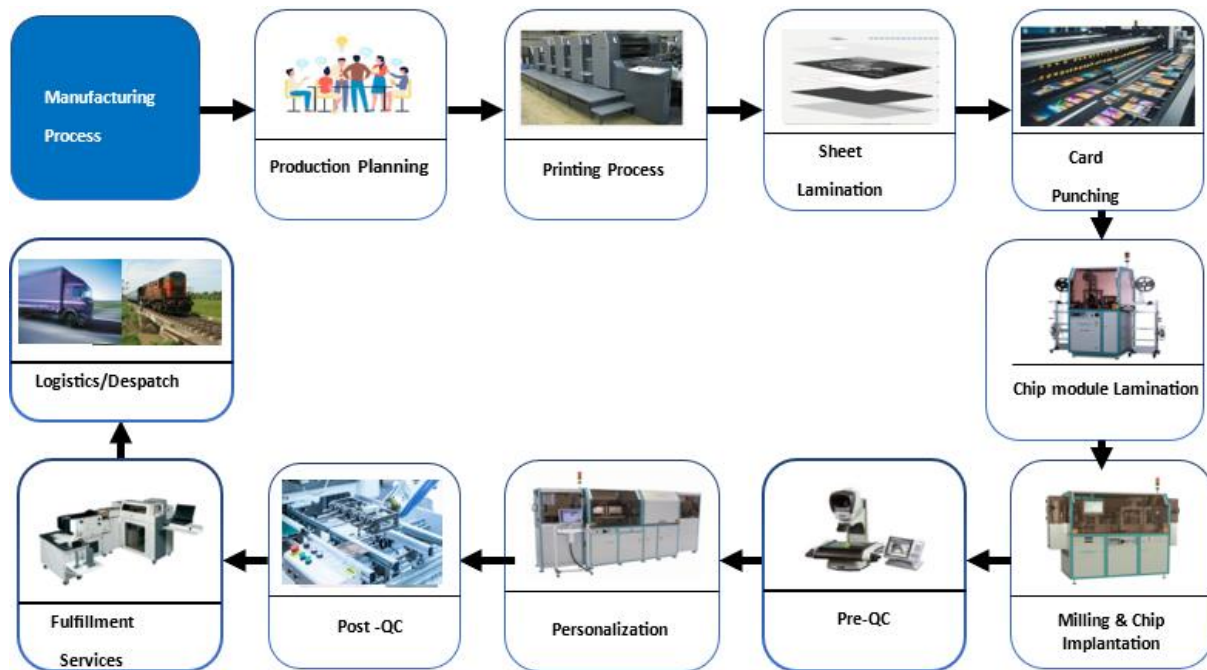
Technologically, Indian manufacturers prioritize security, design, and efficiency. Firms certified by Visa, Mastercard, and NPCI (National Payments Corporation of India), offer a range of smart card and smart tag solutions. Their products span debit and credit cards to smart wearables and merchant QR code kits, highlighting the industry's move towards contact & contactless transaction methods. These solutions encompass technologies like magnetic stripe, NFC (Near Field Communication), RFID (Radio-Frequency Identification), EMV chip-based, and dual interface cards. The manufacturing process is highly automated, involving encrypted networks and machines that encode private information onto cards, followed by rigorous quality checks to ensure compliance with company and regulatory standards.

Furthermore, the environmental impact of card manufacturing is an aspect that is gaining attention. As sustainability becomes a global priority, Indian manufacturers are exploring ecofriendly materials and processes. Biodegradable plastics and recycled materials are increasingly being considered for card production, reflecting a shift towards environmentally conscious manufacturing practices.

Payment card manufacturing is a highly operationally intensive business that demands a precise blend of advanced technology, secure infrastructure, and flawless execution—capabilities that take years to build and refine. The process involves multiple complex stages, including chip module integration, card lamination, secure personalization, and stringent quality control, all of which must be synchronized seamlessly to ensure reliability and compliance. Moreover, entry into this industry is restricted by the need for multiple global certifications—such as those from Visa, Mastercard, RuPay, and PCI—which involve rigorous audits, data security protocols, and physical infrastructure standards. Achieving these certifications requires substantial investment and a long gestation period, creating a high entry barrier and limiting credible global-scale players. As a result, only a few firms globally possess the technical depth, operational maturity, and certified capabilities needed to serve regulated and high-volume markets, making card manufacturing a niche yet critical component of the global payments ecosystem.

8.1. Manufacturing Process of Payment Cards

Exhibit 93: Manufacturing Process of Payment Cards



A few payment card manufacturers also provide end-to-end service to their customers. This involves manufacturing the card and ensuring it is successfully delivered to the end user and managing the entire card life cycle. They also ensure that their process is completely compliant to all security measures in order to safeguard the end users and the bank. Manufacturing of payment cards is a complex process that requires specialized skillset and hence manufacturers need to keep up with technology developments while ensuring security and efficiency. The overall card manufacturing process can be divided into three key steps:

- Base card manufacturing
- Personalization
- Fulfilment

Card Design and Production:

The manufacturing process for payment cards, like credit cards or debit cards, involves several steps to ensure security, durability, and functionality. Manufacturers need to possess skillset of Designing of artwork, choosing of right raw material, precession manufacturing, State of the art machinery and technology to handle complex process such as Plastic/Metal bonding, design & printing, Precise collation, lamination, Die cutting and quality control.

The manufacturing of PVC cards is a multi-stage process that involves several key steps:

1. Sheet Preparation: Large sheets of polyvinyl chloride (PVC) are used, and the artwork is printed on these sheets.

2. Printing: The design and information for the card are printed onto the PVC surface using various techniques like offset printing, screen printing, or thermal printing. This can include text, images, barcodes, or other elements depending on the card's purpose. In one sheet multiple cards are printed.

3. Collation: The front and back printed sheets are collated with intermediate antenna layer, followed with protective overlay on both side of the card body and securely held together by welding.

4. Lamination: A process of sandwiching the PVC layers using heat and pressure. The sheets are fused together in the said process and a single uni layer is produced.

5. Die-Cutting: The laminated sheets are fed through a die-cutting machine that precisely cuts out individual CR 80 card shapes.

6. Chip Embedding: For smart cards, an integrated circuit chip is embedded into a pre-cut cavity within the card's core layer. The chip is soldered to the intermediate Antenna, this chip can store data, enable secure transactions through contact and contactless functionalities.

7. Quality Control: Each card undergoes rigorous quality control checks at each stage to ensure it meets the required specifications and standards. This includes verifying print quality, chip functionality, and magnetic stripe readability.

PVC identity cards have a shorter lifespan compared to other ID card materials and need to be replaced at more frequent intervals.

Personalization

Card personalization is the process of adding unique customer information and security features to a blank card, transforming it into a functional payment, identification, or access card. Unique information specific to the cardholder is added to the card, such as their name, card number, and expiration date by graphical embossing, debossing, or indenting. The chip is encoded with the data in encrypted format as per PCI-DSS standards which makes the chip very secure. Card personalization is a critical step in the card issuance process, ensuring the card is secure and ready for use by the cardholder.

Fulfilment

Card fulfilment encompasses the end-to-end process of preparing and delivering personalized cards to customers. This includes Auto affixing of the personalized cards to welcome letters, And insertion of them into envelopes with other collaterals such as booklets, terms and conditions and pouch etc. Followed with Strict quality control checks, packaging, and shipping to the cardholder's address. Card fulfilment can also involve handling returns or replacements. Efficient and secure card fulfilment is crucial for ensuring and maintaining the integrity of card programs.

Despatch/Mailing

The ready kits are then handed over to Despatch team which further connect the shipments to last mile using secure logistics to the customer or card issuer for distribution to end-users.

8.2. Entry Barriers for the Industry / Critical Success Factors

(a) Compliance and Security Protocols / Strict Government Regulations / Certifications

The nature of the industry requires adherence to different standards and certification requirements, consistent delivery ensuring reliability and long-standing relationships with customers. This offers a distinct advantage in terms of future contracts being awarded, and acts as an entry barrier against new entrants.

For card payment security, entities are required to adhere to various standards such as PCI-PIN, PCI-PTS, PCI-HSM, and PCI-P2PE, over and above the Payment Card Industry Data Security Standard (PCI-DSS) and Payment Application Data Security Standard (PA-DSS). This emphasizes the importance of securing cardholder-authentication applications, processes, and sensitive data, presenting another layer of complexity for new entrants depending on its timeline and infrastructure / setup requirements. These certifications are critical as it builds trust and credibility, ensures market access and competitiveness, helps meet compliance, improves customer satisfaction, and boosts investor and stakeholder confidence.

Recent regulatory developments have also brought challenges to the credit card and BNPL ecosystem in India. For instance, RBI's new directions issued in the first quarter of the 2022-23 financial year consolidated and clarified regulatory requirements for credit cards, charge cards, and debit cards. These directions extended the scope of regulations to certain BNPL models, adding another dimension to the regulatory landscape that new entrants must consider. The regulatory framework for the BNPL segment, while easier for FinTech firms, still poses challenges due to disruptions from RBI clarifications and stipulations regarding co-branding arrangements

(b) Quality controls

Quality control in payment card manufacturing is a significant barrier due to complex processes and high standards. Modern cards require thorough treatment and cleaning. Cleaning metal parts for strong polymer bonding involves specialized washing and activation methods like plasma or corona treatment.

Innovative technology is vital for efficient, waste-free production. Manufacturers need systems to differentiate high and low-quality components and minimize waste. Precise communication with material suppliers, such as plastic blanks, metal sheets, and microchips, is crucial even before assembly.

Effective waste management is essential to reduce waste from over-processing, punching errors, printing defects, or lamination issues. This aligns with sustainable manufacturing, increasingly valued by consumers.

(c) Data security

The industry requires high security and data protection, owing to access to highly sensitive cardholder information. As a result, banks are selective about the partners with which they work and typically seek out manufacturers who have a well-established reputation for trust and quality and are able to meet their service requirements.

The Payment Card Industry Data Security Standard (PCI DSS) is a global cardholder data security standard established by major payment card brands like VISA, MasterCard, JCB, AMEX, and Discover. It mandates security requirements for policies, procedures, network configurations, and software design to safeguard cardholder data. All entities handling cardholder data, including merchants and service providers, must

adhere to PCI DSS standards / regulations. Additionally, organizations in India often pursue Information Security Management System (ISMS) certification to manage broader information security concerns. While ISMS covers various aspects of information security, PCI DSS specifically targets cardholder data protection. Many organizations undergo annual assessments to maintain both PCI DSS and ISMS certifications, enhancing overall information security. Banks and customers to payments card manufacturers are selective about the partners with which they work and typically seek out manufacturers who have a well-established reputation for trust and quality and are able to meet their service requirements.

The rise of digital payments in India, accelerated by events like the COVID-19 pandemic, has led to increased debit and credit card transactions and the adoption of contactless payment technologies like near field communication (NFC). The Reserve Bank of India (RBI) has promoted contactless payments, allowing transactions up to Rs 2,000 without a second authentication factor. However, this shift has also heightened the risk of payment data breaches, necessitating businesses to implement robust and up-to-date security frameworks. Insufficient cardholder data protection can have significant financial repercussions, with the average cost of a data breach in India reported at INR 128 million. To mitigate such risks, it is imperative for organizations to follow best practices in data protection. Furthermore, emerging payment methods, like the PCI Contactless Payments on COTS (CPoC) standard, provide critical security measures for accepting payments through merchant consumer off-the-shelf (COTS) devices such as smartphones or tablets, ensuring the confidentiality and integrity of payment account data.

(d) Technology

The payment card industry in India has rapidly evolved from magnetic strip cards to EMV and contactless cards. Manufacturers must constantly upgrade their technologies for security and user convenience. They face the challenge of designing products that are adaptable to different form factors, from wearable devices to payment cards, and that are resistant to various types of attacks, including remote software, board level, and silicon level attacks.

In India, there is also a specific demand for secure microcontroller-based solutions for payment cards. This demand has evolved from traditional magnetic strip cards to contact EMV cards and now to dual-interface cards, including contactless payments. These advancements necessitate manufacturers to develop cost-efficient products with scalable embedded non-volatile memory (eNVM), high cycling capability, good retention, and low power consumption over a wide temperature range.

Furthermore, with the increasing interconnectedness of devices and the rising prominence of India in the electronic payments sector, manufacturers face the challenge of ensuring world-class safety and security systems. They must adopt global standards of EMV, Tokenization, and employ advanced fraud solutions and artificial intelligence to combat sophisticated and fast-moving organized crime networks. Ensuring such high-level security is critical, especially as domestic networks grow and attract the attention of international crime syndicates.

(e) End to end solutioning

End to end solutioning with logistics and other value-added services to provide a seamless and hassle-free experience for their customers and banks also acts as a key entry barrier for the industry and continues to be a critical success factor for vendors in the market. Banks prefer to work with partners offering one stop solutions across all three services (cards, cheques and logistics).

(f) Pricing

Pricing is crucial for maintaining cost competitiveness (lower production costs through economies of scale and advanced manufacturing techniques), positioning the brand, acquiring and retaining customers, ensuring sustainable profit margins, adapting to market changes, complying with regulations and certifications costs, and managing global market dynamics (including managing currency fluctuations and adapting to regional pricing strategies)

(g) Strategic location and proximity to customers

Location and proximity to customers is crucial as a strategic location enhances logistics and distribution efficiency, reduces turnaround time, improves customer service, strengthens supply chain management and fosters collaboration among others

Industry Challenges & Threats

In the payment card industry, encompassing credit and debit cards, manufacturing vendors encounter numerous threats and challenges, such as:

1. **Regulatory Changes:**
 - **Increased Regulation:** More stringent regulatory requirements can lead to higher compliance costs and greater operational complexities.
 - **Data Protection Laws:** Complying with data protection regulations can be both difficult and costly.
2. **Cybersecurity Threats:**
 - **Data Breaches:** The ongoing threat of hacking and data breaches can cause significant financial losses and harm to reputation.
 - **Fraud and Identity Theft:** The rising incidents of fraud and identity theft require continuous investment in security technologies.
3. **Consumer Behavior Changes:**
 - **Shift to Digital Payments:** The move towards non-card-based digital and contactless payments may decrease the demand for physical cards.
4. **Economic Factors:**
 - **Economic Downturns:** Economic instability can result in reduced consumer spending and higher default rates on credit cards.
 - **Inflation:** Increasing costs can negatively impact consumer spending.
5. **Operational Challenges:**
 - **Supply Chain Issues:** Disruptions in the supply chain can affect the production and distribution of physical cards.
 - **Technological Upgrades:** Constant technological upgrades are necessary to remain competitive, which can be resource-intensive and costly.
6. **Partnership and Integration Risks:**
 - **Reliance on Third Parties:** Dependence on third-party providers for technology and services can pose risks if these partners encounter problems.
7. **Global Market Dynamics:**

- **Geopolitical Risks:** Political instability and changes in trade policies can impact global operations, the economy, and consumer spending.
- 8. **Environmental Concerns:**
 - **Sustainability Pressures:** Growing awareness and regulatory pressures around environmental sustainability will require the development of eco-friendly cards, increasing production costs.

IDENTIFICATION, ANTI-COUNTERFEITING & TRACKING TECHNOLOGIES : FOCUS ON RFID, HOLOGRAMS & QR CODES

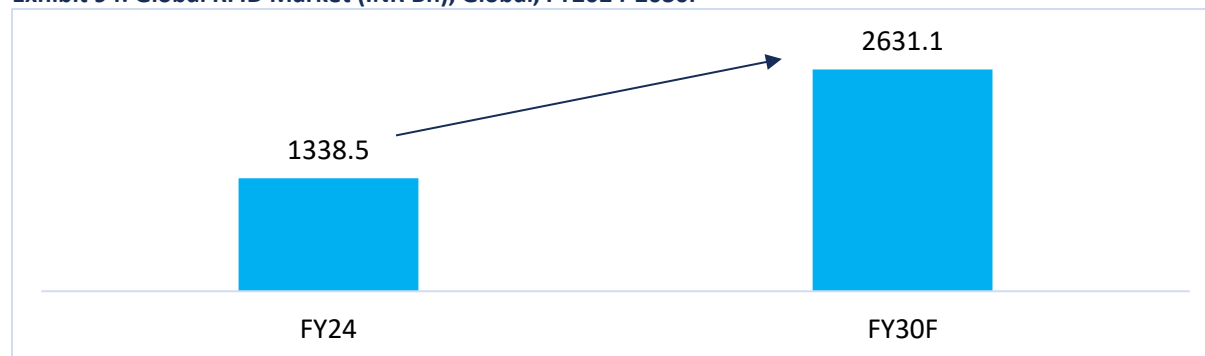
9.1. RFID MARKET

Global RFID Industry Overview

Radio Frequency Identification (RFID) is a wireless communication technology utilizing electromagnetic coupling to identify and track objects. The RFID market comprises of tags, readers, and middleware, with further categorization into active and passive types. Frequency-based segmentation includes Low, High, and Ultra-high frequency RFID. RFID uses electromagnetic fields to automatically identify, and track tags attached to objects.

The global RFID market, valued at approximately INR 1,338.5 billion in 2024, is projected to grow at a 11.9% CAGR and reach INR 2,631.1 billion by 2030. RFID technology offers real-time visibility of object location, status, and movement, enabling businesses to enhance inventory tracking, identify inefficiencies, and improve operational efficiency.

Exhibit 94: Global RFID Market (INR Bn), Global, FY2024-2030F



Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

The COVID-19 pandemic accelerated RFID adoption in retail, e-commerce, logistics, and healthcare sectors, facilitating contactless solutions and enhancing supply chain efficiency. Beyond inventory management, RFID applications extend to real-time supply chain visibility and omnichannel offerings such as buy online/pick up in store, ship from store, and self-checkout. A major use case of RFID technology by corporates around the world is for tracking corporate assets, furniture, office equipment, IT hardware and servers.

There's been an increased RFID adoption since 2018, particularly in retail. For example, Inditex, parent company of Zara, implemented RFID for garment tracking in its inventory management and Stock Management/Replenishment systems.

RFID Ecosystem (Chip, tag, reader/antenna manufacturers, software, label/printer providers)

Radio Frequency Identification (RFID) technology comprises essential elements: Antenna, Transceiver, Tags, and a database. The Antenna and Transceiver combine to form the RFID reader, which serves as an intermediary between RFID tags and the database. Tags, also known as Transponders, transmit data to the reader. Middleware software processes this data and interfaces with the backend systems. The database, as the final component in this ecosystem, stores and manages the information relayed through middleware.

The integration of RFID tunnels, gates, encoders, packing stations, and point-of-sale (POS) systems is enhancing the RFID landscape and infrastructure, making it more robust and versatile.

The RFID ecosystem encompasses various systems and frequency bands, which determine the technology's capabilities and applications. RFID systems typically operate at Low Frequency (LF), High Frequency (HF), Ultra-high Frequency (UHF), and extremely high frequencies. Higher frequencies correlate with increased screening ranges for readers. As an example, high-frequency RFID systems support detecting objects from a distance of 1 metre while UHF can achieve read ranges of 4-12 meters depending on environment and reader power.

The RFID ecosystem's primary stakeholders include hardware vendors, software vendors, system integrators, and consultants.

Hardware vendors comprise manufacturers of Readers, Inlays, converters, and resellers. Inlay manufacturers produce tags inlays, using antennas, and chips as raw-materials, while converters integrate inlays into finished tags or labels. Peripheral vendors supply additional components for system installation, such as portals, reader and antenna mounting hardware, and motion sensors.

Software vendors provide database management systems, middleware, application software, and interfaces for existing applications.

System integrators design RFID systems by selecting appropriate hardware and software components. They handle installation and integration of these systems into existing infrastructure.

Consultants offer specialized expertise in areas including business requirements, documentation, technical aspects, facilities, and training.

Market trends, growth drivers, opportunities, and challenges ; Importance of offering solutions to customers through tags**Market Trends**

Passive UHF RFID Tags: These tags are battery less and are powered by the electromagnetic energy emitted by the RFID readers. Passive UHF RFID tags are typically used in large scale operations due to their longer read ranges. They are cost-effective with quicker data transfer speeds. Their demand stems from efficient and scalable applications

such as supply chain management, retail inventory management, and asset tracking. The capability of passive UHF tags to handle simultaneous reading of multiple tags further enhances their appeal.

Supply chain optimization: RFID technology facilitates tracking and tracing of goods from warehouse to other entities and their transportation mechanisms. RFID tags contribute to minimizing errors, wastage, stock loss, reducing costs, and ensuring timely product delivery.

Advancements in RFID technology: Recent developments in RFID technology include improved read ranges, greater data storage capabilities, and more compact sizes. Additionally, reader technology advancements are resulting in enhanced accuracy, faster reading speeds, and the ability to process a higher volume of tags simultaneously. These improvements are opening up new applications across various industries.

RFID in retail and ecommerce: RFID technology assists retailers in streamlining inventory management, reducing shrinkage, and enhancing overall customer shopping experiences. Examples include smart shelves that monitor stock levels and initiate reorders, and automated checkout systems utilizing RFID tags for quicker billing and more convenient transactions.

Key Growth enablers for the segment include:

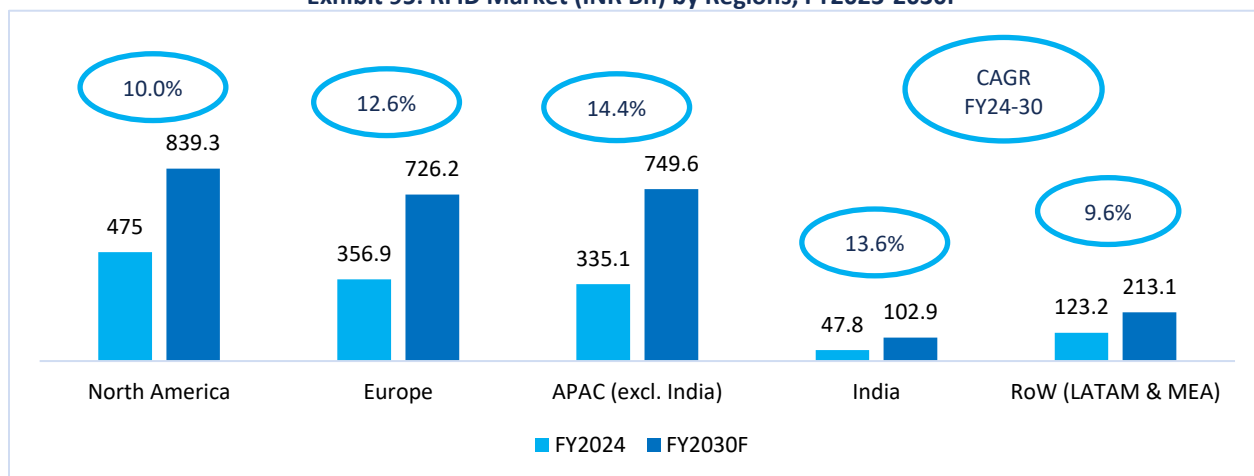
1. **Increased Demand for Real-Time Tracking & Inventory Management:** RFID technology is widely adopted in industries like retail, logistics, healthcare, and manufacturing for efficient asset tracking, real-time inventory management, authentication and supply chain optimization. Businesses benefit from improved operational efficiency, reduced labor costs, and minimized inventory inaccuracies.
2. **Integration with IoT & Digital Transformation:** The growing integration of RFID with IoT devices enables seamless data sharing, enhanced automation, and intelligent decision-making. As companies increasingly focus on digital transformation, RFID technology is becoming essential for enhancing visibility in operations, boosting productivity, and offering predictive analytics.
3. **Regulatory Mandates and Industry Standards:** Sectors like healthcare, pharmaceuticals, and food & beverage are subject to strict regulatory standards for product traceability, safety, authentication and anti-counterfeiting measures. RFID ensures compliance with these regulations, thus driving its widespread adoption in critical industries.
4. **Decreasing Costs of RFID Technology:** Advancements in RFID hardware, including tag miniaturization and lower production costs, have made RFID systems more affordable. This reduction in the cost barrier has allowed small and medium-sized enterprises (SMEs), small volume applications to leverage RFID, expanding the market further.
5. **Rise of E-commerce and Omnichannel Retail:** The rapid growth of e-commerce and omnichannel retail models demands real-time inventory visibility, faster order fulfillment, and efficient supply chain operations. RFID technology helps retailers track goods from warehouse to delivery, improving overall customer satisfaction.
6. **Advancements in RFID Technology:** Continued R&D has led to improvements in RFID's read range, accuracy, and environmental durability. Enhanced capabilities such as RFID sensors and active RFID systems are expanding its application in high-value asset tracking, environmental monitoring, and smart infrastructure.

7. **Expansion of RFID in Emerging Markets:** Emerging economies are increasingly adopting RFID solutions across industries like automotive, logistics, defence, livestock, agriculture, and government services. These regions are driving growth as RFID supports modernization initiatives and industrial automation efforts.

These enablers position RFID as a critical technology for improving operational efficiency, reducing errors, and driving innovation in various sectors.

RFID Market: Split by Regions

Exhibit 95: RFID Market (INR Bn) by Regions, FY2023-2030F



Note: 1 USD = 82.5 INR (2024), 1 USD = INR 83 (2030)

Source: Frost & Sullivan Note: FY2025-2030 is Forecasted

The RFID market in North America is expected to grow from INR 475 billion in FY24 to INR 839.3 billion in FY30 growing at a CAGR of 10%. The North American market is characterized by robust adoption across diverse industries such as retail, healthcare, logistics, and defense, driven by the region's advanced technological infrastructure and focus on automation. In the retail sector, major players like Walmart utilize RFID for inventory optimization, enhancing stock accuracy and customer satisfaction. The healthcare industry increasingly deploys RFID for patient tracking, equipment management, and ensuring medication authenticity. Growth in e-commerce is boosting RFID adoption in logistics and supply chain management, where real-time tracking and automation have become critical. Integration with technologies like IoT further enhances the utility of RFID in achieving smarter and more efficient operations. Additionally, the U.S. government supports RFID adoption in defense applications for asset tracking and security. Other key drivers include the increasing use of RFID in cashless payment systems and a regulatory push towards digital transformation. North America's emphasis on research and development ensures the region remains a leader in RFID innovation, with a growing focus on sustainability, such as the use of eco-friendly tags.

The RFID market in Europe is expected to grow from INR 356.9 billion in FY24 to INR 726.2 billion in FY30 growing at a CAGR of 12.6%. The RFID market in Europe is experiencing significant growth, driven by its widespread adoption across sectors such as retail, manufacturing, automotive, healthcare, and logistics. A key trend in Europe is the integration of RFID with Industry 4.0 initiatives, particularly in manufacturing and automotive sectors, where RFID enhances automation, asset management, and supply chain visibility.

For example, major European automotive manufacturers use RFID for tracking components throughout the production process, ensuring seamless logistics and inventory control. The healthcare sector in Europe is also embracing RFID for tracking medical equipment, improving patient safety, and ensuring compliance with stringent regulations for pharmaceuticals and medical devices. The European Union's regulatory framework, particularly around food safety and pharmaceutical traceability, has been a strong growth driver, pushing industries to adopt RFID for compliance. Additionally, sustainability is a growing focus, with eco-friendly RFID tags becoming more prevalent as companies strive to meet environmental goals. The shift towards contactless technologies and the digital transformation of industries further contribute to the accelerating growth of the RFID market in Europe.

The RFID market in APAC is expected to grow from INR 335.1 billion in FY24 to INR 749.6 billion in FY30 growing at a CAGR of 14.4%. The RFID market in the Asia-Pacific (APAC) region, is experiencing rapid growth, driven by technological advancements and increasing demand across various sectors, including retail, logistics, healthcare, and manufacturing. China, Japan, and South Korea are leading the charge, with China seeing widespread adoption in sectors such as retail, manufacturing, and transportation, where RFID is used for inventory management, supply chain optimization, and asset tracking. In Japan, RFID technology is integral to the development of smart cities and contactless payments, with a strong emphasis on improving urban mobility and streamlining public services. The region's rapid urbanization and expansion of e-commerce are key growth drivers, as businesses seek to enhance supply chain transparency, reduce operational costs, and improve customer experience through real-time tracking and automation. Additionally, the automotive industry in Japan and South Korea increasingly relies on RFID for inventory management and component tracking in production lines. As the APAC region continues to embrace digital transformation, the demand for RFID is further fueled by government initiatives promoting technological adoption. The growing focus on security and fraud prevention in sectors like retail and logistics is also contributing to the expanding market for RFID in the region.

The RFID market in India is expected to grow from INR 47.8 billion in FY24 to INR 102.9 billion in FY30 growing at a CAGR of 13.6%. Demand for RFID is expected to increase in India along with organised retail, logistics supply chain, automotive, manufacturing, health care, and public transit sectors. The retail sector leads this transformation, with RFID being used for inventory management, enhancing supply chain efficiency, and reducing theft, as retailers look to meet the demands of an increasingly digital and customer-centric economy. The logistics and transportation sectors are also significant contributors, particularly with initiatives like the FASTag for toll collection, which has seen wide adoption across India's road networks. Additionally, RFID technology plays a crucial role in the manufacturing sector as India moves towards Industry 4.0 with increasing automation and smart factory solutions. The government of India has been a key driver of RFID adoption, particularly with projects aimed at modernizing the country's infrastructure, such as the development of multi-modal logistics parks and the implementation of smart city projects. These initiatives, coupled with an increased focus on digital transformation, have led to enhanced tracking, better inventory management, and improved operational efficiency in both public and private sectors. The growing e-commerce, automotive and infrastructure sectors in India also boosts RFID demand, as logistics companies require efficient tracking and real-time data for last-mile delivery, authentication and tracking. Moreover, the rise in contactless payment solutions, including RFID-enabled banking cards, further accelerates the market's expansion. In RFID manufacturing, chip bonding is the cornerstone of tag functionality, bridging the gap between design and practical application. As industries increasingly adopt RFID, domestic production of RFID components and systems becomes essential to

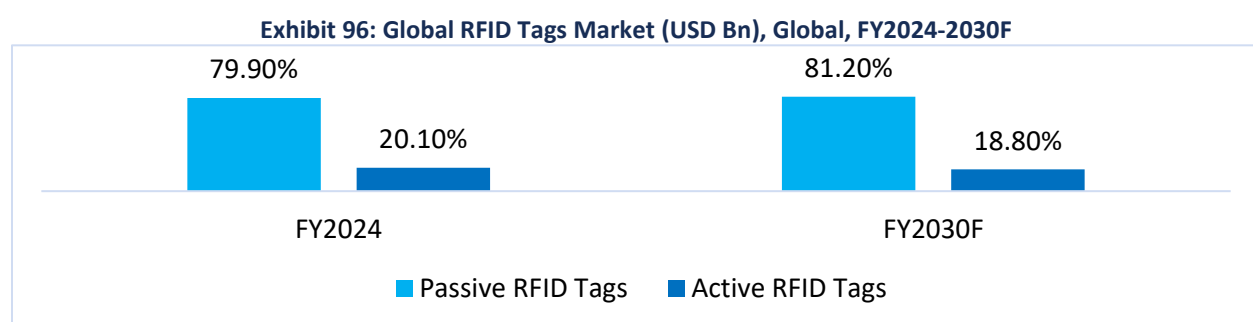
address several economic, strategic, and operational challenges. Advancements in chip bonding will play a key role in enhancing performance, reducing costs, and enabling new use cases. Building domestic capabilities in this area would reduce the need for importing finished RFID products or components and enhance supply chain resilience and support the “Make in India” Government Initiatives.

The RFID market in Middle East & Africa is expected to grow from INR 123.2 billion in FY24 to INR 213.1 billion in FY30 growing at a CAGR of 9.6%. The RFID market in the Middle East & Africa (MEA) is experiencing steady growth, driven by increasing adoption across sectors such as retail, logistics, oil & gas, and smart city projects. The Middle East, in particular, is seeing significant investments in smart cities and infrastructure development, where RFID plays a key role in optimizing transportation, access control, and security. For instance, countries like the UAE and Saudi Arabia are integrating RFID technology into their urban infrastructure for enhanced traffic management and public safety, while also adopting RFID for asset management in government services and large-scale events. In the retail sector, RFID is gaining momentum for inventory management, product authentication, and loss prevention, as businesses look to enhance customer experiences and improve operational efficiency.

In Africa, RFID adoption is being driven by the need for improved supply chain management and traceability, particularly in industries such as agriculture, healthcare, and logistics. For example, RFID is being used to track livestock and manage agricultural supply chains more efficiently. The oil and gas sector in countries like Nigeria and Angola is also embracing RFID for asset tracking and monitoring, improving safety and compliance in remote and hazardous environments. Another notable trend in Africa is the increasing use of RFID in healthcare for tracking medical supplies and patient data, which is essential for improving service delivery and addressing logistical challenges in healthcare systems. The growth of e-commerce and digital transformation across the region is further bolstering the demand for RFID, as businesses seek to streamline operations and improve transparency in inventory and delivery management.

The market in MEA is also supported by government initiatives focused on modernization and digitalization, as well as the expanding use of RFID in sectors requiring secure and efficient identification, such as banking, transportation, and hospitality. Additionally, RFID's potential in enhancing security and anti-counterfeiting measures is driving its uptake, particularly in the luxury goods market. Overall, the RFID market in MEA is expected to grow steadily, with key growth drivers including urbanization, technological advancements, and sector-specific needs for operational optimization and security.

RFID Market: Split by RFID Tags Type



Source: Frost & Sullivan

Note: FY2025-2030 is Forecasted

The global RFID tag market is primarily divided into active and passive RFID tags, both of which serve distinct roles across various industries. These two types of tags differ in terms of functionality, cost, range, and application, and each is seeing unique growth drivers and trends in the global market.

Passive RFID Tags Market

The passive RFID tags market globally is estimated to be USD 13 billion in FY24 and is expected to grow to USD 25.7 billion in FY30 growing at a CAGR of 12.1%. The passive RFID tags market is by far the largest segment in the RFID industry due to their cost-effectiveness, simplicity, and widespread adoption across various sectors. These tags operate without a battery, drawing power from the RFID reader's signal to transmit data. This makes them ideal for applications such as inventory management, asset tracking, and supply chain logistics, where low-cost, high-volume deployment is essential.

One of the key trends driving growth in the passive RFID tag market is the increasing adoption in retail. Retailers are using passive RFID tags to streamline inventory management, enhance customer experiences, and reduce shrinkage. The automotive and pharmaceutical industries also leverage passive RFID for parts tracking and drug traceability, respectively, benefiting from the ability to tag large quantities of products at a low cost.

Another growth driver is the integration with IoT. The rise of IoT-enabled systems has made passive RFID tags a critical part of connected supply chains and smart inventory management systems. As industries across the globe adopt digital transformation, the demand for passive RFID tags continues to grow. Additionally, government mandates and regulations, especially in sectors like healthcare (for tracking medical devices and pharmaceuticals), also contribute to market expansion.

The passive RFID market is expected to continue growing due to cost-efficiency, wider adoption in asset management, and increasing demand for supply chain visibility.

Active RFID Tags Market

In contrast, active RFID tags are gaining traction due to their higher range and ability to transmit signals independently, powered by a battery. These tags are particularly useful in applications requiring real-time tracking and monitoring, such as in logistics, security, and asset management, where high-value or critical assets need to be tracked over long distances.

The growth of the active RFID market is closely tied to developments in logistics and supply chain management, where businesses are increasingly investing in real-time tracking to optimize inventory, reduce errors, and improve operational efficiency. Active RFID tags are widely used in environments where continuous data monitoring is essential, such as for high-value goods, personnel safety, or vehicle tracking in the transportation sector. The healthcare industry is another significant user of active RFID, particularly for patient monitoring, tracking medical equipment, and ensuring the security of pharmaceuticals.

Key drivers for the active RFID market include the rising demand for real-time data, automation in manufacturing processes, and increased investment in smart logistics. These drivers are amplified by the growth of smart cities, where RFID technology plays a central role in transportation management, asset tracking, and public safety applications. Furthermore, advancements in battery technology and

miniaturization are making active RFID tags more affordable and effective for a wider range of applications.

The active RFID market is expected to expand rapidly as industries continue to demand more sophisticated and real-time tracking solutions. As the Internet of Things (IoT) and big data technologies evolve, the need for advanced RFID systems capable of providing constant, reliable data will further drive the market's growth

Both the active and passive RFID markets are set to benefit from the growing demand for automation, digitization, and data-driven solutions across industries worldwide. While passive RFID continues to dominate due to its low cost and simplicity, the active RFID market is seeing significant growth driven by applications that require real-time tracking, security, and high-performance systems. As these technologies evolve, the global RFID market is poised to witness innovation in how these tags integrate into broader IoT ecosystems, creating new growth opportunities in sectors ranging from retail and logistics to healthcare and manufacturing.

RFID across Industry Verticals: Application & Growth enablers

RFID in Retail

Early 2000s

Early Days

- Walmart mandated all its vendors tag items with RFID. This mandate created hype about the RFID growth prospect in retail. However, the technology did not gain traction because of RFID tag price and performance.

2013 Onwards

Gradual Uptake

- As performance levels of tags improved, the retail industry witnessed many pilots/implementation, especially by large retailers Macy's, Herman Kay, and Tesco, worldwide. This uptake lowered RFID tag prices.

2015 Onwards

Online shopping as a catalyst

- Online shopping witnessed a considerable increase, especially in growing economies such as India, driving retailers to adopt RFID technology. The technology helped retailers manage their inventories efficiently.

2020 & Beyond

Future of Retail

- The future of retail shopping might witness cashierless checkout and lower billing time at stores, with click-and-collect shopping models gaining popularity. Sustainable tags are likely to be in huge demand in the future.

RFID automatically identifies objects, which makes retrieving information about each object in retail easier than using technologies, such as barcodes. In the retail industry, RFID tags can attach or integrate with any product at the manufacturing stage. RFID would be able to store data of various parameters of a product, such as brand, cost, dates of manufacturing and expiry, supplier information, and categories of information available around the product. The information that RFID tags collect can feed into SCM systems as a valuable IoT tool for end users.

The main benefits of including RFID in the retail sector are as follows:

- Sharing accurate information with the SCM ensures the better management of goods.
- Ensuring the traceability and trackability of assets aids in the better delivery and return management of products.
- Product security improves with anti-theft features.

It enables evaluation of the entire supply chain.

RFID as a critical growth enabler in Garment Retail

The growth of RFID (Radio Frequency Identification) technology in the garment retail sector has been significant, driven by the need for greater efficiency, inventory accuracy, and supply chain transparency. RFID enables retailers to track individual items throughout the supply chain, from manufacturing to the retail floor, enhancing inventory management, reducing theft, faster billing, efficient return management, and improving customer experience. RFID is a critical component in the larger adoption of IoT in retail, enabling stores where products, shelves, and checkout systems are interconnected. This integration paves the way for innovations like fitting rooms, where RFID-enabled mirrors suggest products, and automated checkouts, further improving the overall customer experience. Global companies like Zara, Uniqlo, and Nike have pioneered RFID adoption in their operations, leading the way for other retailers to follow suit.

The adoption of RFID in garment retail continues to grow as retailers recognize its value in improving inventory accuracy, reducing shrinkage, and enhancing the overall customer experience. With major global brands leading the charge, RFID technology is set to become a standard tool in the retail industry's digital transformation journey.

RFID in Library Management

RFID technology has revolutionized library operations by automating and accelerating key processes such as book circulation, inventory management, and security. Each book is tagged with a passive RFID label containing a unique identifier, allowing for non-contact, rapid scanning using handheld or fixed readers. Patrons benefit from self-service kiosks that enable fast check-in and check-out without staff intervention. Additionally, book drop kiosks equipped with RFID readers allow users to return books conveniently. These kiosks instantly update the book's status in the library management system and can generate return receipts automatically, even after hours.

Library staff use RFID handheld devices for quick shelf audits and to locate misplaced books. Exit gates fitted with RFID antennas act as theft deterrents by detecting unauthorized removals. With real-time integration into the library management software, RFID systems provide complete visibility into book status, circulation history, and overdue alerts, enhancing both operational efficiency and user experience.

RFID in Keyfobs

RFID has become the de-facto backbone of modern key-fobs, transforming the way people unlock cars, access buildings and authenticate at secure kiosks. Today passive ultra-high frequency (UHF) and high frequency (HF) RFID tags are embedded in automotive and access-control fobs, and this is expected to rise as smart-mobility and prop-tech ecosystems scale. In vehicles, low-frequency and high-frequency

chips deliver hands-free entry, engine start and personal-profile recall, while ultra-wideband (UWB) is now being layered on top to thwart relay attacks with centimetre-level ranging. Commercial real-estate operators deploy key-fobs to manage employee movement, integrate time-and-attendance, and push dynamic credentials from the cloud—eliminating the re-keying costs of legacy magnetic stripes. Hospitality brands are migrating to Bluetooth-NFC hybrid fobs that can be over-the-air provisioned and audited, cutting check-in time and card waste.

RFID in EV Battery Charging

For EV charging, RFID cards are used to make it easy to pay for charging at charging points. An RFID card enables the user to start a charge at a public charging point by tapping his card against a reader. The card contains unique data that is transmitted to the charging station, allowing it to identify the user and initiate the charging process. Manufacturers are now working on options of having RFID enabled charges (7.5KW) for home installations to be activated through and RFID keyfob inked to the charging reader. The synchronization between the RFID keyfob and the EV charging reader involves a process that enables the charging system to identify the user, grant access, and initiate charging.

RFID in Access Control & Payments

RFID technology is increasingly being utilized in events to enhance access control and payment processes. By integrating RFID into event management, organizers can streamline operations, improve attendee experiences, and provide secure payment options.

RFID wristbands, cards, or badges can be used for contactless entry into events. Attendees simply scan their RFID-enabled device at entry points, significantly reducing wait times compared to traditional ticketing systems. RFID systems allow event organizers to monitor attendance in real-time, tracking the flow of attendees, and managing crowd control more effectively.

RFID-enabled wristbands or cards can be prepaid instruments or can be linked to attendees' payment accounts, enabling cashless transactions at food stalls, merchandise booths, and other vendors. This simplifies the payment process and enhances convenience. Attendees can make purchases by simply tapping their RFID wristbands or cards at point-of-sale (POS) terminals, reducing queues and improving the overall event experience.

RFID as a critical growth enabler in Solar energy sector

The growth of RFID (Radio Frequency Identification) technology in the solar energy sector is a relatively new but rapidly emerging trend. RFID is being increasingly used in solar energy projects to enhance the efficiency and traceability of solar panels, improve supply chain management, ensure compliance with quality standards, and reduce operational costs. As the solar industry expands globally, RFID plays a crucial role in improving asset tracking, enhancing monitoring systems, and ensuring accurate data management in large-scale solar farms. Several global companies have begun integrating RFID into their solar operations, partnering with RFID technology providers to streamline their processes.

Key Benefits of RFID in Solar Energy

1. **Asset Tracking and Inventory Management:** In large-scale solar farms, managing thousands of solar panels and associated equipment is a complex task. RFID tags affixed to individual solar panels and components allow companies to monitor their movement, installation status, and

operational performance. This ensures better control over inventory, reduces the risk of loss or theft, and enhances the lifecycle management of assets.

2. **Supply Chain Visibility:** RFID enhances supply chain transparency by tracking solar panel production, shipping, and installation in real-time. This ensures compliance with industry standards and improves accountability at every stage, from manufacturing to deployment on-site.
3. **Quality Assurance and Maintenance:** By tagging solar panels and components with RFID, companies can track the history of each component, including manufacturing details, certifications, and performance data. This is critical for maintenance operations, as it allows operators to identify underperforming panels and track warranty information more efficiently.
4. **Data Collection and Performance Monitoring:** RFID-enabled sensors can be integrated into solar panels to collect performance data such as energy output, temperature, and environmental conditions. This real-time data is crucial for optimizing energy production and identifying issues before they cause system failures.

As the solar industry continues to expand globally, the adoption of RFID technology is expected to grow. Governments and organizations are increasingly focused on the efficient management of renewable energy projects, and RFID offers a scalable solution for optimizing solar farm operations. Furthermore, the push for higher transparency and traceability in solar supply chains, particularly in compliance with sustainability and ethical standards, will drive further investment in RFID technology.

RFID in Exports Sector

The growth of RFID (Radio Frequency Identification) technology in the export sector has been fueled by its ability to provide real-time tracking, enhance supply chain visibility, ensure compliance with international trade regulations, and improve overall operational efficiency. Exporters worldwide are adopting RFID to streamline logistics, reduce human error, authenticate products, and combat issues like counterfeiting and theft. As global trade becomes increasingly complex, RFID has emerged as a critical tool for ensuring smoother international transactions, improving inventory management, and delivering better transparency to customers and regulatory authorities.

Key Drivers of Growth in RFID for the Export Sector

1. **Enhanced Supply Chain Visibility:** RFID provides real-time tracking of goods across international borders, ensuring that exporters can monitor shipments from the point of origin to the final destination. This helps reduce delays, minimize risks, and ensures that products are delivered on time.
2. **Compliance with Trade Regulations:** Many countries have strict regulations regarding the import and export of goods, particularly in industries like pharmaceuticals, electronics, and food. RFID ensures that exporters can provide accurate shipment information, which is crucial for customs clearance and meeting compliance requirements.

3. **Counterfeit Prevention and Product Authentication:** RFID tags are increasingly used to verify the authenticity of goods, especially for high-value exports like luxury goods, pharmaceuticals, and electronics. This helps protect against counterfeit products entering international markets, which is a significant concern for exporters and consumers alike.
4. **Efficiency in Logistics and Automation:** RFID allows exporters to automate inventory management, loading, and shipping processes. This reduces the chances of human error, speeds up operations, and minimizes the time spent on manual processes, leading to faster delivery times and reduced operational costs.
5. **Integration with IoT and Blockchain:** RFID's integration with Internet of Things (IoT) and blockchain technologies has further fueled its adoption in the export sector. This combination allows for granular tracking of shipments and creates tamper-proof records, improving transparency, security, and compliance in global trade.

The continued growth of RFID in the export sector promises to revolutionize global trade by providing enhanced visibility, better compliance with international regulations, and improved operational efficiency for exporters.

RFID in Logistics

The use of RFID (Radio Frequency Identification) technology in logistics has grown significantly over the past decade, driven by the increasing demand for real-time visibility, supply chain efficiency, and accurate inventory tracking. RFID technology allows for the automatic identification and tracking of items, improving asset management, streamlining operations, and reducing human errors. The logistics sector has adopted RFID across various processes, from warehouse management and transportation to last-mile delivery. Major global companies have been leveraging RFID to optimize their supply chains and enhance customer service, while several key contracts and partnerships have shaped the growth of RFID in this field.

Key Benefits of RFID in Logistics

1. **Manage inventory and supply chain traceability:** RFID-based source tagging involves embedding RFID tags into products at the point of manufacture. This technique enables tracking and identification throughout the supply chain, from production to retail, and provides numerous benefits that enhance efficiency, visibility, and security. RFID tags allow for real-time monitoring of inventory levels, making it easier to keep track of stock as items move through different stages of the supply chain. Manufacturers, distributors, and retailers can see exactly where each tagged item is located. By providing **accurate data on inventory levels**, RFID-based source tagging helps in maintaining optimal stock levels, reducing the chances of stockouts or excess inventory.
2. **Enhanced Security:** RFID helps in reducing theft, misplacement, and counterfeiting in the supply chain by providing detailed tracking of every asset. Goods can be traced back to their source, and unauthorized tampering or diversion can be detected.

- 3. Efficient Warehouse Management:** RFID enables automated tracking of products entering and leaving a warehouse. This automation minimizes errors during the picking, packing, and shipping processes and speeds up warehouse operations.
- 4. Optimized Transportation:** RFID tags on containers, trucks, and shipments provide real-time updates on the location and condition of goods in transit. This helps in route optimization, reducing delivery times, and improving overall logistics efficiency.

Future Growth and Opportunities

The future of RFID in logistics is bright, with the technology poised to play an even greater role as supply chains become more complex and globalized. Several factors will drive RFID adoption in logistics, including:

- 1. E-commerce Growth:** As e-commerce continues to expand, the need for efficient inventory management and fast delivery will push more companies to adopt RFID in their logistics operations.
- 2. Automation and AI Integration:** RFID will increasingly be integrated with automation systems, artificial intelligence (AI), and the Internet of Things (IoT) to create smart supply chains. This will allow for better forecasting, predictive maintenance, and real-time decision-making in logistics.
- 3. Sustainability Initiatives:** RFID can help companies reduce waste, improve energy efficiency, and minimize their environmental impact by optimizing transportation routes and inventory levels. Sustainability-focused supply chains will drive the need for RFID solutions to track and reduce carbon footprints.

RFID Localisation in India

Radio Frequency Identification (RFID) localization in India is gaining significant momentum as the country seeks to build a robust ecosystem for indigenous development, production, and adoption of RFID technology. This initiative aligns with the broader vision of *Aatmanirbhar Bharat* (Self-Reliant India) and addresses the growing need for secure, efficient, and locally manufactured RFID systems across industries.

Importance of RFID Localization:

- 1. Reducing Import Dependency:** India has traditionally relied on imports for high-quality RFID components such as tags, antennas, and readers. Localization aims to reduce this dependency, ensuring self-sufficiency.
- 2. Cost Reduction:** By manufacturing RFID systems locally, the cost of production and deployment can be significantly lowered, making the technology more accessible for small and medium enterprises (SMEs).
- 3. Enhanced Security:** Locally developed RFID systems reduce the risk of external data breaches and cybersecurity concerns, especially in critical sectors like defense, banking, and government projects.

4. **Sectoral Integration:** Localization supports the growing demand for RFID applications in sectors such as transportation (e.g., FASTag for toll collection), logistics, retail, agriculture, and healthcare.

Initiatives Driving RFID Localization:

1. **PLI Scheme:** The Production Linked Incentive scheme incentivizes local manufacturers to invest in production
2. **National IoT Policy:** The government's push for IoT adoption includes the promotion of RFID technology to improve logistics, inventory management, and asset tracking.
3. **Make in India Program:** Encourages foreign and domestic investment in RFID manufacturing through tax incentives, ease of doing business, and access to resources.
4. **Public-Private Collaboration:** Partnerships between Indian startups, research institutions, and global players foster innovation and knowledge sharing in RFID development.

India's efforts in RFID localization are expected to:

- **Enhance Efficiency Across Industries:** Local production will drive widespread adoption in logistics, healthcare, public transportation, and supply chain management.
- **Promote Technological Independence:** Build a strong foundation for related technologies such as the Internet of Things (IoT), smart sensors, and automated systems.
- **Boost Exports:** Position India as a major hub for affordable, high-quality RFID systems, catering to both domestic and global markets.

Through focused investments, policy support, and public-private collaboration, India is poised to emerge as a leader in RFID technology, contributing to both national growth and technological advancement.

Challenges in the RFID Sector

While RFID (Radio Frequency Identification) technology is experiencing rapid growth, it faces several challenges and threats that could impact its adoption and expansion. Some of the key threats and challenges include:

Privacy and Security Concerns

As RFID technology can track and collect data wirelessly, privacy concerns have arisen, especially in sectors such as retail and healthcare. Unauthorized reading of RFID tags, data breaches, and misuse of personal information are potential threats that could deter consumer and organizational trust in RFID systems. Ensuring secure encryption and limiting access to sensitive data is critical to overcoming these concerns.

Interference and Signal Obstruction

RFID technology relies on wireless signals, which can be prone to interference from other radio waves or physical obstructions such as metals and liquids. Signal disruption, which affects the accuracy and

efficiency of RFID systems, remains a technical challenge in environments with many overlapping signals or physical barriers.

Standardization Issues

While organizations like GS1 and Rain RFID have established global standards for UHF RFID systems, fragmentation still exists in certain sectors and regions. Regulatory differences, varying frequency allocations, and country specific compliance requirements can create interoperability issues between different systems. Different countries or industries may adopt different RFID frequencies or protocols, making it difficult for global companies to implement customize systems across regions or sectors to meet local regulations.

Environmental Factors

RFID systems can be vulnerable to extreme environmental conditions such as high temperatures, humidity, and chemical exposure. Tags and readers may malfunction or degrade in harsh environments, reducing the technology's effectiveness in industrial and outdoor settings.

High Implementation Costs

One of the biggest challenges to the widespread adoption of RFID is the high initial cost of deploying the technology. This includes the cost of RFID tags, readers, infrastructure, and system integration. For many businesses, especially small and medium-sized enterprises, niche use cases these costs can be prohibitive, slowing down the adoption rate.

Consumer Resistance

In sectors like retail, consumers may be wary of RFID due to concerns over tracking and data misuse, fearing that their personal information or purchasing behaviors may be used without their consent. This perception can lead to resistance against RFID-enabled products and services.

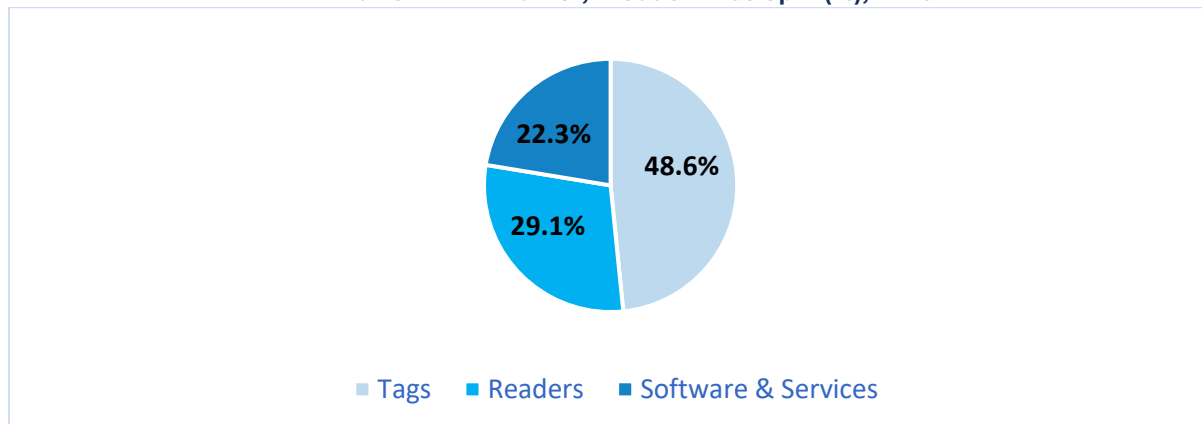
Technological Alternatives

RFID faces competition from other emerging identification and tracking technologies like Near Field Communication (NFC), Bluetooth Low Energy (BLE), and QR codes, which offer similar functionalities at lower costs or with fewer privacy concerns. These alternatives could slow the adoption of RFID, especially in sectors where lower-cost options are more practical.

Addressing these challenges will be crucial for the RFID market to continue its growth trajectory, requiring advancements in technology, improved regulations, and broader industry collaboration.

RFID Market, Split by Products (Tags, Software and services, Readers)

Exhibit 97: RFID Market, Product Wise Split (%), FY2024



Source: Secondary Sources, Frost & Sullivan Analysis

The tags segment accounted for approximately 48.6% of the total RFID market value in FY2024. Tags are fundamental components in RFID solutions and constitute a significant portion of the market due to their extensive use across multiple applications in large quantities; consequently, this segment captured the largest market share in 2024. The number of tags deployed significantly exceeds the quantity of readers and software utilized in a comprehensive RFID system within an organization. Furthermore, as the number of assets increases, the number of installed tags grows correspondingly; however, existing readers can often scan new tags without requiring replacement. This is why the market size for tags is the largest within the RFID ecosystem.

Competitive Landscape

Top Vendors and Industries served

Perfect ID is a provider of identification and tracking solutions, with a strong focus on RFID (Radio Frequency Identification) technology. The company offers a range of RFID tags, readers, and software solutions tailored to industries such as logistics, healthcare, retail, and manufacturing. Perfect ID's RFID technology enables real-time tracking and automation of assets, inventory, and equipment, improving efficiency and accuracy across operations. Known for its durable and high-performance RFID systems, Perfect ID helps businesses enhance visibility, reduce errors, and optimize workflows with secure and scalable RFID solutions.

Infotek Software Solutions is a technology provider specializing in innovative software and hardware solutions, with a strong presence in **RFID (Radio Frequency Identification)** technology. The company offers a comprehensive range of **RFID systems**, including **RFID tags, readers, and custom software integration** to support industries like **logistics, retail, healthcare, and manufacturing**. Infotek's RFID solutions enable real-time tracking, inventory management, and automation, helping businesses improve operational efficiency and accuracy. With a focus on delivering scalable and secure RFID technology, Infotek empowers organizations to optimize their asset management and streamline workflows across various sectors.

Avery Dennison is a global leader in labeling and packaging materials, renowned for its innovative solutions that enhance brand visibility and operational efficiency. The company has a significant presence in RFID (Radio Frequency Identification) technology, particularly through its RBIS (Retail Branding and Information Solutions) division, which focuses on apparel and retail applications. Avery Dennison's RFID solutions enable retailers and brands to improve inventory accuracy, enhance supply chain visibility, and streamline operations in the apparel industry. By integrating RFID technology into tags and labels, Avery Dennison helps businesses automate tracking processes, reduce shrinkage, and optimize stock management. The RBIS division is committed to driving digital transformation in the retail space, offering solutions that support sustainability and improve the overall customer experience through enhanced product information and seamless inventory management.

ID Tech Solutions is a RFID and smart-ID specialist that helps enterprises digitise “things” across their supply-chain and security footprints. The company designs and manufactures a full stack of passive- and active-RFID products—including UHF/HF/LF inlays, rugged asset & library tags, NFC key-fobs, smart cards and tamper-proof windshield labels—supported by its own range of fixed/hand-held readers, antennas and Bluetooth beacons. On the solutions side, ID Tech delivers turnkey platforms for warehouse automation, cold-chain tracking, livestock management, tool-crib visibility, people access-control and university smart-campus programmes, bundling its EdgeSoft middleware with APIs for SAP, Oracle and popular WMS/ERP suites. Complementary offerings extend to barcode printers & scanners, biometric attendance devices, QR-based loyalty cards and customised plastic card printing, enabling clients to source everything from a single vendor. With in-house R&D, ISO-certified production and nationwide field-service teams, ID Tech positions itself as an end-to-end partner—from feasibility study and antenna calibration to software integration, analytics dashboards and post-deployment AMC—helping Indian and overseas customers drive real-time visibility, authentication and cost efficiency across manufacturing, retail, logistics, healthcare and government projects.

Market threats and challenges

Cybersecurity risks: While RFID technology offers significant benefits in enhancing operational efficiency and data management, it also requires careful attention to cybersecurity measures. Some low-cost RFID systems may have limited encryption or authentication features, emphasizing the importance of robust security protocols in deployment. Ensuring that RFID systems are equipped to mitigate risks such as data skimming, eavesdropping, or cloning is crucial for maintaining trust in the technology. For instance, a recent analysis of Dormakaba's Saflok RFID-based keycard locks highlighted the need for continuous security enhancements in electronic locking systems.

Lack of Infrastructure: RFID systems generate vast amounts of data through tracking and monitoring. Handling such data requires robust backend data support. Businesses face challenges such as server overload and low storage capacities when proper infrastructure for RFID systems is not in place.

Complexities in adopting RFID system: Choosing a suitable RFID system for a business is crucial and requires expertise and knowledge. Integrating the RFID system with existing IT infrastructure necessitates intricate customization to ensure synchronization and seamless data flow. Handling the large volumes of data generated by RFID systems also requires specialized expertise. Companies often need to collaborate with RFID solution providers and consultants to help them adopt and maintain RFID systems, which adds

to the cost factor. Consequently, small businesses and startups may lack the knowledge and resources to overcome the complexities involved in adopting RFID systems.

9.2. Anti-Counterfeiting Tools in India: Focus on Tax Stamps

Tax Stamps Market in India: Evolution of Physical and Digital Systems

Tax stamps are security labels or marks affixed to excisable goods – such as alcohol bottles or cigarette packs – to indicate that the required tax has been paid, while also serving as a tool for product authentication. In India, the use of tax stamps has historically been driven by state excise regulations, especially for alcoholic beverages. State excise departments began introducing tax stamps in the late 20th century, evolving from simple paper stamps in the 1980s–90s to polyester-based holographic stamps by the late 1990s. Over time, stamps incorporated advanced security features (e.g. taggants, microtext, holograms) and digital elements like serial numbers and QR barcodes (around 2015–2016) to enable track-and-trace capabilities. After India’s 2017 GST tax reform (which centralized most taxes but *excluded alcohol and certain other goods*), state excise on liquor became one of the largest revenue sources for states. This heightened focus on securing excise revenue has reinforced the importance of tax stamps in the regulatory framework.

Today, India represents one of the world’s largest market for liquor tax stamps, with 27 states together consuming on the order of 30–35 billion excise stamps annually. In 2024–25 the government amended the GST law to enable a digital “track and trace” mechanism for high-risk goods like cigarettes and pan masala, mandating unique identification codes on each package to curb evasion. This marks India’s first national initiative to extend tax stamping (in digital form) to tobacco, aligning with the WHO FCTC Protocol against illicit trade. Overall, India’s tax stamp regime has evolved from basic tax collection instruments into a more sophisticated excise management system combining physical security features with digital traceability, often termed a “phygital” approach. Recent policy moves – such as introducing *biodegradable* tax stamps with QR codes in 2025 – underscore the ongoing innovation and regulatory emphasis on tax stamps as a nexus of revenue protection, anti-counterfeiting, and sustainability.

Market Segmentation

The Indian tax stamp market is largely driven by the liquor industry. The table below summarizes the estimated market size (in volume of stamps) across key product categories and the status of physical vs. digital stamp usage:

Product Category	Ballpark Estimates of Annual Volume (Stamps)	Adoption
Alcoholic Beverages	~30–35 billion units	Physical holographic or paper-based tax stamps mandated in all states. Many incorporate digital codes

	(barcodes/QR) for track-and-trace, i.e. a hybrid “phygital” system.
Tobacco Products ~None (cigarettes, chewing tobacco)	No excise stamp affixed historically. Tax is enforced via manufacturer reporting and GST/cess. However, in 2024 the GST Council approved unique identification marking on cigarette and pan masala packs to enable electronic tax tracking. Once implemented, this will effectively serve as a digital tax stamp system for tobacco. Further, in early 2025, the Union Budget proposed amendments to the Central Goods and Services Tax Act, 2017, introducing a 'Track and Trace' mechanism aimed at curbing tax evasion in high-risk commodities like cigarettes.

Source: Secondary sources, industry news / articles

As shown above, alcohol excise stamps dominate the Indian market. India’s annual consumption of ~30-35 billion liquor stamps is massive by global standards, making it one of the largest excise stamp program worldwide. The potential market expansion into tobacco is enormous, if even the cigarette industry is brought under a unit-level stamping regime. The government’s new track-and-trace initiative will likely capture this opportunity by deploying digital stamps (unique IDs) for cigarettes and smokeless tobacco, thereby significantly increasing the overall stamp/UID volume in coming years.

In terms of format, physical security labels/stamps remain the norm in 2025, but with growing digital augmentation. Virtually all of the 30-35 billion liquor stamps are physical security labels (holographic paper or polymer) purchased by state governments and affixed to bottles. However, a large share now carry serialized codes or data matrix barcodes printed on them, linking each stamp to an electronic tracking system. A few states even experimented with fully digital stamps (printing a barcode directly on the product packaging without a holographic sticker),but reverted to using physical security labels after counterfeiting incidents. Thus, the trend is toward “phygital” tax stamps – combining overt physical authenticity features with covert digital identifiers. For example, Kerala’s newest excise stamp (the *THTT* label) integrates a taggant, hologram, and track-and-trace QR code. In 2025, India introduced “BioSHEAL” biodegradable tax stamps that include *dual* QR codes alongside holographic and tamper-evident features. These developments reflect a broader shift: traditional tax stamps are evolving into high-tech labels enabling supply chain traceability. Meanwhile, the forthcoming GST-sanctioned codes for tobacco and pan masala indicate that purely digital tax stamping (unique codes without an accompanying sticker) will also become part of the landscape. Overall, India’s tax stamp market is poised for growth not only in volume (as new categories are brought in) but also in technological sophistication, blending physical and electronic systems.

Key Use Cases by Product Category

Alcohol (Liquor) Excise Stamps

Alcohol is India's largest tax-stamp domain. Every bottle must carry a state-specific holographic or paper based adhesive label placed across the cap, acting as a tamper-evident seal and a legal proof that duty is paid. Modern stamps merge overt security (holograms, colour-shift inks, micro-text) with covert digital features: a unique serial or QR code logged in the state's excise IT system. Scans at bottling plants, depots, retail outlets and even by consumers track each bottle's journey and expose diversion between low- and high-tax states. Upgrades follow fraud trends—states that downgraded holograms saw illicit liquor surge, then reinstated high-security stamps for revenue and public-safety protection.

India's alcoholic-drinks market is vast and still accelerating: the International Spirits & Wines Association of India (ISWAI) pegs retail sales at about US \$55 billion in 2023 and projects the figure to reach roughly US \$64 billion by FY 2028. Expansion is fuelled by demographics (20 million new legal-age consumers annually), rising urban disposable incomes, modern retail/e-commerce pilots and premiumisation—whisky, craft beer and RTDs are lifting value faster than litres. As volumes formalise, state excise “tax-stamp” demand grows in lock-step: every bottled unit must carry an authenticated revenue stamp, so higher output translates directly into larger stamp orders, creating a parallel CAGR for stamp printers and digital-track-and-trace providers. The push to curb illicit liquor further amplifies stamp usage, as more states shift from manual excise labels to high-security tax bands with QR/UV features. Together, demographics, rising affluence, changing social norms and a tightening compliance net position India to remain one of the world's most dynamic—and closely regulated—alcohol markets through 2028.

Tobacco Products

Historically, India never stamped tobacco packs, relying on factory audits, yet illicit cigarettes cost a fortune in lost tax. Budget 2025 reverses course: every cigarette and pan-masala pack will soon bear a machine-readable Unique Identification Mark generated through the GST Network. The datamatrix code—effectively a digital tax stamp—records production and shipping events, allowing handheld or mobile-app verification by officials and consumers. Once deployed, India will join the EU and Turkey in unit-level tobacco traceability, shrinking smuggling, levelling competition for compliant firms and fulfilling WHO FCTC obligations. Physical stickers may still be unnecessary; the stamp exists entirely as encrypted data.

Other Regulated Products

Beyond liquor and forthcoming tobacco codes, India sparsely applies stamps elsewhere. Fuel uses chemical markers, lottery tickets embed security print, and narcotic medicines employ special barcodes. The GST Council's new unique-code rules for pan masala broaden the footprint, proving digital stamps can target any high-evasion category. Policymakers may next consider codes on cottage-industry bidi, gold bullion hallmarks or high-value electronics to verify customs duty. Each extension follows the same logic:

low-cost unit identifiers linked to central databases deter tax fraud and counterfeits. Thus, tax-stamp principles are evolving into a universal Indian framework for revenue protection and product authenticity.

In summary, the use cases of tax stamps and analogous security labels in India span from ensuring tax revenue (alcohol, tobacco, pan masala) to safeguarding quality and authenticity (medicines, seeds). Each category adapts the core concept to its needs: an alcohol stamp prioritizes tamper evidence and tax auditing, a seed QR tag prioritizes supply chain transparency and farmer trust. Together, they illustrate the broadening role of “stamps” from purely revenue instruments to general product authentication and traceability tools in the Indian market.

Value Proposition for Stakeholders

Tax stamps and their digital equivalents deliver a multi-faceted value proposition to different stakeholders in India’s economy.

- Government: Increased tax revenue and regulatory control
- Industry: Fair competition and brand security
- Consumers: Product authenticity and safety

This trifecta of benefits explains why India is investing in both improving physical stamp security and transitioning to sophisticated digital systems. Tax stamps have evolved from mere tax collection tools to “dual role” instruments for supply chain monitoring and authentication, delivering tangible value across the board.

Growth Drivers and Emerging Trends

The Indian tax stamp market’s growth is propelled by several key drivers and trends, reflecting changes in policy, technology, and market dynamics:

- **Regulatory reforms & enforcement focus:** 2025 GST amendment adds track-and-trace, expanding stamps from liquor to tobacco / pan masala and, potentially, other high-risk goods. Spurious-liquor tragedies and WHO protocols keep political pressure high for ever-stronger, authenticated stamps.
- **Government-Led Mandates:** State governments (like UP and Delhi) mandate holograms on liquor bottles to prevent tax evasion and counterfeiting.
- **Counterfeit & illicit-trade risks:** Roughly 25% of cigarettes and a sizable share of liquor evade duty, costing millions to the government. High-security stamps raise copying costs, create traceable codes that pinpoint diversion, and unify government and industry interests in tighter enforcement.
- **Technological innovations:** Biometric taggants, nano-holograms, color-shift inks and hybrid substrates harden physical labels, while QR printing, smartphone scanners and GSTN databases scale digital verification. “Phygital” stamps (hologram + encrypted QR) promise high ROI and drive constant upgrades.

- **Modernization of excise management:** States now log every stamp in online portals, enabling real-time route monitoring and data analytics that flag suspicious patterns. Tenders increasingly bundle secure printing with turnkey track-and-trace platforms, prompting laggard states to follow early adopters.
- **Environmental & social factors:** Biodegradable, plastic-free stamps and research into eco-friendly inks reflect sustainability mandates. *Make in India* and *Atmanirbhar Bharat* spur local R&D and keep more contracts with domestic suppliers, boosting home-grown innovation.

Taken together, these drivers have resulted in tangible growth outcomes. More states are upgrading their stamp programs – e.g. Rajasthan implementing an end-to-end holographic stamp traceability system in 2022; Chandigarh and others floating tenders for new stamp technologies; and pan-India efforts for tobacco in 2024. In India, the market is expected to not only expand in volume (as new products like cigarettes get stamped) but also in value per stamp as more high-security and digital-enabled stamps are used instead of rudimentary ones. The challenges that come with these trends include ensuring interoperability (e.g., linking state excise systems with central GST track-and-trace) and protecting data security in digital systems, but these are being actively addressed via standards (India is aligning with ISO 22382 for tax stamp programs and leveraging global best practices). Overall, the outlook is that tax stamp usage in India will continue to grow robustly, driven by the twin goals of maximizing revenue and minimizing counterfeits, aided by progressive policy and technology adoption.

Competitive Landscape: Key Vendors and Providers

The market for supplying tax stamps and traceability systems in India involves a mix of domestic security printing companies, government security presses, and international solution providers. Below is an overview of key players and their roles:

Vendor / Organization	Description & Offerings	Notable Projects / Market Presence
Holostik India Ltd (India)	Indian security printing and hologram company; offers customized tax stamps with multi-layer security (e.g. holographic foils, UV inks) and integrated QR/barcode solutions. Also provides track-and-trace software modules for supply chain visibility.	Supplies holographic tax stamps to excise departments. Holostik's stamps are used on liquor bottles and the company actively collaborates with governments on new stamp designs and anti-counterfeit initiatives.
Kumbhat Holographics (India)	An Indian manufacturer of security holograms and labels, established over 20 years. Provides excise stamp products, shrink sleeves with holographic stripes, and has capability for nano-optic features through technology licensing. Also offers	Provides anti-counterfeiting and tax stamp products. It has partnered with international firms (e.g. Nanotech Security Corp) to bring advanced optical features (KolourOptik® films) to the Indian tax stamp and pharma packaging market.

authentication solutions for Kumbhat's holographic tax stamp foils are supplied to pharmaceuticals and other products. to and used by excise departments.

Madras Security Printers (MSP) (India)	A Chennai-based company specializing in e-governance, track-and-trace, and secure printing solutions. MSP offers end-to-end excise tax stamp programs, secure stamp printing, IT systems for stamp issuance and verification, and even related services like revenue reconciliation. The company is an integrated solutions provider implementing excise stamp and track-and-trace systems. The company has an Indian state for a client and also foreign governments (won contracts in African countries for tax stamps). MSP has one-stop capability and has also worked on related areas like secure credentials and vehicle registration, giving it a broad govt. project portfolio.
SPMCIL India Security Press (India Govt.)	The Security Printing and Minting Corporation of India Ltd. (SPMCIL) is the government-owned printer of currency, passports, and various security documents. Its unit, India Security Press (Nashik), prints excise adhesive labels among many other items. The company is a Public sector supplier. ISP Nashik has historically supplied excise stamps to certain states and union territories. However, with the rise of holograms, many states moved to private vendors for those specialized stamps. The government press brings assurance of security and confidentiality, which is why it's often involved in sensitive print jobs.
SICPA SA (Switzerland)	A global leader in secure inks and tax stamp systems. SICPA provides comprehensive excise tracking platforms (e.g. SICPATRACE®) which include encrypted stamp designs, verification hardware, and data analytics. SICPA has been active in promoting its solutions in India. SICPA has an India office and has participated in forums and tenders; if India's central government standardizes digital stamps, SICPA could play a role either directly or via partnerships.
UFlex	UFlex's Holography Division supplies full-polyester, tamper-evident excise adhesive labels. Its security-grade portfolio ranges from self-adhesive tax bands and heat-transfer strips to registered-lens paper labels. The company controls the entire chain in-house—mastering, electroforming, embossing, metallizing and variable data printing—enabling rapid, high-volume runs while maintaining 30-plus layered security features. Won the high-security hologram contract for Andhra Pradesh's liquor-track system, setting up a dedicated facility to meet the state's daily demand for bottle-neck bands. In Tamil Nadu the company defended the tender for polyester hologram labels used by TASMAL.

Partnerships are common in this landscape. For instance, global tech providers team up with local printers: the Nanotech-Holostik-Kumbhat collaboration on nano-optic features, or SICPA potentially aligning with

an Indian integrator (Kranthi Track & Trace) for GST track-and-trace. Such partnerships combine global innovation with local execution capability. On the government side, coordination between central and state agencies is increasing – e.g. India’s National Research Development Corporation (NRDC) stepping in to develop new stamp materials and then supplying them to states. This suggests the competitive landscape may also see government-led solutions (public-private partnerships) playing a bigger role going forward (the biodegradable stamp is one example where a government R&D outcome is being commercialized in states).

India’s tax stamp vendor landscape is dynamic, with established domestic firms leading on production of physical stamps, and strong interest from global specialists to provide next-generation digital traceability solutions. This competitive environment is likely to drive further innovation and possibly consolidation (or consortium approaches) as India scales up its stamping programs across sectors.

India’s tax stamp journey is now converging with global trends: moving from purely physical to digital-integrated stamps, extending coverage to tobacco, and employing cutting-edge security akin to other leading programs. While India could learn and emulate what countries like Turkey, EU, Kenya, and US have done, India’s scale and its focus on alcohol stamps provide lessons for others (India’s liquor stamp market size is unparalleled, and its innovations like biodegradable stamps may set a new example).

To summarize, the Indian tax stamp market is largely driven by the liquor industry, with other sectors still nascent in its adoption, like tobacco products, pharmaceuticals, and agricultural seeds. Beyond liquor and forthcoming tobacco codes, there is sparse application of stamps in India in other industries. For instance, for the fuel industry, chemical markers are used, lottery tickets embed security print, and narcotic medicines employ special barcodes. The GST Council’s new unique-code rules for pan masala broaden the footprint, proving digital stamps can target any high-evasion category. Tax-stamp principles are evolving into a universal Indian framework for revenue protection and product authenticity. India’s tax stamp journey is now converging with global trends, moving from purely physical to digital-integrated stamps, extending coverage to tobacco, and employing advanced security akin to other leading programs.

9.3. Anti-Counterfeiting Tools in India: Focus on Secure Labels and Holograms

Market Overview

India’s anti-counterfeiting market, driven by increasing incidents of product duplication, has witnessed significant demand for secure labelling and packaging solutions—especially holographic technologies. Secure labels and Holograms are widely used as tamper-proof, visual authentication tools that help end-users identify genuine products at a glance. These tools are gaining traction across industries such as pharmaceuticals, FMCG, liquor, education, government documentation, and more.

The Indian hologram industry is among the most mature and technologically advanced in Asia, and it is evolving from traditional 2D holograms to 3D, digital, optical variable devices (OVDs) and track-and-trace integrations.

Role of Holograms in Secure Documents & Payments

Domain / Document	Primary Security Purposes
Tax-stamp labels	• Overt authenticity cue for consumers and inspectors • Tamper-evidence (hologram fragments if removed) • Deterrent to refill / diversion fraud
National ID & smart cards	• Visual authentication at checkpoints • Protection of personalised data layers • Anti-skimming in e-IDs (optional metallic grid)
Payment-scheme cards	• Quick merchant-level legitimacy check • Brand integrity for the scheme • Forensic examination in fraud cases

Key Industry trends

- **Adoption of Smart & Digital Holograms**
Movement from static holograms to QR-coded, RFID-embedded, or app-verifiable holograms.
- **Integration with Track & Trace Systems**
Increasing use of secure labels and holograms with serialization and traceability software in pharma and agrochemical sectors.
- **Sustainability Focus**
Development of eco-friendly holographic films and non-PVC solutions aligned with ESG goals.

Key Drivers and industry enablers

- **Surge in Counterfeiting**
Industry loss due to counterfeiting in sectors like pharma, auto parts, and FMCG is huge. Holograms offer low-cost, high-visibility deterrents.
- **Brand Protection Needs**
Growing awareness among Indian brands to protect brand reputation and customer trust.
- **Export & Certification Requirements**
Many exports and government certifications now require holographic authentication as part of packaging compliance.
- **End to end visibility and Traceability**
Brands demand end-to-end visibility; scan-enabled hologram labels map every unit's journey, curbing grey-market diversion and satisfying regulators' real-time audit requirements.
- **Serialisation**
Unique, machine-readable IDs printed within holographic elements block duplication, enabling item-level recalls and automating anti-counterfeit checks across global supply chains.

- **Secure Packaging/Label**

Multi-layer holograms with tamper-evident films and covert features deter imitation, assuring consumers of authenticity and protecting revenue from fake look-alike products.

Growth challenges and restraints

- **Cost Sensitivity of SMEs**

Smaller manufacturers often see secure labels and holograms as additional cost overheads.

- **Lack of Standardization**

No unified national guidelines for anti-counterfeiting tech across industries.

- **Technological Obsolescence**

Hologram replication techniques are also evolving; thus, static holograms alone are not foolproof.

Applications Across Key Industries

Industry	Use Case
Pharmaceuticals	Packaging, tamper-evident seals, and patient safety assurance.
Alcohol & Beverages	Mandatory excise label verification (state-regulated).
Education & Certificates	Degree certificates, mark sheets, ID cards with embedded holograms.
Government Documents	Passports, PAN cards, vehicle registration certificates.
FMCG & Consumer Goods	Product authentication, anti-tampering, and brand security.
Automobile Spares	Packaging-level authenticity for spare parts and accessories.

Pharmaceuticals

In the pharmaceutical industry, counterfeit drugs pose a severe threat to public health and safety. Holograms are used extensively on blister packs, cartons, and seals to ensure product authenticity and integrity. They serve as a tamper-evident layer that helps patients, pharmacists, and regulators identify genuine medicines. Secure labels and Holograms also integrate with serialization and QR-code systems for track-and-trace capability, supporting regulatory compliance like India's DAVA (Drug Authentication and Verification Application). By embedding security into packaging, Secure labels and holograms protect pharmaceutical companies from brand erosion and litigation risks while safeguarding end-user trust.

3. FMCG & Consumer Goods

In the FMCG sector, holograms are applied to packaging, labels, and promotional materials to tackle counterfeit products and imitation brands. Products like soaps, cosmetics, shampoos, and packaged foods frequently face duplication in tier-2 and tier-3 cities. Secure labels, Holograms and secure packaging act as visible security seals, often with interactive features like scratch codes or QR verification, enabling customers to verify authenticity instantly. These tools help build consumer trust, reduce losses due to fake goods, and support marketing campaigns by highlighting product originality.

4. Education & Certificates

Academic institutions and certification bodies deploy holograms on mark sheets, degree certificates, and ID cards to prevent forgery and duplication. These holograms are embedded with institution-specific visual elements, such as logos, UV inks, and microtext, making them extremely difficult to replicate. They uphold the credibility and sanctity of academic credentials, and help employers and immigration authorities verify qualifications easily. With rising incidents of fake educational certificates, holograms have become a critical safeguard for institutions and students alike.

5. Government Documents & IDs

Government agencies rely on holograms to secure a wide range of critical documents such as passports, PAN cards, vehicle registration certificates, tax stamps, and more. These holograms incorporate overt and covert security features, including 3D effects, color-shifting elements, and laser-readable data. They provide a strong first line of defense against identity theft, forgery, and fraud. By incorporating holograms and printed security features, governments can enhance public trust, reduce financial crimes, and ensure secure digital and physical identification systems.

6. Automotive & Spare Parts

The automotive industry faces significant challenges with fake and substandard spare parts that can compromise safety and vehicle performance. Secure labels and Holograms are applied on packaging, engine components, and service manuals to establish product authenticity. These are often paired with digital verification tools that customers or dealers can use. This helps OEMs protect their brand, maintain quality assurance, and reduce warranty claims. Authentication is especially critical in rural markets and grey channels where counterfeit parts are prevalent.

Competitive Landscape

The Indian hologram manufacturing market is **fragmented but innovation-driven**, with a mix of:

- **Large, diversified players** like Holostik and Uflex dominating large contracts (govt. and pharma).
- **Niche tech specialists** offering customized 2D/3D/QR-based holograms.
- **Growing collaborations** with IT companies to embed **blockchain, serialization, and track-and-trace capabilities**.

The competitive edge is shifting from **just Secure labels and holograms** to integrated **digital security, AI-based authenticity checks, and smart packaging ecosystems**.

Key Hologram Manufacturers in India

Holostik India Ltd.

Holostik is one of the leading companies in India's hologram manufacturing industry. With over three decades of experience, the company offers a wide array of anti-counterfeiting solutions including security holograms, tax stamps, track-and-trace systems, QR code integration, and digital authentication

platforms. Holostik has served government agencies, FMCG companies, pharma firms, and liquor manufacturers. Their key strength lies in high-volume production capabilities, advanced security features (like nano-optics, covert images, and microtext), and the ability to deliver end-to-end authentication ecosystems combining physical and digital security layers. Holostik is ISO certified and exports to more than 90 countries.

Manipal Payments and Identity Solutions Limited (MPi)

Manipal Payments and Identity Solutions Limited (MPi) is one of the leading companies and a diversified one offering secure printing and packaging solutions, including high-security holograms and security labels. The firm is a trusted partner for government-issued IDs, banking instruments, tax stamps and secure labels. MTL's holographic solutions are known for robust process control, optical features, and integration with smart card technologies. It is also among the few players with the capability to offer security features across ID cards, cheque books, banking forms, and exam certificates under one roof. Their investments in digital traceability and tamper-evident technologies further enhance their position in the secure printing domain.

3. Uflex Limited – Holography Division

Uflex's holography division is a global player offering sophisticated holographic films, security labels, shrink sleeves, and hot stamping foils. With a focus on large-scale production and innovation, Uflex serves clients in packaging, tax stamps, FMCG, and government sectors. Their holographic solutions are embedded with color-shifting effects, kinetic movement, covert codes, and hybrid printing technologies. Uflex has earned recognition for integrating holography with sustainability (recyclable films) and boasts strong export capabilities, serving clients across Latin America, Europe, and the Middle East.

4. Shriram Veritech Solutions

Shriram Veritech specializes in high-security authentication and brand protection solutions, catering to industries like pharmaceuticals, liquor, agriculture, and education. Their hologram offerings include 2D/3D holograms, tamper-evident labels, and track-and-trace-enabled smart labels. Veritech is known for its strong R&D focus, ISO 9001 and ISO 27001 certifications, and capability to produce multi-layered holographic solutions with overt, covert, forensic, and digital features. They emphasize customizable solutions and rapid turnaround time, making them a preferred vendor for enterprises looking for tailored brand security systems.

5. Kumbhat Holographics

Kumbhat is one of the earliest entrants in the Indian holography industry, known for delivering cost-effective and customizable hologram labels for sectors like education, textiles, electronics, and industrial goods. They manufacture tamper-evident holograms, embossed holograms, and barcode-embedded stickers. While they may not match the scale of larger players like Holostik or Uflex, Kumbhat holds a niche in serving SMEs and regional players who require basic to medium-level anti-counterfeiting solutions at competitive pricing.

9.4. Secure QR Codes for Anti-Counterfeiting in India: Market Overview and Trends

Secure QR codes are two-dimensional barcodes enhanced for authenticity and traceability. Unlike ordinary QR codes, *secure* QR codes typically embed product-specific data (e.g. unique IDs, batch details) often tied to a verified database or digital signature, making them useful for regulatory compliance, supply chain transparency, and counterfeit prevention. Scanning such a code with a smartphone or scanner reveals essential product information – for instance, a medicine’s manufacturer, batch number, and expiry – allowing instant verification that the item is genuine and traceable. This technology has become a cornerstone of anti-counterfeit packaging in India. Secure QR codes serve as a digital security stamp, helping regulators and companies ensure that products in circulation are authentic, properly labelled, and traceable back to their source. This plays a vital role in regulatory compliance (meeting government mandates on product labeling), supply chain transparency (tracking products through production, distribution, and even facilitating recalls), and counterfeit prevention (empowering inspectors and consumers to verify goods before use). India is witnessing secure QR codes move from novelty to necessity across industries, as stakeholders strive to protect public safety and brand integrity in an era of complex supply chains.

Key Market Trends

Several recent mandates and initiatives have accelerated the adoption of secure QR codes in India’s product markets:

- Pharmaceutical QR Labeling:** A landmark development was the **August 2023** implementation of mandatory QR codes on the packaging of the country’s top 300 pharmaceutical brands. Notified by the Union Health Ministry under the Drugs Rules, this mandate requires drug manufacturers to affix a barcode/QR code containing a wealth of data – unique product ID, drug name, manufacturer, batch and license numbers, production/expiry dates, etc. Scanning the code lets regulators, pharmacists, or patients verify if a medicine is authentic and trace its origins, addressing India’s long-standing problem with spurious drugs. This trend is expanding: by late 2024, authorities signalled plans to extend QR code requirements beyond the initial 300 brands to more pharmaceutical products, integrating *track-and-trace* more deeply into the pharma supply chain.
- Agrochemicals and Insecticides:** Another key policy driver is in agrochemicals. Effective June 2025, the Ministry of Agriculture has amended labelling rules for insecticides to mandate QR codes on all retail pesticide packs. The QR code must link to the manufacturer’s website or database and embed at minimum the product’s unique identifier (e.g. GTIN), batch number, manufacturing date, and expiry date. This enables farmers, dealers, and inspectors to scan a pesticide bottle and retrieve its authenticated label and leaflet information. The goal is to curb counterfeit or unregistered pesticides in the market and improve traceability of agrochemicals, much like the pharma sector.

- Alcohol Excise Track-and-Trace:** State governments are also leveraging secure QR codes to tackle counterfeit alcohol and tax evasion. For example, the Punjab excise department introduced a QR code-based “Track and Trace” system in 2022, affixing unique QR coded labels on every liquor bottle. A dedicated mobile app allows consumers or officials to scan the bottle’s QR code and instantly see its provenance, the licensed distiller, brand, batch, and manufacturing details, thereby checking the genuineness of the liquor. This initiative aims to ensure no illicit or untaxed liquor is sold, and has been accompanied by public helplines to report suspicious bottles. Similar QR-based excise systems have been or are being rolled out in other states (Haryana, Uttar Pradesh, etc.), reflecting a broader trend in the alcohol industry toward digital tax stamps and authentication codes on bottles.
- Consumer Product Packaging Digitization:** In the consumer electronics and retail sector, regulatory changes have begun to accommodate QR-coded digital labels. Notably, the Legal Metrology rules were amended in July 2022 to allow manufacturers of electronic commodities to provide certain mandatory declarations (manufacturer/importer details, product dimensions, customer care info, etc.) via a QR code on the packaging, instead of solely printed on the box. This was a pilot for one year, intended to simplify packaging and “digitize” consumer information delivery – with the added benefit of product authenticity verification through the QR code. The success of such measures could lead to wider adoption in FMCG packaging, where space is limited and information requirements are high. Many FMCG brands are already using QR codes for consumer engagement and authentication (e.g. scan for product info or loyalty points), complementing traditional holograms and security seals.
- Government Documents and IDs:** Outside of product packaging, a parallel trend is the use of secure QR codes in official documents to deter forgery. Aadhaar, India’s national ID, now includes a digitally signed QR code on printed and electronic versions that contains the holder’s demographic details and photograph. This QR code can be scanned with a UIDAI-provided app to instantly verify if an ID card is genuine, since the data is validated against UIDAI’s digital signature in real time. Likewise, educational certificates, land records, and other government-issued papers increasingly feature QR codes that link to an official verification portal, allowing quick authentication by employers, banks or citizens. This trend in the public sector underscores the broad acceptance of QR codes as a trust mechanism by 2025.

India has moved decisively toward QR-coded authentication across multiple domains. Going forward, one can expect these policies to mature into fully implemented systems, with secure QR (or successor technologies) standard on most regulated products and many everyday documents, creating an integrated ecosystem for traceability.

Market Drivers

Several factors are fuelling the growth of secure QR code adoption in India’s anti-counterfeiting and traceability market:

- **Regulatory Enforcement and Compliance Imperatives:** Government mandates are the primary driver. Strong enforcement focus by regulators, from drugs to agriculture to excise is compelling companies to implement QR codes to meet compliance. Regulators see QR codes as tools to improve oversight efficiency; scanning can assist in audits, help track distribution, and facilitate product recalls when quality issues arise. In short, robust regulatory push – underpinned by laws and periodic crackdowns provides a strong impetus for adoption.
- **Digital Public Infrastructure and Consumer Digital Literacy:** India’s broader digital infrastructure boom makes QR solutions feasible and familiar. The ubiquity of smartphones and the success of national digital platforms have normalized QR code use. Unified Payments Interface (UPI), for instance, popularized QR scans for payments at millions of merchants, training consumers to trust and use QR interfaces. Similarly, government-backed platforms like Aadhaar and ONDC have embraced QR codes. In 2024, the Open Network for Digital Commerce launched an interoperable QR code system to link small offline sellers to online discovery, bridging physical and digital retail. The digital readiness bolstered by nearly 700 million internet users means that by mid-2020s both businesses and consumers are prepared to leverage QR codes for authentication. The presence of digital public goods (apps, verification servers, etc.) lowers the barrier for implementing secure QR systems at scale.
- **Corporate Brand Protection and Consumer Trust Needs:** Private sector dynamics also drive adoption. Companies facing revenue loss and reputational damage from counterfeit goods are proactively investing in anti-counterfeit packaging. Industries like pharmaceuticals, electronics, cosmetics, and luxury goods see secure QR codes (often combined with other features like holograms) as a cost-effective way to protect their brands. The scale of counterfeiting provides ROI justification for these solutions. Moreover, offering an easy authenticity check enhances consumer trust; brands can publicly assure buyers that “you can scan our product to verify it’s genuine.” This not only differentiates genuine products from fakes but also builds engagement, as the scan might provide additional product info or loyalty rewards. In a market where consumers are becoming quality-conscious, the ability to verify a product’s authenticity via QR code is a value-added service. Thus, rising awareness of anti-counterfeit technologies and a push for corporate transparency (often in ESG agendas) are propelling voluntary adoption beyond what regulations strictly require.

Market Restraints and Challenges

Despite strong drivers, several challenges temper the growth and effectiveness of secure QR codes in India:

- **Implementation Cost and Complexity:** Adding unique QR codes to every product unit can be costly and technically demanding, especially for small and medium enterprises. Upgrading packaging lines, installing code printers and verification systems, and managing the data for millions of codes require significant investment and process changes. The cost and complexity

barrier means some companies delay compliance or seek extensions, slowing full market penetration of the technology.

- **Awareness and Enforcement Gaps:** The mere presence of a QR code does not automatically stop counterfeiting; it must be scanned and checked. Here, a gap in awareness and behavior can limit impact. Enforcement by authorities also varies – while the law mandates QR codes in certain sectors, on-the-ground inspection to ensure every product actually carries the code (and that fake codes are not used) is challenging. Therefore, continuous public awareness campaigns and strict enforcement actions are needed to realize the potential benefits of secure QR codes.

Applications Across Key Verticals

Secure QR codes are being applied across a range of industries and use-cases in India, each with specific drivers:

- **Pharmaceuticals:** The pharma sector is a pioneer in QR adoption, driven by patient safety and regulations. As of 2023, all top-selling prescription drug brands must carry a secure QR code on their packaging. This code holds the drug's unique ID, manufacturer, batch, license, and expiration details, which can be scanned by chemists, regulators or patients to authenticate the medicine. The system bolsters track-and-trace – helping detect counterfeit or substandard drugs and even enabling targeted recalls if a batch is found defective. With India supplying medicines globally, QR codes also prepare companies for international traceability norms. Going forward, as the mandate extends to more drugs, virtually every strip or bottle of medicine in India could be verified via QR scan, significantly shrinking avenues for fake drugs.
- **Agrochemicals:** In agrochemicals (pesticides, insecticides, crop protection products), secure QR codes are becoming mandatory on retail packs under the new 2025 rules. These serve a similar anti-counterfeit function; farmers and dealers can scan a pesticide's QR code to confirm it's a registered product from the legitimate company, not an adulterated or banned chemical. The codes also improve supply chain transparency by encoding GTIN (global trade item number) and batch information, which will facilitate tracing any quality or efficacy issues back to their source. This is crucial in agriculture, where fake or substandard pesticides can cause crop failures.
- **Alcohol and Excise:** The alcoholic beverages industry, under state excise departments, uses secure QR codes to enforce taxation and quality controls. Consumers can verify the genuineness of liquor bottles and avoid contraband alcohol, which has been a public health hazard. For the government, these systems help track every bottle from factory to retail, curbing smuggling and revenue loss.
- **Consumer Electronics:** In consumer electronics and appliances, QR codes are increasingly used for both compliance and brand protection. High-value electronics often come with QR-coded warranty cards or authentication labels that buyers can scan to register the product and check

its legitimacy. The 2022 legal metrology amendment allowing QR-coded declarations on electronic product packages has further spurred this trend.

- FMCG and Retail Goods:** The FMCG sector sees a mix of regulatory encouragement and voluntary adoption of secure QR codes. While not yet universally mandated, there is a strong business case due to rampant counterfeiting in everyday consumer goods. Many FMCG brands now incorporate QR codes into their packaging or labels often in combination with holograms or special inks as a means for consumers to verify product authenticity via smartphone. Some companies also leverage these QRs for marketing (scans might show usage instructions or promotions), creating a dual benefit.
- Government Documents and Certificates:** Beyond physical products, secure QR codes play a key role in validating official documents. Identity cards (like Aadhaar) and certificates (educational degrees, vehicle registrations, COVID-19 vaccination certificates, etc.) frequently feature QR codes that encode the document's details and a digital signature. Scanning these with the appropriate government app instantly tells whether the document is authentic or has been tampered with, as the data is cross-verified with the issuing authority's records.

India's regulatory landscape and market forces are together transforming QR codes into a backbone for authenticity and traceability. The market is poised for growth, albeit with continuous evolution in technology and practices to address security challenges. Stakeholders – regulators, companies, and consumers are coalescing around the vision of transparent supply chains and counterfeit-free markets, with secure QR codes playing a central, integrative role in that vision.

Competitive Landscape

The QR code ecosystem in India is highly competitive, with a mix of payment aggregators, banks, and tech enablers vying for market share. Fintech players like PhonePe, Google Pay, and MobiKwik compete based on QR issuance, merchant rewards, and ease of onboarding. QR code-based loyalty and engagement is a rising segment where CRM firms and martech platforms are now active. Government-backed initiatives like Bharat QR offer standardization, while regional players offer industry-specific QR code integrations (e.g., for pharma traceability or education verification).

Key QR Code Manufacturers and Enablers in India

Manipal Payments and Identity Solutions Limited (MPI)

Manipal Payments and Identity Solutions Limited (MPI) is one of India's leading secure print and digital solution providers. It plays a pivotal role in QR code printing for high-security applications including academic certificates, tax stamps, ID cards, and utility bills. With decades of experience in handling government and financial sector requirements, MPI offers tamper-proof QR code solutions integrated with encryption, serialization, and verification features. It supports both static and dynamic QR implementations, making it a preferred partner for regulatory and large-scale enterprise use.

Holostik India Ltd.

A pioneer in anti-counterfeiting and holographic technologies, Holostik has extended its capabilities into secure QR code printing as part of its broader suite of product authentication solutions. It offers track and trace systems using encrypted QR codes combined with security features such as holograms and covert elements. Holostik's QR-enabled labels are widely used in pharma, FMCG, and agrochemical packaging, providing supply chain visibility and consumer-level authentication.

Shriram Veritech Solutions

Shriram Veritech is a premium provider of brand protection and secure packaging technologies in India. It specializes in QR code-enabled packaging, serialization, and warranty management systems. The company caters to industries like automobile spares, electronics, government ID printing, and alcohol packaging. Its integrated digital platform allows clients to leverage QR codes for consumer engagement, loyalty programs, and regulatory compliance.

9.5. Thermal Paper Industry in India

India's thermal-paper industry, is dominated by everyday POS receipts, tickets and logistics labels, but a small yet strategic segment is the Voter-Verified Paper Audit Trail (VVPAT) roll used with every Electronic Voting Machine (EVM).

VVPAT architecture: Each EVM is paired with a compact thermal printer that accepts a 58 mm-wide, ~30 m roll; it prints a 56 × 99 mm slip, stays visible to the voter for seven seconds, then drops into a sealed box for later audit. During a national election roughly one million VVPAT units consume two rolls a piece (polling day and mandatory recount/FLC), creating a cyclical demand of 2 million security-grade rolls per full election.

Value proposition: Thermal technology offers ink-free instant imaging, low maintenance and long image life when top-coated, while VVPAT fulfils the Supreme Court's transparency directive by giving voters a tangible audit record. VVPAT rolls also have a much higher shelf life compared to other thermal rolls as the record needs to be maintained for a longer duration. For suppliers, the segment presents steady, high-visibility contracts aligned with *Make-in-India* procurement rules.

Growth drivers:

1. **Regulatory certainty:** 100 % VVPAT deployment is now statutory, and simultaneous-election proposals (One Nation One Election) could spike the demand across multiple years as per the Election Phases, rather than a single spike for the General Election year followed by steady revenue over the other years.
2. **Rising numbers of electorate in India:** Demand for VVPAT rolls in India is structurally tied to the size and enthusiasm of the electorate, both of which are climbing. The Election Commission's final rolls for the 2024 general election listed 970 million registered voters—up by almost 60 million

since 2019 and nearly 200 million since 2009—and demographic projections indicate the roll will cross 1 billion electors before 2030 as the post-2000 birth cohorts reach voting age. At the same time, civic engagement is rising: average Lok Sabha turnout has moved from 58% in 2004 to 67% in 2019 and remains above 65% despite the pandemic-era dip, while many state polls now breach 75%. Because each EVM must be paired with a VVPAT unit, every additional polling station created for new voters directly lifts paper demand. Continuous by-elections, full VVPAT deployment in all states and the push for audit-trail recounts in five random booths per constituency further compound consumption. Together, population growth, higher turnout and expanded audit requirements make VVPAT rolls one of the few election consumables poised for steady, volume-driven growth through the decade.

3. **Wider receipt digitalisation:** Rising QR-POS and toll-receipt volumes provide baseline manufacturing scale that keeps unit costs low.
4. **Security manufacturing ecosystem:** PSUs **BEL** and **ECIL** build the printers and source rolls, while private converters laminate holographic top-coats and variable-data codes for state tenders, keeping most value addition domestic.

Although VVPAT rolls represent a small portion of national thermal-paper tonnage, their mandated use, strict specs and election-driven surges give them outsized strategic importance. Combining predictable electoral batches with fast-growing POS and logistics receipts, the Indian thermal-paper sector is expected to be on a growth trajectory well until 2030, with security-grade rolls (VVPAT, e-way-bill kiosks, high-value POS) becoming the premium niche that commands higher margins and drives technology diffusion across the broader market.

GLOBAL M&A TRENDS IN THE CARD MANUFACTURING, BIOMETRICS & DIGITAL SECURITY PROVIDERS

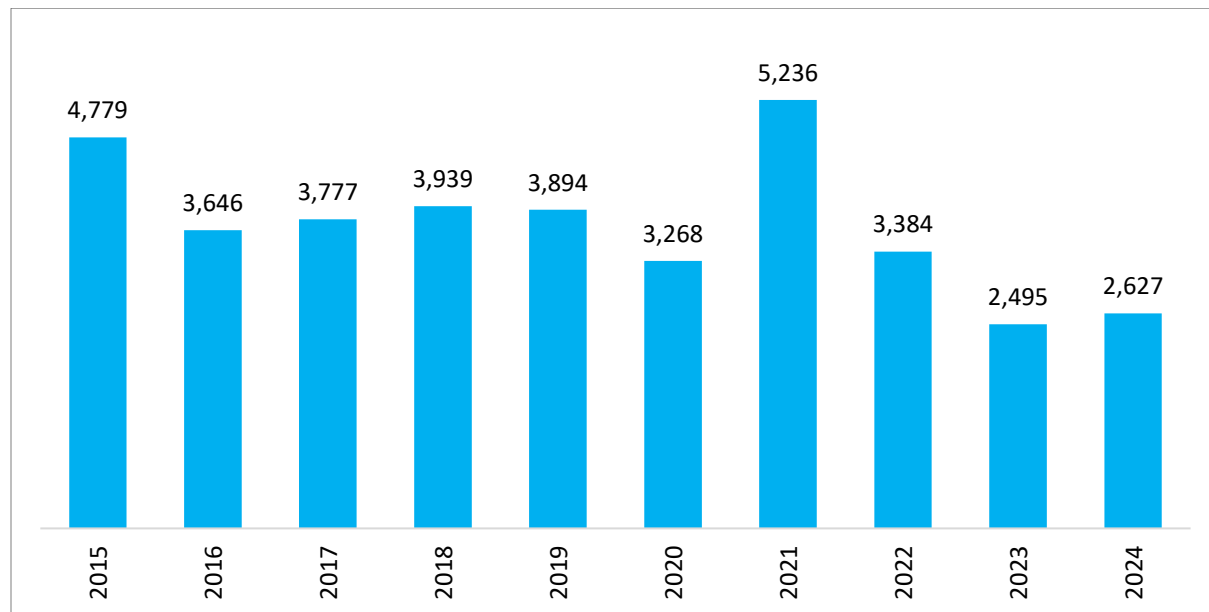
10.1. Transformation Through Value Creation

The ultimate objective of any M&A transaction is to create value, a legitimate means of enhancing top-line growth and shareholder return. Transformation underpins practically every aspect of an M&A activity, with freshly enhanced solutions, cross-selling of acquired services, and significant opportunities to streamline operations.

In the Card Manufacturing, Biometrics & Digital Security industry, companies are undergoing significant transformation through value creation strategies rooted in targeted mergers and acquisitions. By acquiring firms with specialized capabilities—ranging from biometric authentication and secure credentialing to advanced personalization and instant issuance—they are rapidly expanding their product portfolios and addressing evolving customer demands. Companies like Entrust, HID Global, Oberthur, and CPI Card Group are not merely expanding their footprint; they are actively reshaping their value chains to integrate upstream technologies and downstream service capabilities. These acquisitions are enabling them to offer more end-to-end solutions, enhance customer stickiness, and build defensible competitive advantages in a market increasingly driven by security, digital identity, and real-time personalization. The consistent focus on acquiring IP-rich, innovative, and regionally strong firms also reflects a commitment to long-term differentiation, cost synergies, and accelerated go-to-market timelines, thereby creating measurable value for customers, partners, and shareholders alike.

10.2. Global M&A Transactions Value

Exhibit 98: Global M&A Transactions Value CY2015-2024 (USD Bn)



Source : Secondary Data, Frost & Sullivan Analysis

10.3. M&A: Top Acquisitions in Card Manufacturing, Biometrics & Digital Security Market

Target	Acquirer	Year	Deal Rationale
Entrust Inc. (USA)	Datacard Group (now Entrust, USA)	2013	Secure ID solutions expansion
Vesta Card Manufacturing (USA)	American Card Services (Spell Capital, USA)	2013	Expanded gift/loyalty card footprint
Lumidigm (USA)	HID Global (ASSA ABLOY, Sweden/USA)	2014	Fingerprint biometric authentication expansion
NagraID Security (Switzerland)	Oberthur Technologies (France)	2014	Display card technology for online transactions
EFT Source Inc. (USA)	CPI Card Group (USA)	2014	Advanced personalization and instant issuance
IdenTrust (USA)	HID Global (ASSA ABLOY, Sweden/USA)	2014	Digital identity verification
SafeNet (USA)	Gemalto (Netherlands/France)	2015	Enterprise data protection and encryption
Trüb AG (Switzerland)	Gemalto (Netherlands/France)	2015	Government ID programs leadership
Fundamenture A/S (Denmark)	Valid (Brazil)	2015	Scale in SIM & EMV card market
Veridos (JV) (Germany)	Strategic Partnership (G+D & Bundesdruckerei JV)	2015	Strategic ID security partnership
Vormetric	Thales	2015	Data encryption & security
Aviobook	Thales	2016	Digital solutions for pilots

3M Identity Management (USA)	Gemalto (Netherlands/France)	2017	Biometric ID and document security expansion
Safran I&S (Morpho) (France)	Advent Intl. → IDEMIA (France)	2017	Created IDEMIA (Morpho + Oberthur)
Arjo Systems (France)	HID Global (ASSA ABLOY, Sweden/USA)	2017	Strengthened eID and passport portfolio
Gemalto	Thales	2017	Thales targeted to be a global leader in the digital security market by acquiring Gemalto which is in digital security and smart cards business
Aveillant	Thales	2017	Drone detection & radar tech
Guavus	Thales	2017	Big Data analytics & AI
Crossmatch (USA)	HID Global (ASSA ABLOY, Sweden/USA)	2018	Fingerprint authentication for enterprise/government
E-Seek Inc. (USA)	Veridos (Germany, G+D & Bundesdruckerei JV)	2018	Enhanced ID verification solutions
Harvard Card Systems	PLI Card	2018	No deal information available, researched official website, new articles and data platforms. Before this acquisition PLI Cards acquired by Platinum Equity Buy Out Fund
AmaTech	Paragon ID	2018	Secure card technology & RFID solutions
CPI Card - UK Business	Sea Equity	2018	

Gemalto (Netherlands/France)	Thales (France)	2019	Expanded digital security footprint
De La Rue – Int'l Identity Solutions (UK)	HID Global (ASSA ABLOY, Sweden/USA)	2019	Citizen ID solutions acquisition
nCipher Security (UK)	Entrust Datacard (USA)	2019	Hardware security module expansion
Thames Card Technology (UK)	Paragon ID (France)	2019	Entry into payment card production
FutureCard Industries LLC (Qatar First Bank L.L.C)	TOPPAN Gravity	2019	Extend smart card solutions and penetrate new markets
X Core Technologies	IDEMIA	2019	Expansion into smart metal card
Transtrack International	Giesecke+Devrient	2019	Strengthening Banking Tech solutions
Psibernetix	Thales	2019	AI-powered decision-making systems
Ercom	Thales	2019	Secure communications & collaboration
Thames Technology	Paragon ID	2019	Strengthen payment solutions in FinTech
First Data Corporation	Fiserv	2019	Create Global Leader in Payments and FinTech
NextDocs (SISTEC)	Austria Cards	2019	Added digital services expertise, including document management, e- archiving, and physical archiving solutions.

Thames	Paragon ID	2019	
TAG Systems	Austria Cards	2019	Acquired payment card manufacturer; enhanced personalization and fulfillment services across UK, Spain, and Poland; added solutions for Neo Banks.
TAG Systems USA	Austria Cards	2019	Expanded in the U.S., offering personalization and fulfillment services to a large, underserved market.
Security Label GmbH (Germany)	Paragon ID (France)	2021	RFID baggage tags market leadership
Omni-ID (USA)	HID Global (ASSA ABLOY, Sweden/USA)	2021	Industrial RFID tag and IoT solutions
Face Technologies	TOPPAN Gravity	2021	Expansion to african identity business
Pod Group	Giesecke+Devrient	2021	Enhancing IoT Infrastructure expertise
Security Label	Paragon ID	2021	Growth in contract manufacturing for retail
InterCard Holding AG	Exceet Card	2021	Strengthening position in the Banking & Government card solutions market
SG Technologies	Exceet Card	2021	Expanding presence in the Benelux region and enhancing smart card solutions portfolio
CloudFin	Austria Cards	2021	Acquired a majority stake (65%), gaining software capabilities in management services, automatic identification, and ERP system integration using machine learning.

Nitecrest	Austria Cards	2021	Expanded UK presence by acquiring full ownership of TAG Nitecrest Limited, a card production and personalization company.
Valid USA – Payment & ID Business (USA)	Giesecke+Devrient (Germany)	2022	Expanded US card manufacturing footprint
NBS Technologies & UbiQ Software (Canada/UK)	Matica Corp. (Italy)	2022	Secure issuance and personalization software expansion
Netcetera	Giesecke+Devrient	2022	Strengthening IT Services capabilities
OneWelcome	Thales	2022	Identity & Access Management (IAM)
S21sec	Thales	2022	Cybersecurity services expansion
Excellium Services	Thales	2022	Cybersecurity services expansion
Tracktio	Paragon ID	2022	Strengthen IoT infrastructure solutions
UrbanThings	Paragon ID	2022	Expand smart public transport offerings
NetSeT Global Solutions (Serbia)	Veridos (Germany)	2023	Expanded national ID solutions
Pink Post	Austria card	2023	expand AUSTRIACARD's service offerings in secure information management.
Hogier Gartner & Cía. S.A.S.	TOPPAN Gravity	2023	Geography expansion in smart card technology

MECOMO	Giesecke+Devrient	2023	Expansion into logistics technology
Imperva	Thales	2023	Expand cybersecurity offerings
Cobham Aerospace	Thales	2023	Strengthen avionics & connectivity
Tesserent	Thales	2023	Cybersecurity expansion in Australia
E-Commerce Monitoring GmbH	Austria card	2024	enhance capabilities in e-commerce monitoring and security.
Citizen Identity Solutions, part of HID	TOPPAN Gravity	2024	Establish as one of the largest leaders in security and identity solutions
GetSAT	Thales	2024	Strengthen Satcom capabilities
GlobalTrust (part of E-commerce Monitoring)	Austria Cards	2024	Acquired a full-service provider for e-signatures and certificates compliant with eIDAS standards.
LSTech	Austria Cards	2024	Acquired a research and data analytics company with expertise in data collection, processing, and decision-making insights.

10.4. Macro Themes driving these deals across the industry

M&A: Key Acquisition Themes		
1	Security-First Orientation	Rising cyber threats and demand for secure credentials have pushed firms to acquire biometric and encryption-focused startups
2	Omni-Channel Credentialing	Acquisitions support both physical card issuance and digital ID platforms
3	Customer-Centric Customization	Moves toward instant issuance, loyalty card personalization, and user-friendly smart cards
4	Globalization Strategy	Companies acquiring globally to enter new geographies or absorb regional leaders

10.5. M&A: Key Acquisition Themes across these deals

Acquisition Theme	Examples	Purpose
Biometric Authentication Technology	HID Global acquiring Lumidigm, Entrust acquiring various tech firms	To integrate advanced security layers and biometrics
Card Manufacturing & Personalization	CPI Card Group acquiring EFT Source	Strengthening end-to-end personalization and issuance
Digital Identity & Secure ID Solutions	Datacard (Entrust) acquiring Entrust Inc., NagraID Security by Oberthur	Building a full-stack secure ID and credentialing portfolio
Loyalty, Gift & Financial Cards	American Card Services acquiring Vesta Manufacturing	Expanding into niche card verticals like gift and loyalty
Display Card & Smart Card Technologies	Oberthur acquiring NagraID, others	Enhancing product differentiation through next-gen features

As leading players use **inorganic strategies** to drive transformation and competitive advantage, these themes point toward strategic consolidation in critical areas of technology, geographic expansion, and end-to-end capability development.

1. End-to-End Secure Identity Solutions

A major theme is the vertical integration of identity and credentialing capabilities—from card issuance and personalization to digital authentication and lifecycle management. Companies like Entrust and HID

Global have acquired firms that bolster their offerings in digital ID, multi-factor authentication, and credential management, enabling them to serve as comprehensive secure identity providers.

2. Biometric and Authentication Technologies

Another dominant trend is the acquisition of companies offering fingerprint, facial recognition, and advanced biometric authentication. This reflects a growing need for frictionless security and identity assurance across physical and digital channels, especially in government, banking, and enterprise environments.

3. Display, Contactless & Next-Gen Smart Cards

Firms like Oberthur Technologies have focused on integrating next-generation card features, including OTP display, EMV chip, and dual-interface/contactless capabilities, responding to the need for innovation in physical card formats that remain relevant in hybrid environments.

4. Loyalty, Prepaid, and Financial Card Personalization

There's a focus on acquiring niche card manufacturers and fulfillment providers (e.g., loyalty, gift, and prepaid cards) by players like CPI Card Group and American Card Services. These deals support high-volume personalization, retail market expansion, and greater customer engagement solutions.

5. Geographic Market Entry & Regional Consolidation

Several acquisitions serve the purpose of entering new markets or consolidating regional leadership—especially in the U.S., Europe, and Asia. These are strategic footprint expansion moves, reducing go-to-market time and capturing local customer bases.

6. Technology Differentiation and IP Acquisition

A recurring pattern is the focus on acquiring companies with proprietary technology, patents, or software IP—critical for differentiation in a commoditizing industry. This theme underlines a commitment to future-proofing offerings and building defensible moats.

Collectively, these acquisitions demonstrate a forward-looking strategy by market leaders to position themselves as secure, scalable, and innovation-driven partners in identity, access, and payment technologies. They are not just buying companies—they are acquiring strategic value levers that future-proof their business models and broaden their customer reach across geographies and verticals.

COMPETITIVE LANDSCAPE

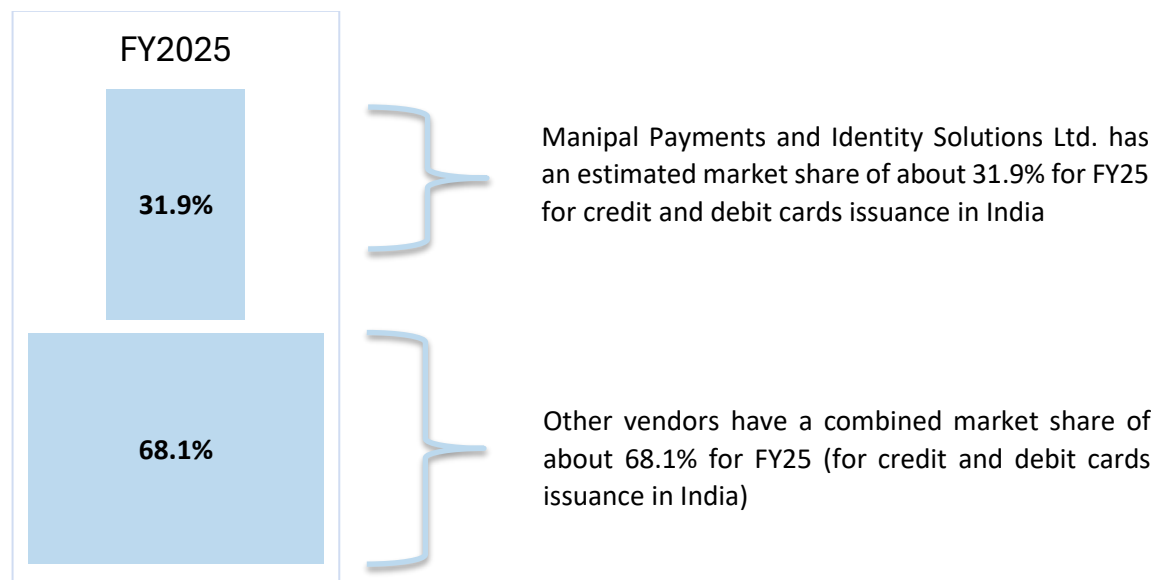
The global payment cards manufacturing domain is driven by technological advancements, security needs, customization demands, sustainability efforts, strategic expansions, regulatory compliance, and superior customer service. Leading companies are continuously innovating to maintain their competitive edge and meet the dynamic needs of the global market.

Thales, Idemia, G+D, CPI Card Group, Perfect Plastic printing, Goldpack, Eastcompeace, Hengbao, Tianyu Inform Industry, XH Smart Tech, Manipal Payments and Identity Solutions Ltd. etc. are some of the top ranked payment card manufacturers globally as per Nilson report, (Issue 1272 published October, 2024).

Shipment of Payment Cards by Manufacturer (2023)		
Rank	Manufacturer, Headquarters	Payment Cards with Chips (Mn)
1	Thales, France	945.0
2	Idemia, France	676.0
3	G+D, Germany	567.0
4	XH Smart Tech, China	152.4
5	CPI Card Group, US	149.7
6	Eastcompeace, China	142.6
7	Hengbao, China	140.4
8	Tianyu Inform Industry, China	126.4
9	Goldpac, Hong Kong	120.6
10	AustriaCard, Australia	113.5
11	Manipal Payments and Identity Solutions Ltd., India	102.2

Note: Chip card types include dual interface, microprocessor, memory and contactless; Includes tag for AustriaCard

Source: Nilson Report, October 2023, Issue 1251

India: Credit and Debit Cards Manufacturing Competitive Landscape

In India, some of the key cards manufacturers include the likes of Manipal Payments and Identity Solutions Ltd., Sheshaasai, Idemia, G+D, KI Hitech etc. Manipal Payments and Identity Solutions Ltd. is one of the largest manufacturers of payment cards globally and in India in FY2025. As per Nilson report, (Issue 1272 published October, 2024), Manipal Payments and Identity Solutions Ltd. is the highest ranked Indian company (and ranked 11th globally) in terms of shipment of payment cards with chips in CY2023. As per the same report, Manipal Payments and Identity Solutions Ltd. is also among the top 10 card manufacturers in Visa & Mastercard issuances globally.

Besides Manipal Payments and Identity Solutions Ltd. produced 95.38 and 86.77 million credit and debit cards (including both magstripe and chip based cards) respectively in FY24 and FY25, translating into an estimated market share of about 31.9% for credit and debit cards issuance in India for FY25.

Additionally, the company holds an estimated market share of approximately 36.2% in the credit card issuance market and 31.2% in the debit card issuance market in India for FY25, having produced 14.44 million credit cards and 72.33 million debit cards during the financial year.

11.1. Top Vendors in India's Card Manufacturing Market**Seshaasai:**

Seshaasai, founded in 1993, is one of the leading players in India's payment card manufacturing market. They specialize in various smart card technologies, including magnetic stripe, NFC, RFID, EMV chip-based, and dual interface cards. Seshaasai's production capacity and technological expertise allow them to produce millions of personalized cards for credit, debit, and prepaid card applications.

Certified by major payment networks like Visa, Mastercard, and NPCI, Seshaasai meets rigorous security requirements, ensuring international standards for safeguarding cardholder data.

Seshaasai's Picture Personalization service, powered by the YoursTruly app, lets users personalize payment devices with photos or gallery selections. Their partnership with Fingerprint Cards aims to introduce contactless biometric payment cards in India, offering a secure and convenient payment option in the post-COVID era. Seshaasai produces EMV chip-based and RFID tag-integrated intelligent magnetic strip cards in secure environments, accommodating both large and small orders with customizable authentication methods.

Idemia:

IDEMIA, a multinational technology company headquartered in Courbevoie, France, specializes in identity-related security services. The company is known for its solutions in biometric identification and security, as well as secure payment systems. Additionally, IDEMIA provides biometric terminals for contactless access control, leveraging facial recognition and fingerprint recognition technologies.

In the realm of facial recognition, IDEMIA's technologies are employed in various applications, such as facilitating smooth entry at airports and stadiums, identifying individuals banned from certain venues, spotting fugitives in crowds, and verifying identities in restricted areas.

Furthermore, IDEMIA produced 3 billion identity documents worldwide in 2020, including passports, identity cards, and driving licenses. The company's research efforts have also led to advancements in payment card technology, such as embedding fingerprint recognition in the thin structure of a card and dynamically changing visual cryptograms.

Giesecke+Devrient (G+D):

Giesecke+Devrient (G+D), headquartered in Munich, Germany, is a major player in the payment card manufacturing industry, renowned for its innovations in banknote processing, smart cards, SIM cards, identification systems, and e-payments. Having expanded operations since the 1970s, G+D is now one of the world's largest supplier of banknotes and operates banknote printing facilities in Germany and Malaysia. The company also produces paper for banknotes, checks, bonds, certificates, passports, and other identification documents. G+D opened a smart card production facility in Delhi to cater to India's booming chip card market. This facility produces SIM cards for mobile communications and payment cards, with an annual capacity of over 40 million chip cards. G+D India Pvt. Ltd., established in 2001, has become one of the biggest SIM card suppliers in India, serving major mobile network operators.

Globally, G+D has shipped 1.9 billion contactless payment cards over the last five years. G+D's commitment to sustainability is evident in its pledge to replace all virgin plastic in its card products by 2030, aligning with its value-driven offerings to banks and focus on end-to-end Environmental, Social, and Governance (ESG) strategies.

KL-HiTech:

KL HI-TECH, founded in 1988 and headquartered in Hyderabad, India, the company is one of the key players in the payment card manufacturing sector. The company has an annual capacity of over 72 million banking cards per year.

In 2021, KL HI-TECH partnered with Zwipe, a pioneer in biometric payment card development, to bring next-generation biometric payment cards to its clients in India and key international markets. This collaboration aims to deliver physical cards that enable completely touchless payments through a PIN-free checkout experience, enhancing safety and hygiene for consumers.

With over 30 years of experience, KL HI-TECH has been instrumental in enabling secure payment transactions, facilitating communications, and creating digital identities. The company prides itself on its innovative approach, producing a variety of card materials such as Hololam, Metal cards, Vertical cards, Quick Read Technology, Core Edges, Biodegradable cards, and RFID cards.

CPI Card Group:

CPI Card Group is a U.S.-based payment technology company specializing in the design, production, personalization, and fulfillment of a wide array of payment card solutions. Headquartered in Littleton, Colorado, CPI serves financial institutions, fintechs, and prepaid program managers with offerings that include credit, debit, and prepaid cards, as well as digital solutions like instant issuance and push provisioning.

The company emphasizes eco-focused products, such as its Second Wave and Earthwise cards, which incorporate upcycled materials to meet sustainability goals. With a network of high-security, PCI-compliant facilities across the U.S., CPI is committed to innovation, quality, and customer-centric service in the evolving payments landscape. Additionally, CPI's push provisioning technology enables instant digital card issuance to mobile wallets, enhancing user convenience. Their Card@Once platform further exemplifies innovation by allowing financial institutions to issue cards instantly on-site, improving customer satisfaction and operational efficiency. These integrated solutions position CPI as a leader in providing end-to-end payment technologies that cater to evolving consumer and industry demands.

CPI Card Group reported robust financial performance in 2024. The company achieved an 8% increase in full-year net sales, reaching \$480.6 million, with the prepaid debit segment experiencing a remarkable 26% growth, surpassing \$100 million in sales. This growth was driven by strong demand for contactless and eco-focused cards, as well as higher-value packaging solutions. Furthermore, CPI expanded its market presence by acquiring Arroweye Solutions, Inc. for \$45.55 million, enhancing its digital card production capabilities and reinforcing its commitment to innovation in the payment technology sector.

CompoSecure:

CompoSecure is a leading U.S.-based provider of premium metal payment cards and digital security solutions. Headquartered in Somerset, New Jersey, the company serves over 150 payment card programs globally and has produced more than 200 million metal cards since 2010. CompoSecure's offerings include innovative products like the Arculus platform, which integrates secure authentication and digital asset storage into a single metal card, enhancing user security and convenience.

In 2024, the company reported net sales of \$420.6 million, marking an 8% increase from the previous year, and achieved a 62% rise in free cash flow to \$84.9 million. CompoSecure's commitment to innovation and excellence was recognized with nine industry awards in 2024, including accolades from the International Card Manufacturers Association and The Digital Banker's Global Cards & Payments Innovation Awards. These achievements underscore CompoSecure's position as a trusted partner in the evolving landscape of payment and security solutions.

CompoSecure stands out in the payment technology industry by merging luxury design with advanced security solutions. This combination appeals to banks, fintechs, and consumers seeking both style and security in their payment methods.

Manipal Payments and Identity Solutions Limited:

Manipal Payments and Identity Solutions Ltd. is a pioneering company specializing in payment solutions, identifications solution, secure solutions, smart tagging and IOT solutions along with development and distribution of advanced payment card solutions. The company is one of the largest manufacturers of payment cards globally and in India in FY2025. As per Nilson report, (Issue 1272 published October, 2024), Manipal Payments and Identity Solutions Ltd. is the highest ranked Indian company (and ranked 14th globally) in terms of shipment of payment cards (ones with chips and magstripe both) in CY2023. For shipment of payment cards with chips alone, the company is ranked 11th globally. As per the same report, the company is ranked 10th globally excluding vendors from China. As per the same report, Manipal Payments and Identity Solutions Ltd. is also among the top 10 card manufacturers in Visa & Mastercard issuances globally in CY2023. Besides, the company is also ranked 2nd, only behind XH Smart Tech, in the list of High-security cards (which includes cards such as American Express, Diners, Discover, JCB, Elo, RuPay, Mir and ATM and PIN-based debit).

Manipal Payments and Identity Solutions Ltd. offers a diverse basket including banking cards (DI and EMV), smart cards, government identification cards, cheques logistics solutions and embedding chips on smart wearables. Since 2012, Manipal Payments and Identity Solutions Ltd. has been one of the leading card payment technology enabler in India, having played a vital role in the transition of technology for payment cards from magstripe cards to chip-embedded cards for major card networks.

Manipal Payments and Identity Solutions Ltd. has developed payment applications, which allows them to be certified by various payment networks. The company is among the first few payment card manufacturers to adopt this capability. Further, as of March 31, 2025, Manipal Payments and Identity Solutions Ltd. was one of the select few companies to have issued metal cards in India, and one of the leading metal card manufacturers in India holding a patent for metal cards manufacturing. As of March 31, 2025, the company supplies metal cards to the top four credit cards issuers in India who constitute to more than 70.00% of total credit cards outstanding. As the metal card opportunity grows in the country, the company is well set to capture a meaningful market. In Fiscal 2024, Manipal Payments and Identity Solutions Ltd. was also one of the largest manufacturers of DI cards in India. Further, as of March 31, 2025, Manipal Payments and Identity Solutions Ltd. is one of the few manufacturers of NCMC-compliant DI cards for transit use in India. The company pioneered the manufacturing of National Common Mobility Cards in 2024 in partnership with Airtel Payments Bank, and also launched India's first recyclable polyvinyl chloride ("PVC") Rupay card along with Tide and Transcorp in 2024.

Manipal Payments and Identity Solutions Ltd. has developed RuPay products and have been certified by the RuPay Compliance Program for RuPay DI applet. The company is among the select few domestic manufacturers with letter of award for RuPay products.

Manipal Payments and Identity Solutions Ltd. is also one of the select few manufacturers and suppliers of polycarbonate cards for driving license and registration certificate for transport authorities in various states. The company also pioneered the manufacturing of India's Polycarbonate ("PC")-based driving license cards using specialised ink, along with registration certificates. Manipal Payments and Identity Solutions Ltd. is also among select card manufacturers of 99.00% recycled PVC ("RPVC") cards, which are made from recycled plastic to enable banks to achieve their green goals. Further, the company has also been certified by Visa for rPVC-100% Card for magnetic stripe and dual interface configurations.

Manipal Payments and Identity Solutions Ltd. is also among the select partners to engage for projects like polycarbonate-based ID cards, in compliance with guidelines of the Ministry of Road Transport and Highways ("MORTH"). The company intends to strategically service the requirements of central and state government across India by pursuing select identity card opportunities. PVC identity cards have lower shelf lives and need to be replaced at more frequent intervals

Leveraging cutting-edge technology and a customer-centric approach, Manipal Payments and Identity Solutions Ltd. delivers innovative, reliable, and versatile payment solutions designed to meet the evolving needs of businesses and consumers in a rapidly changing digital economy. The company has successfully deployed India's large-scale instant issuance kiosk solution, rolling out over 500 kiosks simultaneously for State Bank of India.

Manipal Payments and Identity Solutions Ltd. has made substantial investment in strengthening the technology, infrastructure and security systems at their facilities. Spread over an area of more than 53,000 square feet, the Manipal Facility conforms to layout specifications set forth in their agreements with network providers and is one of the largest plastic card facility in India.

Manipal Payments and Identity Solutions Ltd. utilizes the facility for both, production and personalization of cards, and the company is eligible to manufacture EMV and DI cards based on certifications received from Visa, MasterCard and RuPay. The company's Mumbai Facility, with an area of approximately 15,000 square feet, is also certified by Visa, MasterCard and RuPay for EMV and DI cards, and the facility is used for personalization services.

The company has received certifications from Diner's Club, Discover, Afrigo, Verve and American Express all of which collectively allows them to offer payment cards across the ecosystem of global network operators enabling them to address the global exports market for the base cards.

In addition, as of March 31, 2025, Manipal Payments and Identity Solutions Ltd. has clients across the regions of Asia-Pacific, Middle East & Africa, Europe and the United Kingdom. For instance, the company is one of the select few companies to have manufactured metal cards for local payment networks in the UAE.

In Fiscals 2022 and 2025, the company manufactured 51.79 million and 87.69 million payment cards, reflecting a CAGR of 19.2% between Fiscal 2022 and Fiscal 2025. The company has scaled up its operations in line with growth in the total payment cards issued in India, which grew from 257 million units in 2020 to 302 million units in 2025 (inclusive of debit cards, credit cards and PPI cards).

As of June 30, 2025, the company is also one of the largest producers of Aadhaar cards in India, having successfully printed over 1 billion cards in 12 regional languages. As per Frost & Sullivan estimates, 18.24 million Aadhaar cards will be issued in Fiscal 2026 and in Fiscal 2030 the issuance will be 7.47 million cards.

Critical Success Factors for Manipal Payments and Identity Solutions Ltd.:

1) Certification & technology

The company has a number of certifications as highlighted below –

- Payment network certifications (Mastercard, Visa, RuPay, Discover, Diner's Club International, JCB)
 - IT and Infrastructure Certification (ISO 9001:2015, CMMi Level 3, PCI DSS (level 1), ISO 27001, Integraf etc.)
- Industry-specific certifications (e.g., PCI-DSS) demonstrate that the company meets stringent regulatory standards, instilling trust among clients and partners.

- 2) Location (Plant and Personalization bureau)
Company is strategically placed to tap into the southern and western belt of the country (with one manufacturing facility in Manipal and personalization bureaus in Manipal, Chennai, Noida and Mumbai) which houses close to 40% of the savings accounts in the country. This proximity to the customers ensures a quick turn around time. Besides, the company is also planning new facilities (personalization bureau) in Nigeria and UK to expand to global regions.
- 3) End to end solutioning and cheque book
Manipal Payments and Identity Solutions Ltd. provides end to end solutions bundled with cheque books and logistics. By offering such a comprehensive suite of services and end to end solutioning, Manipal Payments and Identity Solutions Ltd. provides a seamless and hassle-free experience for their customers and banks.
- 4) Data security
Robust security measures in place at Manipal Payments and Identity Solutions Ltd. facilities and provision to secure vendors as well as also highlighted by certifications held by the company
- 5) Approval for Visa, Diners and Rupay for metal cards which opens up the local as well as global markets for the company
- 6) Qualification for government projects for DLRC, Aadhaar card and ePassports
- 7) Strong legacy and uninterrupted / reliable partnership and service to the banks for 15+ years

11.2. Vendor Comparison Across Parameters

Company Name	Product/Service Portfolio	Regional/Market Presence
Seshaasai	The company offers solutions for payment cards, smart card products, custom chip modules, smart wearables, and merchant QR code kits, among others.	India, APAC, Africa
IDEMIA	2. They offer a range of products in biometrics, payment, connectivity, access control, identity, and travel. This includes card issuance services, payment cards, digital payment solutions, and biometric access control systems.	Europe, Middle East, Africa, Asia Pacific, North America, and South America.
	Besides payment card services, the company also offers solutions across smart card services, card issuance services, digital payment and authentication solutions, mobile payment services, wearable payment technologies, and smart card technology.	Europe, APAC, Americas, Australia, Middle East and Africa
DZ Card	Smart card for payments, identity and biometric cards, transport solutions, driving licenses, and healthcare cards.	India, Thailand, Malaysia, Philippines, South Africa
KL-HiTech	Banking and biometric cards, secure print, RFID products etc.	Major banks in India and Asia

11.3. Financial Benchmarking

Financial Benchmarking (1/2)

Figures in INR Mn		MPISL	Seshaasai	IDEMIA	G+D	KL Hitech
Headquarters		India	India	France	Germany	India
Revenue from operations (INR Mn)	FY2022-2023	9,021.74	11,462.99	17,261.70	5,552.07	1,950.51
	FY2023-2024	12,475.22	15,582.56	20,159.80	8,083.38	2,602.60
	FY2024-2025	12,560.71	14,631.51	NA	NA	NA
Revenue growth (YoY) (%)	FY2022-2023	NA	70.44%	NA	NA	NA
	FY2023-2024	38.28%	35.94%	16.79%	45.59%	33.43%
	FY2024-2025	0.69%	(6.10)%	NA	NA	NA
Profit after tax (INR Mn)	FY2022-2023	1,176.72	1,080.98	3,521.6	862.99	35.25
	FY2023-2024	2,491.65	1,692.78	5,661.0	714.24	222.15
	FY2024-2025	2,822.14	2,223.20	NA	NA	NA
EBITDA (INR Mn)	FY2022-2023	1,787.20	2,074.27	5,096.60	1291.42	143.92
	FY2023-2024	3,555.72	3,030.10	7,938.8	1115.23	387.04
	FY2024-2025	4,087.66	3,703.65	NA	NA	NA
EBITDA Margin (%)	FY2022-2023	19.42%	17.98%	29.53%	22.06%	7.38%
	FY2023-2024	28.04%	19.30%	39.38%	12.10%	14.87%
	FY2024-2025	32.01%	25.13%	NA	NA	NA
Profit after tax Margin (%)	FY2022-2023	12.78%	9.37%	20.40%	23.26%	1.81%
	FY2023-2024	19.65%	10.78%	28.08%	13.80%	8.54%
	FY2024-2025	22.10%	15.09%	NA	NA	NA
Return on Equity (%)	FY2022-2023	60.41%	37.26%	88.53%	113.02%	7.21%
	FY2023-2024	79.42%	39.00%	117.53%	46.02%	36.31%
	FY2024-2025	55.08%	34.84%	NA	NA	NA
Return on Capital Employed (%)	FY2022-2023	49.30%	28.65%	112.64%	162.60%	10.80%
	FY2023-2024	51.95%	33.47%	158.28%	67.64%	36.10%
	FY2024-2025	33.97%	31.87%	NA	NA	NA
Fixed Asset Turnover Ratio (Times)	FY2022-2023	7.10	NA	NA	NA	NA
	FY2023-2024	9.78	NA	NA	NA	NA
	FY2024-2025	7.27	NA	NA	NA	NA
Revenue from Export Sale (INR Mn)	FY2022-2023	95.15	NA	NA	NA	NA

Figures in INR Mn		MPISL	Seshaasai	IDEMIA	G+D	KL Hitech
	FY2023-2024	176.20	NA	NA	NA	NA
	FY2024-2025	544.29	NA	NA	NA	NA
Revenue from Domestic Sale (INR Mn)	FY2022-2023	8,926.59	NA	NA	NA	NA
	FY2023-2024	12,299.02	NA	NA	NA	NA
	FY2024-2025	12,016.42	NA	NA	NA	NA
Volume of chip-based Banking Cards (Mn)	FY2022-2023	82.08	NA	NA	NA	NA
	FY2023-2024	92.00	NA	NA	NA	NA
	FY2024-2025	86.15	NA	NA	NA	NA
No. of Personalization Bureaus	FY2022-2023	9	NA	NA	NA	NA
	FY2023-2024	12	NA	NA	NA	NA
	FY2024-2025	14	NA	NA	NA	NA
Net Working Capital Days	FY2022-2023	66.09	74	NA	NA	NA
	FY2023-2024	41.71	62	NA	NA	NA
	FY2024-2025	45.55	95	NA	NA	NA

Source: Annual Reports, Other secondary sources

Financials in INR million. Fiscal year is April – March

Data for the respective companies - Manipal Payments, Seshaasai, Idemia, G+D and KL Hitec is for the respective financial years ending March, 2022, 2023, 2024 and 2025; Fiscal year considered for these companies is April-March

The table represents consolidated financials for the respective companies including all lines of businesses.

Revenue from operations means the revenue from operations for the year/ period.

Revenue growth = [(revenue from operations for the current fiscal year/ revenue from operations for the previous fiscal year)-1].

EBITDA = Profit for the period / year plus Total tax expense plus Finance Costs plus Depreciation and amortisation expense less exceptional items;

EBITDA Margin = EBITDA divided by total income.

Profit after tax is calculated as profit/ (loss) for the period/ year.

Profit after tax Margin = profit/ (loss) for the period/ year divided by total income.

ROE = Profit after tax for the year / period divided by Average Shareholders' Equity.

(Average Shareholders' Equity = (Opening Total Equity plus Closing Total Equity (excluding Amalgamation adjustment deficit account)) / 2))

Return on Capital Employed = EBIT divided by Average Capital Employed.

Avg. Capital employed = (opening capital employed plus closing capital employed) divided by 2 and capital employed is calculated as total equity (excluding amalgamation adjustment deficit account) plus borrowings plus lease liabilities

EBIT = Profit for the year / period plus Total tax expense plus Finance costs minus exceptional items

Fixed Asset Turnover Ratio is calculated as Revenue from operations/ Average Net carrying Amount of Property, Plant and Equipment and Right-of-use assets while Average Net carrying amount of Property, Plant and Equipment and Right-of-use assets is calculated as (Opening Net Carrying amount of Property, Plant and Equipment and Right-of-use assets plus Closing Net carrying amount of Property, Plant and Equipment and Right-of-use Assets) divided by 2

Revenue from export sales means revenue from export sales for the period/ year

Revenue from domestic sales means revenue from domestic sales for the period/ year

Volume of Banking Cards refer to chip-based payment cards billed to Banks, Fintechs and other customers

Personalisation bureaus include Personalisation bureaus for cards, Driving License/ Registration Certificate projects and cheques separately

Net Working Capital Days is calculated as Inventory Days plus Trade Receivable Days minus Trade Payable Days while Inventory Days is calculated as (Inventories divided by Revenue from operations) multiplied by 365, Trade Receivables Days is calculated as (Trade receivables divided by Revenue from operations) multiplied by 365 and Trade Payables Days is calculated as (Trade payables divided by Revenue from operations) multiplied by 365

Exchange rate used 1US\$ = INR 83

Financial Benchmarking (2/2)

Figures in INR Mn		CPI Card Group	Composecure
Headquarters		USA	USA
Revenues	FY2021-2022	4.52	267.95
	FY2022-2023	5.73	378.48
	FY2023-2024	5.36	390.63
	FY2024-2025, Dec 2024	5.79	420.57
Revenues CAGR	FY2021/22 – 23/24	8.86%	20.74%
	FY2021/22 – 23/24	8.61%	16.22%
PBT (INR Mn)	FY2021-2022	0.29	82.56
	FY2022-2023	0.59	136.18
	FY2023-2024	0.42	117.08
	FY2024-FY2025	0.30	-80.98
PBT CAGR	FY2021/22 – 23/24	20.28%	19.08%
	FY2021/22 – 24/25	1.66%	-199.36%
EBITDA (INR Mn)	FY2021-2022	0.84	103.78
	FY2022-2023	1.13	146.01
	FY2023-2024	0.93	151.63
	FY2024-FY2025	0.91	133.58
EBITDA CAGR	FY2021/22 – 23/24	5.46%	20.87%
	FY2021/22 – 24/25	2.81%	8.78%
Net Income	FY2021-2022	0.19	83.41
	FY2022-2023	0.44	131.82
	FY2023-2024	0.29	112.52
	FY2024-FY2025	0.24	-83.16
Net Income CAGR	FY2021/22 – 23/24	22.66%	16.14%
	FY2021/22 – 24/25	6.99%	-199.90%
EBITDA Margin (%)	FY2022	18.53%	38.73%
	FY2023	19.66%	38.58%
	FY2024	17.39%	38.82%
	FY2025	15.72%	31.76%

Figures in INR Mn		CPI Card Group	Composecure
PBT Margin (%)	FY2022	6.35%	30.68%
	FY2023	10.33%	34.06%
	FY2024	7.75%	30.13%
	FY2025	5.21%	-34.91%
ROE (%)	FY2022	-12.31%	-13.80%
	FY2023	-35.98%	-13.82%
	FY2024	-35.80%	-13.28%
	FY2025	-44.59%	NA
ROCE (%)	FY2022	28.55%	-33.04%
	FY2023	40.80%	-23.64%
	FY2024	29.47%	-28.65%
	FY2025	25.82%	-60.14%

Source: Annual Reports, Other secondary sources

Financials in INR million. Fiscal year is April – March

Data for the respective companies - Manipal Payments, Sessaasai, Idemia, G+D and KL Hitec is for the respective financial years ending March, 2022, 2023, 2024 and 2025; Fiscal year considered for these companies is April-March

Composecure data as on December, 2021, 2022, 2023 and 2024; Fiscal year for the company is January - December

Composecure data source: <https://finance.yahoo.com/quote/CMPO/balance-sheet>

CPI Card Group data as on December, 2021, 2022, 2023 and 2024; Fiscal year for the company is January - December

The table represents consolidated financials for the respective companies including all lines of businesses.

EBITDA = Profit for the period / year plus Total tax expense plus Finance Costs plus Depreciation and amortisation expense less other income; PAT includes total income

ROE = Profit after tax for the year / period divided by Average Shareholders' Equity.

(Average Shareholders' Equity = (Opening Total Equity excluding Amalgamation adjustment deficit plus Closing Total Equity excluding Amalgamation adjustment deficit) / 2)

Return on Capital Employed = EBIT divided by Average Capital Employed.

Avg. Capital employed = ((Opening Total equity plus Total borrowings) plus (closing Total equity plus Total borrowings))/2.

EBIT = Profit for the year / period plus Total tax expense plus Finance costs

Exchange rate used 1US\$ = INR 83