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June 28, 2024

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Financial Technology

Tapping Into Small-Ticket Transactions: Exploring Contactless Payments

In 2018, we outlined the emerging opportunity of contactless payments in the United States (see note), which at the time had essentially no uptake; it was our view that contactless payments were poised for adoption in the U.S. and further adoption globally, and this adoption would serve as an incremental driver of the secular shift toward electronic payments. While the pandemic helped fuel adoption, the growth of contactless payments has been dramatic. Today in the United States, tap-to-pay represents nearly 50% of in-person transactions for Visa (versus approximately 1% in 2018), and about 79% of in-person transactions outside the U.S., while 67% of Mastercard's transactions are contactless.

We continue to believe that technology (e.g., payment tokens, APIs, smartphones) is helping accelerate growth of electronic payments, as it has never been easier to make an electronic payment. Contactless payments can have many forms (e.g., QR codes, text to pay), but for the purpose of this report we are focused on NFC-enabled card and phone based "tap" payments. Visa has previously indicated that tap-to-pay can increase card transactions by over 15% at maturity, and disclosed that debit tap-to-pay users have more than two transactions and $70 more card spending per month (versus non-tap). Mastercard has suggested that contactless functionality helps move cards toward the top-of-wallet.

At the core, contactless increases the convenience of card based transactions, which in turn should drive the adoption of cashless payments. Further, contactless payments provide both consumers and merchants benefits such as improved transaction speed, payment security, and overall experience. Contactless has been available within the U.S. since 2014, but adoption remained limited until 2018 as issuers began enabling cards, merchants improved payment infrastructure (spurred by the adoption of EMV), and consumer behavior evolved.

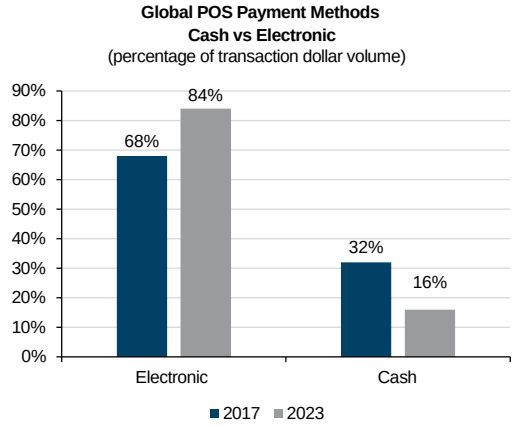
The data suggests that the convenience of contactless has been especially relevant for small-ticket transactions, which represents one of the final frontiers of cash usage. Consider in the U.S. cash was used in 46% of in-person transactions that were $5 or less (versus only 21% for transactions over $5), based on Federal Reserve data. Similarly, in Europe, cash accounted for 81% of transactions that were less than €5, according to the European Central Bank. Mastercard has previously cited that 80% of contactless transactions were under $25 (versus the global average ticket size of $43).

Clearly Visa, Mastercard, and American Express are positioned to benefit from the growth of contactless transactions and the increased adoption of electronic payments for small-ticket transactions, as are other participants of the consumer payments ecosystem, such as the merchant acquirers, card issuers, and payment processors. Further, we believe that Cantaloupe and Nayax, which are primarily focused on unattended retail space and have average ticket sizes between $2.00 and $3.00, are clear pure-play beneficiaries of the trend.

Contactless payments are just one example of the technologies that the payment networks (e.g., Visa, Mastercard, and American Express) are leveraging to take increasing share of personal consumption expenditures, driving sustained growth within their core consumer payments businesses, especially within markets where electronic payments are already heavily penetrated. We believe that the convenience of contactless payments can help accelerate the displacement of cash, which even in the most mature and penetrated markets remains in heavy use for small-ticket transactions. In addition to the networks, we believe that increased card-spend driven by contactless payments should benefit essentially all participants within the card-based payments ecosystem (i.e., networks, acquirers, issuers, and issuer processors). Further, we believe that providers focused on the unattended space such as Cantaloupe and Nayax are helping drive the growth of contactless payments and are direct beneficiaries of the trend, as unattended markets (food and beverage vending, parking, laundry, amusements) tend to have small-ticket transactions and are heavily cash-based today.

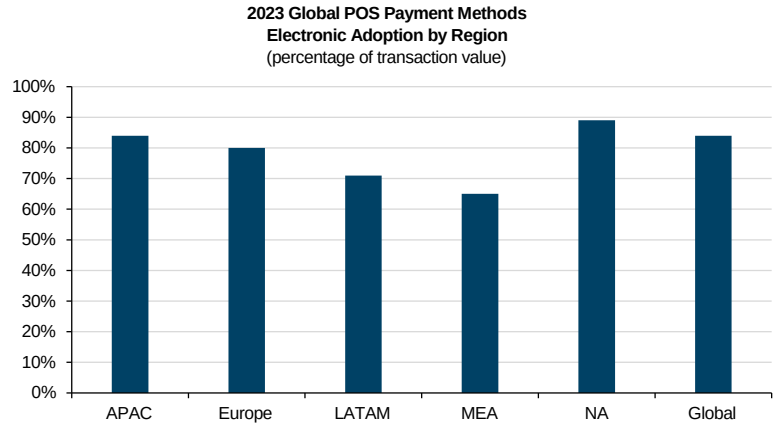
Adoption of Electronic Payments for In-Person Transactions

Across the estimated $45 trillion of global consumer flows, technology continues to drive the shift toward electronic payments, and in-person transactions are no exception. As we outline in the following exhibit, based on data from the Worldpay Global Payments Report, electronic methods accounted for 84% of in-person transaction dollar volume in 2023, up from 68% in 2017. Clearly, the COVID-19 pandemic accelerated the transition, but we expect these trends to continue over time, fueled by technological innovation and adoption; consider by 2027, Worldpay estimates that 89% of global point of sale volume will be through electronic means.



Sources: Worldpay Global Payments Report and William Blair Equity Research

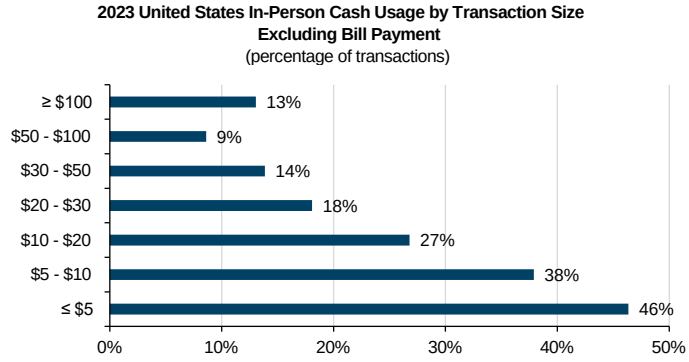
Penetration rates vary by region, but as we outline below, North America is the most penetrated, as electronic methods account for 89% of in-person transaction dollar volume, while the Middle East and Africa region has the lowest penetration rate at 65%, according to the Worldpay Global Payments Report.



Sources: Worldpay Global Payments Report and William Blair Equity Research

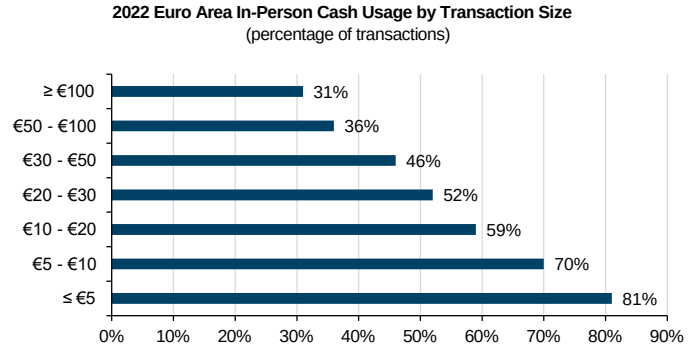
Cash Still Dominant Method for Small-Ticket Transactions

Multiple opportunities to displace paper-based payments remain, but we believe that converting small-ticket transactions to electronic payments is a clear opportunity, particularly in more penetrated markets.As outlined below, in the United States (one of the more mature markets for electronic payments), cash was used in 46% of in-person transactions that were $5 or less (versus 21% for transactions over $5), based on data from the Federal Reserve.



Sources: The Federal Reserve and William Blair Equity Research

We note similar trends are evident in consumer spending within the euro area; cash was used in 81% of transactions at or below €5, with the percentage mix declining as transaction size increases.



Sources: European Central Bank and William Blair Equity Research

Data for other geographies is limited, but we believe global trends are directionally consistent with those observed in the United States and the euro area, both of which represent more mature markets for electronic payments. We attribute the elevated use of cash in small-ticket transactions to several factors including convenience, merchants offering cash-discounts or steering consumers (i.e., requiring dollar minimums for card payments), and the lack of card acceptance for small-ticket transactions.

Given the continued cash-usage dynamics for small-ticket transactions, participants within the payments ecosystem, led by the networks, have deployed a host of strategies to accelerate card usage in small-ticket transactions, including the introduction of contactless payments, prioritizing the unattended retail vertical (e.g., parking meters, vending machines) and adjusting interchange/ providing interchange fee reimbursements to acquirers/payfacs for small-ticket transactions.

Contactless Payments

Unlike traditional mag-stripe or chip-based card payments that required the consumer to swipe or dip their card into a reader, contactless payments use near field communication (NFC) technology that enables parties to share encrypted payment information between two devices via a tap. Unlike traditional card payments, payment data for NFC transactions are dynamic, generating a one-time, specific code for every transaction, and thus tend to be much more secure (versus traditional methods).

Contactless payments have a variety of benefits for consumers including speed, security, reliability, cleanliness, and convenience. For instance, Mastercard has reported that contactless transactions are 10 times faster than other in-person payment methods, and cites increased safety over cash as the card does not leave a consumer's possession and each transaction is uniquely encrypted. Given the

clear benefits of contactless payments over traditional in-person card acceptance methods (i.e., swipe and dip), adoption has occurred across transactions of all sizes.

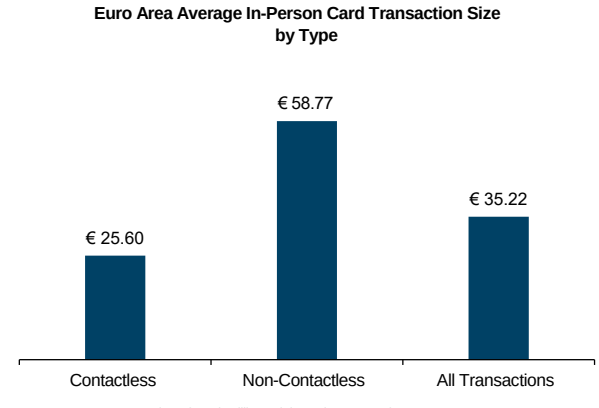
While limited, data from Visa and Mastercard suggests that contactless payments have been effective in driving increased card use, positively impacting not only the networks, but issuers, issuer processors, and merchant acquirers. Select data points from Visa and Mastercard are outlined below:

- In 2021, the average contactless active debit cardholder had two more transactions and $65 in additional spend each month—Visa
- Globally, we've seen a 20% lift in card transactions following the rollout of tap to pay—Visa
- In the United States, we've seen a lift on tap to pay cards of plus four transactions per month and plus $160 of spend per month—Visa
- We see consumers who are engaged in contactless increase their level of usage from anywhere from 30% to 80% is what we've seen in markets around the world—Mastercard
- Up to 3.8-times transactions per active card and 1.8-times spend per active card for tap to pay users in Asia-Pacific—Visa
- 16% increase in active cardholder spending from tap to pay activation in CEMEA—Visa
- For example, on transit for London Services, we started double the transactions and 70% higher growth in spend by tap to pay transport for London users versus those not using tap to pay—Visa
- Enabling tap-to-pay on transit can bring more than a 15% lift in transactions for merchants in the surrounding neighborhoods—Visa

Card issuers have played a key role in driving the enablement of contactless payments. While initially contactless cards may have been viewed as a novelty, we believe that consumers are increasingly demanding the functionality and as such, contactless cards have become table stakes for issuers. Consider, a 2020 survey from Mastercard found that a third of U.S. consumers would switch their top-of-wallet card for one that offered contactless capabilities. In addition, the prospects of increased card spend, resulting in increased interchange revenue, provides further incentivize for issuers to adopt contactless capabilities.

For merchants, contactless payments drive a faster and more efficient checkout experience for customers (i.e., fewer abandoned sales) and provide operational benefits. Merchant acquirers have been key in driving the increased acceptance of contactless payments across both SMB and enterprise merchants.Nearly 15 years ago, Square launched its payment dongle, which essentially enabled any smartphone to accept a card payment, yet in recent years various acquirers have enabled smartphones to accept payments via NFC technology (without the need for a dongle) and Visa's tap-to-phone or Mastercard's tap-on-phone capabilities. Phone-based card acceptance remains in a nascent stage, but exiting fiscal 2023 Visa had 3.3 million active Tap-to-Phone terminals and approximately 100 million transactions; Mastercard is live with Tap-on-Phone is over 100 markets and has over 1.5 million devices active. Clearly this is a trend to monitor as there are nearly 7 billion smartphones globally.

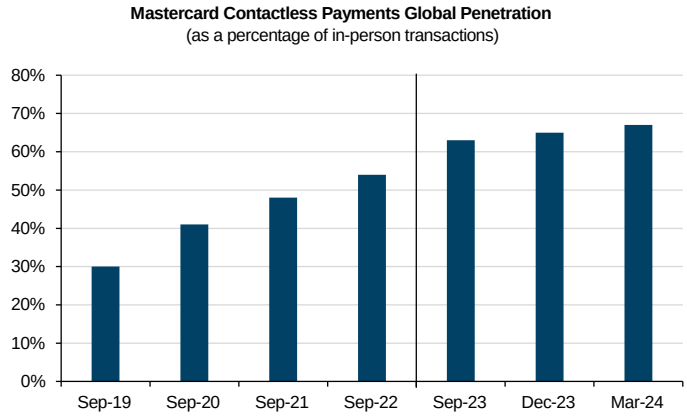
Contactless payments are taking share from larger-ticket swipe and dip transactions, but the data suggests that contactless payments are helping convert small-ticket transactions to electronic payments. Mastercard has previously cited that 80% of contactless transactions were under $25, which compares to the company's 2023 global average ticket size of $43. Further, based on data from the European Central Bank, the average ticket size for an in-person contactless transaction was approximately €26, while the average ticket size for a non-contactless card payment was €59.



Sources: European Central Bank and William Blair Equity Research

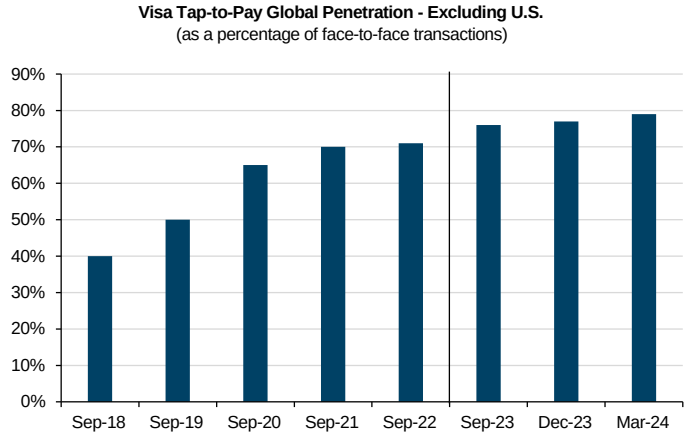
Consumers Embracing Contactless Payments

At the core we believe that the benefits of contactless are driving new consumer behaviors and perceptions around the use of card based payments and are helping accelerate the secular shift toward electronic payments. Consider that contactless accounted for 63% of Mastercard's global in-person transactions exiting the September 2023 quarter (versus 30% exiting the September 2019 quarter), and was 67%, exiting the March 2024 quarter.



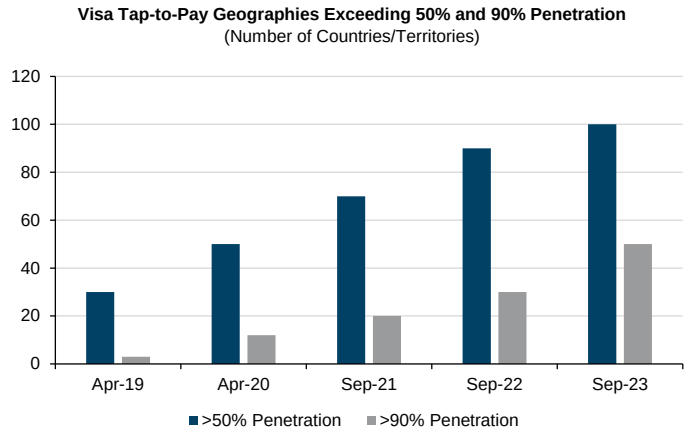
Sources: Company Reports and William Blair Equity Research

Similarly, tap-to-pay accounted for 76% of Visa's ex-U.S. global in-person transactions exiting the September 2023 quarter (versus 40% exiting the September 2018 quarter), and was 79% exiting the March 2024 quarter. Disclosures are intermittent, but including the United States, Visa's global penetration of tap-to-pay transactions was 63% exiting the September 2023 quarter (versus 15% exiting the September 2017 quarter).



Sources: Company Reports and William Blair Equity Research

While penetration varies by geography, the number of countries where contactless payments have reached a meaningful level of adoption has grown rapidly in recent years. Exiting the September 2023 quarter, Visa tap-to-pay penetration exceeded 50% in over 100 countries/territories (versus 30 in April 2019), and 90% penetration in 50 countries/territories (versus 3 in April 2019). Regional and country level data is limited and disclosures are intermittent, but at Visa's last investor day in early 2020, management disclosed tap-to-pay penetration was 41% within the APAC region and 70% in Europe, and highlighted that CEMEA had the highest level of penetration across all Visa regions.

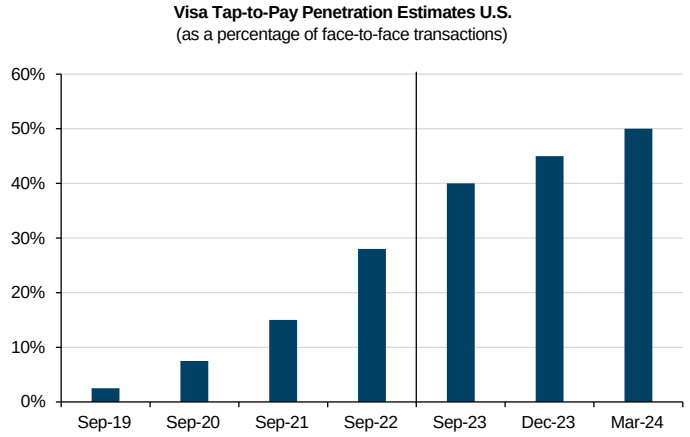


Note: Penetration calculated as percentage of face-to-face transaction which are contactless
Sources: Company reports and William Blair Equity Research

Comparisons are complicated given varying sources, but based on data from the European Central Bank, contactless accounted for 71% of euro area in-person card transactions in the first half of 2023, while based on data from UK Finance, contactless accounted for approximately 87% of U.K. in-person card transactions in March 2024.

Contactless Payments in the United States

As was the case with other payment innovations (e.g., EMV cards), the adoption of contactless payments in the United States has lagged other markets**.** Contactless has been available within the U.S. since 2014, but adoption remained limited until 2018 as issuers began enabling cards, merchants improved payment infrastructure (spurred by the adoption of EMV), and consumer behavior evolved. As we outline below, tap-to-pay now represents nearly 50% of U.S. in-person Visa transactions (versus approximately 1% in 2018); key drivers of this growth are outlined below.

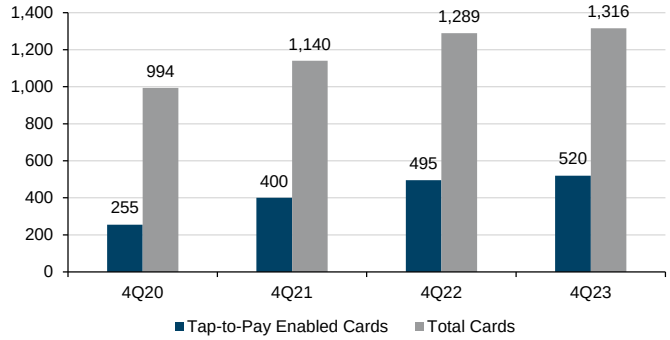


Sources: Company Reports and William Blair Equity Research

Contactless Acceptance. Contactless acceptance has increased significantly within the U.S.; consider in 2017 less than a third of Visa transactions in the U.S. occurred at a tap-to-pay enabled merchant, which compares to over 80% today. To comply with EMV requirements, U.S. merchants upgraded point-of-sale terminals and many of these new terminals included contactless capabilities that were either active or able to be activated through software updates.

Issuer Adoption. One driver of the increased adoption of tap-to-pay is the increased penetration of enabled cards; consider in 2017, there were fewer than 15 million enabled Visa cards in the United States (versus 863 million total Visa cards in the U.S.), while there were 520 million enabled cards exiting fiscal 2023 (versus 1.3 billion total Visa cards in the U.S.).

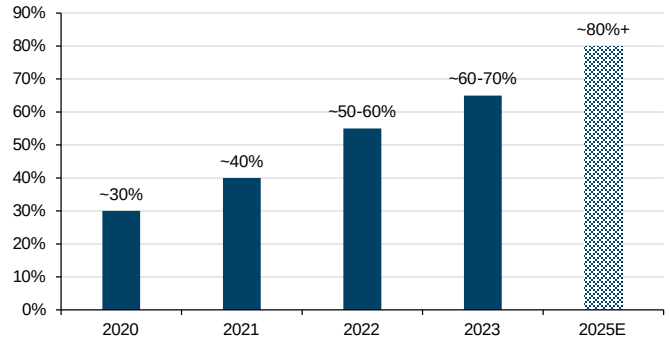
Visa U.S. Tap-to-Pay Enabled Cards vs. Total
(number of cards in millions)



Sources: Company reports and William Blair Equity Research

Visa's disclosures are directionally consistent with CPI Card Group, which estimates that 60% to 70% of U.S. cards in circulation exiting 2023 were contactless, driven primarily by large U.S. financial institutions, and the company foresees significant opportunity to increase adoption from small and midsize financial institutions, which in turn would lead to over 80% penetration by 2025. We believe consumers are increasingly demanding contactless capabilities as behaviors evolve.

Estimated U.S. Contactless Card Penetration
(as a percentage of U.S. cards in circulation)

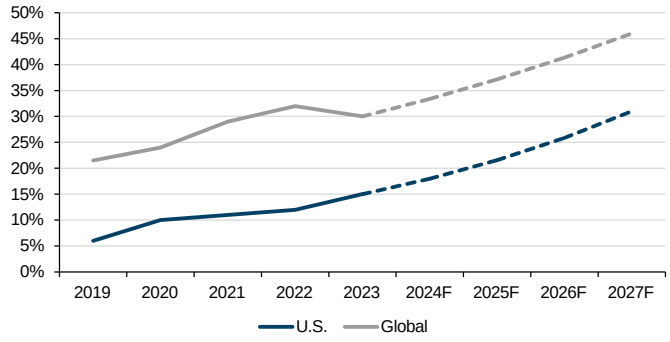


Sources: CPI Card Group and William Blair Equity Research

Digital Wallets

While card enablement remains important, the growth of digital wallets (e.g., Apple Pay, Google Wallet, Samsung Pay) has been and will remain an important driver of tap-to-pay adoption. As outlined below, digital wallet transactions represented about 15% of point-of-sale transactions in the United States (versus 6% in 2019), and 30% globally (versus 22% in 2019), according to Worldpay. Further, based on a 2023 survey by Forbes Advisor, 53% of Americans use digital wallets more often than traditional payment methods and 51% said they would stop shopping with a merchant that does not accept digital wallets.

2023 POS Digital Wallet Usage
U.S. vs Global
(percentage of transaction value)



Sources: Worldpay Global Payments Report and William Blair Equity Research

Investors frequently cite the growth of digital wallets as a headwind to the networks, but the data suggests digital wallets are generally funded by credit cards (36% of total) or debit cards (29% of total), according to Worldpay. Account-to-account (A2A) payments represent an alternative payment method to credit/debit cards and have historically traveled over bank payment infrastructure, which generally does not provide the security/benefits such as liability protection, allow for easy returns, or provide various fraud protection services. Further, the card networks have become increasingly focused on A2A payments and open banking.

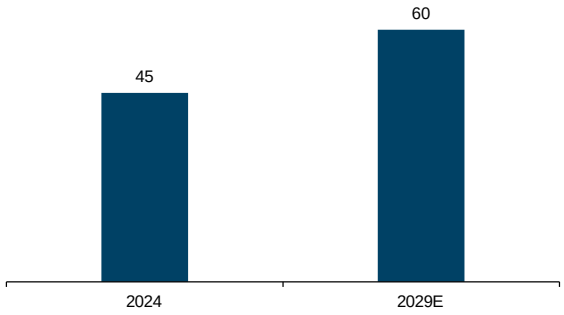
Mastercard's open banking strategy was largely developed through the acquisitions of VocaLink ($920 million, closed 2017), Nets' Corporate Service business ($3.2 billion, closed 2021), Finicity ($825 million, closed in 2020), and Aiia (estimated less than $200 million, closed 2021). Further, Mastercard helps power Pay-by-Bank, which is an ACH-based payment that uses open banking technology. The initiative enables bill payments between parties securely without the need to manually enter a routing number and account information, and helps add new value-added services for traditional ACH transactions.

Visa's €1.8 billion acquisition of Tink (closed March 2022) and the $1 billion acquisition of Pismo (closed January 2024) should bolster Visa's open banking and service capabilities. Through APIs and various acquisitions, Tink provides services that help with account aggregation, payment initiation, personal finance management, and data analytics that support open banking. Brazil-based Pismo is a cloud-native, API-driven microservices platform that supports various functions including card issuing, digital banking, digital wallets, corporate banking, and digital lending. Interestingly, management indicated that it will bring Tink capabilities to the United States in 2024 and indicated that the U.S. market is much less developed (versus Europe).

Unattended Market

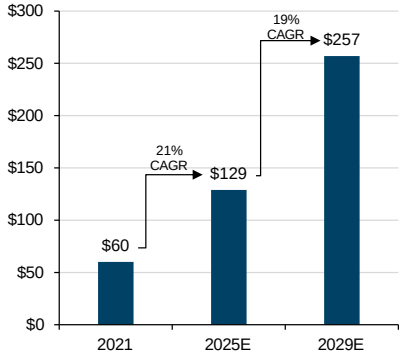
Beyond public transit, we believe the unattended market remains a key opportunity to expand into small-ticket transactions and contactless payments. Consider there are an estimated 45 million unattended machines globally (expected to reach 60 million by 2029), and less than 10% of existing machines accept cashless payments. Further, the average ticket size for most unattended transactions is less than $3.00, and 69% of vending transactions in 2023 were cashless (versus 67% in 2022), while 45% were contactless (versus 36% in 2022) according to Cantaloupe's *Micropayment Trends Report.* Total unattended retail payment volume is estimated at $129 billion globally and is expected to grow at a 19% compound annual clip, according to Nayax.

Nayax Estimated Unattended Machines Globally
(millions)

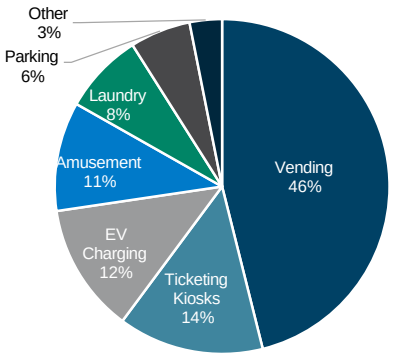


Sources: Company reports and William Blair Equity Research

Estimated Unattended Retail Market Volume
($s in billions)



Estimated Unattended Retail Vertical Mix
(percentage of 2029 estimated total market volume)



Sources: Company reports and William Blair Equity Research

Transit Systems: Driving Small-Ticket Contactless Transactions

Changing consumer behavior remains one of the more difficult dynamics that most companies face, yet implementing contactless payments across transit systems has been a key initiative to introduce consumers to contactless payments for small-ticket transactions and drive adoption.

We believe the New York Metropolitan Transportation Authority (MTA) is a strong case study of changing consumer behavior. For perspective, the MTA is the largest transportation network in North America that serves over 15.3 million people across its geographic market. In an effort to improve the consumer experience and reduce the need for tokens, the MTA launched the mag-stripe Metrocard in 1994, and introduced the open-loop payment system OMNY in 2019. Tokens were phased out of the system in 2003, and the Metrocard is expected to be phased out in 2025.

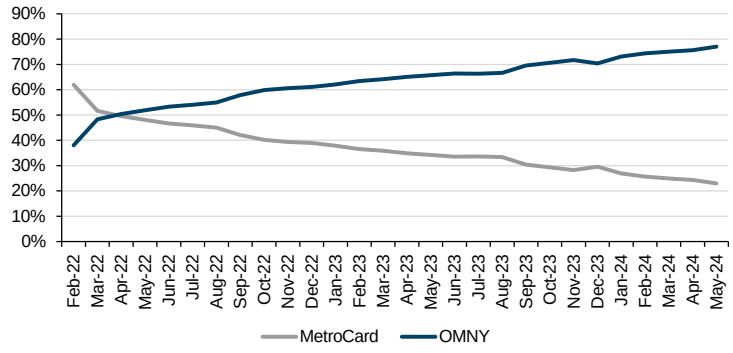
MetroCard vs OMNY

Source: Metropolitan Transportation Authority

The OMNY platform was developed by CUBIC, and was introduced to all New York City subways and buses in 2020. The platform enables riders to use the card payments (either the stored value OMNY Card or any contactless open-loop debit/credit card) to pay the $2.90 per ride standard fare. The MTA has stated that "*nearly 70% of OMNY customers tap into the system with their smart device with the remaining using debit, credit, or OMNY card.*"

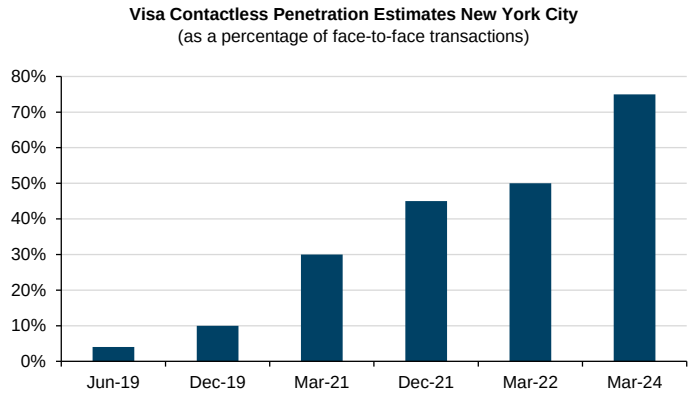
As a result, we view OMNY usage as a proxy for tap-and-pay adoption for the 3.6 million daily subway riders and 1.1 million daily bus riders. As we outline below, 77% of full fare riders used the OMNY system in May 2024, up from 38% in February 2022. Despite this growth, we note daily subway ridership remains 68% of pre-pandemic levels, while bus is 63%, according to the MTA.

Full Fare MTA Payment Method Mix
MetroCard vs OMNY Use
(percentage of ridership)



Sources: Metropolitan Transportation Authority and William Blair Equity Research

Contactless penetration within New York City has followed a similar trend to OMNY adoption. Data is limited but based on disclosures from Visa, approximately 75% of face-to-face transaction in New York were completed using tap-to-pay in the March 2024 quarter, which compares to 4% of transactions in May 2019.

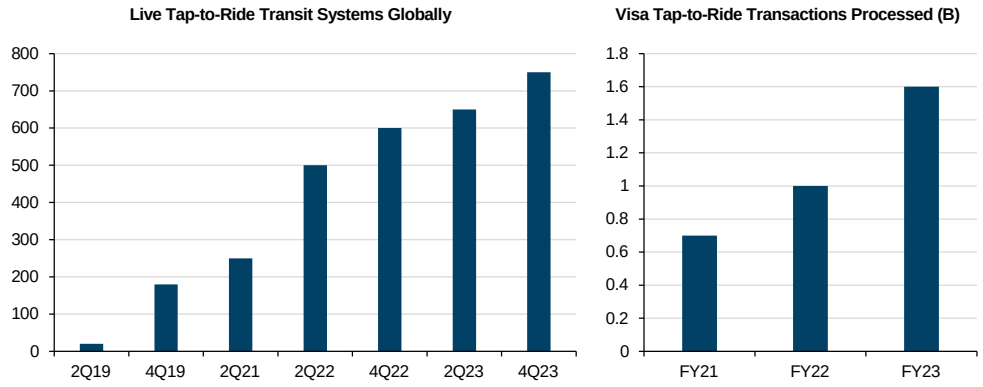


Sources: Company Reports an William Blair Equity Research

We believe that Japan represents another strong example of transit-led contactless adoption. In partnership with the government, Visa has helped launch 89 transit projects in Japan, and as result of these efforts, 30% of Visa transactions within Japan are tap-to-pay (versus 0.1% in 2019). While it is difficult to assess the exact impact of contactless adoption on cash use, according to the Japanese Ministry of Economy, Trade and Industry, the overall penetration of cashless payments within Japan has increased from 27% in 2019 to 39% in 2023, nearly achieving the governments' goal of reaching 40% cashless adoption by 2025.

We anticipate the continued adoption of contactless payments across transit systems; consider Visa's Future of Urban Mobility study found that 94% of transit riders expect contactless payments, while the Visa Economic Empowerment Institute found that 83% of transit agencies that did not have open-loop technology planned to implement the technology.

Interestingly, Visa has disclosed that it enabled about 150 transit systems (40% of which used value-added services) in fiscal 2023 to nearly 750 systems and that the number of tap-to-ride transactions grew over 30% to 1.6 billion in fiscal 2023 (versus over 212 billion processed transactions). We note that American Express has cited acceptance at nearly 600 transit systems globally, but only about 80 are live with tap-to-pay.



Sources: Visa and William Blair Equity Research

The prices of the common stock of public companies mentioned in this report follow:

American Express Company (Outperform) $228.40

Block, Inc. (Market Perform) $63.39

Cantaloupe, Inc. (Outperform) $6.65

CPI Card Group $27.56

Mastercard Incorporated (Outperform) $442.75

Nayax Ltd. (Market Perform) $21.36

Visa Inc. (Outperform) $266.59

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DOW JONES: 39164.10
S&P 500: 5482.87
NASDAQ: 17858.70

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Coverage Universe	Percent	Inv. Banking Relationships *	Percent
Outperform (Buy)	72	Outperform (Buy)	8
Market Perform (Hold)	28	Market Perform (Hold)	1
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