

# HOW BETTER PAYMENT SYSTEMS CAN IMPROVE PUBLIC TRANSPORTATION

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## Summary

America's payment system is transforming as methods of transacting digitally grow. Digital transactions offer the opportunity to move money faster, cheaper, and more conveniently for customers and businesses. Digital transactions can also unlock new methods for businesses to operate; the online economy is only possible because of online payments.

Our current payment system has solved one set of challenges to unlock the new economy, but the system causes significant problems for others. The current system has a cost structure that is expensive for digital micro-payments, which are small dollar payments. Furthermore, digital payments require accessing digital currency which is easy for the wealthy but can be expensive for those with less income.<sup>1</sup> Finally, digital payment acceptance is fragmented, cumbersome, and slow, creating delays.

These problems form a perfect storm when it comes to transit agencies. Public transit has a large share of low-dollar, high-volume payments. Transit agencies face unique challenges in adapting their fare payment systems to best meet the needs of riders while simultaneously solving concerns regarding user ease, speed, interoperability, and costs. Public transit is generally funded by a combination of user fees and subsidies by multiple levels of government. Federal, state, and local governments have all embraced public transit to serve multiple goals of providing basic mobility, supporting equity, catalyzing economic growth, and creating a more sustainable transportation system. The federal government's recent infrastructure legislation is a historic investment in transit that provides transit agencies a unique opportunity to improve payment collection systems. To achieve this, payment systems have to become more efficient and effective for low-dollar, high-volume transactions, a key characteristic of transit fare payments.

Enhancing payment efficiency for low-dollar, high-volume payments offers benefits beyond public transit as America's infrastructure and mobility methods rapidly evolve. Electric vehicle charging, e-bikes, scooters,

tolls, and even traditional parking meters have moved into digital payments, which, similar to transit, often result in low-dollar, high-volume transactions. Transportation technology is rapidly evolving in a direction that involves greater use of micro-payments which exposes many problems in America's payment system.

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A payment is comprised of two parts: the transfer of money and the information necessary to conduct that transfer (e.g., who is paying whom, how much, from where, and when). While the information necessary for a payment often goes through non-bank firms, the settlement of money is currently bank-centric with most funds flowing through financial institutions. Non-bank companies, including technology firms providing card systems, messaging firms providing information services, and processing firms, have played critical roles in managing the flow of information and the methods in which payments are transacted, although increasingly, they are also participating in the flow of funds.

This paper lays out the challenges inherent in scaling up open payments in the public transportation context and begins to outline potential paths for solutions. It begins with an overview of the current landscape of transit payments, followed by a discussion of existing and emerging payment systems, including how those systems currently operate, the costs of the systems, and who bears those costs. It then considers the specific issues involved in moving toward open payments from the perspective of public transit agencies. It concludes with a potential path for solutions.

## | Payment services in the transit context

For most of its history, transit has relied primarily on cash payments. Historically, transit riders paid their fares in cash, either directly or through the purchase of tokens from a station agent. Even today, transit agencies spend a lot of money dealing with cash. The cost and time involved in handling cash payments is significant for agencies for multiple reasons.

- Cash is the slowest payment method; paying cash to board a bus requires extra time for each passenger, which adds up to slower service for all riders.
- Vending machines that use dollar bill readers can jam, rendering them out of service and requiring repairs.<sup>2</sup>
- Providing change in coins can tax cash storage capacity, particularly when some customers are using \$10 or \$20 bills to purchase \$2 trips.
- Collecting, centralizing, and depositing cash from a fleet of buses and station vending machines has significant costs in terms of staff time. For example, the Greater Richmond Transit Company collected \$7.4 million in fares in FY2019 but spent \$1.6 million to do so.<sup>3</sup>
- Handling cash makes operators more vulnerable to theft.

It is no surprise then that transit agencies have implemented methods to reduce the cost of handling cash. Many introduced farecards that could be pre-purchased with cash or a credit or debit card, making it easier for riders to board without requiring cash for each transaction. Farecards are a type of closed-loop payment system, meaning that they can only be used to pay a transit fare and have no value for other transactions. Farecards offer several advantages compared to the cash-based pay as you go method. They allow riders to store value so they can pay for multiple trips. They also allowed others, such as employers, to contribute directly to employee transit, which is a tax-preferred benefit (similar to employer-provided parking). Today, many transit riders can pre-load their farecards online or even store them on smartphones, eliminating the need to stop at fare vending machines and speeding entry onto trains and buse—which benefits not only the rider but the transit agency as well.<sup>4</sup>

Though they have some advantages over cash payments, closed loop payment systems have multiple disadvantages, including their incompatibility with other forms of payment. A transit card cannot buy groceries or anything else outside of transit. Prepositioning money on a closed loop system precludes those funds from being used for other purposes. [This is particularly](#)

[difficult for people who live on the financial edge](#) faced with uncertain income and expenses for whom liquidity is particularly valuable.

More recently, as the marketplace for mobility has become more competitive with the proliferation of ride-sharing, bikeshare, and e-scooters, transit has had to evolve again to retain and attract customers. Many of the new mobility services offer payment options and user experiences that are more efficient and more convenient for customers than traditional transit fare media. Transit agencies will need to upgrade both software and hardware to offer payment options more suited to this competitive landscape. Some agencies now allow fare payments to be made with a smartphone app. A few have implemented open loop payments, in which a transit-specific farecard is no longer required and fares can be paid directly at the farebox, typically with a debit or credit card. Their experiences are described in more detail in a later section of this paper. Many other agencies are currently considering open payments, along with other innovations such as integrated fare payments with bikeshare or other micromobility services.

Though the payment landscape at transit agencies is becoming more diversified, widescale adoption of open payment options has remained elusive. There are a variety of reasons for this. Some agencies still use old fare collection equipment, such as cash-only fareboxes on buses, which limit the ability to innovate. Updating collection equipment requires capital expenditures, which agencies should compare against the potential savings in time (both for the transit service and the riders) from speedier fare collection in deciding when to modernize. Even for systems with more modern equipment, there is still ground to make up to become competitive with other services consumers encounter in their daily lives. In many places, transit riders can purchase a cup of coffee on their way into the station without waiting in a separate line with a bankcard and pick up their dry cleaning at the end of their trip using the same bankcard, but they cannot use that bankcard to pay for the trip itself. Moreover, transit riders generally cannot pay for other mobility services—whether bikeshare or simply an adjacent transit service—with the same payment method, instead

having to purchase multiple farecards or maintain different accounts through multiple apps. Transit agencies are also limited in the flexibility they can provide in terms of passes, packages, and discounts due to the lack of fare payment integration among different mobility providers.

Transit agency leaders are facing important choices about the future of fare payments for their systems. These decisions have real-life consequences for riders and for the agencies themselves. While innovations in fare payment can make riding transit faster and more convenient, issues of cost allocation and equity must also be resolved. For transit leaders to make informed choices in this regard, they must have an understanding of how various payment systems work, who uses them, what entities are involved, and how costs are distributed among those entities. The next section addresses these issues.

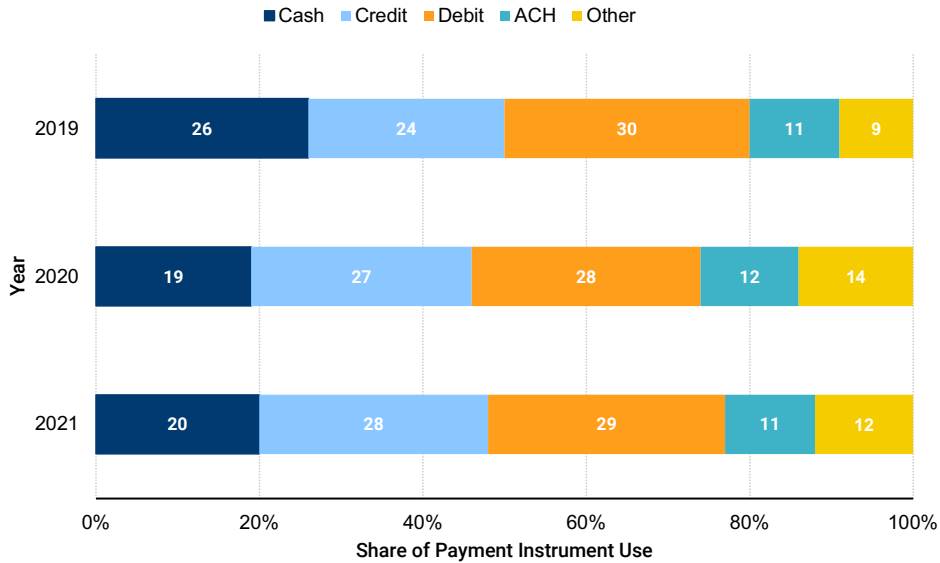
## The payment landscape

In all other aspects of their lives, transit riders participate in an extensive network of payment systems. Card-based systems (debit and credit) comprise a majority (57%) of payments in America today. This was true pre-pandemic as well, although cash usage was higher in 2019. Cash usage declined sharply in 2020, impacted by the pandemic, technological change in payments, and the broader economy. Data published in [2021](#)<sup>5</sup> and [2022](#)<sup>6</sup> by the Federal Reserve Bank of San Francisco documents consumer payment usage.<sup>7</sup> Figure 1 looks at total transactions starting at 2019 for a baseline pre-pandemic, 2020 when the economy was in major flux due to the pandemic, and 2021 when reopening was well underway.

Consumer usage of payment type is correlated with dollar amount and age, with cash more common for smaller dollar transactions, among the young (under 25), and old (above 65), while credit is more common among the middle (25 to 64). Debit card usage is most common among the young and least common among older Americans, as shown in figure 2.

FIGURE 1

### Share of Payment Instrument Use by Year

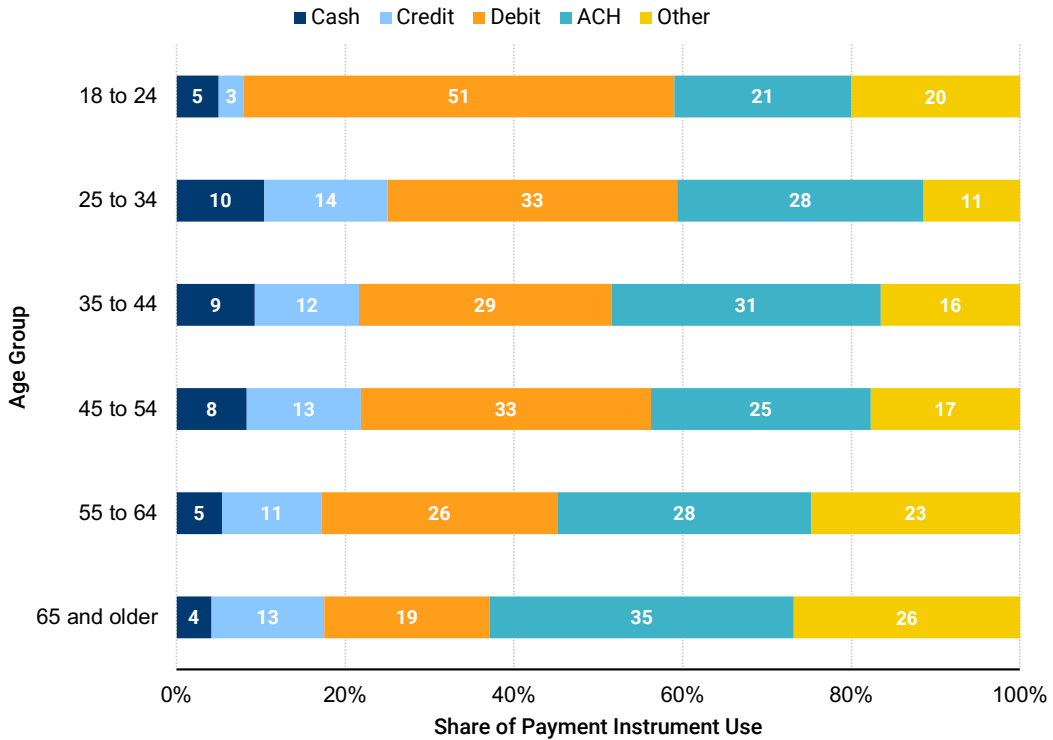


Source: Federal Reserve Bank of San Francisco, 2022

BROOKINGS

FIGURE 2

### 2020 Payment Instrument Use by Age

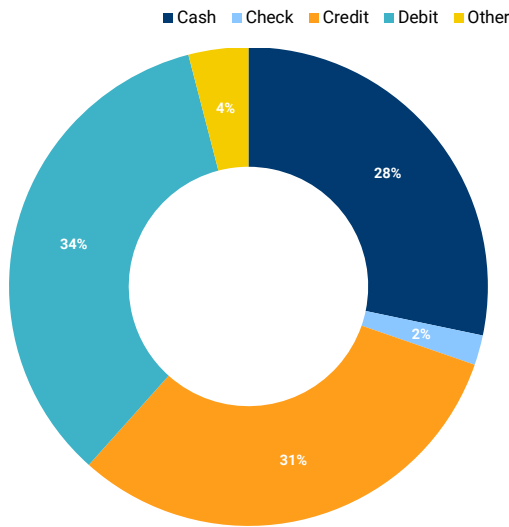


Source: Federal Reserve Bank of San Francisco, 2021

BROOKINGS

FIGURE 3

### Share of Payment Usage for In-Person Bill Payments



Source: Federal Reserve Bank of San Francisco, 2021

## BROOKINGS

Payment choice is highly correlated with transaction type. Focusing on in-person non-bill payments—the type of transactions that dominate transit—highlights that cash, credit, and debit are even more dominant. Figure 3 illustrates that debit remains the most common choice of payment while credit and cash are relatively common.

The COVID-19 pandemic impacted payment usage as physical activity diminished and much of life went virtual. Shifting to the digital sphere inherently requires digital money. How much of this change is permanent is difficult to know. Part of this change came from merchants driving consumers to use digital money: “[C]onsumers are noticing merchants asking patrons to use cards rather than cash, called steering, has become more common since the start of the pandemic and may be a factor in consumers’ use of cash” according to the San Francisco Fed.<sup>8</sup> That research found that during the pandemic about one-quarter of merchants were frequently steering consumers away from cash while another 20% were sometimes steering consumers toward a card or digital payment. For example, baseball stadiums are largely cash-free as restrictions that [began during the pandemic have continued](#). Merchants have some ability to drive consumer payment

choice, and adoptions of specific payment methods by some merchants can even have ripple effects pushing consumers to more frequently consider that payment form in other contexts. It remains unclear whether the dominant force driving merchant movement toward digital payment systems was to avoid potential disease transfer from physically handling cash, a desire to avoid the associated costs of handling cash, a realization of benefits of accepting digital transactions, or a combination of any or all of these factors. One note is that the costs and benefits to merchants of cash compared to digital payments can vary substantially depending on the types of transactions the merchant is engaged in.

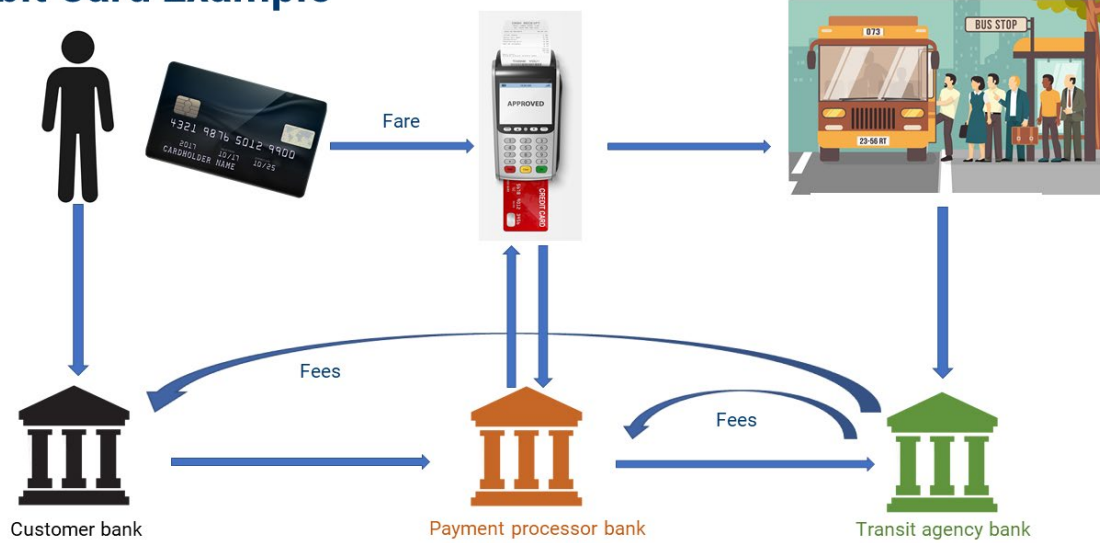
## Costs of payments

Each form of payment comes with its own set of costs. Cash requires storage, handling, accounting, and is subject to easier theft than digital payments. While these costs can be difficult to quantify, they are quite real. Additional concerns regarding public health and the handling of cash took center stage during the COVID-19 pandemic when the term ‘laundering money’ took on a literal meaning as some thought the virus could be transmitted through touching cash.

Electronic payments have fees more easily quantified. The chart below highlights the three-party exchange in most electronic payments. The focus of the chart is on a debit card example, although it could be easily modified for credit card in which case one more arrow is required to show the customer receiving funds back, usually in the form of rewards (points or dollars). Credit card transactions typically have higher variable costs, 1-4% of the transaction, which provide for these rewards.<sup>9</sup> Debit card transactions usually have smaller or no percentage amount but have a flat fee. These fees collectively are generally referred to as “interchange.”<sup>10</sup>

The exact amount of the interchange fee varies along a wide range of dimensions governed by a combination of general law and regulation and specific contracts between payment service providers and merchants. Some factors affecting these costs include the type of

FIGURE 4  
**Debit Card Example**



SOURCE: Author. Rider pays fare using debit cards in a transaction with three parties: rider, payment processor, and transit agency each of whom has a bank involved. Fees are taken usually by both the rider's bank and payment processor and the transit agency ends up with the fare, minus the fee in its bank account.

card, whether it is physically present at the time of the transaction or not, the category of merchant, and the type of bank issuing the card. The Durbin Amendment to the Dodd-Frank Act of 2010 required the Federal Reserve to engage in regulatory rulemaking to reduce the cost of debit interchange.<sup>11</sup> However, the law contains a carve-out for smaller financial institutions that in effect creates a two-tier pricing structure for debit interchange in which cards from smaller financial institutions generally result in higher interchange fees, although not always the case for the smallest dollar transactions. To be precise, smaller banks (defined as those with less than \$10 billion in assets) are allowed to charge more for certain debit transactions. Transactions from these banks are referred to as 'unregulated debit' as they were meant to be excluded from the cost reduction in the Durbin Amendment. The vast majority of debit cards issued are from banks that are considered 'regulated debit' (those with more than \$10 billion in assets). Enactment of the Durbin Amendment offers insight as to how interchange costs can be lowered but also the consequences of creating differing price structures for types of debit cards, a topic that will be explored further in the paper.

At the time the law was enacted, the financial technology (fintech) industry was far smaller. In the interven-

ing decade fintech has exploded. Some fintech firms may appear to consumers like banks but are actually technology companies that operate interfaces with consumers while partnering with banks who provide access to FDIC insurance and Federal Reserve payment systems. Many fintechs partner with smaller financial institutions creating the opportunity to [earn higher debit interchange fees](#) than if that consumer was with a larger financial institution. This changes the economic profitability of certain types of customers (heavy debit users) who may be more likely to engage in high-volume, low-dollar transactions as heavy debit users are typically lower income than heavy credit card users. Finally, it is important to note that consumers are almost always charged the same amount regardless of how they choose to pay. A series of [legal and contractual agreements](#) have taken hold in the U.S. (different than in many other parts of the world) that result in one price for a consumer regardless of the method of payment.<sup>12</sup> This generally applies to transit as well.

## FINANCIAL INCLUSION

While money is universal, how people interact with the financial system varies substantially. This is important for transit agencies to understand, as different



segments of their ridership experience the payment system differently, making a one-size-fits-all solution difficult to develop. Ninety-five percent of households have a bank account, [according to the FDIC](#), but between 15-20% of those with bank accounts still use check cashers, money transmitters, or payday lenders for financial services as well.<sup>13</sup> Those people are often referred to as “underbanked.” About one in twelve American households rely on overdrafts frequently (defined as ten or more a year), sometimes resulting in high fees for small dollar transactions.<sup>14</sup> This data illustrates that for many families, basic banking and payment services can be high cost.

Understanding payment options and costs for lower-income households, who disproportionately use transit, helps explain why some techniques employed by other high-volume, low-dollar service providers may not work. Coffee shops are one example of high-volume, low-dollar transactions, with some independent coffee shops reporting paying more in swipe fees for payments than for coffee.<sup>15</sup> Other larger companies with the benefit of scale like Starbucks developed entire payment apps to reduce costs. Starbucks has been incredibly successful in using its payment app, which, with 25 million users spent most of the last decade as the most used payment app in America.<sup>16</sup>

Starbucks’ solution was to have users upload larger amounts of funds and then slowly spend down those funds at each transaction. This reduces costs particularly on debit transactions where there is a fixed fee as opposed to variable costs. For example, a one-time upload of \$50 as compared to ten transactions at \$5 each would save a total of \$2.25, assuming a per-swipe fixed fee of 25 cents—more than enough savings to justify a free cup of coffee as a customer reward for uploading funds.

This example is mentioned in the financial inclusion section because it assumes the user has \$50 to pre-position in Starbucks “money.” Pre-positioning money has few costs for those with large amounts of liquidity, including many Starbucks customers. But for people living paycheck to paycheck, particularly those 25% of Americans discussed earlier in the un-/under-banked context, pre-positioning funds has its own

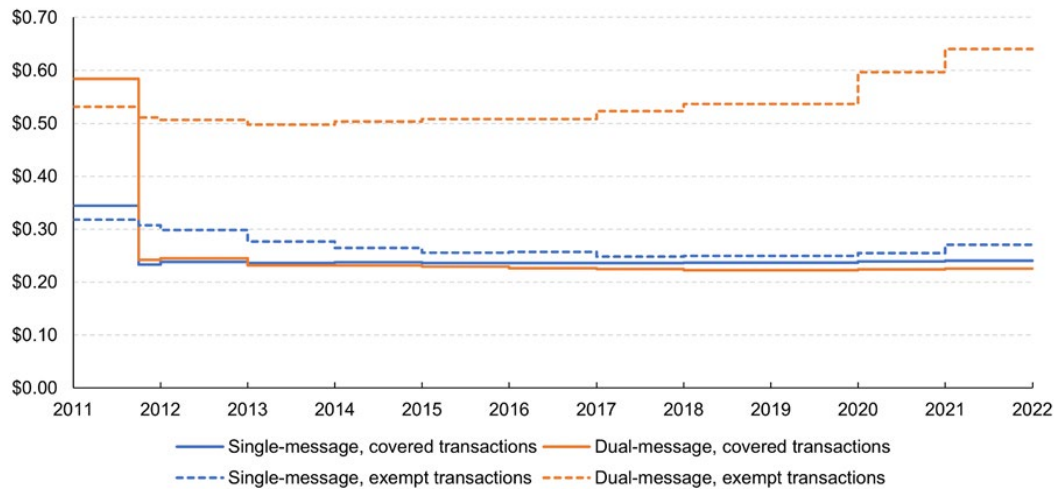
set of costs. The inability to use pre-positioned funds for other purposes precludes many from making this trade even at relatively high potential rewards.

Transit systems that offer bonus fare value for buying higher denomination cards can incentivize greater pre-positioning of funds (and lower transaction costs for transit agencies), but should realize these benefits are likely going to riders who can afford to pre-position funds, which may be a mix of wealthier riders and heavy transit users. New York MTA, the nation’s largest transit system, recently voted to [eliminate its program](#) that provided a 5% fare bonus to those who purchased or reloaded higher value fair cards. This occurred when New York relied heavily on a closed loop payment system with fare cards only usable on their system. Benefits and costs of closed vs. open loop payment systems are discussed in a later section.

## DIFFERENCES WITHIN DEBIT CARDS

Credit and debit cards come with different fee structures depending on the type of card and method of transaction. As mentioned earlier in the paper, the Durbin Amendment resulted in two-tier pricing for debit cards based on the size of the issuing bank. While the Federal Reserve’s implementation of the Durbin Amendment resulted in a decrease in average debit transaction costs by approximately 50%, research has indicated that those declines differ by the size of transaction. [Research from the Federal Reserve Bank of Richmond](#) found that small-dollar transactions experienced a small decline in transaction costs and in some instances actually experienced an increase in costs. The chart below shows the sharp decline in costs when Durbin was implemented just before 2012 and the spread that still exists with exempt transactions.<sup>17</sup>

Average Debit Card Interchange Fee



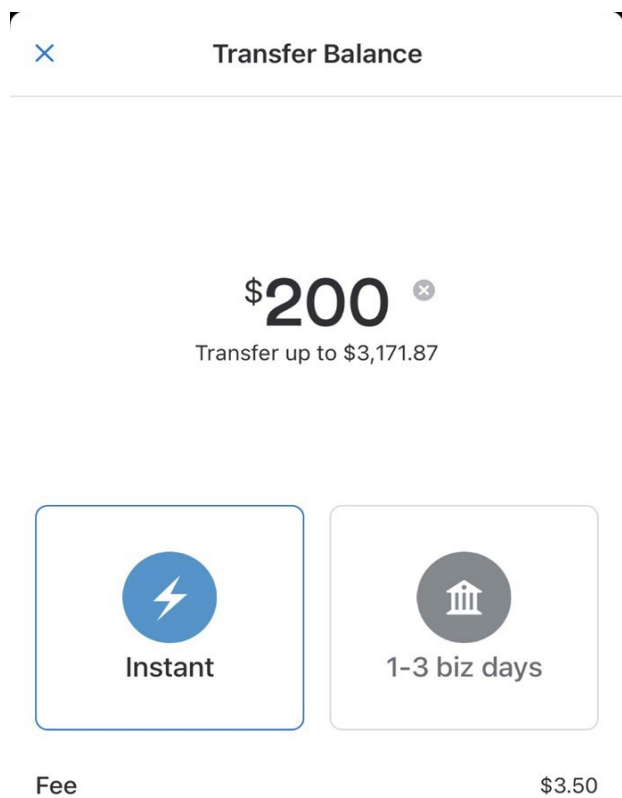
Note: Data for years prior to 2013 reflect a split between covered/exempt issuers, rather than covered/exempt transactions.  
 Accessible Version

SOURCE: Federal Reserve Bank, "Regulation II (Debit Card Interchange Fees and Routing)," September 23, 2022, <https://www.federalreserve.gov/paymentsystems/regii-average-interchange-fee.htm>.

## New Payment Systems

America's payment system has been dominated by plastic cards (debit, credit, and pre-paid) for decades. New fintech companies have created multiple new methods for payment. Some of these methods are simply new forms of authorization or access that may appear to the consumer to be new but on the backend simply ride existing payment rails. ApplePay is one such example, as are the corresponding payment methods for Google, Samsung, and Android phones. Under these methods a smartphone basically replaces the physical plastic card in providing the payment information. The actual funds and system processing the payment remain the existing bank rails for the underlying account, e.g., the credit account with the underlying bank with whom the credit card is issued. Apple or the other providers generally add a service fee to the payment transaction on top of the existing fees from the banks and other payment providers.

Paypal and Venmo can behave similarly, linking accounts directly to underlying bank accounts (debit or credit). Paypal and Venmo also offer digital wallets where one can store value. Using funds in a digital wallet with Paypal or Venmo is a different system than using those apps as a means to move funds from a bank-linked card. When people Venmo each other balances stored on their accounts (not in their financial institutions) the funds can flow instantly and cost-free between accounts. However, those funds remain stored in these accounts. In order to downstream those funds back into a bank account, customers have two choices: They can use the automated clearing house (ACH) system, which takes one to three business days (up to six days in real time, depending on holidays, weekends, and time of the transaction), or they can transfer it instantly for a fee. When consumers opt to use the ACH system, Venmo and Paypal typically waive the ACH fee, which is on the order of 3 to 4 cents. When consumers



SOURCE: Author. Screenshot of the Venmo app

opt to move their money instantly back to their bank account, Venmo and Paypal charge around 175 basis points of the transaction. In order to move the money instantly, they often use a product called Visa direct debit.

Several important facts can be seen from this. The first is that some consumers are willing to pay 1.75% of their total funds transferred in order to save several days. This highlights the time value of money, particularly for people living paycheck to paycheck. Given the high costs of small dollar credit (overdrafts, payday loans, etc.), paying \$3.50 to move \$200 instantly can make a lot of sense as opposed to dealing with a single \$35 overdraft fee. The second is that there are limitations to the usage of money stored in digital wallets. Despite the large and growing acceptance of Paypal and Venmo among retailers, they are still not nearly as ubiquitous as bank accounts, which can be accessed through debit cards and online banking and can easily be turned into cash.

The ACH system has some limitations when it comes to transit systems. ACH is operated by the Federal Reserve and is [currently closed on weekends and holidays](#). While transit systems typically operate seven days a week and on holidays (although often with reduced hours), the nation’s major interbank payment system does not. As a result, payments from banks often are held, not settling until the ACH network resumes operation. Within ACH there is an option for the standard system or so-called ‘Same Day ACH’ which clears within that same day. The cost of choosing to settle more quickly through same day ACH is a function of the network cost (what the ACH system charges), the mark-up the bank processing the transactions add to that cost, and the additional cost should charges be returned (fraud, error, etc.) depending on how many such charges are included in that batch of ACHs.<sup>18</sup> The ACH system, whether traditional or same day, operates under so-called batch processing. The easiest way to think of a batch system is that it is similar to a load of laundry: A set of payments are collected and are all processed together. Regardless of when the clothes got dirty or were put into the laundry machine, they all come out clean at the same time, after the entire cycle is done.

The Clearinghouse, the largest private interbank system in the United States, operates a realtime payment (RTP) system. Realtime payments tend to settle nearly instantly (seconds to minutes) and are generally done individually (as opposed to a batch). RTP systems can and often do operate 24 hours per day, seven days per week, 365 days per year. The Clearinghouse’s RTP system is supported by all of the largest banks and many smaller banks and credit unions. While not ubiquitous like the ACH network, [RTP reaches banks that collectively accounts for over 60% of all accounts and 75% of all American consumers](#) (many people have multiple banks).

The Federal Reserve has committed to building its own realtime payment system, FedNow. FedNow plans to launch a pilot phase sometime toward May to July 2023. FedNow could in theory provide a realtime payment network to every bank. However, the Fed does not currently plan to require banks to use FedNow, providing them optionality on which payment system to

use. For a FedNow payment to work both the merchant and consumer, banks must use them. As Federal Reserve Vice-Chairman for Banking Michael Barr recently [testified to Congress](#), “[I]t will take time to build the number of institutions that are well positioned to offer the kinds of services that FedNow will then allow them to do. Ramp up time is going to take a while.”

America’s payment system is often described in rail terms: running on tracks, with payments like riders experiencing service in batches, with substantial delays. While transit agencies typically operate everyday (some, like New York, every day and all day), America’s payment system operates more akin to banker’s hours. While riders wait for trains, transit agencies wait for payments to clear. New payment rails (like many new transit lines) are being built and scheduled to arrive. However, delays abound and until then the system is trying to make do with what we have.

## Open payments in transit

As transit agencies are working to woo riders back post-pandemic, some are looking to tap into the rapidly evolving payments landscape to offer more convenience and greater optionality for riders. Several transit agencies have addressed these issues with the introduction of open payments, also known as contactless EMV payments.<sup>19</sup> As their name suggests, open loop systems allow customers to use any credit or debit card, and often general reloadable pre-paid cards, to pay for their trips at fareboxes and faregates. Open loop systems have multiple advantages over traditional and closed loop systems. Open loop systems speed the customer’s trip and allow them to access transit as conveniently as they do any other merchant. Unlike closed loop systems, they do not have to pre-load funds onto a transit-specific card. This gives riders free access to their funds, providing the liquidity that is particularly important to people living on the financial edge.

For transit agencies, open loop systems can potentially increase transaction costs in dealing with electronic payments. Because open loop systems do not require

pre-positioning funds, they are more prone to having smaller dollar transactions. The ‘pay as you go’ model inherently favors more smaller payments as compared to one larger payment. When transaction costs include a fixed component, as is the case with almost every debit and credit card, then the fixed cost is repeated every time. These increased costs for payment processing can and do add up as shown below.

Though there are more than a thousand transit agencies in the United States serving millions of passengers per day, only a handful currently offer open payments, including New York MTA, Chicago’s local and regional systems (CTA, Metra, and Pace), TriMet in Portland, Oregon, Miami-Dade Transit, and four agencies in California outside of the largest metropolitan areas. Initial data from the California agencies’ experience with open payments is now available.

### CAL-ITP

California is poised to lead the nation in expanding the availability of open payments through the work of Caltrans’ Integrated Travel Project (Cal-ITP), which is dedicated to making mobility options in the state more integrated with each other and more accessible to all Californians. As part of this work, Cal-ITP has produced service contracts for contactless payments that are available to all transit agencies in the state and across the country, with the potential to significantly expand the number of transit agencies offering this option to their riders. These contracts allow for transit agencies to use the Cal-ITP rates but not to aggregate transactions across transit agencies, which would be challenging for a variety of reasons.

Initial data aggregated from the four California transit agencies that offer contactless payments provides a useful snapshot of customer preferences regarding the type of payment used, as well as the cost of those transactions to the transit agencies.<sup>20</sup> Over the six months from July-December 2021, there were 19,904 contactless payment transactions with a value of \$72,079 (average transaction size: \$3.62). The total merchant service charge (MSC), which is the total cost to the transit agencies for collecting those payments, was \$4,983.12, averaging 25 cents per transaction,

just under 7% of total fare revenue. Losing 7% of total fare revenue in transaction costs is significant and appears in line with [other broader experiences, as one article stated](#), “Transit agencies, unless they broadly aggregate transactions, have to pay a high percentage of the transaction amount in merchant fees based on interchange—sometimes as much as 6% or more.” Aggregating transaction fees may lower costs for transit agencies but they could cause burdens for users, particularly if the user is unaware of when the payment is processed, potentially triggering a costly overdraft.

Table 1 provides a breakdown of transactions by type of payment, showing that regulated debit cards (debit cards issued by most financial institutions, see earlier definition under Durbin Amendment) represented nearly two-thirds of transactions, with credit cards making up a little more than one-quarter and unregulated debit (issued by smaller financial institutions) and prepaid cards representing far less. Table 2 provides additional detail on the composition of the MSC, showing that interchange fees represent the bulk of the MSC during this period.

**TABLE 1**

### Breakdown of transactions by scheme and payment type

	Visa	Mastercard	Total
Credit	21.9%	5.7%	27.6%
Regulated debit	59.0%	4.9%	63.9%
Unregulated debit	2.4%	2.8%	5.2%
Prepaid	2.6%	0.7%	3.3%
Total	85.9%	14.1%	100.0%

NOTE: Visa and Mastercard are the only two payment schemes currently supported, but we expect American Express and Discover acceptance to be supported soon.

**TABLE 2**

### Breakdown of Merchant Service Changes by type

	Total (\$)	Total (%)
Interchange fee	\$3,586.34	72.0%
Scheme fee	\$792.42	15.9%
Acquirer fee	\$604.71	12.1%
Total	\$4,983.12	100.0%

SOURCE: The data in tables 1 and 2 was provided to the author by Cal-ITP and is available upon request.

# Benefits of open payments in transit

Broader adoption of open payments in transit would have benefits for both the transit and financial sectors. For transit, open payments can improve the customer experience, an important factor in agencies' efforts to attract and retain riders in the post-pandemic environment. Transit agencies can also expect to see reduced cash handling costs and faster boardings. The benefits for the financial sector include access to the transit market in which millions of payment transactions are made each day and the potential to introduce unbanked or underbanked individuals to affordable financial products. New payment technology can make the system more accurate, faster, and easier for riders, transit providers, and third parties.

In addition, the transit market can support financial institutions' environmental and social goals (ESG), as discussed below.

## ESG CONSIDERATIONS

Open payments can encourage transit ridership by improving the convenience of accessing the system. Increasing ridership of public transit has large positive externalities for environmental and social goals. The EPA estimates a "typical passenger vehicle" emits 4.6 metric tons of carbon dioxide annually.<sup>21</sup> In addition, the transportation sector is responsible for 29% of all U.S. greenhouse gas (GHG) emissions and experiences faster growing GHG emissions than any other sector.<sup>22</sup> The U.S. Department of Transportation and the Environmental Protection Agency (EPA) cite cars and other light-duty vehicles as contributing over 50% of total GHG emissions in the transportation sector.<sup>23</sup> The Department of Transportation even goes as far as to say "[s]witching to riding public transportation is one of the most effective actions individuals can take to reduce their carbon footprint."<sup>24</sup> Incentivizing individuals to use public transit is an important step towards meeting ESG goals for carbon emissions, especially in a sector that dominates current GHG emissions.

Improving the way people pay for transit by deploying modern technologies can incentivize Americans to use public transit and make providing that service more

efficient. Increasing the use of transit instead of individual passenger vehicles reduces carbon emissions. For every public transit convert, the transportation sector could see as much as a 4.6 metric ton reduction in CO<sub>2</sub> emissions annually. It would take just eight public transit converts to reduce CO<sub>2</sub> emissions by the weight of a metro train.

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## New payment technology can make the system more accurate, faster, and easier for riders, transit providers, and third parties.

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To the extent that open payments support greater efficiency in transit operations, more of the agencies' limited funds can go toward improved service, which has a racial equity impact as well as an environmental one. Nationwide, 60% of transit riders are non-white. Black riders represent 24% of those who use transit despite making up only 12% of the total U.S. population. Bus riders are even more likely to come from communities of color: 30% of bus riders are Black, and another 21% are Hispanic.<sup>25</sup>

Financial institutions are increasingly feeling the need to commit to ESG goals to meet investor and consumer demand. As financial institutions commit to ESG considerations, supporting a push towards public transit will help. Banks and payment companies partnering with transit agencies to lower costs will not only improve services for customers but will incentivize public transit over individual cars, subsequently improving carbon emissions in the transportation sector.

# Expanding open payments in transit

Although there would be many benefits of making open payments available on a wider scale, expanding open payments in transit presents a number of unique issues. Any payment system in the transit context must be able to accommodate large numbers of riders at multiple points: Each bus and every rail station must have the ability to accept fare payment in some form. Fare collection must be quick and efficient or schedules are disrupted. If fare media other than cash is used, it must be readily available to all who want to ride. To accommodate occasional riders (as opposed to regular commuters who may use passes) and low-income riders who may not have the cash flow to purchase passes up front, fare collection must allow for fares to be paid individually for each ride, resulting in a high number of low-dollar transactions.

Transit agencies offering open payments have had to navigate through these and other issues to develop a workable system suited to their operating environment and ridership demographics. This section lists the major considerations involved in adopting open payments and potential strategies for addressing them developed by the agencies currently offering open payments.

- **Interchange fees.** As the data in the previous section shows, interchange fees can vary significantly depending on the mix of payment methods used by riders and the rates charged by the different entities involved. Though the rates may be known to transit staff at the time of initial implementation of open payments, interchange fees can change over time, becoming higher or lower. Complicating factors even further, fees can be negotiated such that different transit agencies face different fees. For example, transit agencies in California are [reported to have negotiated a lower interchange fee with Visa](#). The choice of payment methods by consumers is difficult to predict accurately and can also change over time. As a result, the cost of adopting open payments can be uncertain, and transit agencies that adopt open payments may find that they end up paying

a higher percentage of fare revenue in fees than they had expected. Interchange fees may be even higher when applied to reduced fare trips, which could become a greater percentage of trips as more communities look at offering discounts for low-income riders.

The way that transit agencies pay interchange fees can vary depending on contractual agreements with payments providers. Fees may be charged per transaction or as a percentage of all transactions aggregated over a certain period of time. The question of how much transit agencies are paying to collect fares, including via open payments, is often not transparent to riders, taxpayers, or local officials. Public budget documents typically do not disaggregate these costs, making it difficult for decisionmakers to assess the relative financial burden on the transit agency from adopting open payments or even from continuing to rely on cash.

- **Discounted fares.** Transit agencies offer varying fares based on the characteristics of riders. Federal law requires that all transit agencies offer half-price fares to seniors and individuals with disabilities.<sup>26</sup> Many transit agencies also offer discounted fares to other categories of riders, such as students and people below certain income thresholds. A large transit system serving several K-12 school districts and a few colleges or universities might have multiple student fares, each different depending on the school the student attends. Some riders may receive fare subsidies from their employers or social services agencies.

The existence of these numerous fare categories can present a challenge for transit agencies looking to implement open payments. When a rider pays with a “closed-loop” farecard—i.e., a card that can only be used to pay transit fares—that card is typically linked to that rider, and any discount for which that rider is eligible will automatically apply. Many transit agencies offer special student or senior farecards for this purpose. If, however, a rider

can pay with any bankcard without pre-registering that card with the transit agency, those discounts cannot be automatically applied as the fare collection system will not recognize the rider as someone eligible for a discount. As a result, at least one agency transitioning to open payments has made that option available only for riders paying full fare.

Early adopters of open payments are actively developing solutions for this challenge that can inform others looking to take advantage of this payment method. One solution under active consideration is adoption of account-based fare payments, which can be deployed in concert with open payments. In such a system, a rider registers a bankcard or cards with the transit system, creating an account which can be linked to any appropriate discounts. Such a system will only work if riders use the card which they have registered to pay their fare. (Discounted fares are different than fare-capping, which limits the amount that a rider pays during any particular period to the cost of a pass for that period. For example, if a weekly bus pass is \$20 and a rider is paying \$2.50 per ride, they will stop being charged after eight rides within a single week. Fare-capping is helpful to riders who do not have the cash available to purchase a \$20 pass upfront, by essentially letting them pay for their pass over time. The ability to provide fare-capping is a benefit of moving to an account-based fare system, whether or not open payments are also allowed.<sup>27</sup>)

A related challenge is eligibility determination. Senior and disabled fares are typically determined by the transit agency. This requires proof of identity sufficient to meet the qualification. Eligibility for student, low-income, and other discounts are often determined by a third-party, such as a school or government agency. That third party agency will then purchase discounted farecards and provide them to eligible riders. Unlike those other entities, transit agencies do not typically have ready access to the documentation needed to make those determinations. For an account-based system to incorporate those eligibility determinations, additional coordination between the transit agency and

others is required in order to ensure that accounts accurately reflect the characteristics of their owners. In California, Monterey-Salinas Transit solved this challenge by working with the California Department of Technology and the General Services Administration to provide confirmation of riders' ages in order to link that information to riders' account so that they could receive age-related discounts. Other agencies are working with local colleges and universities to verify student status so that student discounts can be applied.

Solving for identity on a host of metrics (age, disability, enrollment status, income, etc.) would allow for better integration of discounted fares and payment collection. Many of these identity traits are of interest and collected to some extent by payment providers. For example, verification of age may be part of knowing your customer requirements at banks, while providers of credit typically try to learn a customer's income. To the extent that smart phones become the vehicle for payment (in both closed and open loop systems) identity stored on these phones could be accessed by the transit agency as part of the payment process. Several states (Maryland and Arizona first, more likely to follow<sup>28</sup>) have begun adoption of digital driver's licenses, integrating that data onto smartphones. Additional security and identity features embedded in the phone and in applications could also be accessed quickly and seamlessly with the right technology stack and appropriate privacy protections. Eligibility and identity verification ought to become easier for both riders and transit agencies as a result of widespread adoption of smartphones, although provision must also be made for those who do not have them. Transit agencies would also be wise to ensure that the cost to riders of proving an eligibility for a fare discount is not greater than the savings from the discount itself.

- **Unbanked/underbanked.** Transit agencies are generally hesitant to take actions which appear to benefit more well-off riders at the expense of those who are less well-off. The benefits of open payments would be available only to those who have a credit or a debit card, leaving the approxi-



mately [one in twenty families](#) who are unbanked unable to engage with traditional cards.<sup>29</sup> The disparity between those who pay cash and those who use cards has arisen outside the open payments context as well. One major transit agency interviewed as part of this research has eliminated paper transfers, which means that the transfer benefit—a free or discounted fare on the second bus or train—is not available to riders who pay cash. Only those who pay with a card receive the benefit, as the card registers the trips and time between them and automatically applies the benefit.

However, the existence of unbanked riders does not have to be a barrier to open payments. At least one agency found that moving to open payments actually encouraged some previously unbanked riders to open no-cost bank accounts. Monterey-Salinas Transit, which serves a large farm-worker community, made information available to its riders about cash app cards, a form of prepaid card that allows cash to be uploaded and used digitally.

A related issue is the impact on underbanked riders of the potential for overdrafts due to the timing of when transit payments are processed. As described above, debit card payments are not conducted instantly, but rather processed in batches. Many banks offer consumers overdraft “protection” that in essence allows debit card transactions to be accepted regardless of whether the consumer has the funds in their account to cover the purchase. The bank then extends the consumer credit, in the form of allowing their account to go negative, recouping the exposure the next time funds are deposited. Overdraft is considered a fee, not a provision of credit, through regulatory ruling; if it were a credit the costs (typically \$35 per transaction) would result in an astronomical annual percentage interest rate (APR).

Overdraft ballooned into a very large profit source for banks, [with estimates up to over \\$30 billion a year](#). Abusive practices were prevalent, including some institutions reordering debits from largest to smallest to maximize the number of overdrafts.

Stories of small dollar transactions resulting in large fees were not uncommon (the \$35 fee for a [cup of coffee is often cited](#) but a transit trip could incur the same).

Recently most of the nation’s largest banks and many smaller banks have instituted reforms designed to reduce the number of overdrafts. These changes will help reduce potential costs of open loop systems to lower-income riders. However, not every bank or credit union has taken these steps and [some remain fixated on overdraft revenue for the majority](#) (or even totality) of their profits.

- **Hardware and networks.** Directly accepting bankcards (credit or debit) may require transit agencies to upgrade or replace fareboxes on buses and faregates at rail stations and to update or change software. In addition to requiring funds for capital investment, this process may require transit agencies to renegotiate existing agreements with their current fare equipment provider or to wait until their existing contract comes to an end. There is currently limited competition in the U.S. fare equipment market,<sup>30</sup> with the result that transit agencies have few places to turn if negotiations do not yield results. These factors can add years to the process of implementing open payments.

Network coverage may also be an issue for some transit agencies. Open payments require buses to be able to take payment wherever they are, quickly enough that travel is not delayed. Transit agencies that operate in rural areas may face additional challenges. New forms of fintech that make accepting payments easier, such as Square, could provide additional value in this context should they focus more deeply on serving transit agencies.

Though these issues present challenges to expanding open payments in the transit market, they are not insurmountable. Transit agencies and financial institutions are working together to develop solutions to these challenges, but greater innovation in this space is needed to encourage the widescale adoption of open payments in transit. As the world increasingly moves toward digital payments, it is clear that transit

must modernize or be left behind. Technological, logistical, and engineering solutions already exist or are in development for many of the challenges described above, and further education about these solutions will help more transit agencies adopt open payments for their own systems. However, as long as payment transaction costs remain elevated, the benefits to these agencies of moving toward open payments are more limited, reducing incentives for many transit agencies to move forward with the capital investment required to transition. That said, for larger transit agencies, it is clear that with the growth of digital payments modernization of payment systems is a question of who and when, not if.

## PATH FOR SOLUTIONS

America's entire payment system could use an upgrade and efforts to do so are in happening in the public sector (FedNow) and the private sector (the myriads of fintechs, blockchain, crypto currency, and traditional payment providers Visa, Mastercard, and banks). Perhaps these innovations will unlock options for transit agencies to engage in the systemic reform necessary to solve the problems described in this paper. As important as payment systems are for transit, transit is not as important to the payment system as a whole. Transit's needs are not going to drive holistic payment system change. For holistic change, transit will be a passenger. That said, there are concrete steps available to address some of the problems described in this paper that transit providers and payment systems could take. Here are several:

- Provide lower interchange costs for transit. Debit and credit card systems [offer a myriad of categories](#) for different types of merchants with corresponding fees. These systems could offer transit agencies lower fees by direct negotiation or more broadly by changing the fee structure for transit as a category. As shown earlier in the paper, [that has already reportedly happened for some transit agencies like Cal ITP](#). [One estimate is that](#) reducing the fixed costs for small dollar debit transactions from 22 cents to 2 cents, coupled with an increase in the percentage costs from 5 basis points to 200, would reduce the total trans-

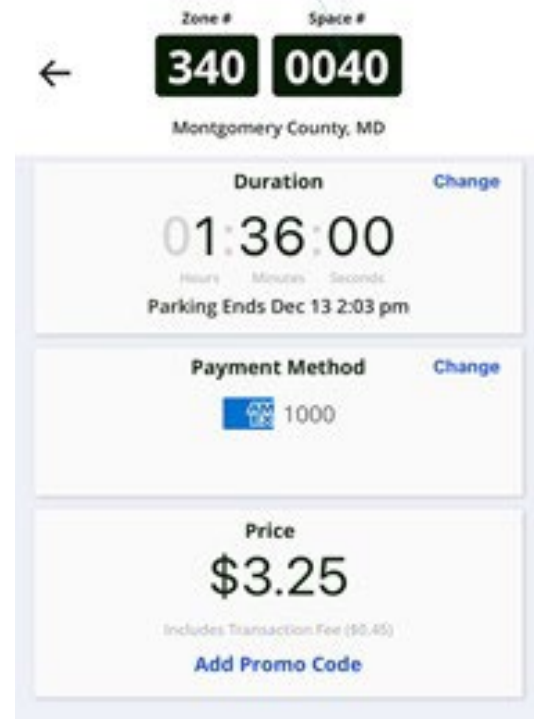
action costs for a \$3 transit payment from 7.8% to 2.7%. That is still a high fee, but it would represent a significant savings to transit agencies equal to roughly 5% of total farebox for customers paying that amount.

- Consider a broader set of factors when transit agencies make decisions to move from closed to open loop systems. Closed loop systems impose costs of pre-positioning funds for transit riders. These costs may not be internalized by the transit system but can be significant to their riders, particularly for lower income and more fiscally constrained riders. Incentivizing riders to pre-position larger sums of money onto closed loop systems may reduce transaction costs for transit agencies but come with increased costs for some riders and generally produce inequitable results benefiting wealthier transit users. The interaction of open payments with account-based systems that allow for pre-positioning funds by users who choose to do so is another area for further research.
- Continue research and highlight best practices. Further research, engagement, and spotlighting of the unique problems transit faces that arise in other high-volume, low-dollar sectors (parking, EV charging, tolls, etc), could drive further attention and specific solutions. Increased attention to the magnitude, causes, and impacts of bank overdraft fees [has led to remarkable reductions in overdraft fees charged by most of America's largest banks](#). This happened without new legislation or regulation, a reminder of the power of data, research, public attention, and the ability of banks to address problems through internal policy and programmatic changes.

## Conclusion

America needs a more efficient payment system that works better for the people and entities it serves with reasonable costs. High-volume, low-dollar, digital transactions occupy a position in the current payment ecosystem that can result in relatively high transaction costs. For transit agencies who occupy this space, the goal is a system that works better for both riders and operators. Given the historic federal commitment to transit and the increasing digitization of money, it is particularly important to harness the potential benefits from increasing electronic transactions at lower costs.

Transit is a prime example of the need for better, cheaper, faster micro-payment processing. Growth of micro-payments for electronic funds in other forms of transportation is coming, potentially at lightning speed. Electric vehicle charging infrastructure often relies on micro-payments. A one hour level 2 EV charge that delivers 8kwh (around 25 miles of charge) can [cost around \\$3 or less](#), depending on the public garage. Parking meters transitioning from coins to apps are another example of micro-payments. The Park-Mobile app for example [often charges an additional transaction fee](#) to pass along their processing costs. While some of these providers run closed loop payment systems, often requiring upfront payment in larger amounts, others run a pay as you go system. Either way, the underlying transactions are inherently small dollar, high volume, and quite expensive; the example transaction below shows transaction costs are 14% of the total cost of parking (45 cents out of \$3.25).



SOURCE: Author. Screenshot of ParkMobile app

America's payment system is in need of an upgrade just as its infrastructure system is. The Bipartisan Infrastructure Law of 2021 has billions in investment for transit systems, electric vehicle charging, and other infrastructure improvements. Federal, state, and local governments and transit agencies would be wise to use some of this investment to upgrade their payment systems. Doing so will allow the entire infrastructure system to operate more efficiently and equitably.

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