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Unmet Payment Needs and a Central Bank Digital Currency

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Abstract

We discuss the payment habits of Canadians both in the current payment environment and in a hypothetical cashless environment. We also consider whether a central bank digital currency (CBDC) would address unmet payment needs in a cashless society. Most adult Canadians do not experience gaps in their access to a range of payment methods, and this would probably continue to be the case in a cashless environment. Some people could, however, face difficulties making payments if merchants no longer generally accepted cash as a method of payment.

For a payment-oriented CBDC to successfully address unmet payment needs, the main consumer groups—who already have access to a range of payment options—would have to widely adopt the CBDC and use it at scale. This is necessary to encourage widespread merchant acceptance of CBDC, which would, in turn, encourage further consumer adoption and use. However, most consumers face few payment gaps or frictions and therefore might have relatively weak incentives to adopt and—especially—to use CBDC at scale. If that were the case, widespread merchant acceptance also would be unlikely. This suggests that addressing unmet payment needs for a minority of consumers by issuing a CBDC could be challenging under the conditions explored in this paper. The minority of consumers with unmet payment needs will only be able to benefit from a CBDC if the majority of consumers experience material benefits and therefore drive its use.

Topics: Bank notes, Central bank research, Digital currencies and fintech, Financial services

JEL codes: C, C1, C12, C9, E, E4, O, O5, O54

Résumé

Nous analysons les habitudes de paiement des Canadiens dans l'environnement des paiements actuel et dans un environnement hypothétique sans argent comptant. Nous nous demandons si une monnaie numérique de banque centrale (MNBC) pourrait répondre à des besoins non satisfaits en matière de paiements dans une société sans argent comptant. La plupart des adultes du pays ont déjà accès à différents modes de paiement et cela ne devrait pas changer dans un environnement sans argent comptant. Par contre, il pourrait être difficile pour certaines personnes d'effectuer des paiements si, de façon générale, les marchands n'acceptaient plus l'argent comptant comme mode de paiement.

Pour qu'une MNBC axée sur les paiements réponde adéquatement aux besoins non satisfaits des gens en matière de paiements, il faudrait que les principaux groupes de consommateurs – qui disposent déjà de différents modes de paiement – adoptent largement cette monnaie et l'utilisent à grande échelle. Cela serait essentiel pour que les marchands acceptent la MNBC de façon généralisée et que, à leur tour, les consommateurs l'adoptent et l'utilisent encore plus. Toutefois, la plupart des consommateurs ne sont confrontés qu'à peu de manques ou de frictions en ce qui a trait aux paiements. Ils pourraient donc être peu motivés à adopter et, surtout, à utiliser une MNBC à grande échelle. Dans ce cas, il serait également peu probable que les marchands acceptent cette monnaie de façon généralisée. On peut en déduire que, selon les conditions examinées dans cette étude, il serait difficile de répondre aux besoins non satisfaits en matière de paiements d'une minorité de consommateurs en émettant une MNBC. Cette minorité pourrait uniquement tirer parti d'une telle monnaie si la majorité des consommateurs en retirait d'importants avantages et, par conséquent, en faisait augmenter l'utilisation.

Nous ne prenons pas directement en compte d'autres enjeux, comme la fixation des prix et les services, qui pourraient se présenter dans un environnement sans argent comptant. Ceux-ci pourront être étudiés plus en détail dans de futures études.

Sujets : Billets de banque; Recherches menées par les banques centrales; Monnaies numériques et technologies financières; Services financiers

Codes JEL : C, C1, C12, C9, E, E4, O, O5, O54

1. Introduction

Like many central banks around the world, the Bank of Canada has been researching central bank digital currency (CBDC), and the Bank is committed to being ready to provide a CBDC should the need arise. In this regard, the Bank has outlined two scenarios that could warrant the introduction of a general purpose, cash-like CBDC in Canada: the emergence of a cashless society or the widespread use in Canada of alternative digital currencies, such as Bitcoin or a foreign CBDC (Lane 2020).[1] A key concern in a cashless society is that some people may no longer be able to make payments and participate fully in the economy. In this paper, we consider whether a CBDC focused on delivering payment services could successfully address such unmet payment needs in a cashless economy if that environment were to develop.

2. The current payment environment

We begin by reviewing the current payment options available to most Canadians. The typical consumer has access to cash, bank accounts, and debit and credit cards and does not face meaningful barriers to accessing financial services or payment methods. Results from the 2021 Methods-of-Payment Survey indicate that 98% of Canadian adults have a bank account and a debit card and that 87% also have a credit card (Henry, Shimoda and Zhu 2022). On average, Canadians hold more than one debit card and about two credit cards per person.[2] Bank accounts provide access to the use of e-Transfer, pre-authorized payments, online bill payments and chequing privileges. Further, almost all urban households and over 90% of all households (urban and rural combined) had access to high-quality internet services in Canada at the end of 2021 (CRTC 2023), and 95% of Canadians aged 15 and older used the internet in 2022 (Statistics Canada 2023).[3]

These data indicate that most Canadian consumers can access a range of payment options at physical points of sale, for person-to-person and online transactions, and to pay bills (**Table 1**).

Table 1: Typical methods of payment used in Canada in common environments

	Point of sale	Person to person	Online	Bill payment
Typical, well-connected consumer Can access a range of payment options	Cash, debit and credit cards, mobile or digital wallet, stored-value card	Cash, cheque, e-Transfer, mobile or digital wallet	Credit cards, mobile or digital wallet, stored-value card	Cash, debit and credit cards, cheque, e-Transfer, pre-authorized debit, online bill pay, mobile or digital wallet, stored-value card

Note: The appendix provides a brief description of a range of payment methods used in Canada.

[1] See also "Contingency Planning for a Central Bank Digital Currency" (Bank of Canada 2020). The Bank currently has no plans to launch a CBDC, and the evidence indicates that neither of the two scenarios seems likely to occur in the coming years (Engert and Huynh 2022).

[2] Authors' calculations from 2021 Methods-of-Payment Survey data. The Global Findex Database (World Bank 2021) indicates that 100% of Canadians (aged 15 and older) have an account with a financial institution, 96% have a debit card, and 83% have a credit card. Almost all Canadians (97%) also have access to at least one (and probably more) automatic banking machine (ABM) in their local communities (Chen and Felt 2022). Across Canada, households live an average of 2 kilometres away from the nearest ABM and 4.5 kilometres from the nearest financial institution branch (Chen, O'Habib and Xiao forthcoming).

[3] In these data, urban households live in population centres of at least 1,000 people with a population density of 400 persons or more per square kilometre. All areas outside of population centres are classified as rural areas. Internet use reported above refers to personal use of the internet by Canadians 15 years and older resident in a province during the three months before the survey, from any location, and excludes business and school-related use.

It follows that a small percentage of consumers are not part of the typical, well-connected cohort. More specifically, some Canadians do not have access to, or do not use, certain payment methods because of their preferences or the constraints that they face. Stylized characterizations of such consumers are presented next (**Table 2**).

Early adopters—People in this group strongly prefer a digital-only lifestyle, avoid cash use and eagerly adopt payment innovations. We can gain some insight into the size of an early adopter cohort by considering that about 9% of Canadians report using a digital wallet app on their smartphones to make a payment in the past week, while mobile purchases accounted for just under 4% of the volume of purchases in 2021 (Henry, Shimoda and Zhu 2022).[4] Only a portion of the people using such innovations reject cash use altogether, and most people adopting such new payment instruments use them alongside more conventional methods, such as debit and credit cards and cash. More generally, only about 14% of all Canadians report that they have "stopped using cash," and about half of these people still carry some cash, presumably as a precaution. The use of cryptoassets for payments offers another perspective on the size of the early adopter cohort. Recent Bank of Canada surveys show that while 13% of Canadians owned Bitcoin in 2021, only 1% of Canadians used it in the past week to make a payment (Henry, Shimoda and Zhu 2022; Balutel et al. 2022a). Ownership and use of other crypto instruments for payments is even less significant. This all suggests that early adopters represent a relatively small part of the population.

Cash dependent—Some people strongly depend on cash to make payments and to manage finances more generally, with little or no use of debit and credit cards or e-Transfer. Such outcomes could reflect the behaviour of underbanked people, who find it difficult to access financial services at an acceptable cost. This group could also include people with a dominant preference for privacy given that cash provides for anonymity in payments.[5] These individuals might also use cash to buy stored-value cards issued by credit card companies for in-person or online shopping. In the 2021 Methods-of-Payment Survey (Henry, Shimoda and Zhu 2022), less than 5% of respondents reported using only cash to make purchases in the past week. Such respondents were twice as likely as the general population to not have access to a bank account. Further, only 7% of Canadians reported holding at least one credit-card branded stored-value card in 2021, which they used for less than 2% of purchases. These data indicate that the cash-dependent cohort represents a small part of the Canadian population.

Technology averse—Some consumers dislike using technology and are therefore reluctant to make payments online. This includes people who do not make purchases online because of poor broadband service where they live or because the technology is not well-suited to their personal needs and capabilities. As noted above, a large majority of Canadians have access to high-speed broadband and use the internet. But Statistics Canada research shows that 8% of Canadians could be categorized as "non-users" of the internet in 2020 and another 11% are considered "basic users" (Wavrock, Schellenberg and Schimmele 2022). People in these categories are much less likely to bank or shop online compared with other cohorts. More specifically, 16% of Canadians in these categories do not shop online. Note also that a share of the Canadian population shifted from the non-user and basic user categories toward more online use between

[4] Wavrock, Schellenberg and Schimmele (2021) show that even among the 34% of Canadians who are categorized as advanced internet users, only 27% had used a digital wallet. Use of digital wallets by less proficient internet users was much lower. These authors estimate that the overall rate of virtual wallet use is around 13%.

[5] Other consumers could also value privacy in payments, but a preference for anonymity does not dominate their behaviour like it does for this group. Other options for online transactions may offer more privacy compared with typical payment methods such as debit or credit cards but remain limited in certain ways. For example, online payment accounts such as PayPal require users to disclose their information to the platform, while keeping it private from merchants. Cryptocurrencies such as Bitcoin are often called pseudonymous because all transactions are recorded and observable on a publicly distributed ledger, even if the exact identities associated with the transactions are obscured in certain cases.

2018 and 2020. The COVID-19 pandemic likely contributed to this shift and might have a lasting effect on online shopping and banking activity.[6]

In sum, a large majority of Canadians have access to and use a range of payment methods, but a small share of the population faces constraints or has preferences that limit their use of certain payment methods.

Table 2: Methods of payment of select consumers in common environments

	Point of sale	Person to person	Online	Bill payment
Early adopter Digital-only lifestyle: Does not use cash	Debit, credit, mobile or digital wallet	Mobile or digital wallet, e-Transfer	Credit, mobile or digital wallet	Debit, credit, mobile or digital wallet
Cash dependent Underbanked: Depends on cash, no debit, credit or stored-value cards	Cash	Cash	None	Cash
High privacy: Demands anonymity, does not want purchases tracked	Cash, stored-value card (MasterCard, Visa) funded with cash	Cash	Stored-value card (MasterCard, Visa) funded with cash	Cash, stored-value card (MasterCard, Visa) funded with cash
Technology averse Avoids digital and online payments	Cash, debit, credit	Cash, cheque	Limited access	Cash, cheque, pre-authorized debit, debit, credit

Note: This table describes consumers who do not use the range of payment methods available to most Canadians due to their preferences or due to the constraints they face in accessing financial services and methods of payment.

3. A cashless environment and central bank digital currency

In this section, we consider an environment where the use of cash for payments is reduced to a trivial level—as a practical matter, virtually eliminated—due to the cumulative effect of Canadians' individual choices over time. It is important to emphasize, however, that the Bank is committed to supplying cash as long as demand for it remains. That is, the Bank will not unilaterally stop supplying bank notes. Therefore, if the volume of cash transactions were to fall to a significantly low level, it would not be because of the Bank's decisions. It would result from the cumulative behaviour of most consumers, merchants and cash distributors (such as banks and other operators of ABMs) moving away from cash.

In our analysis, we simply assume that cash vanishes from the current environment and consider the resulting unmet payment needs. This partial-equilibrium approach probably overstates the payment gaps that would exist if a cashless environment were to develop. In other words, if cash use were to decline over time to a very low level, it would be because consumers generally had modified their payment habits

[6] While 92% of the Canadian population overall were internet users in 2020, only about 62% of Canadians 75 years of age and older had used the internet. Other groups that registered internet use below the Canadian average were people with a disability (84%), unemployed people (85%), those living outside of an urban area (87%) and Indigenous people (88%). See Statistics Canada (2023) for more information.

accordingly. It is also conceivable that the private sector would introduce features in digital payment offerings that mimic some of the benefits of cash, such as greater privacy in payments or some offline capability, if sufficient market demand existed. At the same time, merchants, payment service providers and financial institutions could react to the emergence of a cashless environment by, for example, pricing goods according to payment method used or changing services and fees.

Unmet payment needs in a cashless economy

As noted, in this analysis we simply remove cash from the current environment and consider the resulting gaps or unmet payment needs. Most people—represented by the typical consumer and the early adopter groups—would continue to have their usual payment needs met without cash by using various electronic methods (**Table 1** and **Table 2**). Technology-averse consumers would have access to fewer payment methods in a cashless environment but could continue to transact using debit and credit cards as well as cheques. In contrast, consumers who are strictly cash-dependent, including those who require high privacy, would be most adversely affected. Without cash, these consumers would be unable to make payments in any of the four common payment environments, even if they had stored-value cards.[7]

Without cash, a widely used offline method of payment available for any consumer segment would no longer exist, which could be especially important if a network or power outage occurred. A universal payment outage is unlikely, however, given that the electronic payments landscape in Canada is diversified, is subject to stringent resilience standards and operates across several payment rails. Further, if a temporary disruption of one retail payment provider or clearing and settlement system occurred, alternatives would probably be available to meet market demand. However, if a severe power outage, weather event or other crisis were to occur, the disappearance of cash would mean that a fail-safe backup for electronic payment methods would not exist. Even the well-connected consumers and early adopters would experience significant challenges meeting their payment needs without cash.[8] As a general matter, this suggests the potential system-wide benefits of encouraging digital payment innovations that can function offline as well as the importance of sustaining cash.[9]

A payment-oriented CBDC in a cashless economy

Now suppose that the central bank issues a CBDC focused on providing payment services in this cashless environment. A payment-oriented CBDC would enable electronic transfers while retaining, as much as possible, the distinctive features of cash (Engert and Fung 2017; Jiang 2020). Such a CBDC could have the following characteristics:

- universal accessibility—easy for anyone to use, in principle
- non-interest bearing
- limited incremental costs for the consumer at the point of transaction
- a high level of privacy, but not anonymity[10]

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[7] Shy (2021) emphasizes that funding some digital payment innovations would be challenging for some consumers if cash were not available.

[8] In recent years, discrete areas of Canada have suffered temporary network or power outages due to severe weather events, such as ice or wind storms. As well, in summer 2022, a major telecom provider in Canada experienced a protracted service outage, lasting more than a day. The outage affected millions of telecom customers across the country, including their ability to use some forms of electronic payments. In response, Canadian telecom providers have undertaken to build additional redundancy and provide mutual emergency support to manage such risks. For more on this, see ISED (2022a, 2022b).

[9] For a discussion of offline payments in connection with CDBC, see Minwalla et al. (2023).

[10] Providing for fully anonymous payments with a CBDC is a non-starter because a CBDC would need to comply with existing laws and regulations governing fraud, money laundering and terrorist financing. **Box 1** looks more closely at privacy considerations for payments.

- capability to conduct offline transfers

A universally accessible CBDC that facilitated online purchases could benefit cash-dependent consumers. In particular, cash-dependent people who are unbanked would benefit if their access to CBDC did not require a bank account. And a CBDC that allows users to maintain a high level of counterparty privacy while making purchases could benefit consumers who desire greater privacy in payments. Finally, all consumers would benefit from a CBDC with robust offline capability that could be used if electronic payment methods faced disruptions.

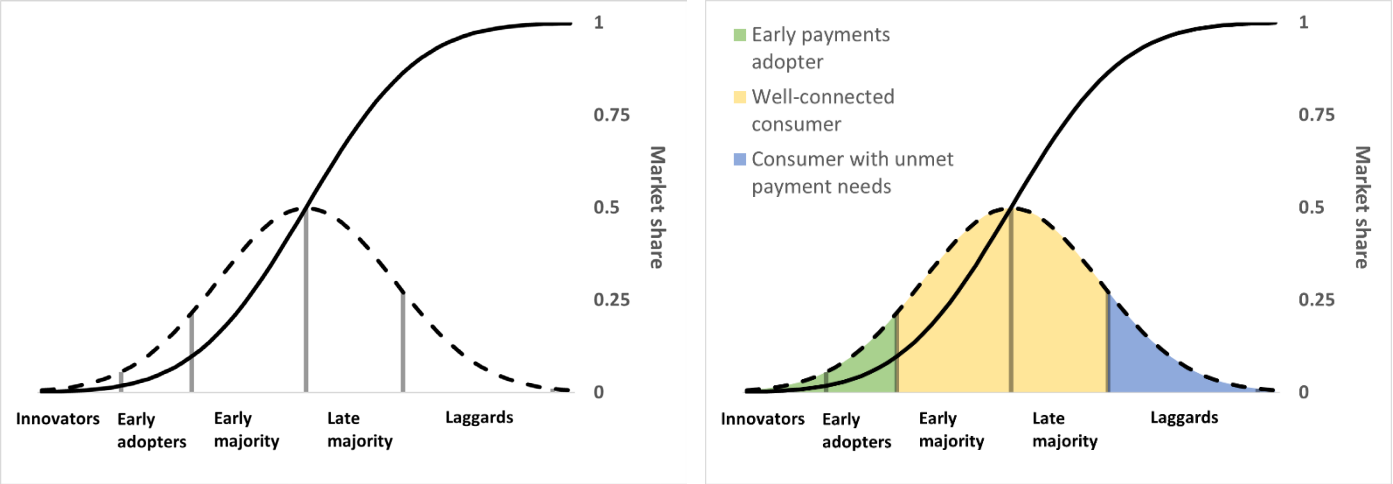
As a practical matter, would such a CBDC be able to address unmet payment needs? Specifically, could a payment-oriented CBDC mitigate the payment gaps experienced by a relatively small minority of consumers in a cashless environment? We can gain some insight into this by considering the typical adoption pattern for new technology. Widespread adoption for a new technology follows the well-known S-curve (Rogers 1995), shown in the panel on the left side of **Figure 1**. After a new technology is introduced, we see that during the initial phase of slow growth the so-called innovators and early adopters are the first to experiment with the technology. These early adopters are motivated by factors such as the perceived benefits and their interest in technology, beliefs about the future and the influence of their social networks (e.g., Balutel et al. 2022b). The rate of adoption can then increase due to reinforcing network effects because benefits from using the new technology grow when more people participate in the network. If the technology is successful, adoption gradually spreads through most of the population. Finally, the rate of adoption slows as it reaches market saturation.

A similar pattern could characterize the diffusion of CBDC, which is illustrated on the right side of **Figure 1.** Two key considerations are relevant to the potential adoption S-curve for CBDC. First, while the payment market is two-sided, involving both consumers and merchants, evidence shows that consumer adoption and use are the dominant factors driving the diffusion of a new payment method (Fung, Huynh and Kosse 2017; Huynh, Nicholls and Zhu 2019; Jack and Suri 2011). Second, the large mass of consumers who are most needed to drive adoption have the weakest incentives to adopt and consistently use a payment-oriented CBDC because they currently have access to a range of payment methods. A CBDC would have to offer compelling advantages to motivate these consumers—particularly the typical, well-connected consumers who account for most of the market—to adopt and use CBDC at sufficient scale to generate widespread merchant acceptance. Without the dominant consumers adopting and using CBDC at scale, merchants are unlikely to undertake the effort and expense to accept CBDC for payments. And that means that consumers with unmet payment needs in this environment cannot benefit from CBDC.

At the same time, some consumers who face gaps in meeting their payment needs in a cashless environment and who might benefit most from a CBDC—cash-dependent, high-privacy and technology-averse consumers—will also likely face relatively high adoption costs. In this regard, for example, Huynh, Nicholls and Zhu (2019) find that cash-dependent cohorts have lower financial literacy and credit scores, which are associated with lower adoption of credit cards for Canada. Similarly, Huynh et al. (2017) show that older, less-educated and rural consumers in Italy—who tend to be relatively cash-dependent—are less likely to adopt a new payment technology.

Most importantly, however, the consumers who would have gaps in meeting their payment needs are a small share of the market. Therefore, even if they were to adopt and use CBDC early in the process, it would probably be insufficient to encourage widespread merchant acceptance.

Figure 1: Illustrative S-curve for technology adoption (left) and for CBDC in a cashless environment (right)



Note: The left panel shows the S-curve model of new technology adoption presented in Rogers (1995). The black dashed line shows the illustrative distribution of the consumer groups identified with respect to their share of total population. This classification is based on empirical observations that time-to-adoption follows a bell curve. The overlayed solid black line illustrates the market share of a new technology (cumulative distribution) at which each of these groups adopts that new technology. This framework can be applied to inform understanding adoption of a central bank digital currency (CBDC), illustrated in the panel on the right side. In a cashless environment, adoption and use of CBDC at scale by the dominant consumer cohorts (in green and especially yellow) are needed to motivate widespread merchant acceptance of CBDC so that those with unmet needs (in blue) would be able to use, and benefit from, a CBDC.

Box 1: Privacy, payments and the role of the government

Kahn (2018) discusses the demand for privacy in payments and identifies three motivations:

- a desire to engage in illegal transactions
- protection from counterparties to a transaction, such as merchants who might use transaction data to exploit consumers
- protection from payment service providers who might use transaction data to exploit consumers

Governments would, of course, seek to avoid providing privacy to benefit illegal activity. For example, the recent Cullen Commission (2022) provides 101 recommendations to the British Columbia government to combat money laundering. A key recommendation is to lower the threshold for the reporting of casino transactions in cash and other bearer instruments from $10,000 to $3,000.

However, demands for privacy resulting from the second and third motivations above are legitimate. With respect to privacy for counterparties to a transaction, prepaid cards, PayPal and digital currencies offer varying levels of privacy for consumers in the existing private market. With respect to protection from payment service providers, safeguarding individual transactional data from being sold to marketing firms could provide benefits, especially from security breaches that can compromise consumers' financial data.

Against this background, central banks provide the public with bank notes that allow consumers to make payments fully anonymously. This design feature—anonymity—was, however, not top of mind when central banks took over issuing bank notes from private banks. Kahn (2018) considers that central banks (and the state) can provide for some elements privacy through a potential CBDC. However, he also argues that neither the public nor the private sector is, taken individually, trustworthy to provide for privacy. As a result, he speculates that the interplay of public and private interests might be optimal, featuring public regulation with scope for pushback by private providers.

4. Alternatives to address payment needs

We show above that most Canadians can access a range of payment options in common transactions environments and that this would continue in a cashless economy. Some consumers, however, face gaps in payment options. In this section, we discuss alternative measures that could reduce the constraints that adversely affect payment access and choice for some consumers and could improve financial inclusion more generally.

Improved internet access

As noted above, access to broadband internet and mobile (LTE) service is generally high in Canada, particularly in urban settings where populations are concentrated (**Table 3**). However, service for high-quality broadband lags in rural areas, and internet access in remote areas is relatively poor. Until 2016, the Canadian Radio-television and Telecommunications Commission (CRTC) and governments across Canada shared a goal of universal broadband access with download speeds of 5 megabits per second (Mbps) and upload speeds of 1 Mbps, which is adequate for basic online tasks. Current CRTC goals are for broadband

speeds of 50/10 Mbps to reach 90% of households by 2021 and 100% of households by 2031. CRTC reports that achievement of these targets is on track (see CRTC 2023). Reaching these goals would provide a range of benefits, including better access to financial services and payment methods for rural and remote communities.

Table 3: Estimated broadband internet and mobile access in Canada

Download/upload speed in megabits per second (Mbps)	All households	Urban households	Rural households
5/1 Mbps or more at the end of 2021 (Service standard until 2016)	99% of households	100%	94%
50/10 Mbps plus unlimited data transfer capacity at the end of 2021 (Current service standard)	91% of households	99%	62%
LTE (4G) mobile coverage at end the end of 2021 (Current service standard)	99% of population	100% of population	97% of population

Note: Urban households live in population centres of at least 1,000 people with a population density of 400 persons or more per square kilometre. All areas outside of population centres are classified as rural areas.

Source: CRTC Communications Market Reports

Low-cost bank accounts and payment options

In 2003, the Canadian government signed memoranda of understanding with the six major Canadian banks, HSBC and Laurentian Bank, whereby those banks publicly committed to providing customers the option of low-cost accounts. These accounts, which set out terms of access and account features, are subject to guidelines administered by the Financial Consumer Agency of Canada (FCAC). Low-cost accounts provide basic banking needs at a nominal cost, particularly for low-income Canadians. Since these accounts were introduced, additional banks have signed on to these provisions, and other institutions, mainly credit unions, have developed accounts that are close substitutes.[11]

It could be worthwhile for policy-makers to consider revisiting the terms of low-cost accounts and their close substitutes to ensure that they remain appropriate to meet the needs of target groups. This could include adequate access to cost-effective payments for low-income Canadians in urban, rural and remote communities served by participating financial institutions.

[11] Gibney, Bibi and Lévesque (2014) analyze the experience with such low-cost accounts. FCAC also conducted a mystery shopping exercise in 2019 at major Canadian banks to assess whether a focus on sales was turning bank branches into "stores," increasing the risk of banks placing sales ahead of consumer interests. Most participants shopping for chequing accounts and for credit cards reported that the recommendations received from bank employees were appropriate for their needs. The highest-income group in the study was more likely than other cohorts to report that the recommendations were not appropriate (See FCAC 2019, Section 3.1.)

Collaboration with retailers, financial institutions and payment service providers

In some cases, merchants collaborate with financial service providers to increase the payment and financial service options available to residents of remote regions (Chen et al. 2021, 2022). For example, the North West Company (NWCo) is a general retailer that focuses on remote, small markets and Indigenous communities, particularly in Northern Canada. NWCo also offers financial services in remote communities through a subsidiary (We Financial) and provides a network of ABMs, a credit card and a prepaid debit card in partnership with Visa. Debit cardholders can receive direct deposits of government benefits and employment payments, and they can make online payments and pre-authorized debits over the Visa network. This product can improve services for people in remote communities in Northern Canada who might otherwise have limited access to various payment methods. Arctic Co-operatives Limited also provides a range of services in Nunavut, the Northwest Territories and Yukon, including a prepaid, reloadable payment card in collaboration with Visa that can provide benefits comparable to the NWCo prepaid card.

Similarly, some government agencies in Canada and in other countries, including the United States and Australia, collaborate with banks and other firms to provide prepaid debit cards for citizens receiving social assistance and other benefits that can also be used for online purchases.

Such collaborations can enhance the range and quality of payment options for:

- particular communities, including those in remote locations that might lack access to traditional banking services
- lower-income and special-needs individuals in urban, rural and remote settings who receive social assistance

Similar collaboration could be encouraged to develop offline payment capabilities.

Sustaining bank notes

In the preceding three cases, where there is a role for the public sector, agencies other than the Bank of Canada could be expected to take the lead to address policy issues. The Bank has a primary role, however, in sustaining bank notes. In this regard, one of the lessons from experience concerns the usefulness of maintaining bank notes as a simple method of payment and store of value. Cash is a relatively simple technology, easy to use and effective under a variety of conditions—and it can be particularly beneficial in periods of crisis (Engert, Fung and Segendorf 2019; Rösl and Seitz 2021). Accordingly, it is important that the Bank of Canada continues to:

- work to maintain the efficiency of the cash infrastructure and cash accessibility
- make investments to provide high-quality bank notes that all Canadians can use with confidence

5. Conclusion

Currently, most Canadian consumers do not experience gaps in their access to payment methods, and this will likely remain the case in a cashless environment. Some people could, however, face difficulties making payments if cash were no longer widely accepted as a method of payment. We consider whether such unmet payment needs might be addressed by a CBDC focused on delivering payment services. To provide such benefits, a CBDC would need to be widely adopted and used at scale by the dominant consumer groups who face few gaps in meeting their payment needs. Such adoption and use would be necessary to motivate merchant acceptance, which, in turn, would encourage further consumer use and merchant

acceptance, and so on. However, the dominant consumer groups in this analysis may have relatively weak incentives for adopting and using a CBDC, so achieving widespread merchant acceptance could be challenging. In that case, the subset of consumers facing material payment frictions would not be able to benefit from a payment-oriented CBDC. For those with unmet payment needs to be able to use and benefit from a CBDC, most consumers who already have a range of payment methods available to them would need to find material advantages from features of a CBDC.[12]

Despite our broad conclusions about high financial inclusion in Canada, widespread access and use of payment methods, and low unmet needs, we are not predicting how various market segments would react to the introduction of a new payment method like CBDC, which could offer a novel value proposition. In this regard, some market segments might be interested in adopting a CBDC, perhaps because of a new functionality, trust in the central bank or the relative cost of payment services in a changing environment. Indeed, the Bank of Canada is currently conducting more granular market research to better understand consumer segments and potential interest in CBDC.

Nevertheless, even if there were greater market interest than we suggest, the two-sided payment market barriers facing broad-based adoption and use—which would be required for a CBDC to be useful—appear to be significant. As a practical matter, achieving wide adoption, acceptance and use of CBDC could be challenging because most Canadians have access to several methods of payment using commercial bank money, provided by sophisticated incumbents. Overcoming such barriers could require significant and sustained investment by the central bank.

Finally, measures exist to reduce payment barriers facing some consumers in the current environment. These include improving broadband access, promoting low-cost bank accounts, undertaking targeted collaboration with retailers and payment service providers, and sustaining cash—which can be especially important when digital networks fail and in crisis periods more generally.

[12] Historical evidence reviewed by Roberds (2022) indicates that the introduction of a new public payment instrument has often been associated with a range of serious implementation and operational problems. To date, the CBDC issued by the central bank of the Bahamas (known as the Sand Dollar) does not seem to have significantly improved financial inclusion, which is the main motivation for issuing that CDBC. Alvarez, Argente and Van Patten (2022) document challenges associated with a government-supported roll-out of an app to facilitate the use of digital payments and Bitcoin in El Salvador.

References

Alvarez, F., D. Argente and D. van Patten. 2022. "Are Cryptocurrencies Currencies? Bitcoin as Legal Tender in El Salvador." Working Paper.

Balutel, D., W. Engert, C. S. Henry, K. P. Huynh and M. Voia. 2022a. "Private Digital Cryptoassets as Investment? Bitcoin Ownership and Use in Canada, 2016-2021." Bank of Canada Staff Working Paper No. 2022-44.

Balutel, D., C. S. Henry, J. Vásquez and M. Voia. 2022b. "Bitcoin Adoption and Beliefs in Canada." *Canadian Journal of Economics* 55 (4): 1729–1761.

Bank of Canada. 2020. "Contingency Planning for a Central Bank Digital Currency."

Canadian Radio-television and Telecommunications Commission (CRTC). 2023. Communications Market Reports.

Chen, H., W. Engert, K. P. Huynh and D. O'Habib. 2021. "An Exploration of First Nations Reserves and Access to Cash." Bank of Canada Staff Discussion Paper No. 2021-8.

Chen, H., W. Engert, K. P. Huynh and D. O'Habib. 2022. "Identifying Financially Remote First Nations Reserves." Bank of Canada Staff Discussion Paper No. 2022-11.

Chen, H. and M.-H. Felt. 2022. "Canadians' Access to Cash Before and During the COVID-19 Pandemic." Staff Discussion Paper No. 2022-15.

Chen, H., D. O'Habib and H. Xiao. Forthcoming. "How Far Do Canadians Need to Travel to Access Cash?"

Cullen, A. F. 2022. *Commission of Inquiry into Money Laundering in British Columbia, Final Report*. June.

Engert, W. and B. S. C. Fung. 2017. "Central Bank Digital Currency: Motivations and Implications." Bank of Canada Staff Discussion Paper No. 2017-16.

Engert, W., B. S. C. Fung and B. Segendorf. 2019. "A Tale of Two Countries: Cash Demand in Canada and Sweden." Bank of Canada Staff Discussion Paper No. 2019-7.

Engert, W. and K. P. Huynh. 2022. "Cash, COVID-19 and the Prospects for a Canadian Digital Dollar." Bank of Canada Staff Discussion Paper No. 2022-17.

Financial Consumer Agency of Canada (FCAC). 2019. "Mystery Shopping at Domestic Retail Banks."

Fung, B. S. C., K. P. Huynh and A. Kosse. 2017. "Acceptance and Use of Payments at the Point of Sale in Canada." *Bank of Canada Review* (Autumn): 14–26.

Gibney, C., S. Bibi and B. Lévesque. 2014. "Banking Fees in Canada: Patterns and Trends." Financial Consumer Agency of Canada.

Henry, C. S., K. P. Huynh and A. Welte. 2018. "2017 Methods-of-Payment Survey Report." Bank of Canada Staff Discussion Paper No. 2018-17.

Henry, C. S., M. Shimoda and J. Zhu. 2022. "2021 Methods-of-Payment Survey Report." Bank of Canada Staff Discussion Paper No. 2022-23.

Huynh, K. P., P. Schmidt-Dengler, G. W. Smith and A. Welte. 2017. "Adoption Costs of Financial Innovation: Evidence from Italian ATM Cards." Bank of Canada Staff Working Paper No. 2017-8

Huynh, K. P., G. Nicholls and J. Zhu. 2019. "Cash Use and Financial Literacy." In *Cash in the Age of Payment Diversity*, 156–187. Proceedings of the 2019 International Cash Conference, September 9–12. Munich, Germany: Deutsche Bundesbank.

Innovation, Science and Economic Development Canada (ISED). 2022a. "Statement from Minister Champagne on Canada's Telecommunications Reliability Agenda following Rogers' outage on July 8, 2022."

Innovation, Science and Economic Development Canada (ISED). 2022b. "Memorandum of Understanding on Telecommunications Reliability."

Jack, W. and T. Suri. 2011. "Mobile Money: The Economics of M-PESA." National Bureau of Economic Research Working Paper 16721.

Jiang, J. 2020. "CBDC Adoption and Usage: Some Insights from Field and Laboratory Experiments." Bank of Canada Staff Analytical Note No. 2020-12.

Kahn, C. M. 2018. "Payment Systems and Privacy." Federal Reserve Bank of St. Louis *Review*, Fourth Quarter: 337 – 344.

Kosse, A. 2021. "An Empirical Analysis of Bill Payment Choices." Bank of Canada Staff Working Paper No. 2021-23.

Lane, T. 2020. "Money and Payments in the Digital Age." Remarks to CFA Montréal FinTech RDV2020. Montréal, Quebec, February 25.

Minwalla, C., J. Miedma, S. Hernandez and A. Sutton-Lalani. 2023. "A Central Bank Digital Currency for Offline Payments." Bank of Canada Staff Analytical Note No. 2023-2.

Roberds, W. 2022. "Unstable Coins: The Early History of Central Bank Analog Currencies." Federal Reserve Bank of Atlanta *Policy Hub* No. 2022-2.

Rogers, E. M. 1995. *Diffusion of Innovations*, Fourth Edition. New York: The Free Press, A Division of Simon & Schuster.

Rösl, G. and F. Seitz. 2021. "Cash and Crises: No Surprises by the Virus." Institute for Monetary and Financial Stability Working Paper No. 150. Goethe University Frankfurt.

Shy, O. 2021. "Digital Currency, Digital Payments, and the 'Last Mile' to the Unbanked." Federal Reserve Bank of Atlanta *Policy Hub* No. 9-2021.

Statistics Canada. 2023. "Canadian Internet Use Survey, 2022." *The Daily*. July 20.

Wavrock, D., G. Schellenberg and C. Schimmele. 2021. "Internet-use Typology of Canadians: Online Activities and Digital Skills." Statistics Canada.

Wavrock, D., G. Schellenberg and C. Schimmele. 2022. "Canadians' Use of the Internet and Digital Technologies Before and During the COVID-19 Pandemic." Statistics Canada.

World Bank. 2021. Global Findex Database.

Appendix: Payment methods

This table provides an overview of payment instruments available to Canadian customers to fulfill their payment needs. Definitions of payment instruments are from Henry, Huynh and Welte (2018) and Kosse (2021).

Table A-1: Payment methods

Payment method	Description
cash	Coins and bank notes.
cheque	Written orders to pay signed by the payer, instructing a bank to transfer an amount from the payer's account to the recipient's account.
credit card	Card allowing a holder to purchase goods and services on credit, both in person and online, and pay the credit card company later.
debit card	Card issued by a bank that gives the holder electronic access to a bank account for making payments and withdrawals from an automated banking machine.
digital wallet app	A mobile phone application that links to existing debit, credit or prepaid cards, allowing for purchases to be made online or in-person by tapping the phone on a contactless terminal.
digital currency	Currency available only in digital form.
in-store electronic bill payment	Consumer brings a paper copy of the bill to a non-bank service provider, who, on their behalf, initiates payment through electronic payment system. Consumer can pay in cash.
Interac e-Transfer	Funds transfer service for personal and business accounts through financial institutions.
online payment account	Account not affiliated with any particular bank but that can be funded to make purchases or transfer money on the internet. Can be funded with a credit card or by linking service to bank account.
pre-authorized debit	Automatic payments that the consumer agrees in advance can be billed and paid at a predetermined frequency from the payer's account. Also known as direct debit.
store-branded stored-value card	Card issued by a retailer that can be used only at retailer venues; these are usually reloadable.
store-offered money orders (MOs)	Prepaid paper-based payment instruction, similar to bank draft or certified cheque. MOs can be purchased at post offices and other non-bank financial service providers. They allow consumers to pay bills even if they do not have a bank account or a payment card.

stored-value card issued by Visa/MasterCard/ American Express	Card that comes loaded with funds at time of purchase and can be reloaded. These cards are issued by banks, retailers and other financial institutions and use the Visa, Mastercard or American Express payment network. A prepaid card payment works the same way a regular credit card bill payment does. However, prepaid cards do not provide access to a line of credit and can therefore be used by people who are unable to qualify for a regular credit card.