

Cash and COVID-19: The Impact of the Second Wave in Canada

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We would like to dedicate this paper to the essential workers at the Bank of Canada, including colleagues who work in the Bank Note Distribution System, the Agency Operations Centres in Montréal and Toronto and in the regional offices. Their work has helped ensure that bank notes remain accessible to Canadians.

Abstract

We use consumer surveys conducted in April, July and November 2020 to study how the COVID-19 pandemic affected the demand for cash and the use of various methods of payment. Continuing from Chen et al. (2020, 2021), we use data from the Bank Note Distribution System (BNDS) to track how the amount of cash in circulation changed throughout 2020. The November 2020 survey included a three-day payment diary. We compare this diary with similar diaries from 2009, 2013 and 2017 to study long-term trends in cash use and payment methods.

Topics: Bank notes, Central bank research, Coronavirus disease (COVID-19), Digital currencies and fintech, Econometric and statistical methods

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

Introduction

Chen et al. (2020, 2021) analyze the effects of the COVID-19 pandemic on cash demand and methods of payment both early in the pandemic and in the summer of 2020 when containment measures were easing. In this paper, we provide an update using data from the Bank Note Distribution System (BNDS) and a survey of Canadians conducted in November 2020. That survey coincided with the second wave of COVID-19, when containment measures were renewed and opportunities for in-person shopping were again restricted, but less severely than during the first wave of the pandemic.

In 2020 we also conducted surveys in April and July, which relied on survey questionnaires only. By contrast, the November survey we discuss in this paper consists of both a survey questionnaire and a consumer diary that records the various transactions made by respondents over the course of three consecutive days. This diary allows us to update payment share estimates for various methods of payment and provide a range of demographic information associated with payment behaviour.

In the next section, we present an overview of cash demand in Canada based on data from the BNDS. Then we turn to results from our survey questionnaire to provide more detailed insights into Canadians' use of cash and other payment methods. Following that, we report results from the diary component of the survey.

The Bank of Canada will continue to monitor how COVID-19 affects cash demand and methods of payment, with additional surveys in 2021. In fact, our latest survey went into the field in mid-April, and we plan to conduct additional surveys later this summer and toward the end of 2021.

Insights from the Bank Note Distribution System

We summarize recent evidence concerning the demand for bank notes based on the deposit and withdrawal data from the BNDS.

The Bank Note Distribution System

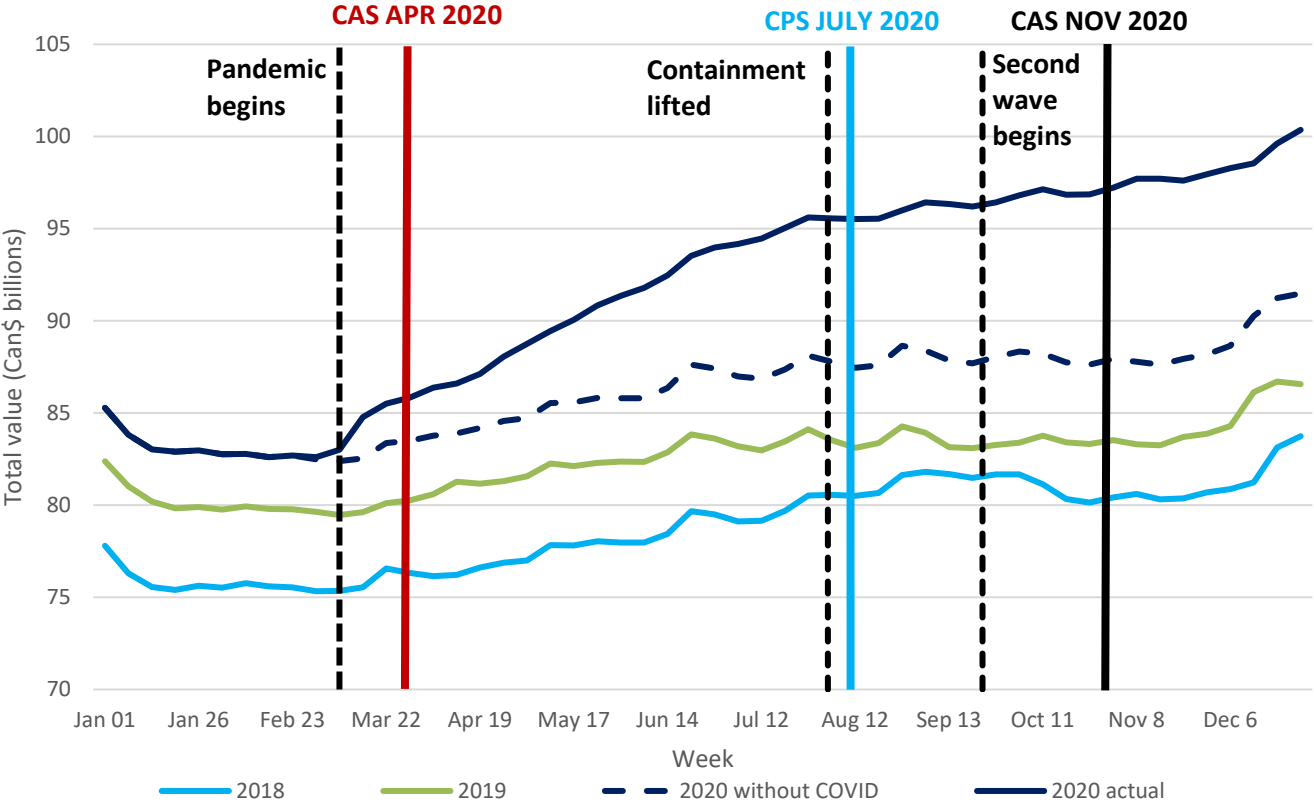
Through the BNDS, the Bank supplies financial institutions with the bank notes they need to meet public demand. More specifically, the Bank distributes bank notes to financial institutions at distribution centres located in regional distribution points (RDPs) across Canada. The RDPs roughly correspond to the country's provinces. So, for example, the Toronto RDP can be considered the main supply centre of bank notes for Ontario. Financial institutions can withdraw notes from the BNDS to meet the demand for cash, or they can deposit surplus notes. The same distribution system is used to return bank notes that are considered unfit for further circulation. (See Bilkes [1997] for more details on the BNDS.)

The pandemic's effect on bank notes in circulation

Chart 1 shows the value of notes in circulation (NIC) from 2018 to 2020. We see that the value of NIC increased significantly in the early months of the pandemic and this growth slowed materially only in July. We also see the characteristic year-end spike consistent with long-standing seasonal trends. As a result of these developments, the value of NIC at the end of 2020 was significantly larger than it was a year earlier. More specifically, NIC reached \$100.4 billion at the end of 2020, which is \$13.8 billion (16 percent) more than in the corresponding week of 2019.

To gauge the pandemic’s impact on NIC, we construct a simple projection (or counterfactual) of 2020 NIC based on what could have been expected if the COVID-19 shock had not occurred. That is, we calculate what the path of NIC would have been after early March if NIC value had increased at the average of weekly growth rates experienced from 2017 to 2019. **Chart 1** (dashed line) presents the result. Our findings suggest the pandemic added around \$8.9 billion to NIC by the end of December compared with what could have been expected in a typical year (about \$4.9 billion).¹

Chart 1: Bank notes in circulation, by year



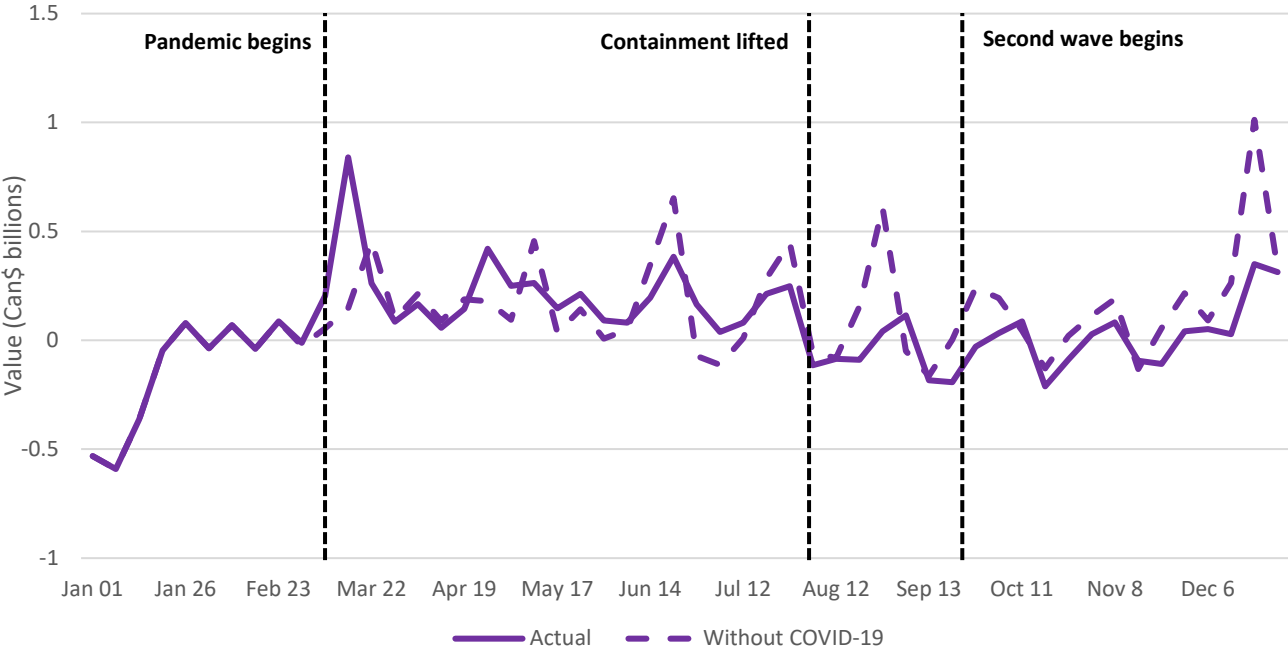
Note: Authors’ calculations of “2020 without COVID-19” refers to a counterfactual scenario for 2020 constructed using the average growth rate of notes in circulation from 2017 to 2019. Timing indicated by the first two vertical dashed lines (“Pandemic begins” and “Containment lifted”) is from Cavalli et al. (2020), and the timing indicated by third dashed line (“Second wave begins”) is based on [an address made by the Prime Minister Justin Trudeau](#). Solid coloured lines indicate the timing of surveys in this series, Cash Alternative Survey (CAS) and Cash Pulse Survey (CPS).

¹ A conventional measure of cash demand is NIC divided by nominal gross domestic product (GDP). For decades, this measure was between 3 and 4 percent of GDP in Canada (Engert, Fung and Segendorf 2019). This ratio increased to around 5 percent in 2020, which reflects both the significant growth of NIC discussed above and the contraction of GDP early in the pandemic.

The change in NIC value equals the value of net note withdrawals from the Bank (withdrawals of bank notes less deposits made to the Bank). **Chart 2a** and **Chart 2b** show net note withdrawals in 2020 grouped by denomination. Small-denomination bank notes include \$5, \$10 and \$20, and large-denomination notes include \$50 and \$100. The small denominations are typically best suited for transactions, while the large denominations typically play more of a store-of-value role, although demand for the \$50 notes might be increasingly considered to have a transactions motive.²

Chart 2a and **Chart 2b** illustrate the contributions of the demand for small- and large-denomination bank notes during the pandemic. We construct counterfactuals of weekly net note withdrawals showing what could have been expected if the pandemic had not happened (dashed lines in the charts). As discussed in Chen et al. (2021), the extraordinary demand for bank notes since March 2020 appears to have been driven mainly by demand for large-denomination notes, suggesting that store-of-value motives have been important. Further, demand for small-denomination notes has been weaker than might have been expected, suggesting less demand for cash transaction balances during the pandemic.

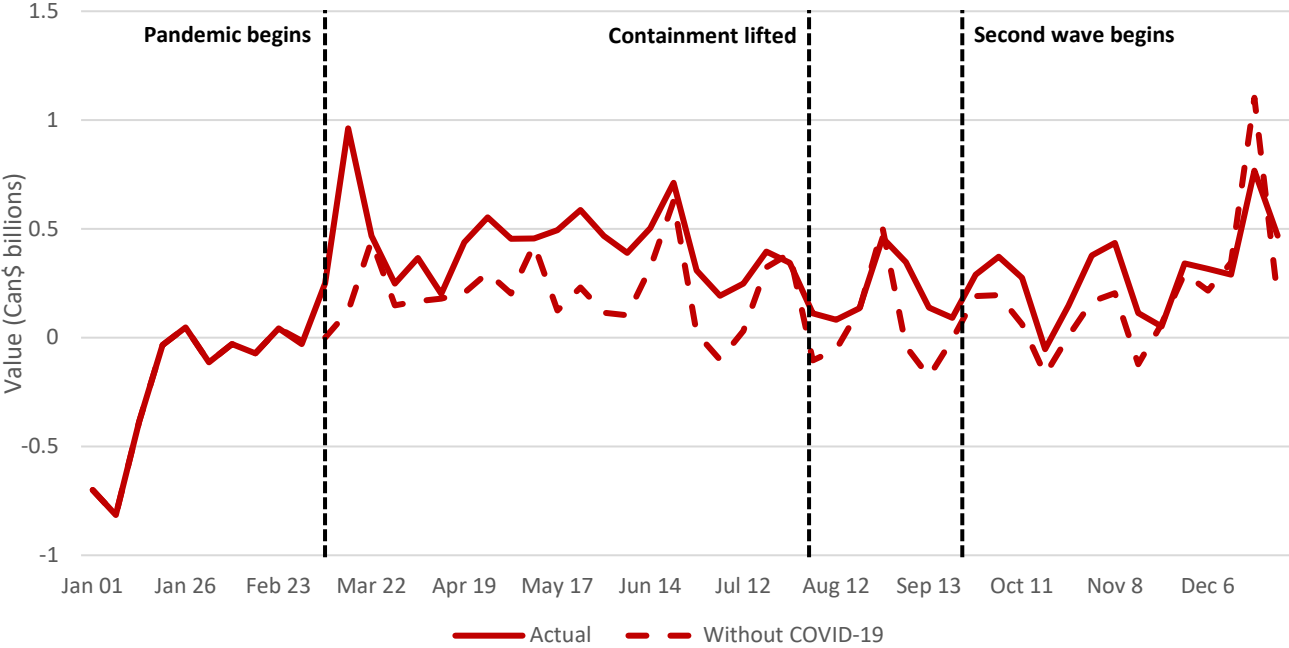
Chart 2a: Net bank note withdrawals from the Bank of Canada in 2020, small-denomination notes



Note: “Without COVID-19” refers to a counterfactual scenario where net withdrawals for 2020 are based on the average weekly change in notes outstanding from 2017 to 2019.

² This is also suggested by the growing availability of \$50 notes in automated bank machines. For a discussion of the evolution of cash demand for transactions and as a store of value, see Engert, Fung and Segendorf (2019).

Chart 2b: Net bank note withdrawals from the Bank of Canada in 2020, large-denomination notes



Note: “Without COVID-19” refers to a counterfactual scenario where net withdrawals for 2020 are based on the average weekly change in notes outstanding from 2017 to 2019.

As noted above, the change in NIC value is the difference between notes withdrawn from and notes deposited to the Bank. We can break down the growth of NIC into those components, as shown in **Chart 3a** and **Chart 3b**. We see that a sharp spike in withdrawals of bank notes occurred early in the pandemic. By July 2020, weekly cash withdrawals from the Bank had returned to amounts more consistent with the pre-pandemic experience. This continued for the rest of the year, although the typical December spike in withdrawals was much less pronounced in 2020.³

Deposits of bank notes have been persistently low relative to the pre-pandemic experience for a somewhat longer period than withdrawals (**Chart 3b**). A few factors could have contributed to this. In the early months of the pandemic, lockdown provisions reduced the opportunities for in-person shopping that are necessary for spending cash, which slowed the turnover (or velocity) of cash in the economy. Persistently low deposits of bank notes to the Bank early in the pandemic could also have been related to a reduced capacity of participants in the cash ecosystem to handle or transport notes, given, for example, physical distancing protocols. Further, as containment measures were relaxed and opportunities to shop in person increased through the summer of 2020, merchants may have accumulated cash. With a second wave of COVID-19 appearing in the autumn, some of the same pressures that discourage circulation of cash might have recurred, reducing the flow of deposits to the Bank. At the same time,

³ Note that we do not seasonally adjust the data in this paper.

individual Canadians increased their own cash holdings later in the year (discussed below), which is also the usual seasonal pattern.

All this suggests that a substantial stock of bank notes has accrued in the economy and could return to the Bank over time when conditions fully normalize. Nevertheless, NIC value could remain at an unusually high level given the extraordinary growth experienced earlier.

Chart 3a: Weekly bank note withdrawals from the Bank of Canada

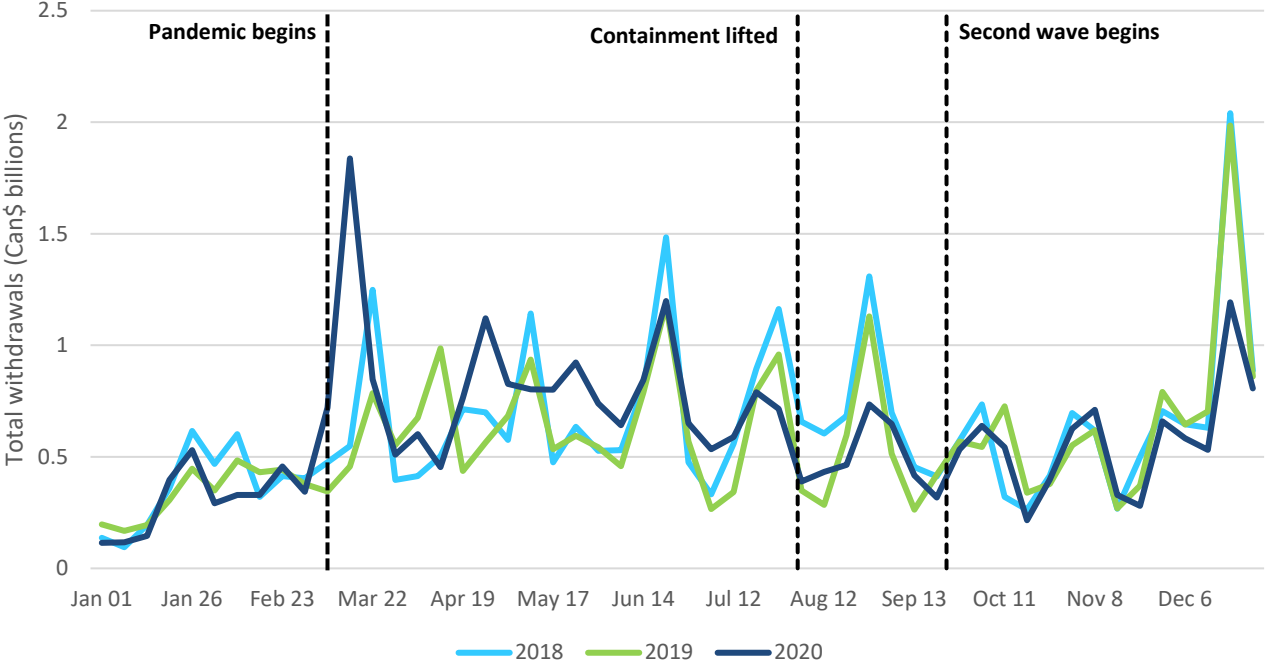
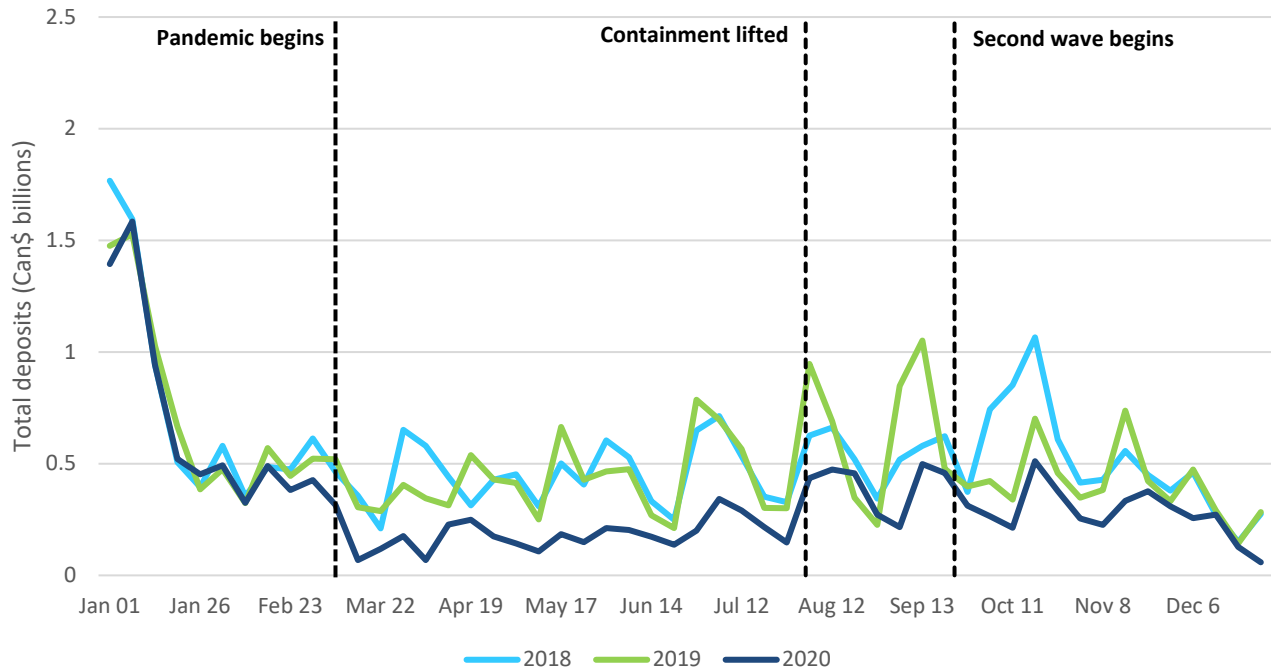


Chart 3b: Weekly bank note deposits to the Bank of Canada



In sum, the main insights from BNDS data are as follows:

- The value of NIC increased sharply during the pandemic from March through December 2020, particularly in the early months of this period. Cash outstanding increased from \$83 billion just before the pandemic to more than \$100 billion by the end of the year. The pandemic doubled the **increase** in the value of NIC that could have been expected over this period in a typical year.
- The increase in NIC during the pandemic was driven more by large-denomination notes than by small-denomination notes, suggesting that precautionary or store-of-value considerations were important for cash demand over this period.
- Early in the pandemic, cash withdrawals from the Bank supported this increase. Withdrawals returned to more typical amounts by the summer, but deposits of cash returning to the Bank tended to remain abnormally low through to the end of 2020.

Insights from the November 2020 Cash Alternative Survey

Consumer spending declined significantly during the first wave of the COVID-19 pandemic. Given physical distancing and other containment protocols, spending shifted away from cash toward card payments (Chen et al. 2020, 2021; Dahlhaus and Welte forthcoming). Part of the Bank's work to assess these recent developments involves a series of surveys to gauge the use of cash and other methods of payment. The results reported in this section are from the third survey the Bank conducted during the pandemic. The first was in April 2020 (2020 Cash Alternative Survey, or CAS), shortly after the pandemic began in Canada. The second survey was in July (2020 Cash Pulse Survey, or CPS), when most containment measures had been lifted.⁴ Our most recent CAS was conducted in November and coincides with the second wave of the pandemic, when containment measures reappeared but were less strict than in the first wave.

A few words on survey instruments and methodology

The November 2020 CAS relies on two survey tools: a survey questionnaire (SQ) and a diary survey instrument (DSI). We collaborated with our survey provider, Ipsos, and with Statistics Canada to develop the SQ and DSI. The November 2020 CAS SQ is similar to the ones used in the April 2020 CAS and the July 2020 CPS, with changes to update Statistics Canada's cross-validation.

Compared with the Bank's 2013 and 2017 Methods of Payment (MOP) surveys, we made minor changes to the November 2020 DSI to streamline the response flow. We asked respondents to provide transaction details for all of their payment transactions or cash withdrawals over the course of three consecutive days. They recorded how much money they spent or withdrew, where they made the transaction, what they bought and how they paid for it. The DSI also asks respondents to record the amount of cash they have on their person at the beginning and end of the three-day period. In addition to cash payments and withdrawals, the DSI tracks other cash transactions, such as person-to-person transfers.

The November 2020 CAS was conducted between October 29 and December 24, 2020, yielding 3,893 responses from participants aged 18 or older, 2,084 of whom also filled in the DSI. Most responses (70 percent of surveys and 92 percent of diaries) were collected in November. Respondents were selected to match the Canadian population with respect to age, gender and province following a non-probability quota sampling. They were drawn mainly from two sources: a proprietary online panel (pre-recruited individuals agreeing to take surveys) and non-panel (known as river sampling, where respondents are available to take surveys but not necessarily willing to join panels).

To minimize bias caused by differences in behaviour between our sample and the Canadian population, we compute weights to ensure that the sample matches certain demographic characteristics of the Canadian population. The weighting methodology used in the November 2020 CAS has undergone extensive testing and analysis and is designed to minimize selection bias. The survey weights were computed on March 9, 2021. In the appendix, we validate our weighted estimates by comparing them with other information sets, including the results from probability-sampled Statistics Canada surveys. We also perform internal validity checks across our surveys (e.g., financial literacy scores over time, primary financial institution and credit card ownership).

⁴ The results of those earlier surveys are discussed in Chen et al. (2020, 2021).

Key takeaways

The main lessons from the November 2020 CAS include the following.

- Canadians who hold cash reported having \$80 in cash on hand (median) in the November 2020 CAS, up from \$70 in the July 2020 CPS. This is comparable to median cash holdings during the first wave of the pandemic, which was \$85 in the April 2020 CAS.
- Use of all payment methods, measured by the percentage of people using them, was stable or increasing in November compared with July. Cash use saw the largest increase, with 59 percent of Canadians reporting that they used cash for transactions during the survey week in November, up from 54 percent in July. This increase continues the trend of growing cash use (according to this metric) after initial lockdown measures were lifted in the summer, even after the second wave of the pandemic began in the autumn.
- A large majority of Canadians (80 percent) reported in the November 2020 CAS that they have no plans to go cashless in the next five years. This is similar to the result reported in the July 2020 CPS (78 percent).
- The shares of the volume (number) and value of transactions paid with cash declined steadily between November 2017 and November 2020. At the same time, shares of contactless payments increased significantly. Nevertheless, a significant portion of low-value transactions is still made with cash. More specifically, in November 2020, 40 percent of the volume of low-value transactions (below \$15) was paid with cash.
- Cash use tends to be more prevalent in certain demographic groups. Older, less-educated, and low-income individuals use cash to pay more than other Canadians do. People in each of these demographic groups pay for at least 25 percent of the volume (number) of their purchases with cash.

Core measures of cash use

Table 1 shows that cash holdings increased in November from July to levels similar to those seen in the spring of 2020. We estimate that Canadians who hold cash held a median of \$80 in their cash on hand and \$270 in their other cash holdings.⁵ We use the median here because the distribution of cash holdings is characterized by some very large positive values and a mass at zero, which reduces the usefulness of the mean as a representative measure of the distribution. The proportion of Canadians who report holding zero cash on hand increased slightly from 20 percent in July to 22 percent in November, and the proportion with zero other cash holdings was 76 percent in November, similar to the share seen in July. Box 1 provides additional perspectives on other cash holdings.

⁵ "Cash on hand" is the amount of cash in the respondent's purse, wallet or pocket. "Other cash holdings" is the amount of cash the respondent's household keeps in locations other than a purse, wallet or pocket, such as at home or in a vehicle.

Box 1: Other cash holdings

In **Table 1** (page 12), we observe that other cash holdings are much larger than cash on hand, on average (mean) and at the median. Other cash holdings (OCH) are motivated by store-of-value or precautionary factors, while cash on hand is likely more for transactions. The store-of-value role of cash can be most pronounced during a crisis or stress period (Engert, Fung and Segendorf 2019; Martin and Zhu forthcoming; and Rösl and Seitz 2021). This is also evident in our recent surveys, from the August 2019 CAS to the November 2020 CAS.

It is important to note, however, that OCH are distributed unevenly across the population. Many people hold no or only minimal cash reserves. By contrast, a small number of people keep very large sums of cash in reserve. These relatively large OCH pull up the mean (non-zero) OCH value, which is \$720 in the November 2020 CAS. **Chart 1-A** presents the quantile distribution of non-zero OCH in our recent surveys and shows that the median OCH (at the 50th percentile) in the November 2020 CAS is \$270. This means that (conditional on non-zero OCH) half of this population holds less than \$270 and half hold more than \$270. The chart also shows that 70 percent of these respondents hold less than around \$500 (November 2020 CAS). At the right tail of the distribution, we see that 10 percent hold more than about \$2,000.

When we compare the OCH distribution across our four recent surveys between August 2019 and November 2020, we consistently find an association between OCH and the COVID-19 pandemic: people have held more OCH when the severity of the pandemic was high. For example, OCH increased at almost every quantile bracket during the first wave (April 2020 CAS), and further increases occurred during the second wave (November 2020 CAS). In particular, the 90th percentile of the OCH distribution in the November 2020 CAS is about \$500 larger than that in the April 2020 CAS. This might also be partly due to seasonal effects, associated with a buildup of precautionary (or stand-by) balances given the year-end shopping season.

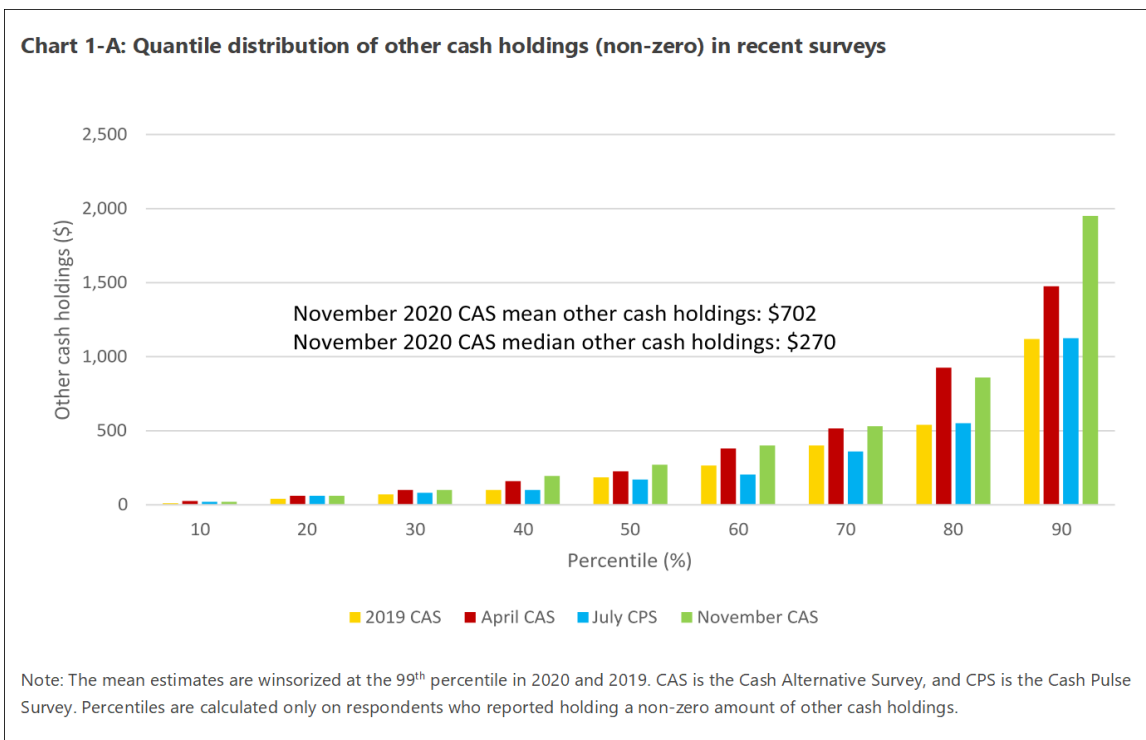


Table 1: Canadians' (non-zero) cash on hand and other cash holdings

	Cash on hand (\$)				Other cash holdings (\$)			
	CAS	CAS	CPS	CAS	CAS	CAS	CPS	CAS
	August 2019	April 2020	July 2020	November 2020	August 2019	April 2020	July 2020	November 2020
Median	70	85	70	80	185	225	170	270
Mean	136	158	134	154	460	523	396	702
Percentage of Canadians holding zero cash								
Share (%)	20	28	20	22	71	82	77	76

Note: The mean estimates are winsorized at the 99th percentile. CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey.

Consistent with the increased cash holdings noted above, more Canadians withdrew cash during the survey week in November than in the surveys conducted in April and July 2020 (Table 2). More specifically, 27 percent of Canadians reported that they withdrew cash from an automated bank machine (ABM) in November, up from 23 percent in July and 19 percent in April. And fewer Canadians reported **not** withdrawing cash from an ABM or teller in the most recent survey.

Table 2: Proportion of Canadians who withdrew cash in the previous week (%)

	CAS	CPS	CAS
	April 2020	July 2020	November 2020
Only automated bank machine (ABM)	19	23	27
Only teller	2	2 ^E	3
ABM and teller	2	2 ^E	2
Did not withdraw from either ABM or teller	77	73	68

Note: We follow Statistics Canada's guidelines on data reliability using the coefficient of variation (CV), defined as the standard error divided by the mean (Statistics Canada 2016, Section 7). "E" indicates "use with caution" (CV between 16.5 and 33 percent). CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey.

Table 3 shows the percentage of Canadians who used various payment methods in recent surveys; these results reflect both in-store and online payments. The percentage of Canadians using most payment methods was stable or increased in November, and the largest increase was in the use of cash. In this regard, 59 percent of Canadians reported using cash in the past week during the November survey, up from 54 percent in July and 36 percent in April. At the same time, our estimates of cash use are less than those for debit use (62 percent) and credit use (71 percent), indicating that Canadians continue to rely heavily on these electronic payment methods. Further, the

proportions of Canadians using contactless debit and contactless credit cards both increased by about 10 percentage points since April. Finally, a smaller but steady share of respondents used Interac e-Transfer (39 percent) during the most recent survey period.

Table 3: Methods of payment used in the previous week (%)

	CAS April 2020	CPS July 2020	CAS November 2020
Cash	36	54	59
Debit	52	62	62
– Tap and go	38	46	49
– Chip and PIN	38	48	45
Credit	62	67	71
– Tap and go	48	56	58
– Chip and PIN	38	45	46
Interac e-Transfer	38	38	39
Mobile	8	12	11
Prepaid card	11	12	12

Note: This table reports use of all payment methods, irrespective of location, including in-store and online payments. Respondents could select multiple answers, so the shares do not sum to 100. The overall measures of debit and credit use include Canadians who made at least one transaction with tap and go (contactless cards), chip and personal identification number (PIN) or both in the week before they responded to the survey. CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey.

Canadians continued to make in-store purchases during the survey week in November, despite being in the second wave of the pandemic (Table 4). Most notably, the percentage of Canadians who reported making an in-store purchase for entertainment or meals increased to 51 percent in November from 44 percent in July. The percentage of Canadians who made in-store purchases overall in November and the number of those purchases were significantly greater than in April, which represents a continuation of the results seen in July. This is perhaps not surprising because most provinces did not restrict store operations during the second wave of the pandemic as much as they did during the first wave, when only essential businesses were allowed to remain open.

Table 4: Percentage of Canadians who made an in-store purchase and average number of purchases, by purchase type

	CAS, April 2020		CPS, July 2020		CAS, November 2020	
	Made purchase (%)	No. of purchases	Made purchase (%)	No. of purchases	Made purchase (%)	No. of purchases
Overall	83	3.8	94	5.1	95	5.2
Of which:						
Groceries or prescriptions	78	1.9	88	1.9	87	2.3
Entertainment or meals	19	2.2	44	2.1	51	2.5
Gasoline	39	1.4	58	1.5	56	1.4
Health care, excluding prescriptions	13	1.8	22	1.4	15	1.3

Note: "Made purchase (%)" and "Number of purchases" are calculated for in-store purchases only, across all payment types. CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey. Average number of purchases is based on respondents who reported making at least one purchase.

Compared with July, indicators of merchant acceptance of cash were generally stable in November (**Table 5**). These measures also suggest somewhat improved acceptance of cash from earlier in the period. For example, in November, 9 percent of Canadians reported that they were unable to use cash at a merchant's point of sale; in April, 12 percent reported this experience. Similarly, 57 percent of Canadians said they did **not** see, hear or experience a merchant refusing to accept cash, compared with 43 percent in April.⁶

⁶ Generally, observed use of cash (and other payment methods) is driven by complex interactions between consumer behaviour and merchant acceptance decisions over time, in a two-sided market (Huynh, Nicholls and Shcherbakov 2019). Changes in reported merchant acceptance of cash during the pandemic reflect several influences: individual merchant decisions about cash acceptance as well as a changing mix of merchants available for shopping because of temporary business closures. This mix of merchants could be more, or less, inclined to accept cash.

Table 5: Consumer reports of merchant acceptance of cash (percentage of Canadians)

	CAS April 2020	CPS July 2020	CAS November 2020
I did not hear, see or experience a merchant refusing to accept cash.	43	58	57
I saw a sign that stated a merchant was not accepting cash.	22	16	17
I saw a sign that stated cash was accepted but other payment methods were preferred.	14	15	17
I heard news reports that merchants stated cash was not accepted.	16	6	5
I was not able to use cash at a merchant's point of sale.	12	9	9

Note: Respondents could select multiple responses, so the shares do not sum to 100. CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey.

Expectations about future cash use

A large majority of Canadians, 80 percent, reported in the November 2020 CAS that they have **no** plans to go cashless (Table 6), slightly more than in July. The share of Canadians stating that they are already cashless decreased to 12 percent in November (from 14 percent in July). However, the share of Canadians who stated in the November 2020 CAS that they are already cashless and actually hold no cash is 6 percent. (This is shown in parentheses in the first column of Table 6.) This outcome is evident across all three surveys and suggests that some respondents might overestimate the extent to which they are already cashless.⁷

Table 6: Canadians' planned future cash use (%)

	Already cashless	Within 5 years	More than 5 years	No plans
CAS, August 2019	10 (4)	6	2 ^E	82
CAS, April 2020	19 (10)	6	1 ^E	74
CPS, July 2020	14 (6)	7	1 ^E	78
CAS, November 2020	12 (6)	7	1 ^E	80

Note: Respondents could select only one option, so the estimates sum to 100 (excluding the estimates in parentheses). The estimate in parentheses is the share of Canadians who stated that they are already cashless and reported zero cash on hand, so stated and actual behaviours are aligned. "E" indicates "use with caution," in accordance with Statistic Canada's guidelines on data reliability (see Statistics Canada 2016, Section 7). CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey.

⁷ For greater clarity, the relevant survey question here is, "Do you currently have any plans to stop using cash in the future?" Being cashless in this context corresponds to the response: "Yes, I have already stopped using cash." This answer could be a respondent's statement of behaviour, a preference or intention about not using cash for transactions or not using cash for precautionary reasons (e.g., holding cash just in case). We plan to consider the interpretation of **cashless** more closely in future work.

Results from the diary survey instrument: payment shares and demographics

In this section, we present results from the payment diary that was part of the November 2020 CAS. This survey tool is time- and resource-intensive and was not included with the surveys we conducted earlier during the pandemic, when the timeliness of core results was a priority. Results from payment diaries also featured in earlier MOP surveys conducted by Bank staff in 2009, 2013 and 2017. Accordingly, here we compare results from the diary component of our November 2020 CAS to earlier MOP surveys.⁸

Table 7 presents the transaction shares of various methods of payment, in terms of volume (number) and value, including both in-store and online transactions. It shows that over one-fifth of the volume of purchases were made with cash in November 2020, during the second wave of the pandemic. We also see that the cash share has been steadily declining in recent years, from 44 percent of purchases in 2013 to 33 percent in 2017 and then to 22 percent in 2020. The main corresponding increase has been in the share of credit card purchases, which went from 39 percent in 2017 to 47 percent in 2020. There has also been a small increase in the volume share of debit cards over this period, from 26 to 29 percent. Not surprisingly, we also find a surge in contactless payments, which we estimate accounted for almost 80 percent of the number of credit card purchases and about 70 percent of the number of debit card purchases in 2020. We find similar trends in the value shares, with the exception of debit—debit shares have been stable over these years.

⁸ The quality of responses in the 2020 CAS payment diary is comparable to those of the 2017 MOP. If the diary is completed perfectly with respect to tracking a respondent's cash purchases, the identity $Cash_{end} = Cash_{start} - Cash_{spent} + Cash_{received}$ would hold for each respondent. This equation is called the cash identity, and the residual error in the identity measures how accurately the DSI was completed. In 2020, 63 percent of respondents had a cash identity result less than \$5. This is similar to 2017 outcome, where 60 percent had a cash identity result under \$5.

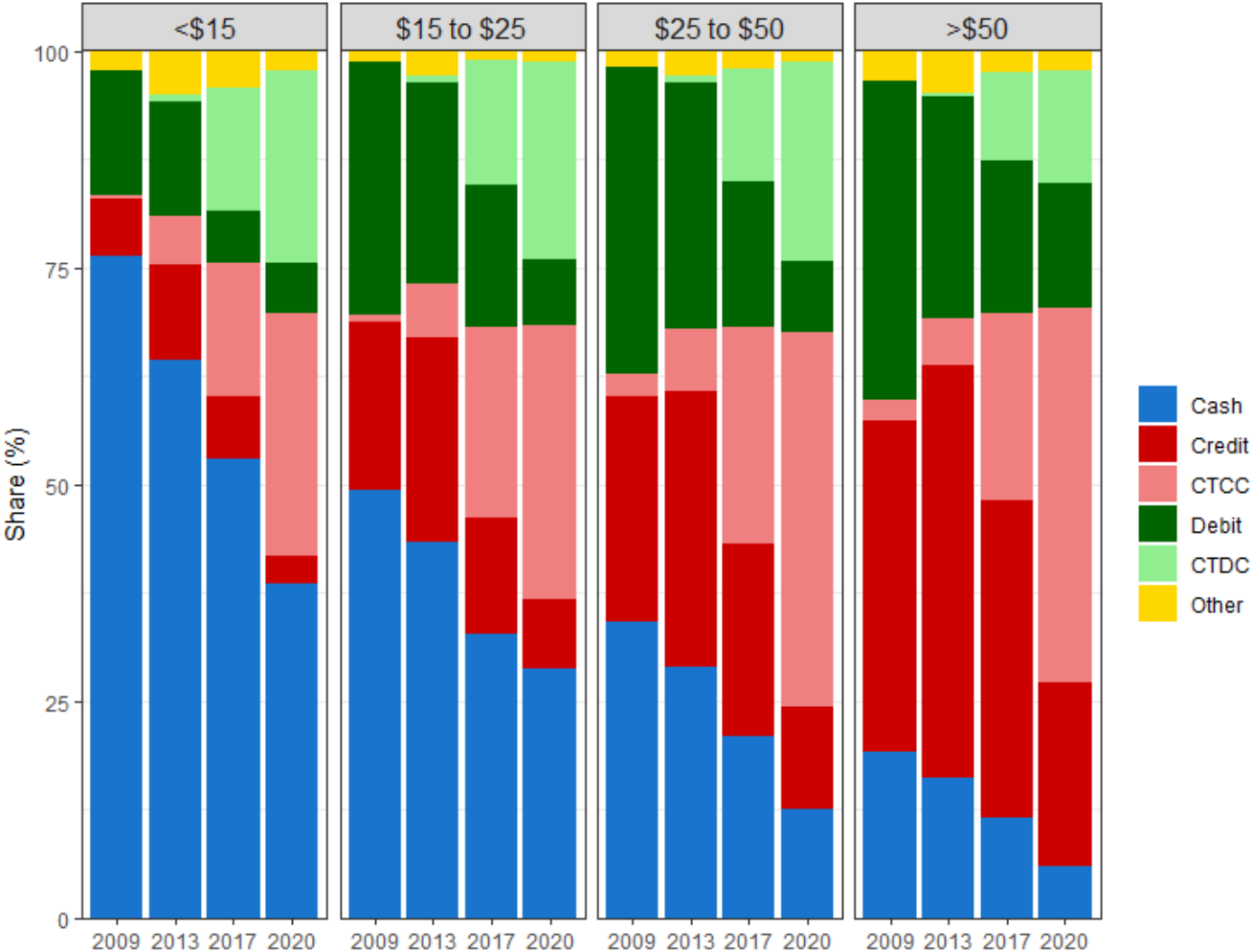
Table 7: Composition of payments in payment diaries from previous surveys

	Cash	Debit	CTDC	Credit	CTCC	SVC	Other
Volume shares							
2009	0.54	0.25	-	0.19	0.05	0.01	0.01
2013	0.44	0.21	0.03	0.31	0.19	0.03	0.01
2017	0.33	0.26	0.50	0.39	0.52	0.02	0.01
2020	0.22	0.29	0.70	0.47	0.78	0.02	0.00
Value shares							
2009	0.23	0.32	-	0.41	0.03	0.01	0.04
2013	0.23	0.25	0.02	0.46	0.12	0.03	0.04
2017	0.12	0.26	0.20	0.56	0.30	0.02	0.01
2020	0.09	0.25	0.48	0.62	0.56	0.02	0.02
Median purchase (\$)							
2009	8	29	-	40	43	5	-
2013	9	27	14	34	20	8	-
2017	10	25	16	35	26	12	25
2020	12	25	21	37	30	17	20
Mean purchase (\$)							
2009	17	51	-	84	-	27	-
2013	19	45	26	63	36	28	-
2017	20	44	26	62	42	34	50
2020	22	46	31	70	47	73	68

Note: The table shows the proportion of the total volume and value by different payment methods, including in-store and online transactions. We also provide the median and mean values of such transactions. CTDC refers to contactless debit cards, CTCC is contactless credit cards, and SVC means stored-value cards (issued by Visa, MasterCard or American Express or store-branded cards). CTDC and CTCC volume and value shares are reported as a fraction of the total volume and value of debit and credit card purchases, respectively. "Other" includes cheques and SVC in all years (2009, 2013, 2020) except in 2017. Other for 2017, "other" includes SVC and the "other method of payment" category. For volume and value shares, rows sum to one, excluding CTDC and CTCC. As in previous reports, some median and mean estimates are not reported due to the small number of observations that were available. CTDC did not exist in Canada in 2009.

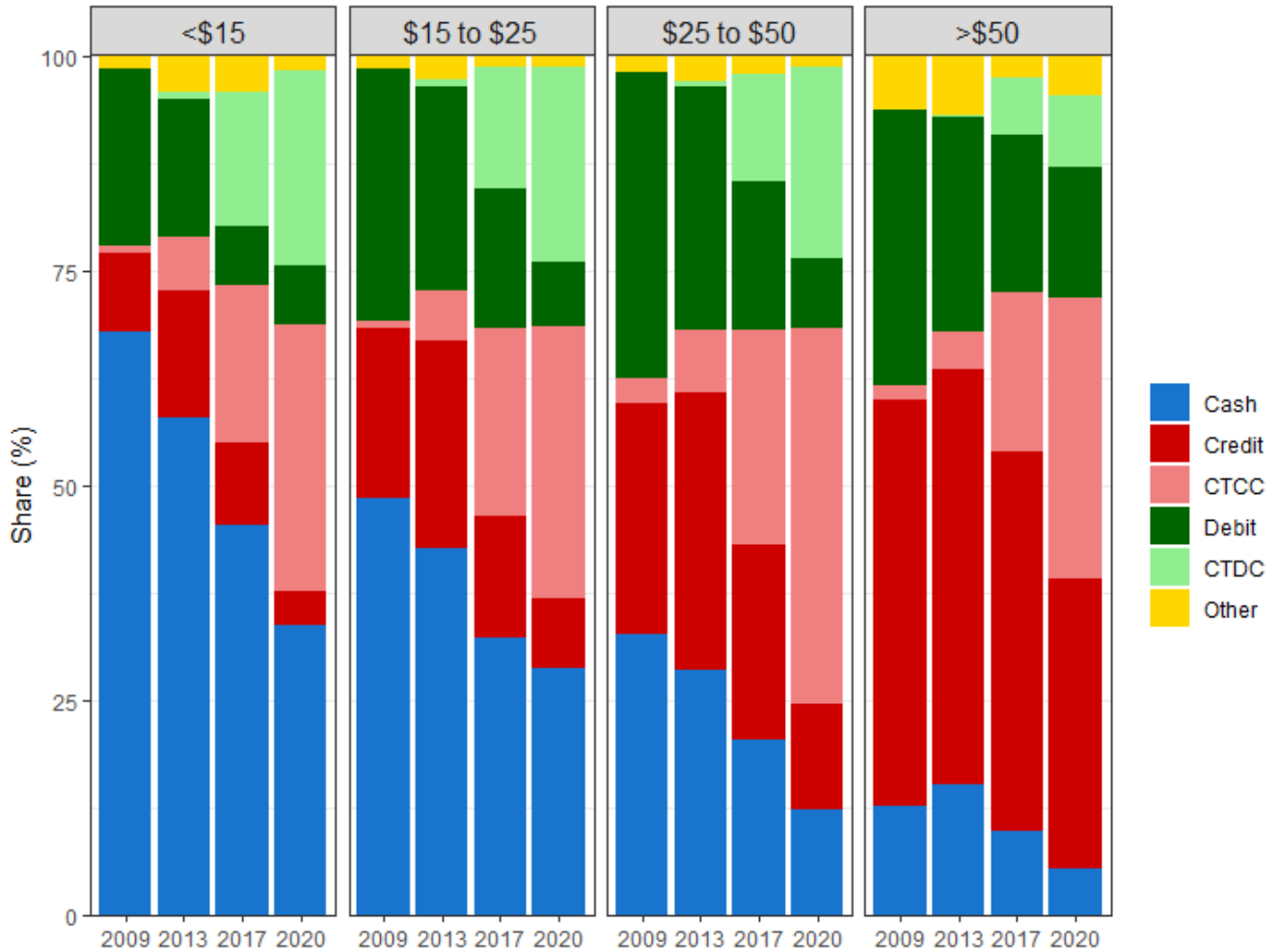
Chart 4a and Chart 4b illustrate the payment shares by transaction value, including both in-store and online transactions. Cash has typically been used more frequently for low-value transactions, and this is also evident in the most recent 2020 data. While cash shares have declined in all categories of transaction amounts, 40 percent of the volume of transactions below \$15 is still made using cash (Chart 4a). Credit card use in every transaction category has increased over these years, while debit card use has increased for low-value transactions but declined for high-value transactions. These charts also illustrate the growing share of contactless debit payments and contactless credit payments across all transaction categories. Contactless cards now account for 56 percent of total payment volume and 47 percent of total payment value. Notably, as the spending limit on contactless transactions at the point of sale has increased, we see the share of contactless cards growing rapidly for high-value transaction amounts.

Chart 4a: Payment shares over time: volume, by transaction value



Note: The chart breaks down the total volume of transactions (including both in-store and online purchases) by method of payment over time, according to the value range of the transaction. CTDC refers to contactless debit cards, and CTCC refers to contactless credit cards. Data are from the 2009 Methods of Payment (MOP) diary survey instrument (DSI weights used), 2013 MOP DSI (SQ weights used), 2017 MOP DSI (DSI weights used) and November 2020 CAS DSI (DSI weights used).

Chart 4b: Payment shares over time: value, by transaction value



Note: The chart breaks down the total value of transactions (including both in-store and online purchases) by method of payment over time, according to the value range of the transaction. CTDC refers to contactless debit cards, and CTCC refers to contactless credit cards. Data are from the 2009 Methods of Payment (MOP) diary survey instrument (DSI weights used), 2013 MOP DSI (survey questionnaire weights used), 2017 MOP DSI (DSI weights used), and November 2020 CAS DSI (DSI weights used).

Table 8a and Table 8b report cash use by demographic characteristics. The same patterns found in previous MOP surveys also appear in our November 2020 survey. The key findings are as follows:

- Older people, males, individuals with less education and people in low-income households use relatively more cash. People in each of these demographic groups used cash to pay for at least 25 percent of their purchases. University-educated respondents rely on credit cards the most and debit cards the least compared with other educational cohorts.
- Credit card use across age groups is similar, but older respondents rely on debit cards less than others do.
- Comparing the November 2020 results with those from the 2017 MOP (not shown), females, middle-aged people and low-income individuals showed the largest decline in cash transaction shares between 2017 and 2020.

Table 8a: Payment shares—volume, according to socio-demographic characteristics

		Cash	Debit	CTDC	Credit	CTCC	SVC	Other
Gender	Male	24.8	29.4	68.4	43.8	76.4	1.6	0.3
	Female	19.0	28.5	70.1	50.7	79.1	1.6	0.1
Age	18 to 34	21.2	29.6	72.0	47.4	79.7	1.8	0.0
	35 to 54	18.2	33.4	73.0	45.9	76.9	2.3	0.2
	55+	26.0	25.1	63.7	47.6	77.4	1.0	0.4
Education	High school	26.9	30.6	73.8	41.4	76.3	1.0	0.2
	College	19.4	34.7	67.7	43.5	78.4	2.0	0.4
	University	18.3	19.9	61.4	59.3	78.7	2.3	0.1
Region	British Columbia	21.8	33.4	61.4	42.0	71.7	2.7	0.1
	Prairie provinces	17.5	34.9	71.4	44.8	68.9	2.2	0.6
	Ontario	23.6	24.8	66.7	49.6	80.0	2.0	0.0
	Quebec	21.2	25.7	74.3	52.3	83.9	0.5	0.5
	Atlantic provinces	29.2	40.2	75.1	30.3	66.3	0.3	0.0
Household income	<\$45,000	29.4	38.9	67.5	31.2	79.0	0.5	0.0
	\$45,000 to \$85,000	25.3	26.7	70.9	46.4	78.1	1.6	0.0
	>\$85,000	18.8	25.2	66.6	53.3	77.4	2.3	0.5

Note: The table shows the breakdown of the total volume of transactions by method of payment, for both in-store and online payments, according to a respondent's characteristics. CTDC refers to contactless debit cards, and CTCC refers to contactless credit cards. CTDC and CTCC volume shares are reported as a fraction of the total volume of debit and credit card purchases, respectively. Rows sum to one, excluding CTDC and CTCC. "Other" includes cheques and SVC in all years (2009, 2013, 2020) except in 2017. For 2017, "other" includes SVC and the "other method of payment" category.

Table 8b: Payment shares—value, according to socio-demographic characteristics

		Cash	Debit	CTDC	Credit	CTCC	SVC	Other
Gender	Male	10.9	24.7	42.0	59.4	56.2	3.4	1.6
	Female	7.4	26.2	54.2	64.0	57.7	0.9	1.5
Age	18 to 34	7.8	27.1	42.7	58.7	61.0	6.4	0.0
	35 to 54	8.1	27.6	56.7	62.5	57.3	1.2	0.6
	55 +	11.0	22.8	43.7	62.4	54.4	1.0	2.9
Education	High school	12.1	28.1	54.7	56.0	60.5	3.4	0.5
	College	8.1	30.2	43.6	57.5	54.6	1.1	3.1
	University	7.1	16.6	40.8	73.2	53.1	1.8	1.3
Region	British Columbia	8.7	31.8	41.0	55.8	42.3	1.5	2.1
	Prairie province	6.9	23.1	60.6	62.3	45.1	6.8	1.0
	Ontario	10.6	20.5	46.3	66.6	57.7	1.6	0.7
	Quebec	10.0	25.8	49.0	60.7	71.0	0.3	3.1
	Atlantic provinces	8.7	43.2	40.4	47.8	45.7	0.3	0.0
Household income	<\$45,000	14.4	40.8	43.1	44.6	55.6	0.2	0.0
	\$45,000 to \$85,000	13.0	24.8	55.6	60.4	59.6	1.2	0.6
	>\$85,000	6.6	19.1	47.5	68.3	56.1	3.5	2.6

Note: The table shows the breakdown of the total value of transactions by method of payment, for both in-store and online payments, according to a respondent's characteristics. CTDC refers to contactless debit cards, and CTCC refers to contactless credit cards. CTDC and CTCC value shares are reported as a fraction of the total value of debit and credit card purchases, respectively. Rows sum to one, excluding CTDC and CTCC. "Other" includes cheques and SVC in all years (2009, 2013, 2020) except in 2017. For 2017, "other" includes SVC and the "other method of payment" category.

Conclusions and next steps

Cash outstanding increased sharply from March through December 2020, particularly in the early months of this period, and the pandemic significantly increased the demand for bank notes. The extraordinary increase in NIC during this period was driven more by demand for large-denomination notes rather than for small-denomination notes, suggesting that store of value was an important factor in these developments.⁹ It also appears that a substantial stock of bank notes may have accumulated in the economy as deposits of notes to the Bank of Canada have been unusually low over much of this period. Some of these bank notes could return to the Bank over time when conditions normalize, but it seems likely that the value of NIC will remain elevated.

To provide more insight into these developments, the Bank conducted another survey in November 2020, part of an ongoing series to assess the impact of COVID-19 on cash demand and payments. We find that use of all payment methods, as measured by the percentage of Canadians using them, was **stable or increased** in November compared with our July survey. In particular, our estimates indicate that 59 percent of Canadians used cash as a form of payment during the November survey period, which was less than the proportion using debit (62 percent) and credit cards (71 percent). Looking ahead, a large majority of Canadians (80 percent) reported that they have no plans to go cashless in the next five years.

Our November survey also included a payment diary that allows us to calculate the transaction shares of various methods of payment. We found that over one-fifth of the volume of purchases was made with cash in November 2020, during the second wave of the pandemic. This indicates a continuation in the decline of the volume share of cash observed in previous surveys, from 44 percent of purchases in 2013 to 33 percent in 2017 and to 22 percent in 2020. The main corresponding increase has been in the share of credit card purchases, which went from 39 percent in 2017 to 47 percent in 2020, driven by a sharp rise in contactless payments. Nevertheless, a significant portion (40 percent) of transactions below \$15 is still made with cash. Similar trends are seen in the value shares.

As in earlier MOP surveys, we find that cash use is more prevalent in certain demographic groups. Older, less-educated or low-income individuals use cash to pay more often than other Canadians do.

The Bank of Canada will continue monitoring how COVID-19 affects cash demand and methods of payment, with additional surveys in 2021. Indeed, our latest survey went into the field in mid-April. Accordingly, we plan to publish further reports as appropriate.

⁹ Similar trends have been seen in other advanced economies; see, for example, Rösl and Seitz (2021), Guttman et al. (2021), Foster and Greene (2021), Hawkesby (2020) and Bank of England (2020).

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Appendix: Calibration and cross-validation of estimates from the November 2020 Cash Alternative Survey

Our general survey methodology has undergone extensive testing and analysis. To reduce total survey error suggested by Baker et al. (2016), we collaborated with Statistics Canada and our survey provider, Ipsos, throughout the ex ante sampling design and ex post survey editing and calibration.

For ex ante sampling design, we use quota sampling to obtain the required number of respondents, as pre-specified by the nested sampling targets, so that we have approximate representations in terms of intersected cells of gender, age and regions. In addition to the above demographic quotas, we also roughly maintain both frame and device compositions in the sampling design to mitigate the artifacts of survey designs.

To account for non-sampling error ex post, we use data cleaning and editing rules, such as analyzing the potential for straightliner respondents and transcription errors, as in Henry et al. (2019).

Finally, to correct for selection bias of the non-probability sample, we follow Chen et al. (2020, 2021) to calibrate our survey questionnaire (SQ) and diary survey instrument (DSI) samples. In addition, we perform extensive sensitivity analysis of our results with variations in the weighting procedure, in the framework of Saisana, Saltelli and Tarantola (2005). Variations pertained to the set of calibration variables, trimming of the weights and non-response adjustments. A detailed discussion of the parameters of the raking procedure can be found in Chen, Felt and Henry (2018). Overall, we find that the range of estimates obtained with these variations was narrow and, in most cases, estimates at each end of the range would draw a similar trend compared with the most recent estimates available.

The main criterion for selecting the final set of weights was how well the set shifted the sample toward the population in terms of demographics not used as calibration variables and the Statistics Canada cross-validation questions. We also strive to maintain consistency with the methodology used in past surveys. We obtain the final weights by raking on gender, age, region, education, marital status, employment status in February 2020 (before COVID-19) and household income, without any non-response adjustment; the weights are trimmed at five times their mean. Separate sets of raking weights are obtained for the SQ sample and the DSI subsample. This differs from the approach adopted in MOP surveys, where DSI weights were obtained by simply rescaling the SQ weights to rebalance the mode effect—paper-based/online—composition. By contrast, the 2020 CAS DSI was completely online. We perform a thorough sensitivity analysis to verify that our final DSI estimates or the changes between 2017 and 2020 estimates are not substantially affected by this modification of the DSI weighting approach. Note that our current weights are constructed under the assumption of selection on observable. Future work will complement the analysis by relaxing this assumption to incorporate the case of selection on unobservable.

Cross-validation analysis shows that our weighted estimates correspond with the results of other surveys, which demonstrates validity. For instance, **Table A-1** reports precautions taken by Canadians to reduce the risk of exposure to COVID-19 based on responses to a Statistics Canada survey that was conducted in July 2020, together with the results from our July CPS and our November CAS. In the latter, we find that 94 percent of respondents reported actively practising physical distancing, 88 percent took steps to improve their cleanliness (particularly through hand washing) and 55 percent took measures to improve their general preparedness, including stocking up on food and

medicine. Mask use increased to 89 percent, up from 77 percent in July. These results are qualitatively similar to those in Statistics Canada’s Canadian Perspectives Survey Series 4 in July 2020 on COVID-19.

Table A-1: Precautions taken by Canadians for COVID-19 (%)

	Statistics Canada	CPS, July 2020	CAS, November 2020
Preparation	53	48	55
Planning	38	29	41
Physical distancing	96	92	94
Cleanliness	94	84	88
Wore a mask	84	77	89

Note: Respondents could select multiple responses, so the shares do not sum to 100. Column 1 is from the Canadian Perspectives Survey Series 4 conducted in July 2020 (Statistics Canada 2020a). CPS is the Cash Pulse Survey conducted in July 2020 by the Bank of Canada.

In particular, all surveys find that making plans for caring for or communicating with family, friends or others was the least common precaution taken, while physical distancing was the most common. Future work will further explore how best to compare and integrate data from probability and non-probability surveys (Wu and Thompson 2020).

Table A-2 provides our second measure of survey validity and looks at precautions Canadians take to protect themselves when they shop online. Our estimates are again comparable to those reported by Statistics Canada. We find that 27 percent of Canadians did not let websites remember their personal information and 32 percent did not let websites remember their credit card information. The most common precaution taken was to shop only on reputable websites, as reported by 59 percent of respondents.

Table A-2: Precautions taken by Canadians for internet security (%)

	Statistics Canada	CAS, Nov 2020
Did not let websites remember personal information	31	27
Did not let websites remember credit card information	38	32
Shopped only on reputable websites	67	59
Used credit card with low credit amount	19	19
Used a third-party payment service (e.g., PayPal)	21	27
Looked for HTTPS in the website address and lock symbol	26	23
Used strong passwords or passphrases	31	39
Did not shop online	21	19

Note: Respondents could select multiple responses, so the shares do not sum to 100. Column 1 is from the Canadian Perspectives Survey Series 5 conducted in September 2020 (Statistics Canada 2020a).

Finally, we also surveyed Canadians' financial literacy in the November 2020 CAS and compared the results with those from past surveys. As can be seen in **Table A-3**, our estimates are comparable to those of the April 2020 CAS and July 2020 CPS. As a test for the stability of the sample collection, the financial literacy measures remain almost unchanged across the three surveys, which indicates that our survey methodologies are generally consistent. Hence, trends that emerge in these data would most likely be driven by changes in respondent behaviours.

Table A-3: Canadians' financial literacy, by demographic (%)

		CAS, April 2020			CPS, July 2020			CAS, November 2020		
		Low	Medium	High	Low	Medium	High	Low	Medium	High
Overall		20	35	45	21	37	42	20	33	48
Gender	Male	16	31	53	17	29	54	16	29	56
	Female	23	39	37	24	45	31	24	36	40
Age	18–34	32	37	31	31	41	28	32	36	32
	35–54	19	36	44	20	39	40	21	32	47
	55+	11	33	56	13	33	54	10	30	60
Education	High school	27	40	33	27	40	33	28	37	34
	College	17	35	47	18	42	40	17	34	50
	University	11	28	61	13	28	59	10	24	66
Region	British Columbia	16	37	47	16E	41	43	15	30	55
	Prairie provinces	19	38	43	21	38	40	18	33	48
	Ontario	19	35	46	19	36	45	20	31	49
	Quebec	23	33	44	22	37	41	21	35	44
	Atlantic provinces	26	34	41	34	34	32	27	37	36

Note: We use the “Big Three” financial literacy questions from Lusardi and Mitchell (2011), which test respondents’ understanding of compound interest, inflation and diversifying risk. In each year, we compute our score measure as the number of correct answers minus incorrect answers, while assigning a score of zero when respondents selected “don’t know.” Low corresponds to a score of 0, medium corresponds to a score of 1 or 2, and high corresponds to a perfect score of 3. This methodology has been used in Henry, Huynh and Welte (2018) and Henry et al. (2019), in addition to Huynh, Nicholls and Nicholson (2020 and Chen et al. (2020, 2021). E indicates “use with caution.” CAS is the Cash Alternative Survey, and CPS is the Cash Pulse Survey.

For additional discussion of methodological considerations relevant to our survey work, see the appendices in Chen et al. (2020, 2021). In addition to reporting the economic significance of changes over different surveys, we assess the statistical significance of changes following Chen and Shen (2019) by using bootstrap resampling variance: most changes are both economically and statistically significant.