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The Need for Speed: The Benefits of Faster Payments and How to Achieve Them

Canada lags behind peer countries in implementing fast payments for transactions involving consumers, merchants and financial service providers. Consumers would reap substantial rewards from fast payments.

Jeremy M. Kronick and Thorsten Koeppl

About The Authors

Jeremy M. Kronick
is Associate Vice President and Director of the Centre on Financial and Monetary Policy at the C.D. Howe Institute.

Thorsten Koeppl
is Professor of Economics at Queen's University, where he is a Robert McIntosh Fellow and RBC Fellow, and Fellow-in-Residence, C.D. Howe Institute.

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The Need for Speed: The Benefits of Faster Payments and How to Achieve Them

by Jeremy M. Kronick and Thorsten Koeppl

- **In this study, we estimate the efficiency gains associated with the introduction of the Real-Time Rail (RTR), Fast Payment System (FPS) in Canada. In a benchmark scenario, we estimate that these gains will amount to $3.24 billion over the first five years after introduction of the system. These gains will arise mainly from: 1) the displacement of inefficient means of payment such as cheques and, to a certain degree, cash, which will lower the aggregate operational costs of retail payments; and 2) the reduction of float, which arises because of the delay in payments processing, meaning consumers and businesses do not have access to these funds for a certain period of time. These gains should more than offset the additional costs for payment service providers to adjust their systems and connect to the RTR, especially since its infrastructure will be built by leveraging the existing Interac e-transfer system.**
- **The gains increase substantially in an optimistic scenario, where stronger adoption of the RTR by consumers and businesses leads to much larger gains of $7.01 billion over five years. In our pessimistic scenario, where RTR adoption is weaker, the gains are lower, at $1.65 billion. However, RTR will do more than just introduce faster payments and enable data-rich payments. Its introduction will catalyze competition and innovation through new entrants, which will add to efforts already under way by incumbents.**
- **We identify three key ways to accelerate the introduction and adoption of the RTR. First, on the technology side, there have been delays in the introduction of a real-time settlement engine. This is a surprise, given that some countries have been able to quickly implement such a system. Operationalizing the settlement engine must have priority. Second, make it easier to challenge incumbent payment methods by promoting a level playing field among them. The RTR will already challenge income earned by financial institutions on float caught up in the system. To facilitate competition further, we hope RTR will cause merchants to be more transparent with pricing for different payment methods. Absent that, regulators should take a look at regulating interchange fees related to credit card transactions. The outcome of both of these competitive dynamics will redistribute income toward the end users of retail payment systems. Third, the Department of Finance should ensure that the RTR agenda moves ahead with a clear and holistic regulatory approach to retail payment systems. We recently saw a first step in the direction of making the RTR the centrepiece for creating competition and innovation, with the Fall Economic Statement announcing the government's intention of opening up direct access to the retail payment system for new payment service providers and local credit unions.**

Introduction

Imagine sending and receiving payments instantly, twenty-four hours a day, seven days a week, for any amount. Consumers could make payments at the last minute and avoid late fees that arise from bill payments that might have been sent but not received in time. Workers would have access to their paycheques immediately to make purchases. And small businesses could use the funds received instantly to manage their cash flow needs more efficiently.

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Over the past two decades, payment systems have changed rapidly with the advent of new, digital technologies that make it possible to transfer funds instantly and safely between users. For this reason, Payments Canada, which owns and operates Canada's payment clearing and settlement infrastructure, embarked on a wide-ranging modernization initiative in 2016 to fulfil its duty to "promote efficiency, safety and soundness of its clearing and settlement systems."[1] As a first important step, it overhauled its large-value (wholesale) payment system – roughly, large financial institutions transferring funds to other large financial institutions – with the introduction of Lynx and the upgrade of the system to ISO 20022, a global messaging standard that allows for data-rich payments.[2]

On the retail front, some groundwork for reform was laid with the introduction of the *Retail Payments Activities Act* (RPAA) together with regulation setting out the rules payment service providers (PSPs) must follow when holding users' funds and performing other payment functions. In 2016, Payments Canada also initiated and committed to its Real-Time Rail (RTR) project, which will allow consumers and businesses to make data-rich payments at any time, also based on the ISO 20022 messaging standard.

Such Fast Payment Systems (FPSs) have been introduced over the past two decades in many advanced and emerging economies (see CPMI 2021). Just recently, the US Federal Reserve introduced its own FedNow system as a public competitor to the FPS run by The Clearing House. The introduction of the RTR here at home, however, has been repeatedly delayed, leaving Canada as the only G20 country currently without an FPS.

In this *Commentary*, we provide both qualitative and quantitative evidence that there are strong net benefits to consumers, merchants and businesses associated with the introduction of the RTR, implying that Canada is not different from other advanced economies that have already introduced an FPS. Indeed, as a recent Payments Canada report points out, "Almost three in five Canadians (57 percent) report experiencing some form of payment friction in the past six months ... relate[d] to either payment choice constraints ... or limits on transfer amounts" (Payments Canada 2021).

The introduction of the RTR must thus be seen as a crucial catalyst for offering Canadian consumers and businesses the best possible value in making retail payments. The project embodies not only moving to new technologies, but also envisions broader access to the system, whereby new, non-bank PSPs can challenge incumbent financial institutions to develop customer-oriented payment solutions. The *Commentary*, therefore, also needs to address what currently holds Canada back from introducing the RTR and how to ensure the success of the project.

The Current Retail Payments Landscape

Each day, the Canadian economy sees billions of dollars in transactions. In 2022 – the last year for which full data are available – there were a total of 20.5 billion transactions, with a combined value of $11.7 trillion in retail payments (see Figure 1). Retail payments are payments made between consumers and businesses for goods and services, as well as person-to-person (P2P); they exclude payments sent through Lynx, which are typically

1 Payments Canada is a public purpose, non-profit organization, fully funded by its members, including the Bank of Canada, chartered banks, credit union centrals, and other financial institutions. Oversight responsibilities rest with the minister of finance. https://www.payments.ca/about/who-we-are.

2 Some changes were also made for the Automated Funds Transfer system that improved the time horizon when funds become available for payees in the system.

Figure 1: Total Payments, Transaction Volume and Value, Canada, 2022

Sources: Payments Canada (2023).

of higher value and made between financial institutions on their own account or for their customers. In Canada, retail payment methods comprise cash, cheques, card payments, and a variety of payments through electronic systems such as the Interac system and the Automated Clearing Settlement System (ACSS). The vast majority of retail payments are processed on the ACSS, a system that relies on deferred net settlement, meaning that transactions are not settled individually and immediately, but are offset against other transactions and settled with delay, usually at the end of the next business day. As a result, payees incur delays and uncertainty in receiving payments, and payors must initiate payments before actual deadlines.

Canada does not differ from other advanced economies when it comes to general trends in retail payments. The rise of the digital economy, the arrival of new financial technology and changes brought forward by the pandemic have accelerated the shift away from traditional forms of payments – such as cash and cheques – to electronic forms.

Six broad findings from the 2022 data detail how Canadians use retail payment systems, which will have ramifications for the introduction of a real-time payment system.

1) The main volume of retail transactions is through credit and debit cards (64 percent) and Electronic Funds Transfers (EFTs), which include direct deposit and online bill payments (15 percent).
2) The use of cash and cheques has declined precipitously over the past five years, to the benefit of direct, electronic or card-based payments.
3) Overall transaction values are dominated by EFTs (59 percent) followed by cheques (28 percent), the latter being driven by the commercial side.
4) The average values of cheque payments ($7,932) and EFT payments ($2,235) significantly exceeds cash ($29) and credit and debit card transactions ($99 and $46, respectively).
5) Consumers tend to pay recurring utility bills and financial payments through both online banking and pre-authorized debit, while personal cheques are mainly used for rent and home services (see Figure A2).

6) Digital and personal services are mainly paid for by credit cards, while point-of-sale transactions are equally often made with debit and credit cards, with the latter being used for larger value transactions (see Figure A2).

The dominance of EFT and cheque payments for larger values is driven mainly by businesses. Recurring payments and payments to suppliers tend to be larger payments, and are common practice for many small and medium-sized enterprises (SMEs). Such payments are fairly rare for individuals. Still, many people have switched out of cash and cheques to electronic transfers for recurring bill payments and P2P small-value transactions. Individuals use cheques, including certified cheques, mainly for larger payments related to paying rent, paying general contractors or paying for larger purchases. The reason might be limits on the total value per transaction per day/per week for e-transfer payments.

On the supply side of retail payments, the Fall Economic Statement released by the federal government recently announced it is looking to change the *Canadian Payments Act* to expand eligibility for membership in Payments Canada beyond (largely) chartered banks and credit union centrals. This broadening will include non-bank PSPs supervised by the Bank of Canada, as well as credit union locals that are members of a credit union central, and, lastly, operators of designated clearing houses. At present, access to payments rails is through a commercial arrangement with direct participants, such as the major Canadian banks.[3] Similarly, provincially regulated credit unions must access Payments Canada systems through credit union centrals. Payments Canada, however, has started a process of modernization, both in terms of the infrastructure for initiating and receiving payments as well as the standards used for payment messaging.

Furthermore, under the RPAA, the Bank of Canada will be charged with supervising all PSPs that perform a payment function as defined in the Act. Participants in the payment system will have to be registered with the Bank, satisfy requirements such as a sound operational risk-management framework, share annual reports on fraud incidents and end-user protection with the Bank and meet Payments Canada's future membership and system participation requirements.[4]

Against this backdrop, a major step in supporting the trend toward electronic payments services and promoting better payment choices for consumers and businesses is the introduction of the RTR. As it is a new payment system, it is appropriate first to ask what benefits real-time payments will bring to the Canadian economy, and whether a rudimentary cost-benefit analysis could justify its introduction.

The Benefits of the RTR

The Real-Time Rail project is Payments Canada's effort to move Canada's retail payments landscape toward "faster payments." The Committee on Payments and Market Infrastructures (CPMI) of the Bank for International Settlements offers the following definition (CPMI 2016): "…fast payments can be defined as payments in which the transmission of the payment message and the availability of final funds to the payee occur in real time or near-real time and on as near to a 24-hour and 7-day (24/7) basis as possible."

3 An exception is Wealthsimple, which has become a direct member of Payments Canada in its role as a securities dealer.

4 The Bank of Canada is already in charge of supervising financial market infrastructure such as payments, clearing and settlement systems in terms of their systemic and payments risks. As such, the Bank oversees Interac's e-transfer system. To the extent that the RTR will involve systemic risk in the area of payments, it is likely to be designated by the minister of finance to fall under the Bank's oversight in line with the *Payments Clearing and Settlement Act*.

The core of so-called real-time payments is thus built mainly on the immediate availability of funds received and round-the-clock ability to receive funds. Payments Canada, however, has used the concept of real-time payments in the broader context of offering Canadian consumers and businesses additional features:

1) Real-time payments clear and settle immediately. This means that payments are irrevocable and cannot be recalled, which ensures "immediate finality" like cash.
2) Immediate confirmation of funds transfer and settlement gives payees certainty about having received the funds.
3) Payments are directly made account-to-account in a secure manner.
4) Additional messaging standards – in particular the so-called ISO 20022 standard – give the possibility for data-rich payments. Use of the ISO 20022 message standard allows for more data about the payment to travel with the payment, facilitating reconciliation of payment records.
5) A broader range of participants including non-bank PSPs gain direct access to retail payments, giving Canadian consumers and businesses a broader set of payment solutions to choose from.

Accordingly, one can view building the RTR as a catalyst in modernizing the Canadian retail payments landscape and bringing it in line with other real-time payments architecture found in many advanced economies. Without doubt, the introduction of real-time payments will affect how Canadians pay for goods and services. Funds will move faster between payors and payees, with funds being exchanged and settled within seconds (see Figure 2). There will be substitutions across different payment types as users switch into faster payments from other payment technologies. And increased competition among existing and new PSPs will offer better payment products and services for consumers and businesses alike. Last, but not least, international efforts are under way to integrate an FPS across different countries to make cross-border payments less difficult and costly (see CPMI 2023).

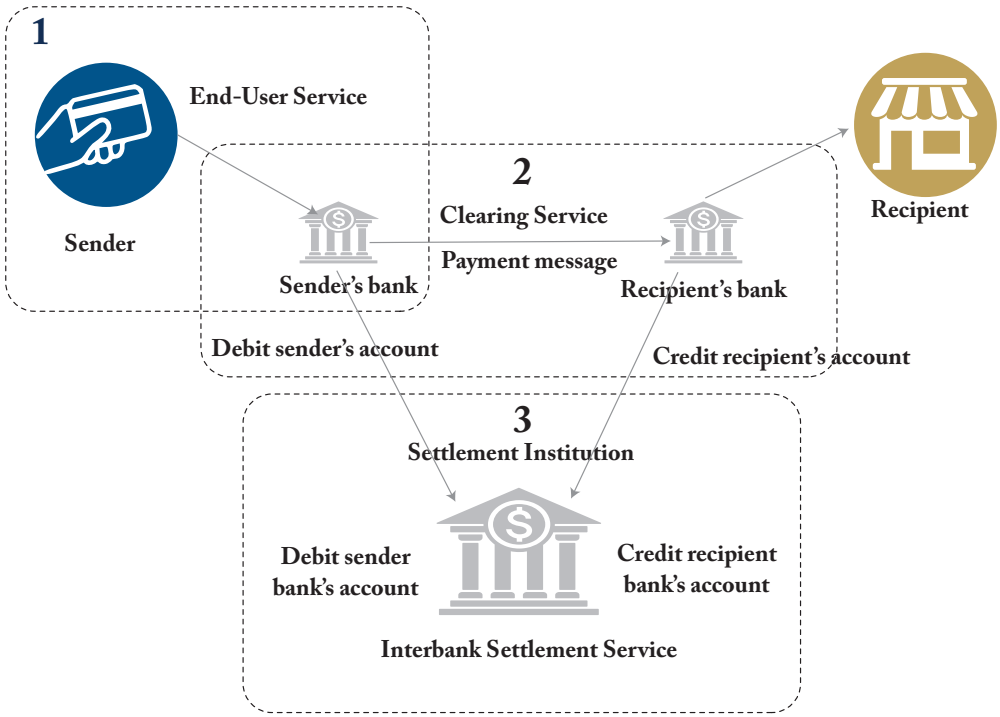
Building the system will be costly for participants. The necessary infrastructure needs to be created, which is a one-time set-up cost for the entire system. And individual institutions that are participants in the RTR will have to connect to the system. Thus, these costs will be borne individually by the financial institutions moving to the new system and by new PSPs joining the system. Most likely, these costs will be passed on directly to the end users of the system and amortized over time.

Payments Canada has already announced that the RTR will include two main components. One is the settlement functionality, which is still under development (see Step 3 in Figure 2). For the other, Interac will draw on its experience with the Canadian e-transfer system to build the RTR Exchange, which will use the payment messaging system using ISO 20022 (see Step 2 in Figure 2). The final component – how end users connect to the system – will have to be provided by financial institutions and by specialized PSPs that can connect directly to the system or through a connection service provider (see Step 1 in Figure 2).

What is the economic calculus for moving to real-time payments in Canada? Here, we focus primarily on the efficiency gains from introducing the RTR relative to the existing retail payment systems. To do so, we first describe in a qualitative way how consumers and businesses likely will benefit from that introduction.[5] We then turn to a back-of-the-envelope quantitative assessment of some of the efficiency gains.

5 See the Payments Canada website at https://payments.ca/systems-services/payment-systems/real-time-rail-payment-system. This site includes how, beyond consumers and businesses, financial institutions, payment services providers, developers and government also will benefit from the introduction of the RTR.

Figure 2: The Payment Process



Source: Authors, based on original figure from Federal Register (2018).

The RTR will be a new payment system alongside other payment systems. Hence, as consumers and businesses adopt the RTR, it will compete with existing systems (see Kosse, Lu, and Xerri 2020). Their decision to switch will depend on the payment methods and features that other retail payment systems offer relative to those of the RTR.[6] Hence, the type of transaction – whether it involves consumers or businesses or both – also might matter for adoption. We therefore distinguish in the qualitative description the main potential efficiency gains for different transaction types.[7]

Starting with person-to-person transactions of smaller values, the RTR will offer an alternative to cash and cheques. The benefits will arise mainly from the increased convenience of direct account-to-account transfers, especially when both the payor and the payee are present during the transaction. Efficiency gains could also be realized in the existing e-transfer system, which operates on a

6 We do not look here at possible migration from the large-value, real-time gross settlement system Lynx to the RTR, as such payments are broadly classified as large-value wholesale payments mainly associated with financial market transactions and transactions involving assets. Notwithstanding, some smaller payments in Lynx might migrate to the RTR, since the latter system also will offer real-time settlement, but might be either more convenient or cheaper to use for certain payments.

7 By offering data-rich payments and straightforward reconciliation, the RTR will also likely be used as the dominant system for making payments to and receiving payments from government entities.

near-real-time basis,[8] but some additional value will arise from having a payment confirmed in real time with certainty that the payment is indeed final and cannot be reversed.[9] It is difficult, however, to quantify this value.

In terms of person-to-business payments, it is necessary to distinguish between different payment methods. For recurring bill payments, the effect again is likely to be minor, since existing payment methods offer enough functionality for consumers. To the extent that businesses receive payments faster, however, the gains could be larger.

For one-time payments, the RTR's 24/7 real-time settlement might offer significant benefits to both consumers and businesses over the use of other electronic or cheque payments. For example, consumers will be able to push payments for large purchases round the clock, not having to wait for certification of funds for the purchase during their financial institution's business hours. Also, processing time for such payments can be several business days. Hence, with real-time payments, consumers will be able to time their payments better. This will free up funds for other uses in the short term and help to avoid late fees when using the RTR. For payments to small businesses, restrictions on the use and size of e-transfers limit people's ability to make medium-sized payments other than through cheques. Hence, the RTR's higher limits for transactions likely will lead to further substitution away from cheques and wire payments through financial institutions that are expensive to process and settle.[10]

For business-to-business payments, the key benefit of the RTR is that payments will be exchanged and settled in mere seconds. The main payment methods businesses currently use are cheques and EFTs.[11] These settle only with a delay of possibly several business days, making the funds not immediately available to the payee once the payer has initiated a payment. Removing the costs of float associated with delay through real-time settlement will have the advantage for both the payer and the payee of reducing liquidity needs.[12] Businesses will need less cash on hand, which will reduce their costs, freeing up funds for investment and making cash management easier. Also, faster payments could lead to faster movement of goods, again leading to productivity enhancements. (See Box 1 for more on the economics of float.)

Taking a broader perspective, the RTR will offer other benefits for retail payments. First, there is the potential for broader membership in the system. With broader access, the RTR is likely to offer consumers and businesses more choice. This will increase competition and support the introduction of enhanced and new payments solutions for end users. Second, the introduction of ISO 20022 will allow for richer payments information and make reconciliation of payments easier – firms will have to spend less resources when tracking their orders and billing within their systems. Similarly, consumers will have an easier time keeping track of their spending, and payment initiation can be facilitated through increased functionality, whereby payees can push payments (i.e., authorize payment)

8 Interac's e-transfer system is available 24/7, but with a delay before funds are available to the recipient of a transfer, depending on the financial institution. Also, settlement of payments typically occurs with a delay of up to one business day.

9 Note that finality means that the original payment cannot be reversed. The underlying transaction can still be reversed, albeit with the requirement of initiating a new, offsetting payment.

10 Notwithstanding where this limit ends up, it will need to be passed on by PSPs to end users and might be reduced due to concerns about fraud risk.

11 Another effort by Payments Canada aims at reducing settlement times for such instruments by reforming the existing ACSS settlement system, upgrading the deferred-net-settlement through a batch system to end-of-day functionality.

12 Interac recently introduced e-transfer for businesses with near-real-time settlement and a limit of $25,000 per transaction.

Box 1: Key Concept Explainer

Where Float Is Not Zero Sum

Not all benefits for consumers and businesses are net efficiency gains. The most important example is "float." Payments offer opportunities for intermediaries to create "float" by debiting the payer for the funds to be paid immediately, while delaying crediting the payee for the funds.

As Greene et al. (2014) point out, float has three different effects on the economy (from Deloitte 2019, pg. 32):

- "the interest costs to the consumers between the time funds are credited to the receiver's account and the settlement time;
- interest gains to the financial institutions from holding the funds until settlement time; and
- the costs arising from a delay in the time when a payment has been processed."

The first two effects of float are roughly zero sum from an economy-wide perspective – a redistribution of gains related to interest costs. The intermediary is able to invest the funds short term, while the payer and the payee bear the opportunity costs of not receiving interest and the costs of needing to finance any liquidity shortfall.

Net efficiency gains from removing float arise only to the extent that these costs for the payer and payee outweigh the gains made by the intermediary, which are part of what we describe as "delay costs." The sum of the real returns on investing idle funds and the financial costs of financing for businesses and consumers (the third effect) is likely to exceed the short-term interest gains by the intermediary. Moreover, reducing float also might free up working capital, as cash flow is less subject to frictions. Hence, businesses and consumers might face lower operational costs, ultimately leading to additional gains in economic activity and productivity.

easily when necessary. Third, immediate finality of real-time payments will reduce the risk of payment cancellations, thus increasing certainty for businesses and individuals alike.[13]

Using the RTR, however, could also come with additional costs and risks. First, participants – incumbent financial institutions and other PSPs – will need to prefund positions in the RTR, rather than settling transactions through a batch or other deferred net settlement system such as the ACSS, which might increase the costs of providing payment services to consumers. Second, as payments move to the RTR, both fraud risk and cyber risk could increase – with real-time exchange and settlement, there will be less time to detect fraudulent activities associated with payments.[14] Stronger authentication schemes and better monitoring will be required, which could increase the costs of instant payment services. The issue of fraud could be exacerbated when smaller, alternative PSPs process payments directly in the RTR. Such institutions could face higher costs in implementing

13 Other potential benefits include financial inclusion and improving the efficiency of government-to-person transfers.
14 For a more detailed discussion of this issue, see Payments Canada (2023).

proper risk controls and have less experience with fraud prevention than is the case for traditional financial institutions. Such concerns could be addressed, however, by new technological solutions (see, for example, the United Kingdom's experience with the FPS) and by tweaks to regulatory requirements and supervision of PSPs that engage in transactions on the RTR.

Unfortunately, these benefits and costs are notoriously hard to quantify without further theoretical modelling of payment choices, which is beyond the scope of this *Commentary*. It is possible, however, to give a rough calculation of the immediate cost savings that would accrue from lower processing costs and faster settlement through the RTR. The idea here is to use cost estimates for traditional payments and projected changes in payments behaviour to arrive at a rough figure for cost savings that could proxy for the efficiency gains. Since we cannot go beyond these efficiency gains to quantify the broader benefits of the RTR, we believe our estimates of the overall benefits from the introduction of real-time payments in Canada are conservative.

Quantifying the Implementation of the RTR

We base our estimates of the efficiency gains from the implementation of the RTR on the following considerations. First, we require an estimate for the adoption of RTR payments by consumers and businesses over time. Second, we also need to estimate how the adoption will affect the use of other payment methods. Given these changes in payments behaviour, we can compute the differences in the overall costs of making payments through the RTR and other methods, based on the estimated cost functions for the different methods of payment. We rely here on the payments literature rather than carrying out our own estimates for these cost functions and the displacement of other payment methods when real-time payments are introduced.

We can also estimate the cost savings for consumers and businesses that arise from faster payments and the resulting minimization of float in the system. Here, we use payment values to calculate how much of the delay costs arising from float will be saved when users adopt real-time payments according to our benchmark scenario.[15]

The results from our benchmark scenario give a good indication of the efficiency gains associated with the introduction of the RTR. We can then compare these gains with the projected investment costs of building the system to give an overall net gain from faster retail payments. Notwithstanding, the overall benefits from the RTR are likely higher, since we do not calculate all the knock-on effects arising from these efficiency gains.[16]

Our estimates, therefore, should be understood as a rough baseline or benchmark for discussing the benefits of real-time payments in the Canadian economy. To add more credibility to our estimate, we also compute two other scenarios for adoption – an optimistic one and a pessimistic one – that show a reasonable range for the effect of the RTR.[17]

We make several additional assumptions for our calculations. First, we assume that there is no substitution between card-based transactions and RTR payments. There is little evidence on how much real-time payments have led to the displacement of card-based transactions (see Deloitte 2019). Also, it is not yet clear to what extent participants in the RTR will develop payment services that allow for merchant payments, either online or at the point-of-sale. We return to this issue later.

15 Appendix B provides a detailed description for the sources of information used in the calculations.
16 We also note the potential for migration from retail wires currently on Lynx, but these are excluded from this calculation.
17 Appendix C provides the detailed calculations for each scenario.

Second, we rely on a five-year horizon for our calculations, and project that both the volume and value of payments grow each year. The growth rate is derived as the observed change from 2021 to 2022 for each payment instrument separately.[18]

Third, following Kosse et al. (2017) and European Central Bank (2022), we look at the total operational costs arising from payments. These costs capture *all* resources that are used in providing payment services, and thus reflect the costs to society from the payment service. Importantly, this includes all costs that occur from the central processing and settlement of payments to running internal systems at PSPs and providing access to the system for end users. It does not, however, include the margins PSPs charge their customers.[19] These are payments from the end user to the PSP and are not part of our calculations, which focus on efficiency gains.

Fourth, we look only at changes by payment type based on overall volumes and do not distinguish between changes in the distribution of payment methods based on transaction size (see Kosse et al. 2017). This implies that we also assume there will be no stringent restrictions on the size of RTR transactions, so that, for example, cheque payments of larger values can migrate to real-time payments seamlessly (see Appendix B).

Adoption of RTR Payments

Adoption of real-time payments depends on a variety of factors. Among these are the size of the economy, the degree of digital commerce in the economy and the usage of legacy payment systems.[20] The United Kingdom has many similarities to Canada in these respects, and we rely on its experience from the introduction of the Faster Payments Service (FPS) in 2008 to project how the adoption of real-time payments might take place here in Canada. In the United Kingdom, FPS payments grew linearly to about 12 payments per capita per year over a five-year period.[21]

A key difference for Canada is that the currently operating e-transfer system will continue to exist but will use the RTR to clear and settle payments. For users of e-transfers, there will be no apparent change when sending payments through the RTR. We therefore assume that the current volume of e-transfers of roughly 1 billion transactions per year simply migrates to the RTR upon launch, but then assume only a growth of two transactions per capita each year (including year one) for our five-year horizon, bringing the total additional growth in the RTR to ten transactions per capita. This implies that, over the five-year horizon, the annual volume of RTR transactions, including the e-transfer migration, will grow to about 1.67 billion transactions, which is a very conservative projection.

As a second step, we need to take a stance on how RTR transactions will replace other payment methods. Deloitte (2019), in a study of countries that have implemented some form of real-time payments, estimates that the rate of displacement per RTR transaction is –0.57 for cheques and –0.38

18 Note that to obtain the growth rate from 2021 to 2022, we use data from Payments Canada (2023). We also acknowledge that the longer we extend the horizon for analysis, the more opportunities there are for more significant efficiency gains (in the instance where gains grow over time). Given how much things can change in five years, however, we believe that horizon is appropriate.

19 This also explains why we cannot rely on pricing data for payment services, but need to resort to estimated cost functions.

20 The study by Deloitte (2019) attempts to estimate the adoption of real-time payments in a cross-country regression using such proxies. The results, however, show little significance after accounting for country-fixed effects. There is also a strong indication that the estimation is misspecified.

21 Fitzgerald and Rush (2020) also document similar adoption paths for countries such as Australia, Sweden and Denmark; see also survey evidence in CPMI (2021).

Table 1: Volume Displaced by Real-Time Rail, by Type of Transaction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5
	percent				
Cash	1.9	3.7	5.5	7.1	8.8
Cheque	11.2	22.0	32.4	42.4	52.1
Electronic Funds Transfer	1.0	1.9	2.8	3.7	4.5

Source: Authors' calculations.

for credit transfers, which we apply to all EFT payments.[22] For cash transactions, the estimates are inconclusive, but the Deloitte study settles on a displacement rate of –0.5, which we assume as well.

As mentioned before, we use the growth rate from 2021 to 2022 to project how the volume of different payment methods would evolve in a scenario without the RTR. After accounting for the displacement of transactions by the RTR, we can then calculate the difference in usage across the two scenarios for different payment methods. For cash, the RTR displaces about 8.8 percent of transactions in the last year of our five-year period, while the displacement rates for cheques and EFTs are 52.1 percent and 4.5 percent, respectively (see Table 1).

Costs per Payment Instrument

Deloitte (2019) reports unit cost functions for cash, cheque and credit transfer transactions. The cost functions are decreasing and convex in the number of annual transactions per capita, so that all three payment instruments exhibit scale economies. Since these functions are fitted to reported cost estimates in seminal contributions to the payments literature, we borrow these functions directly for projecting our cost savings from introducing the RTR.

One issue here is that we do not have a cost function for RTR payments or even a projection of costs per transaction. We start as a baseline with the cost function for EFT transactions given likely similarities between electronic batch-like settlement and electronic real-time processing. However, as a result of needing to do gross settlement in real time, we assume that the fixed costs portion of operating the RTR will be more expensive by about 50 percent. Also, the RTR will operate at a much smaller scale than the existing EFT system. Finally, unit costs are in terms of payment volume, not value, with average payment values varying greatly across these methods. As a consequence, the realized unit costs per payment differ greatly across the two payment methods, with RTR payments being more costly.[23]

22 EFTs mainly include credit transfers where the payor pushes a payment onto the payee's account and direct debit where the payee pulls funds from the payor's account.

23 Importantly, our calculations reveal that the overall costs for retail payments in EFT, cheque, cash and online payments amount to about 0.1 percent of the value of total payments. This is roughly in line with the magnitude reported by a survey article for retail payments costs in Europe (see European Central Bank 2022).

Table 2: Cost Savings from the Introduction of Real-Time Rail, by Type of Transaction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5
	$millions				
Cash	44.9	89.4	133.6	177.5	221.0
Cheque	139.3	281.7	427.1	575.5	726.7
Electronic Funds Transfer	6.6	13.0	19.1	24.9	30.5
Real-Time Rail	–52.6	–99.0	–140.2	–176.7	–209.2
Total	138.3	285.1	439.6	601.1	769.0
Total after 5 Years					2,233.2

Source: Authors' calculations.

Our calculations then reveal that the unit costs for legacy payments do not change much with the introduction of the RTR. The costs of the RTR, however, tend to fall with further adoption. Also, we arrive at relatively large unit costs for RTR payments, which might proxy for the fact that RTR payments are costly in terms of liquidity requirements that are not present with deferred net settlement, which is the case with EFTs that settle in batches throughout the following business day.

The main cost savings from introducing the RTR arise from consumers and businesses substituting away from cheques (recall that this is displacement above and beyond what would have happened without the RTR). In the first year of introduction, based on our calculation, cost savings total $138 million (Table 2). By year five, the cost savings reach around $769 million, driven by cheque substitution. Overall, introducing the RTR reduces operational costs over a five-year period by about $2.23 billion.

Delay Costs Associated with Float

The second efficiency gain arises from the reduction of settlement times. Float, when payees cannot use funds immediately, is associated with delay costs. To quantify the effect of the RTR, we need first to determine the magnitude of float that would be displaced by real-time payments.

EFTs and cheques include delays. Settlement usually takes between one and three business days, but can be as long as seven business days for certain cheques. We assume here that it takes two calendar days on average for EFTs to be available for the payee and four calendar days for cheques. Note that we do not distinguish between personal and business cheques, which tend to have different settlement delays.

We assume that average transaction values increase by 2 percent annually in line with the Bank of Canada's inflation target. Hence, aggregate transaction values, which include the year-over-year increase in volume, increase by more than

Table 3: Total Float Value Caught in the System With and Without Real-Time Rail, by Type of Transaction

Type of Transaction	No Real-Time Rail				
	Year 1 Float Value	Year 2 Float Value	Year 3 Float Value	Year 4 Float Value	Year 5 Float Value
	$millions				
Cheque	521.3	541.9	563.3	585.6	608.7
Electronic Funds Transfer	551.4	573.2	595.9	619.4	643.9
	Real-Time Rail				
Cheque	462.7	422.4	380.6	337.0	291.8
Electronic Funds Transfer	546.0	562.2	579.1	596.6	614.8

Source: Authors' calculations.

2 percent in the base scenario where the RTR is not introduced. Note that the average transaction size for cheques is very large, at more than $8,000, compared with around $2,000 for credit transfers.

Our calculations reveal that, currently, each calendar day around $9 billion is caught in float in the Canadian economy just through cheque processing. For EFTs, the amount is close to $19 billion. To calculate the delay costs, we first apply a factor that represents how many days the funds are unavailable (two and four days for EFTs and cheques). To capture the overall delay costs, we then apply the spread of Banker's Acceptances over the three-month T-Bill rate, which proxies for the extra costs of financing for large corporations (over federal government debt). We adjust this rate by one percentage point to take into account that funding costs are larger for SMEs and consumers. The gains from reducing float sum to roughly $1.01 billion over the five-year horizon, with more that 92 percent coming from the reduced number of cheques used (Table 4, based on the differences between the two scenarios in Table 3).

Discussion of Results

Our baseline calculations reveal total efficiency gains of $3.24 billion over a five-year horizon (Table 2 and Table 4 results combined). Since point estimates are hard to interpret and often biased by particular assumptions, we also look at two alternative scenarios that we label "optimistic" and "pessimistic" (see Appendix C). The optimistic scenario assumes a faster adoption of the RTR, a larger spread for SMEs and consumers, and longer delays for certain non-RTR payments. The pessimistic scenario assumes the opposite. This gives us an overall range of $1.65–$7.01 billion.

These efficiency gains must be offset by the costs of introducing the system. Again looking at the UK system, the costs were estimated to be less than £50 million (Greene et al. 2015). It is reasonable to expect that the costs of building the RTR will be in the same ballpark or perhaps lower. There might be even cheaper ways to build such a system, judging from the experience in Brazil, where a real-time retail system was implemented at a fraction of the

Table 4: Total Float Value Reduction from Introduction of the Real-Time Rail, by Type of Transaction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5	Total Reduction
	$millions					
Cheque	58.5	119.4	182.7	248.5	316.9	926.1
Electronic Funds Transfer	5.4	11.0	16.8	22.8	29.1	85.0
Total Float Value Reduction	**63.9**	**130.4**	**199.5**	**271.3**	**345.9**	**1,011.1**

Source: Authors' calculations.

costs reported for the UK system. Additional costs will arise when PSPs connect to the system and offer services to consumers. Since the exchange component of the new RTR leverages the e-transfer system, we expect the additional upfront costs for PSPs to offer RTR payments to its end users to be rather small. Hence, even at the lower range of our estimate, the benefits will outweigh the set-up costs plus any costs incurred by direct participants of Payments Canada to offer the RTR, which will be passed on to end users.

From a long-run perspective, our calculations clearly imply that the costs of operating the RTR will fall significantly with take-up due to economies of scale. These cost reductions will bring the costs of operating the RTR closer to those for making EFTs in the current system. Hence, we expect that lower system costs and further gains from reducing float will lead to long-run gains in the payment system. Furthermore, as discussed earlier, we expect long-lasting net benefits for the Canadian economy, since additional dynamic benefits, such as increased competition and innovation, will go beyond the mere cost-reduction calculation we have carried out here. Therefore, introducing the RTR from an efficiency perspective will be a clear benefit.

Overall, we can summarize our findings as follows:

1. The efficiency gains from the RTR are very likely to justify the initial investment and additional operating costs.
2. The immediate gains will come from lower operational costs from the displacement of cheques, as well as a significant reduction in delay costs associated with float.
3. Operating costs initially will be higher than the costs of EFTs in the Automated Clearing Settlement System, but will fall over time as adoption of RTR payments increases.
4. An open access, more competitive retail payment system is essential for the adoption of the RTR, and will lead to long-run efficiency gains in the retail payments ecosystem.

Accelerating the Launch of the RTR

With the RTR offering clear benefits to the Canadian economy, why has it not yet been introduced? After all, there has been a commitment to provide instant payments to Canadians for some time. We argue that there are two key related impediments: a delay in operationalizing

the technology, and unhelpful incentives for stakeholders in the payments system.

Regarding the first impediment, the initial project split the infrastructure and settlement part between Interac and Vocalink. The Interac part was built on the backbone of the existing e-transfer system. Vocalink has been involved in some prominent solutions on the settlement side, including the RTP service offered by The Clearing House and the FPS in the United Kingdom. The lack of implementation is surprising to us, as many countries were able to establish real-time settlement for retail payments much faster than we are doing here.

On the second impediment, incumbent PSPs are not incentivized to push for the introduction of the RTR. As we saw earlier, income earned by financial institutions on the float caught in the system can be very large. We calculate that approximately $30 billion is caught up in float every day in the Canadian payment system for an average of about two-and-a-half days. At an annual interest rate of 5 percent, a quick calculation shows that such float could amount to a revenue of $3.75 billion annually for financial institutions. With the introduction of the RTR, this income from float will be largely redistributed to consumers and small businesses once they route their payments through the new system.

Similarly, other revenue sources for incumbents could be eroded with the introduction of additional competition in retail payments. One source is charges for EFT transactions and other services such as certified cheques or wire transfers. Another is revenue earned from interchange fees linked to (particularly credit) card transactions, especially once the RTR starts to compete for point-of-sale and online transactions. A third source is new innovative products that might allow end users to earn close-to-market interest on funds that currently sit idle on accounts used for payments.

How to Ensure the RTR Becomes a Success

We have argued from both a qualitative and a quantitative perspective that introducing the RTR will lead to efficiency gains and further benefits for Canada's payment systems and the economy as a whole, but also that adverse developments have delayed its introduction. How can the RTR move forward and implement real-time payments in a way that maximizes these gains and benefits and gives it the best chance to succeed in terms of welfare of the end user? There are three dimensions to look at: technology, economics and regulation.

Technology

The immediate issue with technology is finishing the implementation of the settlement engine for the RTR. The technology to do so is readily available, with private and public providers developing key components such as fraud protection and liquidity management services. It is not clear to us what features of the Canadian payment system would make implementing existing, albeit somewhat tailored, solutions difficult. If the difficulty arises from integrating the exchange part offered by Interac with a third-party-provided settlement engine, building a single, integrated system should be considered. We believe we are close at present, and want to see the settlement design operationalized to avoid falling further behind peer countries at a time when the discussion has already shifted to connecting fast payment services internationally (CPMI 2023). It is imperative that all stakeholders under the leadership of Payments Canada get together in a transparent manner and finalize remaining issues and launch the project in the first half of 2024.

The RTR project builds the central infrastructure, but leaves the technological development of how end users connect to the

system to participants of the RTR. This is a reasonable approach, as such entities have more expertise in providing innovative, cheaper and value-adding approaches to retail payments. A key step for success here is to ensure that the RTR's infrastructure is flexible enough to allow for applications that enable real-time payments for merchant transactions. Examples of fast merchant payments are already in place in other jurisdictions, such as Brazil and China, where phone-based and QR code payments are commonplace. It is our understanding that the RTR will not include such functionality initially, but that other capabilities, e.g., request-to-pay – where a payee sends a request through a banking or other PSP's app to a payer – will be considered, and assessed collaboratively with the industry, and, indeed, should be encouraged.

The infrastructure for the RTR should also allow for openness. The key issue is the ease with which PSPs will be able to connect to the messaging and settlement system and integrate it in broader financial applications. After all, we envision that new players and incumbents will compete to provide innovative payments solutions for the end user. [24] In particular, integration of payments with open banking – where consumers are in control of sharing their data with financial institutions[25] – will determine the dynamic impact of the RTR on financial services more broadly. The RTR could form a key component in the federal government's agenda for open banking.[26]

Economics

The success of the RTR will depend on how well it can compete on a level playing field against other retail payment systems. There are two main considerations here: bill payments and merchant payments.

For bill payments, the RTR will be the ACSS's main competitor in processing EFTs in a batch system, and will pressure the ACSS to reduce operating costs further and to speed up settlement to end-of-day for all EFTs. As we have discussed, the RTR has its advantages in reducing float for businesses, thus freeing up cash for working capital investments. However, deferred net settlement – as is currently the case under the ACSS – does not require the prefunding of positions, as the RTR will, since it is settled in real time. Therefore, costs may differ for participants between EFTs and RTR. Depending on the preferences, end users might, therefore, prefer one over the other.

The RTR has to ensure that certain parameters are set correctly to offer the best choices for users and to exert the most competitive pressure. The two most important ones, fraud mitigation and a fairly high transaction limit, go hand-in-hand. Once effective fraud mitigation is in place, however, larger transaction sizes could be allowed without compromising user protection.

An important step here is that PSPs that provide access to the system could pass on the higher transaction limits to their customers. The RTR plans to have significantly larger transaction limits than those that exist under e-transfers today, addressing consumer and commercial use cases. It is also in line with the United Kingdom's FPS system, which has raised its limit to £250,000, and the recently introduced US FedNow system, which has set an initial limit of US$500,000. High transaction limits will foster adoption of the RTR by consumers and businesses alike, increasing its scale and lowering its costs as a payment instrument.

24 For the types of innovation coming out from incumbents, see Canadian Bankers Association (2023).

25 See Koeppl and Kronick (2020) for more.

26 In the Fall Economic Statement, the federal government announced that it will introduce legislation in Budget 2024 to establish an open banking framework that would regulate access to financial data.

Box 2: Interchange Fees and Two-sided Markets

Card payments operate in what is called a two-sided market. On the one side, merchants have to offer acceptance of cards through acquiring banks, i.e., financial institutions that accept and process card transactions on behalf of merchants; on the other side, consumers need to request payments through a card provided by an issuing bank. Hence, for such markets, the fee structure imposed on both sides, the merchant and the customer, matters for adoption and usage.

Besides some basic fees levied by networks such as Visa and Mastercard, the main charges for using cards are interchange fees. Specifically, the card-issuing bank charges the merchant's acquiring bank a fee for pulling funds from a cardholder's account, with the acquiring bank passing on the costs to the merchant. Especially when using credit cards, consumers often receive rewards they value, implying a strong preference for this payment type. Merchants then have little choice but to accept credit card payments even though fees associated with such payments exceed other payment methods such as debit card transactions or EFT payments.

There is considerable pass-through of fees to consumers via higher prices by merchants, which make consumers collectively pay for the use of credit cards. Merchants can surcharge consumers (except in Quebec) for the use of credit cards, but it is not common practice,* making the costs of using credit cards not transparent to individual consumers. As interchange fees paid often exceed rewards given to consumers, ultimately either consumers or merchants bear the extra costs, allowing the acquiring and issuing banks to earn high net revenue after reward payments from credit card transactions (see Felt, Hayashi, Stavins, and Welte 2023 as an example).

* See, for example, Angus Reid Institute (2022), which reports a strong tendency for consumers to switch to non-surcharging competitors.

Once again, this underscores the importance from the technology side of having well-developed fraud mitigation tools in place.

A key unknown for the RTR is to what degree PSPs will introduce payment solutions for merchant payments that encompass both sales in physical stores and online purchases. Currently, this payment segment is heavily dominated by debit and credit card transactions. This is due to a pricing structure based on interchange fees that incentivizes consumers to use cards – especially credit cards – but often at the expense of higher overall costs on the items being purchased (see BOX 2).[27]

Without doubt, credit cards offer value to consumers, as they provide access to credit, additional features such as insurance and the possibility of easily reversing transactions. The pricing structure, however, often does not make their true costs transparent to users. In the aggregate, the rewards received on credit cards then

27 Felt, Hayashi, Stavins, and Welte (2023) provide an estimate for the net costs of using credit cards in Canada for PoS retail transactions. Assuming a pass-through of 90 percent by merchants, they estimate the costs net of rewards to be about $120 a year per credit card holder. This estimate, however, excludes additional benefits of credit cards such as the ease of reversing transactions and insurance for certain purchases.

do not compensate fully for the interchange fees that are passed on by merchants to their customers through higher prices.[28] As consumers do not see the costs associated with using their cards, but only the rewards, they have a strong preference for using them.[29]

As a result, in many other advanced economies, interchange fees (and sometimes also the rewards that can be offered) have been regulated, leading to much lower use of credit cards. In Australia, for example, credit card interchange fees are capped at 0.8 percent. The United Kingdom and some EU countries cap interchange fees at only 0.3 percent of the transaction value. As a consequence, credit cards in those countries also offer few rewards, leading to much lower usage as a payment method.

For the RTR to serve its full role as a catalyst for increased competition in retail payments, regulators could level the playing field with card payments for point-of-sale transactions. The weighted average of interchange fees has been capped for in-person Visa and Mastercard transactions at 0.95 percent for small merchants. The rationale for this measure, however, was to relieve costs for such merchants, not to address level playing field concerns in the choice of payment method. Hence, this regulation will mainly benefit merchants, but will do little to expose consumers to a transparent cost-benefit analysis of credit card payments.

The introduction of the RTR itself may not induce consumers to take full advantage of it, given the incentives to use credit cards. Hence it may also limit its use by merchants, unless they price differentiate between payment methods. They might, as RTR gains a foothold in the market, but without such transparency on pricing, the Department of Finance should take a look at regulating interchange fees more generally with the goal of breaking up the pricing structure that seemingly rewards consumers for using their cards while ultimately leading them to pay higher prices. Once consumers are able to make informed payment choices, PSPs will see the chance of leveraging the RTR to enable new, instant payment methods for merchants. Merchants clearly prefer to receive payments in real time, while consumers will see the benefit of credit card transactions mainly because of the auxiliary services they offer, and not because of the rewards they offer. This will favour adoption of the RTR by merchants,[30] and the use of the RTR by consumers for smaller and medium-sized transactions at the point-of-sale, with larger purchases likely to remain credit card based. With RTR transactions also covering a significant share of merchant payments, the costs of processing payments in the RTR likely will fall over time, increasing the benefits we outlined earlier.

Regulation of the System

A key priority for the Department of Finance is to open up payment systems to increased competition

28 Indeed, until October 2022, Canadian merchants could not surcharge for the use of credit cards. It is unclear how many businesses have started surcharging since rules changed in this regard. Many consumers have indicated they would switch to a competitor if businesses charged extra for the use of credit cards (Angus Reid Institute 2022).

29 Recent research has found that in Canada the optimal interchange fees are much smaller and even indicate a reversal where Canadian consumers, from an efficiency perspective, should pay a small amount for using a credit card (see Hyunh, Nichols, and Shcherbakov 2022) rather than apparently gaining from receiving rewards for using their cards.

30 If the interchange fees are lowered by regulation, merchants may be less tempted to immediately switch away from credit cards than if fees remained high. However, the other side of the market, involving consumers, would lead merchants to accelerate this switch because lower fees would lead to lower card rewards for consumers, and therefore increase the demand by consumers for other forms of payment. Regulation, however, always remains a second best solution. A better solution would be for merchants to levy the costs of interchange fees onto consumers directly so that they fully internalize the costs of their payments choice.

from PSPs, subject to the necessary regulations to ensure the safety and security of the system. Along this dimension, Canada has made some progress by putting the Bank of Canada in charge of supervising entities that perform payment functions through the RPAA, with the Bank working on developing its supervisory framework. Moreover, as discussed earlier, the 2023 Fall Economic Statement, released right before publication of this paper, announced that the government intends to change the *Canadian Payments Act* to expand membership availability in Payments Canada to non-bank PSPs supervised by the Bank of Canada, as well as credit union locals that are members of a credit union central, and, lastly, operators of designated clearing houses. We applaud this move, which we advocated in a previously circulated draft of this paper, and encourage the federal government to move swiftly.

To ensure innovation and competition for end users, the details of this plan for broader membership in Payments Canada matter. A sticky point here is that new members would need access to settlement accounts at the Bank of Canada in order to participate fully in the RTR. Access to settlement accounts, however, would come at a high cost for new PSPs. Banks are subject to strict prudential regulation and supervision and face many rules, most notably liquidity and capital requirements that force the holding of certain types of assets to ensure their balance sheets are sound and they can cover their liabilities. Although PSPs are involved in a critical area of the economy – payments – and thus face strict regulation associated with operational risk, they do not face the same regulatory scrutiny in other respects as banks do, especially those with settlement accounts at the Bank of Canada. The trade-off, therefore, of becoming a bank and having settlement accounts at the Bank is a degree of regulation and supervision that many non-bank PSPs currently do not face and may not want to face in the future.

Consequently, hybrid solutions may be part of the future, where non-bank PSPs directly participate only in the exchange (that is, the messaging) part of the RTR, but still need to partner with a settlement agent. Again, this is not an ideal solution, as such tiered access would make non-bank PSPs reliant on incumbents. It would, however, avoid a complete change of the tiered structure of access to the Bank of Canada, which is a hallmark of the Canadian financial system.

To the extent that non-bank PSPs will seek access to settlement accounts, it is not clear from the current discussion what this would involve in terms of additional regulation. For example, local credit unions are subject to many of the rules and regulations that current members of Payments Canada already face. The problem here is that credit unions are provincially, not federally, regulated institutions, which adds to the complexity of granting them access. The RTR could thus form the basis for considering a policy reform whereby broader access to settlement accounts at the Bank of Canada brings the Canadian financial system into line with those of most other advanced economies.

One particular idea here is to scale regulation to the riskiness of the institution to the system – an approach that Payments Canada (Payments Canada 2023) describes as an "open, risk-based access to the core national payment systems." The Bank of Canada is developing such rules under the RPAA, and it could adopt an equivalent approach for access to settlement accounts. With such an approach, financial service providers could make an informed choice whether to participate directly or seek access through an intermediary akin to the current, tiered structure. A risk-based approach together with added technological features of the RTR such as reporting, liquidity and fraud mitigation tools could then implement a level playing field for retail payments where smaller institutions such as credit unions and new, innovative PSPs compete with incumbents for the benefit of end users.

Conclusion

In 2011, the federal government released a report entitled "Moving Canada into the Digital Age." The report states that

> [u]nless Canada develops a modern digital payments system, Canadians will be unable to fully engage in the digital economy of the 21st century, leading to a lower standard of living across the country and a loss in international competitiveness. (Task Force for the Payments System Review 2011, pg. 4.)

As of today, despite some progress, Canada has not modernized its payment system to the degree other countries have. Using both qualitative and quantitative evidence, we showed that the net benefits associated with introducing the Real-Time Rail will not be negligible. Under a conservative set of assumptions, we calculate the efficiency gain associated with the introduction of the RTR to be more than $3.24 billion over the first five years. These gains will come mostly from two sources: first, from the displacement of inefficient means of payments, such as cheques, which will lower the aggregate operational costs of retail payments; and, second, from the reduction of float because of the disappearance of the delay in payments processing, during which time consumers and businesses cannot access these funds.

We suggest a three-pronged approach for Payments Canada, the Department of Finance and the Bank of Canada to move things forward. First, speed up the deployment of the real-time settlement engine for retail payments, and design technological solutions that are open in that new entrants and existing PSPs can create payment solutions that add value for consumers and businesses alike. Second, ensure that end users make informed decisions about how to make retail payments, preferably through increased merchant payment method price differentiation, but, if not, through possible regulation of interchange fees, which will give the RTR a chance to compete broadly in the retail payments space. And, third, follow a clear and holistic regulatory approach to retail payment systems that ensures a level playing field for all PSPs.

The RTR is a unique opportunity not only for building a modern foundation for retail payments, but also for rethinking parts of the infrastructure of the entire Canadian financial system. It is time for the federal government, together with Payments Canada, to bring the RTR, with its broader agenda, finally to life.

Appendix A: Breakdown of Existing Payments by Type

Table A1: Five-year Trend Volume and Value by Type

Payments Method	Total Volume 2017		Total Volume 2022		Change from 2017	Total Value 2017		Total Value 2022		Change from 2017
	$millions	*Percent of Total Volume*	*$millions*	*Percent of Total Volume*	*Percent*	*$millions*	*Percent of Total Value*	*$millions*	*Percent of Total Value*	*Percent*
Cheque	734	4	405	2	-45	4,030,697	42	3,212,624	28	-20
Debit	5,794	28	6,315	31	+9	246,499	3	295,013	3	+20
ABM	532	3	388	2	-27	70,001	1	85,044	1	+21
Prepaid	278	1	330	2	+19	16,495	0.2	21,510	0.2	+30
EFT	2,742	13	3,101	15	+13	4,583,973	47	6,931,749	59	+51
Credit	5,499	26	6,787	33	+23	517,536	5	673,816	6	+30
Online Transfer	261	1	1,118	5	+328	93,513	1	387,255	3	+314
Cash	5,048	24	2,077	10	-59	101,811	1	60,122	0.5	-41
Total	**20,887**	**100**	**20,520**	**100**	**-2**	**9,660,526**	**100**	**11,667,133**	**100**	**+21**

Source: Payments Canada (2023).

Table A2: Bill Payment Heat Map

	Electric/ Hydro	Water/ Sewer	Gas/ Heating	Credit card bill	Cable	Internet service	Mortage	Rent	Car payment	Home insurance	Auto insurance	Home services	Cell phone	Streaming services	Memberships	Media/ software subscriptions	Tax payment
Online banking payment	50%	48%	47%	74%	39%	37%	13%	18%	12%	18%	15%	23%	35%	17%	18%	20%	52%
Pre-authorized debit (PAD)	33%	31%	31%	13%	29%	29%	76%	30%	71%	52%	55%	17%	26%	35%	28%	29%	26%
Credit card (in any form)	8%	9%	12%	3%	24%	26%	4%	4%	7%	22%	22%	23%	30%	40%	38%	39%	6%
Interac e-Transfer	3%	3%	3%	3%	3%	3%	2%	26%	3%	2%	2%	19%	2%	2%	4%	2%	3%
Cheque	2%	4%	2%	2%	2%	1%	2%	14%	3%	3%	3%	9%	1%	1%	3%	3%	7%
Debit card (in any form)	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%	3%	2%	2%
Cash	1%	2%	2%	1%	1%	1%	1%	5%	1%	1%	1%	6%	1%	0%	3%	1%	1%
Prepaid card (Visa/Mastercard)	0%	1%	1%	0%	1%	1%	0%	0%	1%	0%	0%	1%	1%	2%	1%	1%	0%
Other	2%	2%	2%	2%	2%	2%	1%	2%	1%	1%	1%	1%	1%	2%	1%	1%	4%

Source: Payments Canada (2023).

Appendix B: Assumptions and Sources

Our estimate of the gains from adopting the RTR come from two sources: a reduction in the cost of operating the overall payment system, and the cost savings to consumers and businesses from faster payments and the minimization of costly float.

We first assume initial adoption of the RTR in year one and subsequently the speed with which adoption occurs out to year five. As Fitzgerald and Rush (2020) show, the United Kingdom was at approximately 12 transactions per person five years after the launch of its FPS. Given the linear path of adoption the authors show, that implies a rate of adoption of four transactions per capita at launch. Given the similarities between the United Kingdom and Canada, using the former's adoption rate seems appropriate. We lower the number to two transactions – and grow it to ten transactions – in the baseline scenario, given the complete shifting over of e-transfers to the RTR. In the optimistic scenario, we start at four transactions and grow the adoption by four transactions per capita each year instead of two. In the pessimistic scenario, we revert back to two in year one, but with a growth rate of only one transaction per capita per year.

With these adoption numbers in hand, we estimate the costs under different payment options. To do this, we need estimated cost functions, which tell us how costs evolve based on the growth in the number of transactions. Our cost functions, using the Deloitte (2019) assumptions, are as follows:

- for cash and cheque: : $\alpha + \beta\,(volumepercapita) + \gamma\,(volumepercapita)^2$,
- for credit transfers and the RTR: $\frac{1}{(\alpha+\beta(volumepercapita))}$, and
- a 50 percent increase in the fixed costs component of the RTR relative to credit transfers.

The estimated coefficients, again following Deloitte (2019),[31] are:

Unit Cost Relationship	α	β	γ
Cash	1.25	-0.003664	0.000003801
Cheque	3.129037	-0.03597	0.0000176
Credit transfer	0.4565	0.01496	0
RTR	0.3	0.01496	0

We calculate unit costs by payment type using our volume numbers with the growth rate over the five-year period based on the growth rate by type from 2021 to 2022. We then take the cost differences between the scenario with the RTR adoption and the one without.

31 Note that, in the Deloitte study, the coefficient on β for credit transfers and the RTR is 14.96, which we believe is an error.

With respect to reduction in float, we assume the time value of money in our baseline scenario is based on the spread between Banker's Acceptance and a three-month Treasury bill (both sourced from Statistics Canada). This proxies for the cost of a large corporation borrowing relative to the federal government. We add a 100 basis point spread to account for the cost of borrowing by SMEs. In the optimistic scenario, we increase the value of money, adding a 200 basis point spread for SMEs. In the pessimistic scenario, we add no spread for SME borrowing.

Similarly, to penalize float, we also specify a time delay for settlement. In the baseline scenario we use four days for cheques and two days for credit transfers. In the optimistic scenario, we use five and three days, respectively. The greater the delay, the greater the cost of float. In the pessimistic scenario, we reduce the delays to three days and one day, respectively. Importantly, these are calendar days, not business days.

APPENDIX C – SCENARIO COMPARISONS

Benchmark

Table C1: Costs Savings from Real-Time Rail Introduction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5
	$millions				
Cash	44.9	89.4	133.6	177.5	221.0
Cheque	139.3	281.7	427.1	575.5	726.7
Electronic Funds Transfer	6.6	13.0	19.1	24.9	30.5
RTR	-52.6	-99.0	-140.2	-176.7	-209.2
Total	**138.3**	**285.1**	**439.6**	**601.1**	**769.0**
Total After 5 Years					**2,233.2**

Source: Authors' calculations.

Table C2: Total Float Value Reduction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5	Total Reduction
	$millions					
Cheque	58.5	119.4	182.7	248.5	316.9	926.1
Electronic Funds Transfer	5.4	11.0	16.8	22.8	29.1	85.0
Total Float Value Reduction	**63.9**	**130.4**	**199.5**	**271.3**	**345.9**	**1,011.1**

Source: Authors' calculations.

Optimistic

Table C3: Cost Savings from Real-Time Rail Introduction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5
	$millions				
Cash	90.0	180.0	270.0	359.9	449.7
Cheque	283.3	582.0	895.9	1225.1	1498.6
Electronic Funds Transfer	13.3	26.3	39.0	51.2	63.1
RTR	-101.2	-184.4	-253.5	-311.4	-360.1
Total	**285.5**	**603.9**	**951.3**	**1324.8**	**1651.3**
Total After 5 Years					**4,816.8**

Source: Authors' calculations.

Table C4: Total Float Value Reduction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5	Total Reduction
	$millions					
Cheque	124.7	254.4	389.3	529.4	675.0	1972.9
Electronic Funds Transfer	13.7	28.0	42.9	58.3	74.3	217.2
Total Float Value Reduction	**138.5**	**282.4**	**432.1**	**587.7**	**749.3**	**2,190.1**

Source: Authors' calculations.

Pessimistic

Table C5: Cost Savings from Real-Time Rail Introduction

Cost Savings	Year 1	Year 2	Year 3	Year 4	Year 5
	$millions				
Cash	44.9	66.9	88.8	110.4	131.7
Cheque	139.3	209.6	280.1	351.0	422.2
Electronic Funds Transfer	6.6	9.7	12.6	15.4	18.0
RTR	-52.6	-75.7	-96.9	-116.3	-134.2
Total	**138.3**	**210.5**	**284.7**	**360.4**	**437.7**
Total After 5 Years					**1,431.6**

Source: Authors' calculations.

Table C6: Total Float Value Reduction

Type of Transaction	Year 1	Year 2	Year 3	Year 4	Year 5	Total Reduction
	$millions					
Cheque	13.0	26.5	40.5	55.1	70.3	205.4
Electronic Funds Transfer	0.8	1.6	2.5	3.4	4.3	12.6
Total Float Value Reduction	**13.8**	**28.1**	**43.0**	**58.5**	**74.6**	**218.0**

Source: Authors' calculations.

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