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The economic benefit of adopting the ISO 20022 payment message standard in Canada

By Neville Arjani, CPA Research Unit

The research - simplified

Research from the Canadian Payments Association (CPA) estimates Canadians could save billions by adopting the ISO 2022 Payments Standard - But that's just the tip of the iceberg.

\$4.5 billion.....

estimated cost savings from the reduction of cheque use over the next 5 years alone

\$???.....

in additional economic benefits:



The economic benefit of adopting the ISO 20022 payment message standard in Canada

Author notes

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The views expressed in this paper are those of the author, and do not represent an official position of the Canadian Payments Association.

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Sommaire

L'Association canadienne des paiements est engagée dans une initiative pluriannuelle visant à moderniser l'infrastructure nationale de compensation et de règlement du Canada pour que celle-ci réponde mieux aux besoins de paiements des Canadiens. L'adoption de la norme ISO 20022 pour les messages de paiement est au cœur de cet important effort et devrait donner des résultats positifs couvrant l'ensemble de la chaîne de valeur des paiements. Ces résultats comprennent : (i) une plus grande efficacité du traitement des paiements; (ii) une meilleure interopérabilité nationale et internationale; et (iii) une occasion d'innovation dans toute la chaîne de valeur des paiements. L'avantage économique que les Canadiens peuvent attendre de l'adoption d'ISO 20022 devrait donc avoir une vaste portée.

Étant donné que la mise en œuvre de la norme ISO 20022 nécessitera un investissement de la part des institutions financières et des entreprises canadiennes, il est crucial de comprendre clairement les avantages prospectifs que la norme représentera pour les Canadiens et de les chiffrer en dollars. La quantification des avantages attendus de l'adoption d'ISO 20022 pose toutefois un défi.

Comme première étape à cet égard, la présente étude utilise l'analyse de la valeur actualisée nette pour estimer les réductions de coûts pour les Canadiens en tenant pour acquis que l'adoption d'ISO 20022 accélérera l'élimination des chèques en faveur des paiements électroniques moins coûteux. En 2014, il s'écrivait encore près d'un milliard de chèques au Canada, la plupart par les entreprises et les gouvernements. De nombreuses petites et moyennes entreprises au Canada préfèrent toujours les chèques aux paiements électroniques, malgré leur coût, parce qu'elles ne considèrent pas que les paiements électroniques peuvent les remplacer efficacement. Cela alourdit inutilement les coûts pour la société et ralentit la croissance. En favorisant efficacement le traitement direct (c.-à-d. le traitement électronique des opérations de paiement ne nécessitant pas de saisie additionnelle ou d'intervention manuelle) et la conciliation automatisée, nous prévoyons que l'adoption de la norme ISO 20022 rendra évidente la valeur ajoutée des paiements électroniques pour ces intervenants et les Canadiens de façon plus générale.

La présente étude estime que l'avantage économique que les Canadiens tireront de l'adoption d'ISO 20022 pourrait atteindre 4,5 milliards de dollars sur 5 ans grâce aux économies que rendra possibles l'élimination des chèques. Les économies moyennes pour les Canadiens, selon diverses projections, sont estimées à 1,2 milliard de dollars, tandis que l'économie médiane dépasse 700 millions de dollars. Les réductions de coûts sont distribuées sur tous les segments de la population – consommateurs, entreprises et gouvernements et institutions financières. Cela dit, on prévoit que les principaux bénéficiaires seront les entreprises canadiennes, qui forment la plus grande cohorte d'expéditeurs et de destinataires des chèques au Canada et qui portent aujourd'hui le fardeau des coûts du traitement et de la conciliation des chèques.

Les hypothèses qui sous-tendent ces estimations de réductions de coûts sont, de l'avis de l'auteur, conservatrices. Par ailleurs, on prévoit que l'avantage économique global que représente l'adoption d'ISO aura une vaste portée – reflétant l'amélioration des économies d'échelle et l'élargissement de la portée bien au-delà des réductions de coûts découlant de l'élimination des chèques. Il faut donc interpréter comme limite inférieure l'avantage monétaire que notre étude attribue à l'adoption d'ISO 20022, tout en lui reconnaissant d'autres possibilités importantes. La mesure de ces autres avantages possibles pose un problème; notre étude est donc une invitation aux chercheurs qui s'intéressent aux paiements à envisager une approche significative de la modélisation des avantages d'ISO 20022 dans l'écosystème des paiements du Canada.

1. Background and Scope

“It is tempting to think about ISO 20022 as a technical standard, but if serious consideration of this standard rests principally on technical justifications, then we will have missed the point. ISO 20022 is an enabler that can allow the [...] payments community to achieve a wide range of strategic and innovative business outcomes.”

“Messaging standards should not be underestimated for the value they can unlock across the whole payments value chain. They define the electronic information, data and digital content used to process payments, as well as what information can be made available to and used by customers. Messaging standards also set the boundaries of how flexible those in the payments community can be when innovating, both independently and collectively, and how they can use the wealth of electronic information available.”

- Payments NZ “Re-mastering payments messaging” (2015)

The mandate of the Canadian Payments Association (CPA) is to establish and operate systems to support the clearing and settlement of payments among member financial institutions on their own behalf and that of their customers – consumers, businesses, and governments.¹ Clearing and settlement systems are essential to an economy. They underpin economic exchange whereby a customer of one financial institution can affect a transfer of money to a customer of another financial institution to extinguish a financial obligation; for example, related to the non-cash purchase of a good or service. Subsequently these systems determine how much is owed between financial institutions as a result of theirs and their customers’ transaction activity (clearing), and facilitate the final transfer of funds between financial institutions to settle these interbank obligations (settlement).²

The CPA operates two national clearing and settlement systems. The Automated Clearing Settlement System (ACSS) is typically used to clear payments of relatively low value (i.e., up to \$25 million) and limited time-sensitivity.³ In contrast, the Large Value Transfer System (LVTS) is generally used to clear high-value payments which are often time-sensitive. In 2014, the ACSS and LVTS were used to clear 6.8 billion payment items representing approximately \$45 trillion in value. These systems lay at the core of the Canadian payments ecosystem, where they maintain myriad technological and non-technological linkages with other ecosystem components.⁴

The payments ecosystem in Canada is dynamic, with wide-scale changes occurring since the ACSS and LVTS were first introduced in 1984 and 1999, respectively. Notable drivers of change include, but are not limited to, the following.⁵

¹ For more information on the federally-legislated mandate and role of the CPA, as well as the clearing and settlement systems that it operates, please visit the CPA website at www.cdnpay.ca.

² Settlement occurs via a transfer of funds (i.e., the settlement asset) across accounts at the settlement institution. The settlement institution is typically the central bank in the case of large national clearing and settlement systems, including those owned and operated by the CPA.

³ The notion of time-sensitivity refers to the need for immediate or near-immediate funds availability on an irrevocable basis, which is distinct from real-time *settlement* of payments.

⁴ This includes links with the internal systems of CPA members; links with CPA and non-CPA networks that facilitate exchange for different payment schemes in Canada; and, in the case of the LVTS, links with other domestic and international financial market infrastructures.

⁵ See Chapman et al (2015) for a similar list of drivers of change in the Canadian payments landscape.

- Digitization of information.
- Evolving user preferences and needs.
- New and non-traditional entrants with unique service offerings.
- Greater service specialization and supply-chain fragmentation.
- Technological advancement and improved standardization in payments processing.
- Enhanced oversight and regulation.

In response to this evolving environment, the CPA has embarked on a multi-year initiative to improve understanding of the current and future payments needs of Canadians, and to modernize its national clearing and settlement systems, as appropriate, to ensure these needs will continue to be met.⁶

Adoption of the ISO 20022 payment message standard is a cornerstone of the CPA's modernization effort and, in turn, is anticipated to deliver the following benefits to Canadians.

1. Improved efficiency in payments processing.
2. Enhanced domestic and global interoperability.
3. Opportunity for innovation throughout the payments value chain.

This paper explores these benefits in greater detail, while also contemplating the application of quantitative methods to help present them in monetary terms. In this regard, the paper also serves as an invitation to the payments research community to consider meaningful approaches to modeling the benefits of adopting ISO 20022 in the Canadian payments ecosystem.

As an initial building block to benefit quantification, the paper draws on discounted cash flow (DCF) analysis to estimate the cost-saving to Canadians were ISO 20022 adoption to expedite cheque elimination in favour of lower cost electronic payments, as anticipated. This cost-saving represents just one piece of the overall anticipated economic benefit of ISO 20022 adoption in Canada – albeit a piece estimated in the billions of dollars – and thus should be interpreted as a lower bound to this benefit with substantive upside potential.

The remainder of this paper is structured as follows. Section 2 elaborates on the anticipated benefits of adopting ISO 20022 in Canada. Section 3 points to the opportunities and challenges in using quantitative methods to measure these benefits. Sections 4 and 5 outlines the use of DCF analysis for benefit quantification and the related findings of this approach, respectively. Section 6 discusses these findings, while Section 7 concludes.

2. Anticipated benefits of adopting the ISO 20022 payment message standard

This section elaborates on the anticipated benefits to Canadians from adopting the ISO 20022 standard as a cornerstone of any modernized CPA system.

⁶ The scope of the CPA's modernization initiative goes beyond technology, and includes the by-laws, rules and standards governing the exchange and clearing of eligible payment items. More on the CPA's modernization initiative can be found at www.cdnpay.ca.

Benefit #1: Improved efficiency in payments processing

1.1 Expedited migration from paper to lower cost electronic means of payment

Perhaps most important in the Canadian context is that the ISO 20022 standard would allow basic payment details and associated remittance information to travel together in the same payment message.⁷ This should invoke material cost-saving for Canadians by expediting the migration of cheques to lower-cost electronic payments. For example, under the existing Standard 005 payment message format for Automated Funds Transfer (AFT) debit and credit payments in Canada, most remittance information must travel separately from the basic payment details, e.g., via accompanying fax or email, meaning that manual intervention to process and reconcile payments remains a costly way of life for many Canadian businesses and governments.

Tompkins et al (2015) find that limitations to remittance information that can travel with AFT payments under Standard 005 is a key driver behind Canadian businesses' lagging use of electronic payments. Simply put, many small and medium-sized businesses in Canada continue to favour cheques over electronic payments because they do not view the latter as an effective substitute for the former. This puts an unnecessary cost burden on society as a whole and inhibits growth.⁸ Adopting the ISO 20022 standard for AFT payments should help better position electronic payments relative to cheques, generating material cost-saving via straight-through-processing (STP) of payments and automated reconciliation. Even for large corporates in Canada that have been able to unlock the benefits of STP and automated reconciliation through use of Electronic Data Interchange (EDI), these firms should also experience operational improvements via use of the ISO standard.⁹

Ransom (2015) offers supporting international evidence from the United Kingdom (UK) and United States (US). Referencing a 2014 Accounts Payable (AP) Automation Study conducted by the Institute of Financial Operations, the author notes that 70 per cent of UK companies continue to process over half of their invoices, and pay most of their bills, using manual 'paper' procedures, and that most businesses have not measured the cost-saving from moving to an automated environment. The author points out that, while the identifiable costs of staff, postage, paper storage and infrastructure are relatively straightforward for companies to calibrate, other costs are more difficult to quantify. For example, inefficiencies in paper-based systems result in human data-entry errors, duplicate payments and missed opportunities for early payment discounts – all of which can add up to significant and avoidable costs each year. Automation also supports early detection of fraud as well as other anomalies that might otherwise remain undetected for some time in a paper-based environment. The author also notes that, following AP processing automation in the US, federal organizations demonstrated annual cost reductions of 46 per cent for undisputed invoices and 54 per cent for disputed invoices. These international findings are indicative of the cost-savings to Canadian businesses and governments that adoption of ISO 20022 should enable.

The prospective cost-saving of moving from paper to electronic means of payment has also been studied in the payments research literature. For example, Humphrey et al (2003), based on cross-country

⁷ For more on the different types of remittance data being contemplated as part of the ISO standard in Canada, and on the CPA's ISO 20022 initiative more generally, visit the CPA website at www.cdnpay.ca.

⁸ Wells (1996) in a study of cheque use in the United States also raises the possibility that a lack of direct substitutability between cheques and electronic payments contributed to ongoing use of cheques in the United States in the early 1990s, despite a lower estimated social cost for electronic payments.

⁹ Interestingly, anecdotal evidence points to the potential elimination of the EDI payments stream in Canada once the AFT credit stream shifts to the ISO 20022 standard, as EDI payments are expected to migrate to AFT credits.

evidence, propose a general rule of thumb that an electronic (“ACH”) payment costs from one-third to one-half as much as a paper-based (“cheque”) payment.¹⁰ Using Norway as an example, the authors demonstrate that, when a country moves from a wholly paper-based payments system to near-fully electronic, it could save one per cent or more of its GDP annually once transition costs are absorbed.

From a Canadian perspective, the Task Force for the Payments System Review (2012) (hereafter referred to as the “Task Force”) suggests similar cost-saving in shifting to electronic payment and invoicing in a modernized Canadian payments environment that includes ISO 20022 adoption. More recently, and based on a costing exercise by a large Canadian bank, Chant (2015) suggests that Canadian businesses could save between \$1.6 billion and \$4.4 billion annually by transitioning away from cheques toward electronic alternatives.

1.2 Consolidating to a single payment messaging standard

Efficiency enhancements are also expected to accrue to financial institutions and their customers by consolidating multiple payment message formats into one “payment agnostic” ISO standard. There are currently three message formats for electronic payments supported in the CPA Rules, including (i) ANSI x12 format for EDI payments, (ii) Standard 005 format for AFT payments, and (iii) MT103 and MT205 formats for LVTS payments. All of these accommodate basic payment details to ensure that funds can move from one account to another; however, each uses its own template and terminology, and not all support a sufficient amount of remittance information to meet user needs. The allocation of financial, technical and human resources to support multiple message formats for use with different payment types – and all within the same jurisdiction – seems unnecessarily costly and complex. Instead, by replacing existing message formats with the ISO 20022 standard for AFT, LVTS and EDI payments, Canadian businesses, financial institutions and governments would be able to leverage investment in a single message standard over a larger volume of payments activity and realize improved economies of scale.

Benefit #2: Enhanced domestic and global interoperability

2.1 Domestic interoperability

ISO 20022 should generate synergies between payments and other functions carried out (and provided) by businesses and financial institutions. The standard is already widely used in the financial services space, with domains including securities, trade services, and cash management. Importantly, ISO 20022 offers a standardized language that businesses can use to effectively and consistently communicate with their financial institutions, and vice versa, and also for internal units within these organizations to communicate with each other. Adoption of the ISO 20022 payment message standard would mean that businesses and financial institutions could leverage the same investment and maintenance costs across an even greater number of service domains, while helping streamline operations across diverse processes and reducing cost through more integration and less translation.

For the CPA, it is critical that any modernized system be future-proofed to the greatest extent possible. The ISO 20022 payment message is extensible, meaning that it comes with the ability to add new tags or fields, or change the length of existing fields, allowing the message to carry different or larger payloads of data that can enable new services. Put differently, adding new services or payment streams in a system that employs the ISO 20022 payment message standard is less likely to result in a complete

¹⁰ Countries in this study include Norway, Spain, United States, Australia, Germany, Netherlands, and Sweden.

overhaul of the existing standard or design of yet another new message standard, all else equal (Lipis Advisors 2015).¹¹

2.2 Global interoperability

The ISO 20022 standard is also being adopted globally by corporates, financial institutions and financial market infrastructures across a range of financial services, including payments, and is evolving at a pace that will eventually make it the standard of choice for electronic funds transfers and wire payments worldwide. Indeed, Casey (2013) cites nearly 60 ISO 20022 initiatives for both payments and securities around the world, the largest being the Single European Payments Area.

As Canadian businesses and financial institutions continue to seek opportunities to expand their global footprint, and as Canadian financial markets become more integrated with the rest of the world, the case for improved interoperability between domestic and international payments systems has intensified. Whether supporting their international cash management functions locally, regionally, or globally, all multinational companies are dependent on local payment clearing and settlement systems to some extent, even if it is only for local payroll or collections. As a result, a significant amount of cross-jurisdictional variability could be introduced for these firms based on country-specific payment practices, including formats, regulations and indigenous processes. This adds cost and complexity to doing business, and globally-active businesses are increasingly demanding minimal differences when transacting around the globe.¹²

That is, in a global business landscape characterized by an increasing number of large multinational firms that manage multiple client-bank service agreements and a drive towards centralized treasury operations, and as well more sophisticated global supply chains, the cross-border payments environment is hardly as “frictionless” as might be thought. In the ideal scenario, harmonized and consistent processes should be present from payment initiation through reporting, regardless of region, currency, platform or channel. Adoption of a global standard such as ISO 20022 should help globally-active businesses reduce integration costs across service lines and jurisdictions, interact more efficiently with multiple banks, and better capture and leverage cross-jurisdictional data to run their businesses.^{13,14}

Benefit #3: Opportunity for innovation throughout the payments value chain

With new players and products entering the payments ecosystem, service provision along the payments value chain has become more specialized and fragmented as the industry strives to meet the evolving

¹¹ Moreover, as in Canada where multiple payment schemes operate over multiple payment exchange infrastructures, one could argue that resiliency of the national payments system is enhanced where these schemes all employ the ISO 20022 payment message standard. That is, use of the same standard by multiple schemes over multiple infrastructures *could* enable smoother re-routing of payments in the event of a lengthy disruption to one or more payments schemes or possibly even an entire infrastructure.

¹² Banking Technology (2015). On this point, Lipis Advisors (2015) suggests that, even where legacy data standards are maintained locally, if different local standards could at least be mapped to the ISO 20022 standard then some form of translation could be performed to enable communication between the two jurisdictions.

¹³ SWIFT’s recent account of the experience of SEB, a large Nordic financial services group, in offering ISO 20022-compliant services to its corporate customers corroborates with the above (SWIFT 2015). The article notes that, local domestic services for payments processing – which have been developed by the local banking community to use local clearing mechanisms, local formats and local market practices – have become quite efficient over time; however, a high level of fragmentation and variability across jurisdictions has resulted in complex and not easily harmonized cross-border processing. The article also points out that the treasury function within a large corporate institution may have to deal with 20-50 external banks to fully understand its balance position.

¹⁴ Frictions could still be introduced where cross-country differences exist in implementing the ISO 20022 standard.

demands of payments users. In this dynamic environment, and in accordance with its legislated mandate, the CPA remains focused on delivering on its public policy objectives: safety and soundness, efficiency and taking into account the interests of users. In line with this, adoption of the ISO 20022 standard will allow the CPA to provide greater value to its membership – and all Canadians – by fostering innovation in downstream markets and facilitating new revenue-generating opportunities.

With ISO 20022, the wealth of information that can accompany basic payment details in the same message should offer financial institutions insight into their clients that they never had before and create opportunity for new services. In an era of “Big Data” and related analytical solutions, financial institutions are in a better position than ever to effectively collect, organize, and manipulate large amounts of their client-authorized data to build or improve products and services that enhance the overall customer experience. For example, new products and services that could accompany ISO 20022 adoption include those related to cash management and related intraday liquidity reporting, debt management, credit optimization, bill payment and presentment, spend control and management, and even posting and notification, upon which financial institutions could differentiate their commercial offerings to clients.^{15,16}

For financial institutions as well, ISO 20022 offers potential to enhance sophistication and reduce the (running) costs of regulatory compliance, e.g., fraud detection, AML and ATF compliance, while improving payment tracking and reducing the incidence and cost of transaction disputes. For example, ISO 20022 adoption could decrease the incidence of ‘false positives’ flagged by AML and sanctions screening programs, thereby reducing the amount of manual work required to address these occurrences, and importantly, helping financial institutions maintain their strong reputation with customers by not inconveniencing them (sometimes at material cost) with unnecessarily blocked payments.

3. Opportunities and challenges in quantitatively modeling ISO 20022 adoption

Implementation of the ISO 20022 payment message standard in Canada will require material investment by financial institutions and businesses. It is critical from a policy perspective then, to understand the prospective benefits that the standard will bring to Canadians, and more importantly to be able to present these benefits in monetary terms.¹⁷

Applied quantitative methods are necessary here. A rigorous analytical approach – either empirical or theoretical in its roots – is needed for meaningful evaluation of the benefits of ISO adoption. However, this brings its own set of challenges in addition to the common challenge of ascertaining the right data for empirical analysis. These challenges include the following.

- Benefits of adoption vary considerably in their complexity and tractability.

¹⁵ Payments NZ (2015) offers an excellent overview of the long-term potential of adopting the ISO 20022 standard in New Zealand, including enabling new value-added services.

¹⁶ Aside from the slate of new services that ISO 20022 might enable financial institutions to offer their customers, with more enterprise resource planning (ERP) solutions being ISO-compatible, corporates adopting the ISO 20022 message standard across multiple internal business processes should experience improved and more sophisticated in-house analysis through easier integration of data.

¹⁷ In 2014 the CPA engaged its members to develop an industry cost estimate for replacing the current message standards for AFT, EDI and wire transfer payments in Canada with the ISO 20022 standard. While the estimated cost to industry is material, the analysis in the latter half of this paper suggests an overall net monetary benefit from ISO 20022 adoption in Canada.

- Benefits are expected to accrue over time within a dynamic economic environment. It may be difficult to distinguish the impact of ISO 20022 from other “technology shocks”.
- Network effects complicate any future predictions around benefits – e.g., the pace of adoption domestically and globally is unknown.
- ISO 20022 is an enabling technology; a list of prospective “use cases” and resulting innovations is impossible to determine *ex ante*.
- It is not clear at this time what the CPA’s modernized systems will look like; system design will most certainly impact economic outcomes.
- In a ‘macro model’ setting, how does one explicitly or implicitly incorporate adoption of a technical standard like ISO 20022, or clearing and settlement for that matter?

These challenges will not be easy to overcome. As such, this paper represents an invitation to the payments research community to consider a meaningful approach to modeling the benefits of ISO 20022 in the Canadian payments ecosystem.

The remainder of this paper serves as an initial step in this regard by drawing on DCF analysis to estimate the present-value cost-saving to Canadians were ISO 20022 adoption to expedite cheque elimination in favour of lower cost electronic payments, as anticipated. Recall the narrative presented earlier. The payments literature suggests that cheques are more costly than electronic payments, while CPA research shows that ongoing cheque use in Canada is driven by a lack of automated reconciliation capability for electronic payments. The ISO 20022 standard will accommodate richer remittance capacity for AFT payments, enabling STP and automated reconciliation. Thus ISO 20022 should help expedite the migration from cheques to electronic payments in Canada. As this migration continues, the benefits in terms of reduced cost to Canadians from payments processing should accrue, year after year, for the foreseeable future. With every cheque migrated to electronic, the money saved could be directed toward more productive use.

4. Empirical Methodology – DCF Analysis

What is the anticipated cost-saving to Canadians were cheques to be replaced by electronic payments following ISO 20022 adoption?

The sequence of steps encompassing the DCF analysis to answer this question is as follows.

1. Calculate a range for the unit cost differential between cheques and electronic payments using findings from the international literature (in current Canadian dollars).
2. Determine a baseline cheque migration projection, i.e., migration without ISO 20022 adoption.
3. Determine alternative projections of cheque migration assuming ISO 20022 adoption.
4. For selected unit cost differentials in the range, use the baseline cheque migration projection to estimate cost-saving to Canadians absent ISO adoption over a 5-year horizon.
5. For each cheque migration projection assuming ISO adoption, and for the same unit cost differentials, estimate the annual cost-saving to Canadians – above the baseline – over the same 5-year horizon.
6. Report the 5-year stream of cost-saving for each ISO projection in present-value terms.

Each of these steps is elaborated on below. The methodology draws on sensitivity analysis in recognition of inherent uncertainty and the potential for measurement error. As a further means of addressing uncertainty, the analysis errs on the side of conservatism as much as possible.

Step 1: Calculate a range for the unit cost differential based on the international literature.

A summary of the international literature evaluating the unit cost of cheques and electronic payments is presented in Appendix 1.¹⁸ What is important to note in these studies is that the unit cost of a payment reflects a *social* cost, or an aggregation of private costs incurred by each stakeholder segment. For example, embedded in the unit cost of a payment instrument is the cost to “produce” or manufacture the payment instrument, the cost to “use” the payment instrument from the perspective of both originator and beneficiary, and the cost to “process” the payment which includes clearing and settlement costs incurred by financial institutions. The studies are careful to adjust underlying data to avoid double-counting. It is critical in this work to distinguish between *cost* and *economic rent* in each stage of the payments value chain.

This analysis draws specifically on the US and European Union (EU) unit cost differentials estimated by Wells (1996) and Schmiedel et al (2012), respectively. Determining a range for the cost differential based on these studies is appropriate given uncertainty in the exercise. Moreover, as these international estimates reflect different time periods and geographies, price and currency adjustments are needed to present the original estimates in current Canadian dollars. The conversion process uses international exchange rate and price level data found on the websites of the respective central banks – these data were collected in April 2015.

For inflation-adjustment of the original estimates, the following USD and EUR conversion rates are used.

USD1 in 1993 = USD1.63 in 2015

EUR1 in 2009 = EUR1.09 in 2015

To then convert the estimates to Canadian dollars, the following exchange rates are used.

USD1 = CAD1.22

EUR1 = CAD1.35

An additional manipulation is needed for the cost estimate of Schmiedel et al (2012), since unit cost for direct debits and credit transfers in that study are estimated separately as shown in Appendix 1 (i.e., €1.27 and €1.92, respectively). These two costs are combined into a single unit cost estimate for electronic payments based on their arithmetic average, given their roughly equal market shares in the EU retail payments space. The combined unit cost for direct debits and credit transfers is thus $(€1.27+€1.92)/2 = €1.60$.

Table 1 below presents the results of this conversion exercise. Direct debits and credit transfers are simply referred to as “ACH” items in the Table.

¹⁸ The methodology relies on *international* evidence of the unit cost differential given the relative sophistication and completeness of these studies. A preliminary estimate of the Canadian unit cost differential is attempted in Appendix 2, and represents a natural opportunity for future research.

Table 1

	Original local currency estimate		2015 Local currency estimate		2015 CAD estimate	
	Cheque	ACH	Cheque	ACH	Cheque	ACH
Wells (1996)	\$2.78 - \$3.09	\$1.15 - \$1.47	\$4.53 - \$5.04	\$1.87 - \$2.40	\$5.53 - \$6.14	\$2.29 - \$2.92
Schmiedel et al (2012)	€3.55	€1.60	€3.87	€1.74	\$5.22	\$2.35

The last two sub-columns in Table 1 give rise to three possible scenarios for the unit cost differential between cheques and AFT payments in Canada.

Low scenario: ACH \$2.92 / Cheque \$5.53 (Unit cost differential = **\$2.61**)

Moderate scenario: ACH \$2.35 / Cheque \$5.22 (Unit cost differential = **\$2.87**)

High scenario: ACH \$2.29 / Cheque \$6.14 (Unit cost differential = **\$3.85**)

Given use of international evidence in this critical stage of the analysis, and accounting for the possibility that Canada could somehow be *different* in one or more aspects, a fourth (“Pessimist”) scenario is introduced to err on the side of conservatism.

“Pessimist” scenario: (Unit cost differential = **\$2.00**)

To be clear, what is being suggested here is that, in Canada, if one were to aggregate the costs incurred by *all* parties along the payments value chain for a cheque versus an ISO-compliant electronic payment (e.g., AFT debit or credit), then, on average, they would find that *the cheque costs between \$2.00 and \$3.85 more* in its journey through origination, administration, reconciliation, clearing and settlement. Given estimates in Canada suggest, for example, that it costs Canadian businesses between \$9 and \$25 to process a cheque, the unit cost differentials used in this study do not appear far-fetched.¹⁹

Step 2: Determine a baseline cheque migration projection, i.e., migration with no ISO adoption.

Step 3: Determine alternative projections of cheque migration assuming ISO 20022 adoption.

The CPA published its first *Canadian Payment Methods and Trends (CPMT)* survey in 2012, with a second edition expected to be released in Fall 2015. The survey draws on CPA and third-party data to demonstrate the evolution of payment instrument use in Canada over time. Cheque and AFT payments figure prominently in the study given their relative market shares in this space.²⁰

¹⁹ This range from \$9 to \$25 comes from Scotiabank (2014), as cited by Chant (2015). Costs include those of the cheque itself, employees’ time spent authorizing and writing it, distribution and mailing, the expense to recipients in collecting it, and the effort to reconcile (process) it with the appropriate receivable or payable account. Appropriately, there is both a financial and opportunity cost component to this estimate.

²⁰ The CPMT excludes wire payments.

Table 2 below shows preliminary data from the forthcoming 2015 CPMT, covering use of cheque and electronic (EFT) payments in Canada between 2008 and 2014.²¹

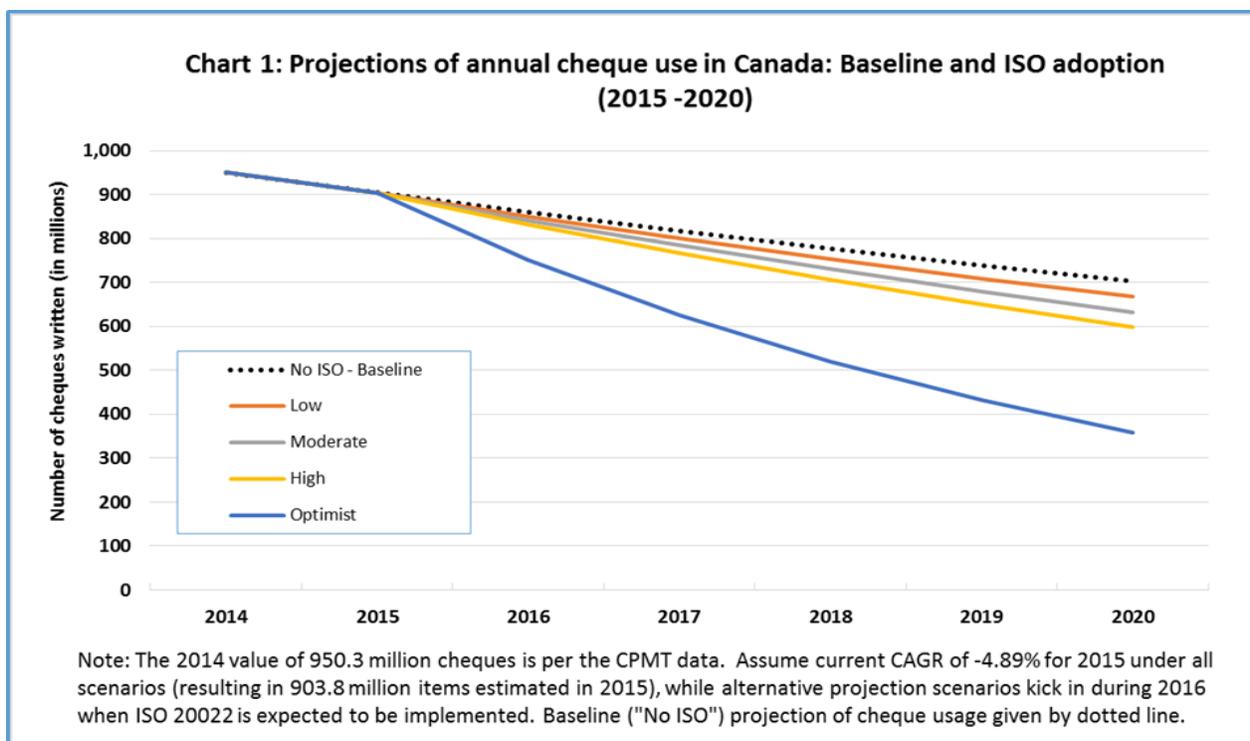
Table 2

Data from CPA's <i>Canadian Payment Methods and Trends</i> report Volumes exchanged, by instrument, in millions of units.			
	2008	2011	2014
Cheques and paper	1,283.9	1,189.1	950.3
-- of which, on-us	256.8	308.0	235.0
Electronic Funds Transfer (EFT)	1,801.6	2,044.0	2,476.4
-- of which, on-us	300.3	340.7	463.1
Total non-cash payments	10,263.6	11,339.7	13,542.2
Total cash and non-cash payments	20,336.1	21,017.7	22,252.4
Note: For purpose of the CPMT, EFT volume includes CPA AFT (debits and credits), electronic remittances, and EDI transaction volume. Based on ACSS volume data for 2014, CPA AFT credits and debits comprise roughly 75% of total EFT volume.			

Table 2 indicates a historical six-year Compound Annual Growth Rate (CAGR) of -4.9 per cent and 5.5 per cent for cheques and EFT payments, respectively. This is consistent with Tompkins et al (2015) who offer compelling evidence that AFT payments have had the single greatest impact on the decline of cheques over the last 10 to 15 years in Canada. Table 2 also shows that, in 2014, there were roughly 950 million cheques written in Canada.

These data can be used to construct a projection of annual cheque use in Canada absent ISO adoption. It is reasonable to assume that even if ISO 20022 were not adopted in Canada, cheques would continue to migrate to electronic over time. Moreover, this rate of migration *could* be similar to what has been observed in the past. The methodology therefore assumes that cheques would continue to decline each year in Canada (replaced by electronic means of payment) at a CAGR of -4.9 percent absent ISO 20022 adoption. This projection is illustrated by the black dotted line in Chart 1 below. In Chart 1 the number of cheques written annually is captured along the vertical axis to the right. The 950 million cheques written in 2014 serve as a starting point in Chart 1, as observed in the CPMT data. All data points beyond 2014 are projected.

²¹ These data are preliminary and may be subject to change in the final CPMT publication. EFT payments include CPA AFT (debits and credits), EDI transactions and electronic remittances. As a rough estimate based on CPA website data, AFT payment volume accounts for nearly 80 per cent of the EFT total. The CPMT combines payment volumes clearing either “on-us” or through CPA systems.



Referring to the other (coloured) lines in Chart 1, which reflect ISO 20022 adoption, consideration has been given to the rate that cheques would migrate to ISO-compliant electronic payments. Based on the findings of Tompkins et al (2015), it is reasonable to assume that ISO 20022 adoption will *expedite* the rate of cheque decline in Canada, as AFT debits and credits transform into a more legitimate substitute for cheques. Once again it is appropriate to consider a range of possible migration rates. Four cheque migration rates are contemplated, each with its own colored line in Chart 1. These rates are given below; recall that the baseline (i.e., no ISO adoption) cheque migration rate is the six-year historical CAGR of -4.9 per cent.

Low acceleration: CAGR = **-5.9%** (Current CAGR less 1%)

Moderate acceleration: CAGR = **-6.9%** (Current CAGR less 2%)

High acceleration: CAGR = **-7.9%** (Current CAGR less 3%)

“Optimist” acceleration: CAGR = **-16.9%** (Current CAGR less 12%)

A couple of clarifying points are warranted. First, the coloured lines in Chart 1 begin to diverge from the black dotted line in 2016, as this is the year that ISO 20022 is assumed to be rolled out in Canada.²² In 2015, all lines exhibit the same annual cheque decline compared to 2014, from 950 million cheques in 2014 to roughly 900 million cheques in 2015, which follows the six-year historical CAGR of -4.9 per cent.

²² The methodology assumes that the ISO 20022 standard will be rolled out in Canada in 2016, so benefits estimated over the medium-term are those accruing during the 5-year period between 2016 and 2020. This is only for illustrative purposes; the methodology can be applied to any ISO 20022 roll-out period.

Second, some context is necessary around selection of the “Optimist” cheque migration rate (the blue line in Chart 1). While this rate of migration might appear implausible at first glance, even under this scenario there would still be almost 400 million cheques written annually in Canada by 2020. This projection is consistent with the Task Force’s “Own the Podium” scenario for 2020. As well, Tompkins et al (2015) estimate that, among the 990 million cheques written in Canada in 2012, 600 million were written by businesses and governments while 390 million were written by consumers largely destined for businesses. One way to interpret the “Optimist” scenario is that, by 2020, virtually all cheques written by businesses and governments will have migrated to electronic means of payment.²³

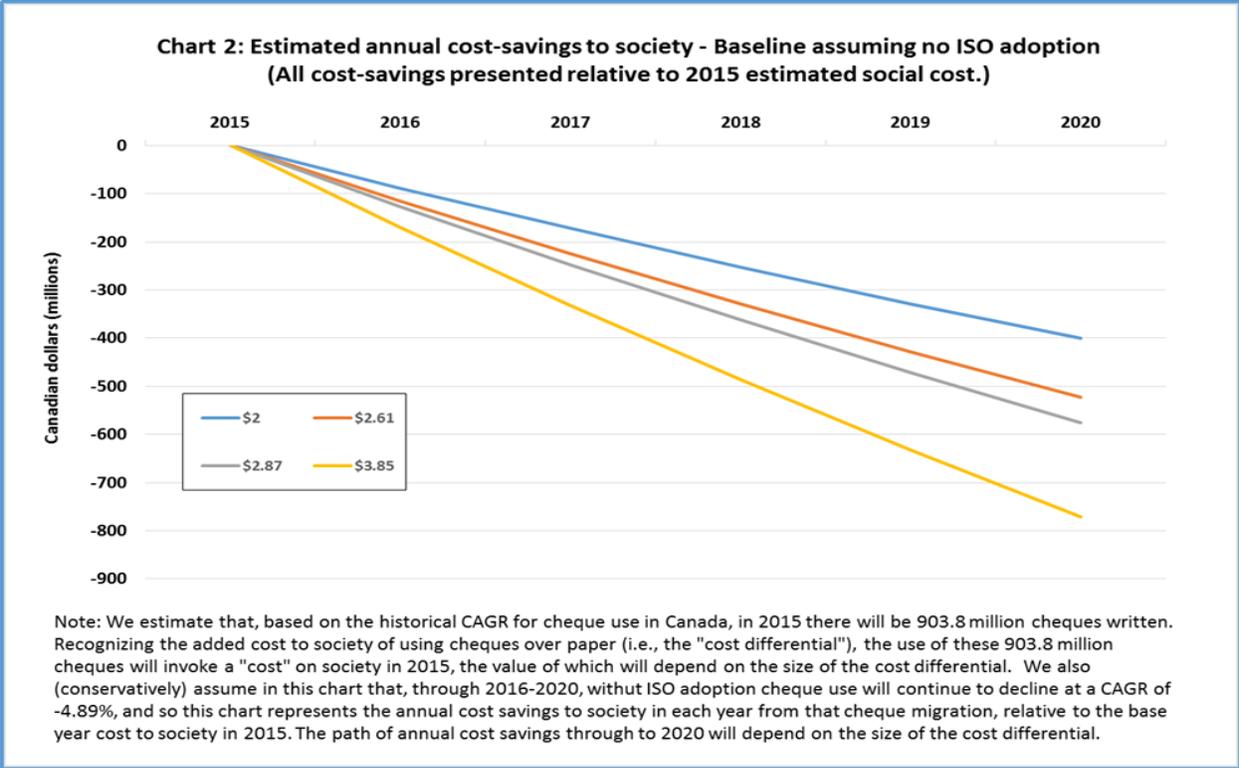
Step 4: For each unit cost differential, use the baseline cheque migration projection to estimate annual cost-saving to Canadians absent ISO adoption over a 5-year horizon.

Step 5: For each cheque migration projection assuming ISO adoption, and for each unit cost differential, estimate annual cost-saving to Canadians over the same 5-year horizon.

As mentioned, cheques are expected to continue migrating to electronic even without ISO adoption in Canada as per the baseline migration rate. This also means cost-savings are expected to accrue to Canadians absent ISO adoption. The challenge then, is to capture the *incremental* cost-saving from ISO 20022 adoption over and above the baseline cost-saving.

Chart 2 below shows the estimated cost-saving to Canadians under the baseline projection (i.e., no ISO 20022 adoption). Savings are measured along the vertical axis. The base year for the cost-saving calculation is 2015; that is, annual cost-savings presented in Chart 2 over the 2016-2020 period are relative to the cost incurred by Canadians from cheque use in 2015. Recall that around 900 million cheques are estimated to be written in 2015. Cost-savings are presented annually in Chart 2 and are not cumulative through the projection period. There are four coloured lines in the chart, each corresponding to a different unit cost differential as estimated in Step 1. For each coloured line, the assumed CAGR for cheques is the same at -4.9 per cent (recall that Chart 2 pertains only to the *baseline* cheque migration projection). Simply put, holding the cheque migration rate constant, the larger the unit cost differential between cheque and electronic payments, the larger the annual cost-saving to Canadians as cheques migrate to electronic.

²³ Other factors aside from ISO 20022 adoption in Canada could drive consumers as well to migrate more cheques to electronic payments, which would carry a similar benefit to society.

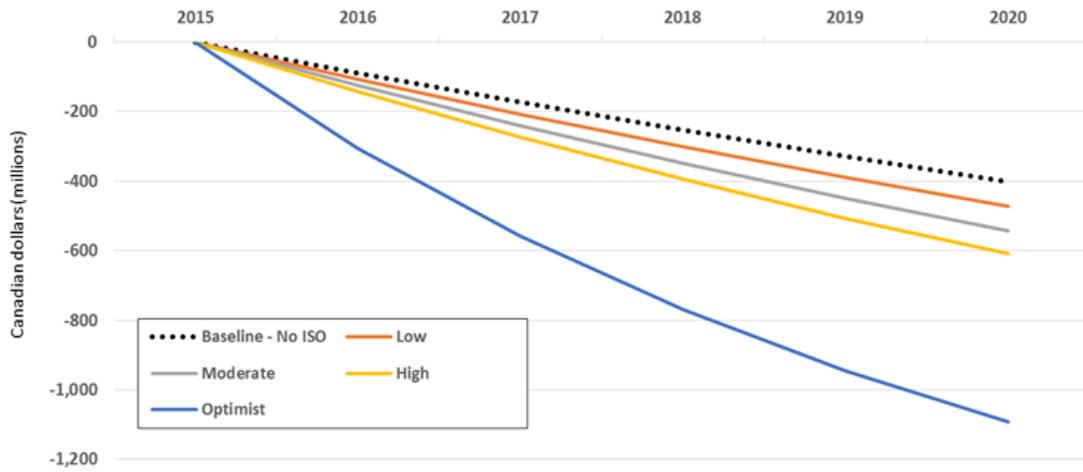


The next step is to consider ISO 20022 adoption in Canada and to calculate the associated cost-saving. This is illustrated in Charts 3-6 and accompanying Table 3 below. There are four charts here – *one chart for each unit cost differential* – and there are five lines in each chart reflecting alternative cheque migration rates (one non-ISO and four ISO projections). As in Chart 2, annual savings in Charts 3-6 are measured along the vertical axis where 2015 constitutes the base year.

Each of the black dotted lines in Charts 3-6 is *the exact same as the coloured line for the corresponding unit cost differential in Chart 2*. These black dotted lines in Charts 3-6 represent baseline (no ISO adoption) cost-saving. For example, the black dotted line in Chart 3 is the same as the blue solid line in Chart 2, where both lines correspond to a \$2.00 unit cost differential and the baseline migration projection. Importantly, in Charts 3-6, the annual cost-saving to Canadians attributed to ISO 20022 adoption for a given cheque migration projection is calculated as *the vertical distance between the relevant coloured line and the black dotted line*. This isolates the monetary benefit of ISO 20022 adoption.

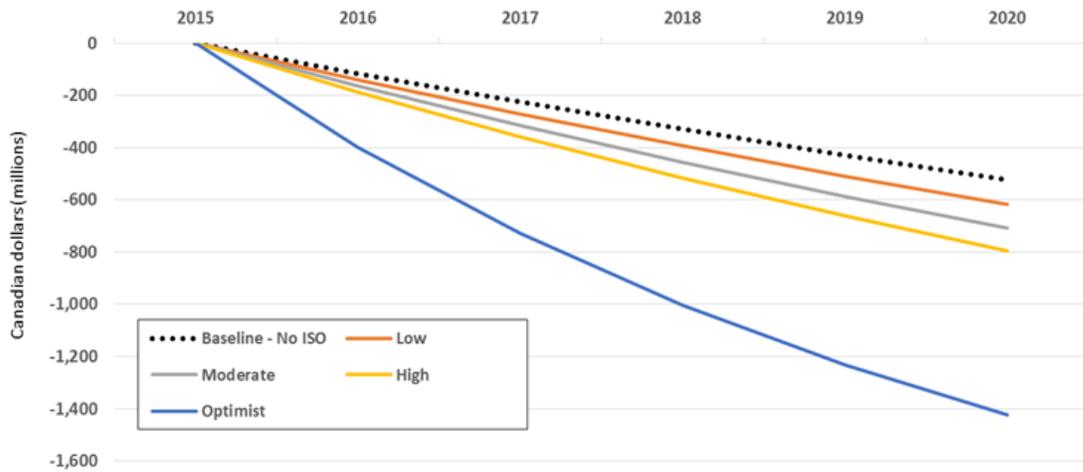
Table 3 presents the same information as Charts 3-6. All figures in Table 3 are reported in \$C millions and reflect the isolated monetary benefit of ISO adoption.

Chart 3: Estimated annual cost savings to society from ISO adoption (2016-2020)
(2015 social cost as base year; Using a \$2.00 cost differential)



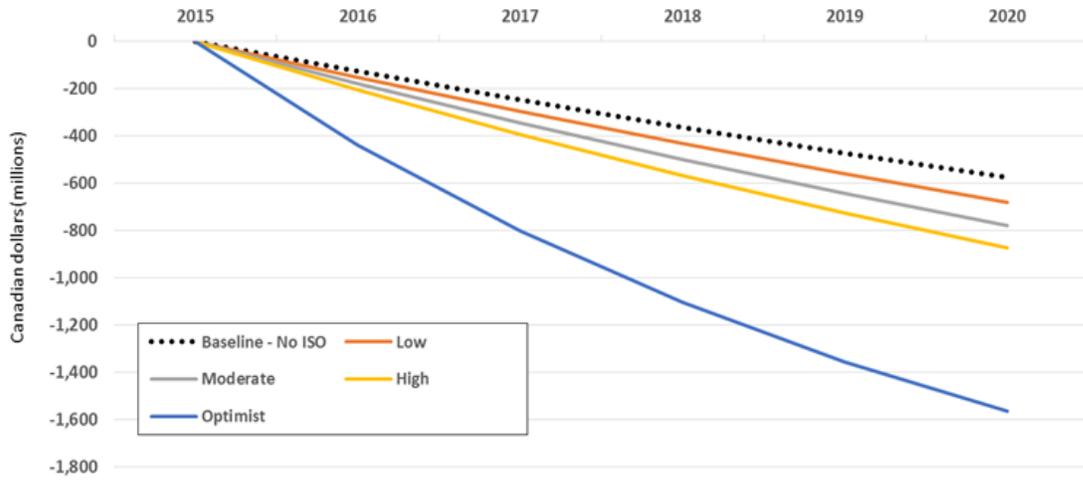
Note: The chart includes 4 projections of annual cost savings given ISO adoption in Canada and also the baseline case (No ISO -- dotted line). Cost-savings are a function of how many fewer cheques were used in the year relative to in 2015, and as well the value of the cost differential between paper and electronic hat is being contemplated.

Chart 4: Estimated annual cost savings to society from ISO adoption (2016-2020)
(2015 social cost as base year; Using a \$2.61 cost differential)



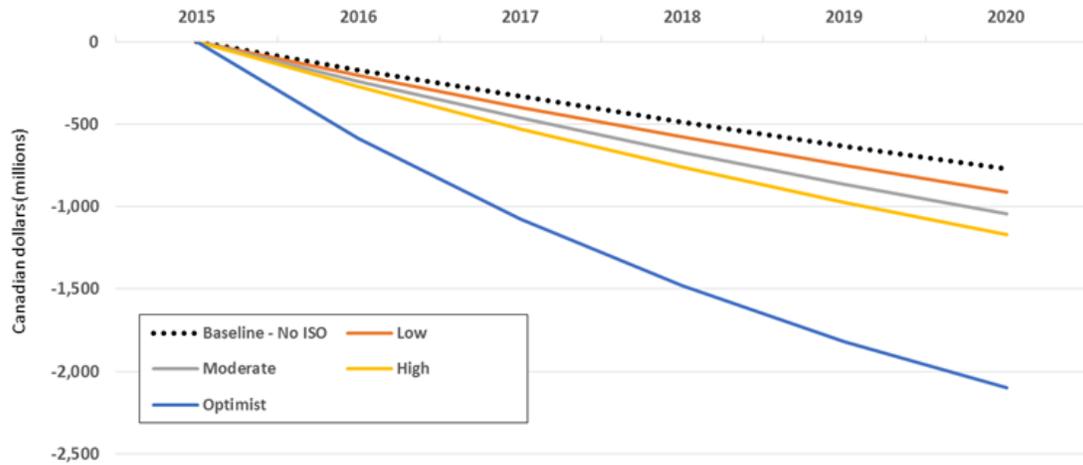
Note: The chart includes 4 projections of annual cost savings given ISO adoption in Canada and also the baseline case (No ISO -- dotted line). Cost-savings are a function of how many fewer cheques were used in the year relative to in 2015, and as well the value of the cost differential between paper and electronic hat is being contemplated.

Chart 5: Estimated annual cost savings to society from ISO adoption (2016-2020)
(2015 social cost as base year; Using a \$2.87 cost differential)



Note: The chart includes 4 projections of annual cost savings given ISO adoption in Canada and also the baseline case (No ISO -- dotted line). Cost-savings are a function of how many fewer cheques were used in the year relative to in 2015, and as well the value of the cost differential between paper and electronic hat is being contemplated.

Chart 6: Estimated annual cost savings to society from ISO adoption (2016-2020)
(2015 social cost as base year; Using a \$3.85 cost differential)



Note: The chart includes 4 projections of annual cost savings given ISO adoption in Canada and also the baseline case (No ISO -- dotted line). Cost-savings are a function of how many fewer cheques were used in the year relative to in 2015, and as well the value of the cost differential between paper and electronic hat is being contemplated.

Table 3

		2016	2017	2018	2019	2020
\$2.00	Baseline	NA	NA	NA	NA	NA
	Low	-18.1	-34.2	-48.5	-61.2	-72.4
	Moderate	-36.1	-68.0	-96.0	-120.5	-141.8
	High	-54.2	-101.5	-142.5	-177.9	-208.3
	Optimist	-216.9	-386.6	-517.5	-616.7	-690.0
\$2.61	Baseline	NA	NA	NA	NA	NA
	Low	-23.6	-44.6	-63.3	-79.9	-94.4
	Moderate	-47.2	-88.8	-125.3	-157.3	-185.0
	High	-70.8	-132.5	-186.0	-232.2	-271.8
	Optimist	-283.1	-504.5	-675.3	-804.8	-900.5
\$2.87	Baseline	NA	NA	NA	NA	NA
	Low	-25.9	-49.0	-69.6	-87.8	-103.8
	Moderate	-51.9	-97.6	-137.8	-172.9	-203.4
	High	-77.8	-145.7	-204.5	-255.3	-298.9
	Optimist	-311.3	-554.7	-742.6	-885.0	-990.2
\$3.85	Baseline	NA	NA	NA	NA	NA
	Low	-34.8	-65.8	-93.4	-117.8	-139.3
	Moderate	-69.6	-130.9	-184.9	-232.0	-272.9
	High	-104.4	-195.4	-274.4	-342.5	-400.9
	Optimist	-417.5	-744.1	-996.2	-1,187.1	-1,328.3

With four unit cost differentials and four cheque migration rates to contemplate assuming ISO adoption, this gives $4 \times 4 = 16$ cost-saving projections. Each of the 16 populated rows in Table 3 – and each of the 16 coloured lines found in Charts 3-6 – represent a cost-saving projection.

This highlights the importance of the baseline cheque migration projection. One could argue that continued cheque migration at a CAGR of -4.9 per cent, in the absence of a major initiative like ISO 20022 to spur greater electronic usage, is simply not achievable. It follows that a higher baseline CAGR (i.e., slower cheque migration) than the assumed -4.9 per cent would increase the estimated benefit of ISO adoption in each of the 16 projection scenarios, all else equal.

Step 6: Convert each projected 5-year cost-saving stream to present-value terms.

The 16 projections in Table 3 should be converted to present value. DCF analysis facilitates this, though a key challenge is determining what discount rate to use. Usually DCF analysis at the firm-level will use a discount rate equivalent to the firm’s weighted-average cost of capital (WACC), for example when evaluating a prospective project investment where the risk profile aligns with that of the firm. All Canadians will benefit from ISO 20022 adoption, but there is no readily-available equivalent of WACC at the societal level.

The choice of discount rate in DCF analysis reflects an opportunity cost of investment, and therefore its level of risk. The risk posed by the ISO 20022 initiative to Canadians is perhaps a matter of perception. To deal with this uncertainty, three discount rates are considered, each reflecting a different degree of risk. Ross et al (2010) estimate the historical risk premium for Canadian common stocks and Canadian long bonds to be 3.41% and 1.82%, respectively, where the risk premium reflects a return over and above

the risk-free rate, e.g., 3-month T-bill rate. The observed 60-month historical yield on 3-month Government of Canada T-bills is 0.89%.²⁴

This gives three possibilities for the discount rate to be used in the DCF analysis: 1%, 3% and 5%. A higher discount rate implies a higher perception of risk and will reduce the present value of the cost-saving projection, all else equal.

5. Empirical results

Results of the analysis are presented in Table 4 below. With 16 cost-saving projections, and 3 discount rates used in the DCF analysis, *this results in $16 \times 3 = 48$ present-value projections for the 5-year economic benefit (i.e., cost-saving) attributable to ISO 20022 adoption in Canada.* These projections are shown in the last three columns of Table 4 (all values in \$C millions).

Table 4 shows that the cost-saving to Canadians from introduction of the ISO 20022 standard *could exceed **\$4.5 billion** over the 5 years following implementation.* As anticipated, results are sensitive to model assumptions. Across the 48 projections, average cost-saving to Canadians amounts to **\$1.2 billion** while median cost-saving exceeds **\$700 million**. As expected, present-value cost-savings are negatively correlated with choice of discount rate and cheque migration rate, and positively correlated with social cost differential. Table 5 below offers a statistical summary of the 48 projections captured in Table 4.

²⁴ Sourced from the Bank of Canada website in April 2015.

Table 4

		2016	2017	2018	2019	2020		DCF (1% DR)	DCF (3% DR)	DCF (5% DR)
\$2.00	Baseline	NA	NA	NA	NA	NA		NA	NA	NA
	Low	-18.1	-34.2	-48.5	-61.2	-72.4		-226.1	-210.9	-197.2
	Moderate	-36.1	-68.0	-96.0	-120.5	-141.8		-446.4	-416.4	-389.3
	High	-54.2	-101.5	-142.5	-177.9	-208.3		-660.7	-616.5	-576.4
	Optimist	-216.9	-386.6	-517.5	-616.7	-690.0		-2,345.1	-2,191.7	-2,052.2
\$2.61	Baseline	NA	NA	NA	NA	NA		NA	NA	NA
	Low	-23.6	-44.6	-63.3	-79.9	-94.4		-295.1	-275.3	-257.3
	Moderate	-47.2	-88.8	-125.3	-157.3	-185.0		-582.5	-543.5	-508.0
	High	-70.8	-132.5	-186.0	-232.2	-271.8		-862.2	-804.5	-752.2
	Optimist	-283.1	-504.5	-675.3	-804.8	-900.5		-3,060.4	-2,860.1	-2,678.2
\$2.87	Baseline	NA	NA	NA	NA	NA		NA	NA	NA
	Low	-25.9	-49.0	-69.6	-87.8	-103.8		-324.5	-302.7	-282.9
	Moderate	-51.9	-97.6	-137.8	-172.9	-203.4		-640.5	-597.6	-558.6
	High	-77.8	-145.7	-204.5	-255.3	-298.9		-948.1	-884.7	-827.1
	Optimist	-311.3	-554.7	-742.6	-885.0	-990.2		-3,365.3	-3,145.0	-2,944.9
\$3.85	Baseline	NA	NA	NA	NA	NA		NA	NA	NA
	Low	-34.8	-65.8	-93.4	-117.8	-139.3		-435.3	-406.1	-379.5
	Moderate	-69.6	-130.9	-184.9	-232.0	-272.9		-859.3	-801.7	-749.4
	High	-104.4	-195.4	-274.4	-342.5	-400.9		-1,271.8	-1,186.8	-1,109.6
	Optimist	-417.5	-744.1	-996.2	-1,187.1	-1,328.3		-4,514.4	-4,219.0	-3,950.5

Table 5

	Projected cost-saving (\$C millions)
Minimum	\$197
25 th percentile	\$409
50 th percentile	\$705
75 th percentile	\$1,857
Maximum	\$4,514
Average	\$1,219

6. Discussion

6.1 On the magnitude and distribution of estimated cost-savings

It deserves repeating that the cost-savings estimated in this paper – though material – capture one piece of the anticipated overall benefit of ISO 20022 adoption in Canada. Thus they constitute a lower bound

for the overall economic benefit that ISO 20022 should bring to Canadians, with substantive upside potential.

These cost-savings are spread across all population segments in Canada (see Appendix 1). That said, since Canadian businesses and governments write two-thirds of cheques in Canada and are the primary beneficiaries of the remaining one-third of cheques written, while also incurring the brunt of the processing and reconciliation costs associated with cheque use, they are anticipated to benefit the most from ISO adoption. This is consistent with the conclusions of the Task Force (2012) and also the discussion in Chant (2015). Of course, any cost-savings reaped by businesses could, in turn, be distributed to consumers in a competitive environment.²⁵

Financial institutions in Canada are also expected to benefit from ISO adoption in this analysis. While the unit cost estimates in the international literature are limited in regard to specific cost data for financial institutions, one can draw on available quantitative and anecdotal evidence to approximate the cost-savings expected for Canadian financial institutions with ISO adoption. For example, the findings of Humphrey et al (2001) suggest that, from the perspective of Norwegian banks, the average cost to process a cheque payment was US\$2.15 during 1989-1995, compared to US\$0.92 for an electronic giro payment – a US\$1.23 cost differential (see Appendix 1 for more on this study). This is consistent with the Task Force (2012) assumption of \$1.00 saving to Canadian financial institutions for each cheque replaced by electronic.²⁶ *Combining this information with Chart 1 above, and using a 3 per cent discount rate, the present-value cost-saving to Canadian financial institutions from ISO adoption could range from \$300 million to over \$1 billion over the five years following adoption.*²⁷ As with all cost-saving projections in this study, this should be interpreted as a lower-bound for the overall benefit to Canadian financial institutions, as it does not even begin to take into account other sources of efficiencies and myriad new revenue-generating opportunities that the ISO 20022 standard will offer.

6.2 Addressing uncertainty in the exercise

As discussed, the DCF analysis is rich in assumptions given the uncertainty involved. Effort has also been made to err on the side of conservatism in a number of aspects of the work. Examples of the latter are provided below.

- As noted in the international literature (see Appendix 1), unit costs of different payment instruments exhibit economies of scale, where the cost differential between paper and electronic payments is expected to rise (perhaps non-linearly) as the latter replaces the former. These economies of scale have been ignored by the methodology in favour of a constant cost differential in each projection.
- Baseline cost-savings have been calculated using the six-year historical CAGR for cheques in Canada. As mentioned, this could be viewed as a conservative assumption.

²⁵ One could also imagine a scenario where the majority of ISO 20022 cost-saving is initially realized by businesses and governments. Financial institutions, in offering the ISO 20022 messaging service to their clients, could realize this and choose to recoup some or all of their ISO 20022 implementation costs by raising prices on ISO-compliant electronic payment offerings.

²⁶ This too appears to be evidence that the unit cost differentials used in this study are quite conservative.

²⁷ The precise cost-saving to financial institutions from migration of cheques to electronic following ISO implementation will depend on what proportion of cheque-related costs borne by these firms are variable and what proportion are fixed. The assumption made here is that there is at least some proportion of this cost that is variable, e.g., branch teller costs. However, to the extent that costs are fixed there is limited potential for cost-saving as long as some cheques remain in the system.

- Addition of a “pessimistic” cost differential of \$2.00 as part of the methodology. While trying to be conservative for purpose of this analysis, available anecdotal evidence²⁸ on the cost of cheque processing in Canada suggests that a unit cost differential this low is highly unlikely.
- Present-value cost-savings are only estimated over a 5-year period following ISO 20022 implementation – this is an avoided social cost year after year for the foreseeable future once a payment migrates to electronic.
- Even given the most ambitious (i.e., “Optimistic”) cheque migration projection for ISO adoption, there are still nearly 400 million cheques assumed written in Canada in 2020.
- Network effects could expedite cheque migration. This could have the effect of front-loading cost-savings over the 5-year projection period, resulting in a larger present-value calculation.
- No consideration has been given to quantifying the return on reinvested cost-savings.

Notwithstanding, there are other assumptions underlying the analysis that could serve as counter to the above.

- The analysis assumes that there would be no further impediments to achieving STP and automated reconciliation.
- Unit cost estimates for cheque and electronic payments do not distinguish between on-us and interbank payments.
- Cheque migration scenarios assumed by the methodology may be optimistic. If migration of cheques were for some reason pushed further into the future – i.e., projected cost-savings were ‘back-loaded’ following ISO 20022 adoption – present-value cost-savings of ISO adoption would be negatively impacted, all else equal.
- Despite strong evidence to suggest that ISO 20022 will expedite the migration of cheques to electronic payments, there is always a risk that the culture of cheque use in Canada is more entrenched than anticipated.
- Cheque imaging and remote deposit capture are anticipated to reduce (but not eliminate) the cost differential between cheques and electronic. The impact of these recent developments in Canada has not explicitly been factored into the methodology; that said, introducing the “Pessimistic” unit social cost differential is likely sufficient to accommodate any impact on the cost differential following introduction of these features.

Regarding the impact of cheque imaging technology on the unit cost differential between cheques and electronic payments, Humphrey and Hunt (2012) estimate cost-savings in the United States from introduction of the Check 21 initiative. The authors provide a chronology of per-unit payment processing costs at the Federal Reserve, which they argue could also apply to U.S. commercial and savings banks given similar technological outfitting. For example, in 2003, before there was any Check 21 volume, the cost to the Federal Reserve of processing and clearing a paper cheque was \$0.074. Compare this to 2010 with Check 21 in full force and where paper cheque processing and clearing at the Federal Reserve was virtually eliminated – the cost to process and clear a Check 21 item was \$0.022. As anticipated, scale economies abound, where the Federal Reserve’s cost to process and clear a *paper* cheque increased to \$2.78 by 2009Q4, compared to just \$0.043 in 1998.

From a Canadian perspective, the introduction of cheque imaging and remote deposit capture could negatively impact the rate of cheque migration to electronic whether or not ISO 20022 is adopted. From an ISO 20022 cost-savings standpoint, this could have mixed effects. On the one hand, this should result in reduced cheque migration rates contemplated for ISO adoption and therefore a reduced cost-saving

²⁸ See, for example, Task Force (2012), Chant (2015) and Carrick (2015).

estimate. On the other hand, cheque imaging and remote deposit capture should lead to a lower baseline cheque migration rate, which would enhance the cost-saving benefit. In the end, the impact of cheque imaging and remote deposit capture on the cost-savings to be realized by Canadians due to ISO 20022 adoption is an empirical question.

6.3 Comparison with the Task Force (2012) study

The Task Force predicts that, by 2020, Canadians could capture annual cost saving of \$7.7 billion (or 0.3 per cent of GDP) by transitioning to electronic payment and invoicing in a modernized national clearing and settlement environment that includes ISO 20022 adoption. The distribution of these cost-savings is spread across all population segments: \$5 billion to large corporates, \$1.4 billion to governments; \$0.7 billion to SMEs, and \$0.6 billion to banks.²⁹ This estimate was based on the Task Force's *Own the Podium* cheque migration scenario where only 330 million cheques were assumed written in Canada by 2020.³⁰ The Task Force's cost-saving estimate differs from the estimate in this paper. Recall that, using the most optimistic cost differential and cheque migration scenario, this paper estimates annual cost-saving to Canadians of \$2.1 billion by 2020, which includes baseline cost-savings (see the blue line in Chart 6). It is difficult to identify the source of the discrepancy between the two studies given available information. This could relate to: (i) scope and weighting of user influence on the cost differential calculation (i.e., there is no consumer segment in the Task Force work); (ii) estimated unit costs and cost differentials between cheques and electronic payments (i.e., it is unclear whether there is adjustment for double-counting in the Task Force estimates); and (iii) differences in time horizon over which cost-savings are estimated.

6.4 Deriving a unit cost differential for Canada

The cost-saving estimates in this paper leverage the findings from a number of international studies that have evaluated the unit cost differential between paper and electronic payments in different countries. Though not evidenced by the international studies, a "pessimistic" \$2.00 unit cost differential was also included in the analysis to be conservative. Rigorous examination of the unit cost differential in Canada is precluded due to lack of available data; notwithstanding, a *preliminary* estimate of this differential is presented in Appendix 2 based on what data are available. The estimated range for the Canadian unit cost differential in Appendix 2 is between \$3.07 and \$8.32, compared to a range of \$2.61 and \$3.85 reflected in the international evidence. Using this preliminary estimate, the cost-saving to Canadians from ISO adoption could be as high as \$10 billion over the 5 years following implementation. While refinement to this Canadian cost differential estimate is recommended for future research, it would appear to corroborate more closely with available anecdotal evidence on the relative cost of cheque processing in Canada. This also suggests that the most optimistic unit cost differential of \$3.85 used in the main analysis *could be* a more probable scenario than first thought – recall again that this value reflects the relative difference in cost between cheques and electronic payments accruing over the *entire* journey covering origination, administration and processing, reconciliation, clearing and settlement.

²⁹ The Task Force also concluded, but did not demonstrate, that ancillary benefits such as online services, renewed workforce productivity, greater interoperability, new technology products and widespread consumer adoption could push the benefit of transitioning to electronic payment and invoicing as high as 1 to 2 per cent of GDP.

³⁰ Annual 2020 cost-savings of \$3.2 billion were predicted for the Task Force's Groundhog Day cheque migration scenario (810 million cheques written in 2020).

7. Concluding remarks

This paper articulates certain economic benefits to Canadians from adoption of the ISO 20022 payment message standard. The analysis takes into account the interests of all population segments, i.e., consumers, businesses and financial institutions, and governments. Adoption of the ISO standard is anticipated to (1) improve efficiency in payments processing; (2) enhance the interoperability of CPA systems; and, (3) foster innovation through the payments value chain.

As an initial step in quantifying this full range of benefits, the paper adopts DCF analysis to estimate the cost-savings to Canadians that would stem from anticipated higher AFT payment use in lieu of cheques following ISO adoption. These cost-savings are estimated to surpass \$4.5 billion over the 5 years following ISO implementation. This should be interpreted as a lower bound to the overall economic benefit that ISO 20022 is expected to bring Canadians, with substantive upside potential.

Looking to the future, the payments research community would ideally consider a meaningful approach to model the benefits of ISO 20022 adoption in the Canadian payments ecosystem. Refinement of the Canadian unit cost differential between cheque and electronic payments is also suggested as an avenue for future research.

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Appendix I - Overview of relevant payments policy research – Estimating the social cost differential between electronic and paper payments

The issue of “*What does it cost to make a payment?*” has been studied at some length in the academic and central bank literature; see, for example, Wells (1996), Humphrey et al (2001, 2003), and Schmiedel et al (2012). These studies are international in nature, adopting an accounting approach to quantify the cost to society (or particular segments of society) from using alternative payment instruments such as cheques and ACH debits and credits.

In these studies, the unit cost of a payment reflects aggregated private costs – i.e., the cost to “produce” or manufacture the payment instrument, the cost to “use” the payment instrument from the perspective of both originator and beneficiary, and the cost to “process” the payment which includes clearing and settlement costs incurred by financial institutions. These studies are careful to adjust underlying data to avoid double-counting. That is, it is absolutely critical in this type of work to distinguish between costs and *economic rents* at each stage of the payments value chain.

While these studies were carried out in different time periods and jurisdictions, certain common findings emerge.

- As a general rule of thumb, an electronic payment costs society from one-third to one-half as much as a paper-based payment. [Humphrey et al (2003)]
- Payment instrument use is characterized by economies of scale. That is, the unit cost of a payment instrument will rise (fall) as use of the payment instrument decreases (increases). This means that one should expect the cost differential between paper and electronic payments to widen as the latter replaces the former. Moreover, scale economies for paper-based payments are small relative to those for electronic payments which infers a non-linear increase in the cost differential as cheques continue to migrate to electronic.
- Perhaps not surprising given the above points, the cost differential across countries is not homogenous. Economies of scale in payments processing means that the cost differential between paper and electronic in a given country is both time-varying and state-dependent.

Among these studies, Wells (1996) is an excellent example for cheque and ACH payments in the United States. Based on 1993 data, the author estimates the unit cost of a cheque to be between US\$2.78 and US\$3.09, while the unit cost of an ACH payment is estimated to range from US\$1.15 and US\$1.47.³¹ A detailed breakdown of the unit cost estimates in Wells (1996) for cheques and ACH payments is provided in Table A1 below.

A more recent analysis covering unit costs of alternative retail payment instruments in the European Union (EU) is presented in Schmiedel et al (2012). The authors’ findings are based on a survey exercise employing 2009 data and with 13 ESCB national central banks participating. The survey data were subsequently extrapolated to produce an estimate for the 27 member states of the EU. The survey results suggest that the market shares of cheques and direct debits/credit transfers in the EU in 2009 were 2.5 per cent and 18.3 per cent, respectively. Cash transactions carried the largest market share (>60 per cent). Importantly, the weighted-average unit cost of a cheque across the 13 ESCB participant countries surveyed was estimated to be €3.55 (most expensive form of payment) versus €1.27 for direct

³¹ Of note, in this and other studies, for businesses and governments, usage costs typically reflect an overall transaction processing cost, which sums together the cost of making the payment as well as related invoice processing costs. Data limitations typically preclude isolating just the payment-related cost.

debits and €1.92 for credit transfers. Cash transactions were estimated to carry the lowest unit social cost (€0.42).

While not a full unit (*social*) cost estimate, Humphrey et al (2001) borrow from a unique dataset covering semi-annual survey data from Norwegian savings and commercial banks on the quantity and price to process various payment instruments. Data used in the study covered the period 1989-1995. The authors show that, from the perspective of a bank, the average cost to process a cheque payment in Norway was US\$2.15 during the sample period, while the cost of an electronic giro payment (direct debit with notification) was US\$0.92. This represents a US\$1.23 cost differential between electronic and paper processing costs for banks in Norway during 1989-1995. This finding is consistent with anecdotal evidence presented by the Task Force (2012) for Canadian financial institutions. This factors in the additional processing and branch/teller costs that accompany paper payment items.

Table A1 Summary of Wells (1996) methodological breakdown of unit social cost estimates for cheques and ACH in the U.S.

Social cost component	Description	Cheque	ACH
Production costs			
- Printing	Based on prices ascertained from a cheque printing company. Range of prices given because consumer and business cheques are priced differently. May be seen as underestimation because it does not factor in the production of non-standard cheques. Author acknowledges that the price of a printed cheque does not equal its cost of production but production cost data not available.	0.02 – 0.04	0.00
- Distributing	Based on the 1993 cost to mail a box of cheques at third-class bulk rate. Cost is small on a per-item basis. ACH payments assumed not to have production costs, because no tangible payment item is associated with them. Acknowledged that there is a data transmission cost to sending an ACH file from a business to a bank, but with a large batch file the per-unit cost is likely to be negligible.	0.004 – 0.005	0.00
Usage costs			
- Payors	Based on weighted payor cost estimates for cheques and ACH, recognizing different user classes – consumers, businesses, governments – and transaction purposes.	1.18	0.80

	<p>Consumer cheques: Assumes opportunity cost of writing a cheque and bringing it to a mail facility is negligible. Business cheques: Broken down by purpose, into payroll, B2C and B2B transactions. For payroll cost, author uses Hackett Group (management consultancy) study estimate of average labour cost per payroll payment; for B2C and B2B, author uses Hackett Group estimates of average labour cost per accounts receivable invoice * Note the Hackett Group cost estimates are transaction processing costs, not just payments costs, and so are best characterized as electronic invoicing and payments costs (similar to the Task Force notion). State and local government cheques: for these government cheque costs, U.S. Treasury data from 1993 are used on direct and support costs for cheques written by the U.S. federal government for its benefit disbursement program. Because cheque processing at the Federal government level is likely to have greater economies of scale, we expect this to underestimate the cheque payment costs for state and local governments. The per unit cost estimate for cheques of \$1.18 in the next column is obviously sensitive to weights used for each payor segment – author used 55% consumers, 40% businesses and 5% governments.</p> <p>ACH costs also calculated based on the weighted cost of the various user segments and transaction types. These include credit originations by the Federal Government for benefit payments (26%); B2C credit originations (32%); B2B credit originations (6%); and debit originations for businesses to collect payments from customers (29%) and from other businesses (6%). The costs of these payments are estimated based on Federal Reserve data (Government ACH) and also firm-level transaction processing cost data from the Hackett Group (business ACH). Note that ACH debit origination costs are included under <u>payees</u> instead of payors since the payee incurs the cost of sending the payment in this instance – customer is payor in this case.</p>		
- Postage	The 1993 cost of first-class postage and an envelope multiplied by the combined weights for consumer cheques written to pay bills (30% of cheques) and business cheques written to pay other than payrolls (30% of cheques).	0.18	0.00
- Payees	Uses the same weighting method as for payor usage costs. For cheques, relevant payees include retailers, businesses receiving consumer bill payments, and businesses receiving payment from other businesses. Retailer payee costs are based on estimates for supermarket cheque processing from the Food Marketing Institute, and are extrapolated to other industries. Business payee costs come from the Hackett	1.25	0.23

	<p>Group – reflecting average labour cost to process an accounts receivable payment.</p> <p>For ACH payments, relevant payees include businesses originating ACH debits and consumers and businesses receiving ACH credits. Author assumes that consumers and businesses incur no opportunity cost to receive an ACH payment. Only cost incurred under ACH is for a business to originate an ACH debit transaction.</p>		
Processing costs			
- Clearing and settlement	<p>For cheques, a range of cost estimates is used since the cost of cheque processing operations at commercial banks can vary greatly depending on a bank's size and scale of operation. Several data sources were used to compile these costs, where cost data include multiple facets, and these sources include the Federal Reserve, Bank Administration Institute, Payment Systems, Inc., and American Bankers Association data. ACH processing cost data also were pulled from multiple sources (same sources as for cheques), and include costs borne by commercial banks and ACH network operators.</p>	0.15 – 0.43	0.12 – 0.44
Total Social Cost		\$2.78 – \$3.09	\$1.15 – \$1.47
Cost differential – electronic to paper items		41% to 48%	

Appendix 2 - Construction of a preliminary Canadian unit cost differential between AFT and cheques

This Appendix attempts to estimate a unit cost differential between AFT payments and cheques in Canada, based on available information. The analysis borrows data from the Task Force (2012), as well as anecdotal evidence provided by members of the Canadian payments ecosystem.

The methodology and underlying assumptions are as follows.

The Task Force’s estimated cost differential between electronic payments and cheques for different population segments are presented in Table A2.1 below.

Table A2.1

	Paper	Electronic	Cost ratio (E/P)
Corporations and governments	\$15 - \$20	\$8	40% - 53%
SMEs	\$4 - \$6	\$2	33% - 50%
Banks	\$1 in savings for each cheque replaced (e.g., processing, branch/teller costs)		

It is assumed that these estimates reflect double-counting – that is, the costs reported in the table for businesses and governments include not only the direct processing costs (e.g., labour costs) incurred by these entities to process each type of payment, but also the fees that their financial institutions charge for processing, clearing and settling the payments. These latter charges should be ignored in the analysis, since they will be accounted for when considering financial institutions’ direct costs of payments processing. That is, they should be ignored to avoid ‘double-counting’ in the unit cost of each type of payment.

What is a reasonable amount to deduct from the unit cost estimates in Table A2.1 to reflect the ‘bank-related’ charges incurred by businesses and governments? There are different pieces of information that can be used to come to a view. Anecdotal evidence provided by one large Canadian bank suggests it charges, on average, \$0.15 to process an AFT payment for a customer.³² At the same time, there is also the previously-cited Task Force evidence that financial institutions save, on average, \$1 for each cheque replaced by electronic. Combined, this evidence supports the following hypothetical bank-related charges being implicitly captured in Table A2.1.

³² Unfortunately this figure is an average across all customers, where it is highly likely that there is a material degree of price differentiation across customer segments.

Corporates and government: \$1.00 per cheque; \$0.10 per AFT

SMEs: \$1.10 per cheque; \$0.20 per AFT.

In this analysis, these amounts are deducted from the costs to corporates and governments and SMEs in Table A2.1 to reflect only the direct costs borne by these stakeholder segments to process paper and electronic payments.

As a next step, the full spectrum of user costs needs to be determined; that is, the direct costs incurred by all stakeholder segments – i.e., individuals, businesses (including financial institutions in their role as payment users) and governments as both senders and receivers of AFT payments and cheques. Addressing a missing element in the Task Force methodology, a consumer (individual) segment is needed as both a sender and receiver of payments. To be conservative, and following the international studies, it is assumed that consumers incur zero direct cost as a sender or receiver of AFT payments and cheques – which, notably, should be viewed as separate from the fees they are charged by financial institutions to carry out these payments.

In addition, there is insufficient data at this time to understand how the costs to businesses and government might differ between sending and receiving payments. As such, it is assumed that sending and receiving payments costs the same for these stakeholders for each type of payment. Finally, as with the international and Task Force studies, costs to business and government to send and receive payments are assumed to reflect an overall ‘transaction processing’ cost, containing both payment-related cost and any invoicing/reconciliation-related cost.

Taken together, the above assumptions combine to provide the user cost schedule presented in Table A2.2 below. The table is broken down by payment type, and by sender and receiver. It follows that all relevant column weightings should sum to 100.

Table A2.2

	Senders (cheques)		Senders (AFT)		Receivers (Cheques)		Receivers (AFT)	
	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost
Consumers	30%	\$0	0%	\$0	5%	\$0	30%	\$0
SMEs	40%	\$2.90 - \$4.90	30%	\$1.80	60%	\$2.90 - \$4.90	20%	\$1.80
Corporates/gov't	30%	\$14-\$19	70%	\$7.90	35%	\$14-\$19	50%	\$7.90

To complete the unit cost estimate exercise, a view on the production and processing (clearing and settlement) costs for each type of payment is required, as outlined below.

Following the methodology in Wells (1996), it is assumed that the standard postage rate per envelope in Canada is \$1, and that 60 per cent of cheques are mailed. Based on these assumptions, and assuming a profit margin for the postal service provider, the average per unit postage cost to mail a cheque in this analysis is \$0.40. It is also assumed to cost a combined \$0.05 to produce and distribute a cheque in Canada. Finally, as per the Task Force study, the assumed per unit cost-saving to financial institutions in Canada from migrating a cheque to electronic is \$1. As such, a reasonable assumption on the direct costs incurred by Canadian financial institutions to process, clear and settle AFT and cheque items is \$0.05 and \$1.05, respectively, on a per unit basis.

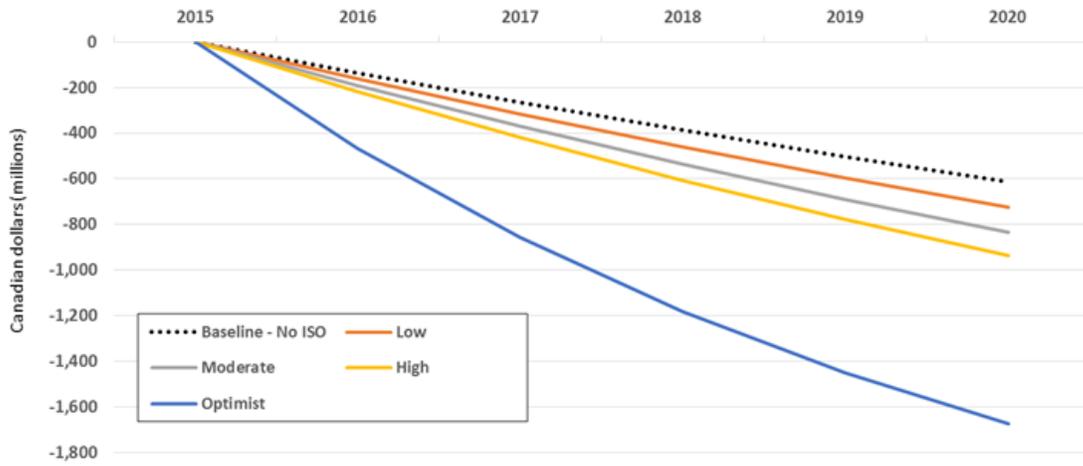
Putting all of the above pieces together, a preliminary estimate of the unit cost for AFT and cheque payments in Canada is provided in Table A2.3 below. The analysis points to a unit cost differential between cheques and electronic payments in Canada ranging from \$3.07 to \$8.32, which marginally overlaps with the international literature.

Table A2.3

Preliminary social cost estimate for Canada		
Social cost component	Cheque	ACH
Production costs		
- Print and distribution	0.05	0.00
Usage costs		
- Senders	5.36 – 7.66	6.07
- Postage	0.40	0.00
- Receivers	6.64 – 9.59	4.31
Processing costs		
- Clearing and settlement / commercial bank costs	1.05	0.05
Total social cost	\$13.50 – 18.75	\$10.43
Cost differential	\$3.07 - \$8.32	
<small>Note: Costs include payments and invoicing as per Task Force and international studies. Sources: Task Force/McKinsey; Author's own estimates based on anecdotal information.</small>		

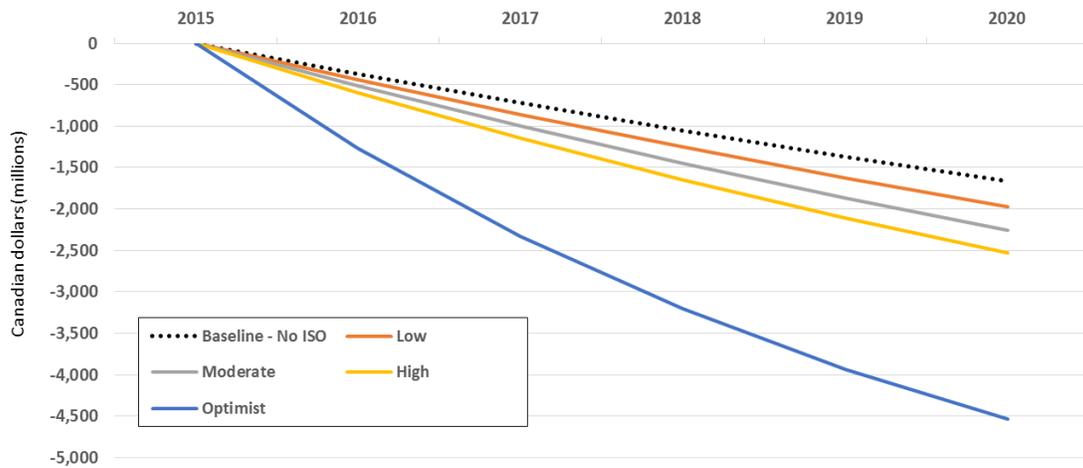
The 5-year projected cost-savings following ISO 20022 adoption using these estimated cost differentials are captured below in Charts A1 and A2. The structure of these charts is the exact same as for Charts 3-6 presented earlier. For ease of reference, the same results are presented in tabular form in Table A2.4. There are a total of 24 projections of ISO 20022 cost-savings presented in this analysis – i.e., 2 cost differentials x 4 cheque migration scenarios x 3 discount rates. Hence 24 populated cells in the last three columns of Table A2.4.

Chart A1: Estimated annual cost savings to society from ISO adoption (2016-2020)
(2015 social cost as base year; Using a \$3.07 cost differential)



Note: The chart includes 4 projections of annual cost savings given ISO adoption in Canada and also the baseline case (No ISO -- dotted line). Cost-savings are a function of how many fewer cheques were used in the year relative to in 2015, and as well the value of the cost differential between paper and electronic hat is being contemplated.

Chart A2: Estimated annual cost savings to society from ISO adoption (2016-2020)
(2015 social cost as base year; Using a \$8.32 cost differential)



Note: The chart includes 4 projections of annual cost savings given ISO adoption in Canada and also the baseline case (No ISO -- dotted line). Cost-savings are a function of how many fewer cheques were used in the year relative to in 2015, and as well the value of the cost differential between paper and electronic hat is being contemplated.

Table A2.3

		2016	2017	2018	2019	2020		DCF (1% DR)	DCF (3% DR)	DCF (5% DR)
\$3.07	Baseline	NA	NA	NA	NA	NA		NA	NA	NA
	Low	-27.73	-52.47	-74.46	-93.93	-111.08		-347.11	-323.79	-302.63
	Moderate	-55.48	-104.42	-147.40	-184.97	-217.62		-685.17	-639.25	-597.57
	High	-83.22	-155.81	-218.80	-273.13	-319.68		-1,014.14	-946.33	-884.78
	Optimist	-332.95	-593.38	-794.34	-946.62	-1,059.18		-3,599.77	-3,364.22	-3,150.17
		2016	2017	2018	2019	2020		DCF (1% DR)	DCF (3% DR)	DCF (5% DR)
\$8.32	Baseline	NA	NA	NA	NA	NA		NA	NA	NA
	Low	-75.15	-142.19	-201.79	-254.56	-301.05		-940.71	-877.51	-820.16
	Moderate	-150.34	-282.98	-399.48	-501.30	-589.78		-1,856.88	-1,732.42	-1,619.46
	High	-225.54	-422.26	-592.96	-740.22	-866.37		-2,748.43	-2,564.65	-2,397.83
	Optimist	-902.33	-1,608.12	-2,152.73	-2,565.44	-2,870.47		-9,755.73	-9,117.36	-8,537.26

Using these preliminary estimates of the unit cost differential in Canada between cheques and AFT payments, Charts A1 and A2 and Table A2.4 show that cost-saving to Canadians realized from ISO 20022 adoption could approach \$10 billion over the 5 years following implementation.

Further refinement of this analysis is deemed a useful avenue for future research.