CT-2010-010

THE COMPETITION TRIBUNAL

IN THE MATTER OF the *Competition Act*, R.S.C. 1985, c. C-34, as amended;

AND IN THE MATTER OF an application by the Commissioner of Competition pursuant to section 76 of the *Competition Act*;

AND IN THE MATTER OF certain agreements or arrangements implemented or enforced by Visa Canada Corporation and MasterCard International Incorporated.

B E T W E E N:

THE COMMISSIONER OF COMPETITION

Applicant

VISA CANADA CORPORATION AND MASTERCARD INTERNATIONAL INCORPORATED

Respondents

THE TORONTO-DOMINION BANK AND THE CANADIAN BANKERS ASSOCIATION

Intervenors

WITNESS STATEMENT OF CHRIS HEWITT

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Public

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WITNESS STATEMENT OF CHRIS HEWITT

I , CHRIS HEWITT, of the Town of Milton in the Province of Ontario, MAKE OATH AND SAY AS FOLLOWS:

I. INTRODUCTION & BACKGROUND

(a) My Background

1. I am employed by The Toronto-Dominion Bank (**"TD"**) as Associate Vice President ("**AVP**"), Direct Marketing. I also have interim responsibilities related to my previous position as AVP, TD Retail Products, Credit Cards.

2. I have worked for TD since 2007 and have worked in the payments industry since 2000.

3. Between 2000 to 2001, I was the National Sales Manager of The Mosaic Group supporting American Express where I gained extensive experience in the credit card direct acquisition sales channel. I joined Canadian Tire Corporation as an Associate in 2001. I was subsequently promoted to Senior Associate and was responsible for, among other things, supporting a portfolio of credit card and insurance products as well as for strategic marketing and advertising planning. In 2005, I was promoted to the position of Marketing Manager of MasterCard Product Development at Canadian Tire. In this role, I was responsible for the end-to-end profit and loss development, marketing and launch of the new credit card products.

4. In 2007, I joined TD as a Senior Manager of Credit Card Loyalty and Benefits. In this role, I led the product management activities for TD's premium credit card products (discussed in detail below) and developed strategies [redacted]

5. In January 2010, I was promoted to the position of AVP of TD Retail Products, Credit Cards. While the focus of this position was the account management and acquisition of credit cards, I also led the development and execution of strategic initiatives, [redacted] and developed strategies for the on-line TD Rewards Portal and for identifying alternate acquisition channel opportunities. I also acted as the primary contact for the TD Credit Card Group with key partners within TD in the credit card space, including distribution channel, merchant services, marketing and credit risk partners.

6. On March 26, 2012, I was appointed as AVP of Direct Marketing. In this position, I oversee TD's direct marketing for all products in North America including supporting all direct marketing activities for TD's credit card products. In the interim, as part of the transition responsibilities flowing from my previous position, [redacted] for the issuing business with MasterCard International ("**MasterCard**") and Visa Canada (collectively with Visa Inc., "**Visa**") relating to our Canadian credit card operations.

(b) The Toronto-Dominion Bank

7. I have reviewed the Witness Statement of Jeff van Duynhoven, affirmed on April 9, 2012. Paragraphs 6-7 of that Witness Statement provides background information regarding TD, and I agree with and adopt this background information.

(c) TD's Credit Card Group

8. TD's Credit Card Group issues Visa credit cards (**"TD Visa Cards"**) to consumers and small businesses (collectively, **"Cardholders"**) and provides supporting credit card services and card benefits to Cardholders. In this respect, TD is known in the payments industry as an "issuer" of Visa credit cards (a Visa **"Card Issuer"**).

9. TD has also recently purchased the portfolio of MasterCard business from MBNA Canada Bank (now called BofA Canada Bank) which issues MasterCard credit cards to their consumer and small business cardholders. That acquisition closed on December 1, 2011.

10. The acquiring side of TD's credit card business, which provides payment card acceptance services to its small, medium and large businesses (**"Merchants Customers"**), will be addressed in Mr. van Duynhoven's Witness Statement. Businesses that provide payment card acceptance services to Merchants are called Acquirers.

II. TD'S RELATIONSHIP WITH VISA RELATIVE TO INTERCHANGE FEES

(a) Background to TD's Contractual Relationship with Visa

11. [redacted]

12. The acquiring aspects of the relationship will be discussed by my colleague, Jeff van Duynhoven, in his Witness Statement.

13. [redacted] the "Visa Manual" which is defined [redacted] as the "Manual" and includes, among other documents, the Visa International Operating Regulations and those Operating Regulations which contain the Operating Regulations that are specific to the Visa Canada Region (the "**Operating Regulations**"). Attached hereto as **Exhibit "B"** are true copies of all the provisions within the Operating Regulations which I discuss in this Witness Statement.

14. [redacted]

15. [redacted] See **Exhibit "A"** for a true [redacted] of the TD-Visa Agreement [redacted]

(b) Specific Clauses Dealing with Interchange Fees

16. As a Card Issuer, TD receives fees from the Acquirers who acquire transactions that flow from TD Visa Cards (**"Interchange Fees"**). The provision whereby Acquirers agree to pay

Interchange Fees to Card Issuers is found in the Visa Manual, which also sets out the technical requirements for calculating and submitting the Interchange Fees. For example, under the "Core Principles" section of the Operating Regulations, Acquirers agree to "pay interchange to issuers for purchase transactions".

17. As there are hundreds of different Acquirers globally from whom issuers of Visa credit cards receive Interchange Fees, Visa sets the default rate at which Interchange Fees may be calculated in respect of a transaction (the "**Default Interchange Rates**") unless the Card Issuer and the Acquirer have negotiated a bilateral agreement relating to the Interchange Fees. This is also described under the "Core Principles" section of the Operating Regulations.

18. As a Card Issuer, TD is free to negotiate with Acquirers the rate at which Interchange Fees are calculated in respect of TD Visa Card transactions acquired by that Acquirer. TD's Credit Card Group is free to enter into a bilateral agreement with an Acquirer whereby TD will agree to be paid a specified rate for Interchange Fees for any TD Visa Card transactions acquired by that Acquirer. [redacted] This right is also expressed in the Visa Manual and, in particular, in the "Core Principles" section of the Operating Regulations.

19. [redacted] there is no economic justification for TD to negotiate Interchange Fees because the Default Interchange Rates set by the payment networks adequately compensate TD for the services that it provides to Cardholders. Negotiating a different Interchange Fee with other players in the payment industry such as Acquirers would be an expensive and cumbersome process.

(c) TD has No Role in Setting the Default Interchange Rates

20. TD does not set Default Interchange Rates. TD does not control or seek to control Visa's setting of Default Interchange Rates even though Interchange Fees are an important source of revenue for the TD Credit Card Group. Visa exercises complete discretion in the setting of the Default Interchange Rates.

21. TD has never discussed or negotiated Default Interchange Rates with Visa or MasterCard. [redacted] Default Interchange Rates were never raised as a discussion or negotiating topic. In my experience, Visa informs TD what the Default Interchange Rate is for specific card products, and then, TD develops a business case for a compelling product taking the Default Interchange Rate into account.

III. PROPOSED ORDER WOULD HARM TD'S ISSUING BUSINESS AND THE PAYMENTS INDUSTRY

22. I have been considering the potential impact of the Order sought by the Commissioner (the **"Proposed Order"**) on TD's issuing business in Canada. It is very difficult to state with certainty what the impact of the Proposed Order will be given the complexities of TD's issuing business. In summary, I believe it is very likely that the following negative impacts of the Proposed Order will occur:

(a) Selective acceptance will cause confusion and frustration to Cardholders;

(b) If selective acceptance occurs, then credit card transaction volumes will go down;

(c) It will be difficult for TD to seek to negotiate acceptance with Merchants and it is likely that attempts will only be made to do so with larger Merchants;

(d) If selective acceptance occurs it will cause a dysfunctional payment network;

(e) TD's brand will be negatively impacted if a Merchant declines a TD Visa Card or if it is surcharged leading to, among other things, increased customer service costs;

(f) If selective acceptance and surcharging occurs on a widespread basis then innovation will be adversely impacted;

(g) If surcharging becomes widespread it will likely take the form of an arbitrary blended fee that may bear no relationship to the cost of acceptance;

(h) There will be a transfer of wealth from Cardholders to Merchants if surcharging becomes widespread;

(i) There will be a shift from credit card use to Other Payment Forms (defined below) if surcharging becomes widespread;

(j) Smaller card issuers and new entrants will be most affected by these changes caused by the Proposed Order; and

(k) If selective acceptance and widespread surcharging occurs then TD will have to redesign its card products to reduce costs and increase revenue streams which will decrease the utility of credit cards as a payment form.

(a) TD's Issuing Business

23. It is necessary to briefly describe TD's issuing business in order to properly describe the impact of the Proposed Order on TD's business.

i. Competition with other Card Issuers

24. Competition between Card Issuers is fierce. TD's goal is to become the number one issuer of credit cards in Canada. TD competes directly with Card Issuers that provide Visa credit cards and/or credit cards from other networks.

25. I believe that Visa introduced the Infinite Card product category (**"Visa Infinite Card**") as a direct competitive response to American Express' success in attracting "high income" and "high spend" Cardholders with their "premium cards". American Express was particularly successful at attracting Cardholders with high incomes by providing them with attractive benefits that were included in their premium cards.

26. TD and other Card Issuers using Visa credit cards were finding it difficult to compete with the rewards offered by American Express to their cardholders. I believe that American Express was able to offer attractive product offerings because its merchant discount fees or card acceptance fees were substantially higher than Visa's Default Interchange Rates.

27. I believe that the increasing number of American Express card transactions was having a corresponding downward effect on Visa transaction volumes. This reduction in Visa transaction volume has a negative effect on Visa itself, as well as on its Card Issuers and Acquirers, as transaction volumes are the means through which Visa, Card Issuers and Acquirers remain viable.

28. TD launched its first Visa Infinite Card known as the TD First Class Travel Visa Infinite Card (the "**Infinite Card**") in March 2008. [redacted] TD structured the Infinite Card to offer a suite of rewards and benefits to Cardholders in order to attract "high income" and "high spend" Cardholders. TD designed its rewards and benefits to encourage these Cardholders to use their "premium card" to spend more often and for larger purchases.

ii. *Competition with Other Payment Forms*

29. The TD Credit Card Group also faces competition from other payment forms. In other words, the Credit Card Group targets all persons requiring a payment mechanism to make

purchases. As such, TD competes with other payment forms such as cheques, cash, debit, money orders, travellers cheques, gift cards, prepaid cards, private label store cards, and other mobile and electronic payment forms, including PayPal ("**Other Payment Forms**").

30. By way of example, TD is increasingly deploying credit cards equipped with "contactless" technology that allow Cardholders to literally wave the card at point of sale equipment to make purchases up to an amount pre-determined by the Merchant. The benefit of this technology is that the payment process is streamlined as Cardholders are not required to enter their PIN or sign a slip. In making the payment process faster and less cumbersome, credit cards with "contactless" technology compete directly with Other Payment Forms (especially cash) that are viewed by consumers as faster alternatives than credit cards and therefore, more convenient for making smaller purchases.

iii. TD's [redacted] in the Payment Industry

31. [redacted]. Canada's issuing business is mature and the number of "cardable" transactions in Canada is not growing at the pace that it was prior to 2008. By cardable transaction, I mean any purchase transaction that could be made using a credit card. In this challenging market context[redacted]

32. [redacted] The term "active accounts" ("**Active Accounts**") is used by TD to measure the size of its credit card portfolio. Active Accounts measure TD's credit card accounts on which the Cardholder either carried a balance or processed a purchase transaction over the course of the proceeding year.

[redacted]

[redacted]

Fiscal Year	[redacted]
2005	[redacted]
2006	[redacted]
2007	[redacted]
2008	[redacted]
2009	[redacted]
2010	[redacted]

Annexed hereto as **Exhibit "C"** is a true copy of the Profit and Loss Statements for TD's Credit Card Group for 2005-2010[redacted]

33. [redacted] the annual sales volume that flowed from TD Visa Cards between 2005-2010 [redacted]

Fiscal Year	[redacted]
2005	[redacted]
2006	[redacted]
2007	[redacted]
2008	[redacted]
2009	[redacted]
2010	[redacted]

34. [redacted]

[1] TD's fiscal years run from November 1 to October 31. For example, Fiscal Year 2010 ran from November 1, 2009 to October 31, 2010.

(a) First, TD has [redacted] market share in the credit card issuing industry by attracting Cardholders away from other Card Issuers and Other Payment Forms; and

(b) Second, TD has offered compelling products and services to encourage Cardholders to utilize their TD Visa Cards (and in particular, TD's Infinite Card) more often and for larger purchases.

iv. TD's Credit Card Products

35. At present, TD offers a total of thirteen (13) different TD Visa Cards, *i.e.*, ten (10) different cards for individual consumers and three (3) different cards for small business customers. These credit cards provide a range of features that appeal to a diverse group of individual and small business Cardholders and accommodate different needs, preferences and priorities. By way of example, for individual Cardholders:

(a) The TD Green Visa, the TD Rebate Rewards Visa, the Drivers Rewards Visa and the Gold Select Visa cards have no annual fees;

(b) The TD Emerald Visa card has a low interest rate and is designed for consumers who regularly carry balances on their credit cards;

(c) The TD Classic Travel Visa, the TD Platinum Travel Visa and the Infinite Card (defined above) are designed for consumers who want "travel" rewards;

(d) The TD Rebate Rewards Visa and the TD Gold Elite Visa cards target consumers who want "cash back" rewards (rebates);

(e) The Drivers Rewards Visa card provides unique "points" that can be redeemed by the Cardholder toward the purchase or lease of any new or used vehicle or towards auto-related services and products; and

(f) The TD U.S. Dollar Visa card allows Cardholders the ability to make purchases in U.S. dollars with the intention of attracting consumers who travel or shop frequently in the United States and who wish to avoid currency conversion fees.

36. TD also offers three (3) Visa Cards for small business customers. TD provides business customers using Visa Cards with detailed account management reporting at no additional fee, a feature not offered to individual Cardholders.

(b) The Economics of TD's Issuing Business

37. Understanding the current economics of TD's issuing business is necessary to properly explain the impact of the Proposed Order on TD and on the payment industry. As a for-profit enterprise, the Credit Card Group's viability as a business and its ability to compete is dependant on a reliable stream of annual revenue that more than offsets its expenses and allows TD to earn a profit each year. If the economics of TD's issuing business are radically transformed then this will result in significant changes to the way in which TD operates in the issuing business.

i. Expenses of the Credit Card Group

38. TD's Credit Card Group operates a capital-intensive business with substantial ongoing expenses. There are four main areas in relation to which the Credit Card Group incurs its largest expenses:

(a) ***Bad Debt / Write-Offs***: Every year, TD is required to write-off [redacted] to reflect (1) outstanding balances on TD Visa Cards for which TD cannot collect payment from Cardholders, and (2) fraud committed on TD Visa Cards. These write-offs are the realization of the inherent credit risk that TD undertakes by issuing credit cards to Cardholders. [redacted]

[redacted]

(b) ***Cost of Money***: The Credit Card Group incurs two distinct and significant capital costs, both of which are not within the business' control:

(i) First, the Credit Card Group expends substantial resources to provide an interest-free grace period to Cardholders for their purchases. This is the "cost of funds" for money that the Credit Card Group borrows from TD between when a Cardholder transacts at a Merchant, and when that Cardholder's expenditure is payable. [redacted] The "cost of funds" is particularly high for Cardholders of premium cards who spend more than Cardholders with non-premium cards; and

(ii) Second, the Credit Card Group is required by its regulator to hold capital reserves in order to account for the credit risk associated with offering credit to Cardholders. [redacted]

(c) ***Rewards and Benefits***: Most of TD's Visa Cards also provide Cardholders with rewards and benefits that are included with their TD Visa Cards, such as TD Points redeemable towards travel or merchandise purchases, the TD Drivers Rewards Program which allows for points to be redeemed towards auto leasing/ vehicle purchases and auto related goods and services, rebates that are credited to Cardholders, and the provision of auto rental collision / loss damage insurance, medical and travel insurance, purchase security and extended warranty insurance. TD competes directly with other

Card Issuers, including AMEX Canada Bank in terms of the rewards and benefits that it provides to Cardholders. [redacted]

(d) ***Service and Support***: From the outset of the relationship between TD and its Cardholders, TD provides ongoing service and support. Initially, TD "adjudicates" or processes the credit card application, which requires it to conduct a credit risk assessment of the applicant. TD then provides initial account set up and support including card plastic issuance and supporting account information, followed by ongoing transaction support, including the handling of all manner of credit card inquiries whether by phone, by the Internet or at a branch. [redacted]

ii. *Revenue of the Credit Card Group*

39. The revenue side of TD's issuing business is driven by three revenue streams:

(a) Annual fees and Other fees;

(b) Interchange revenue (as set by the payment networks); and

(c) Interest earned on revolving balances.

40. Many of TD's credit cards require Cardholders to pay an annual fee and other fees.

41. Interchange Fees are an important source of revenue for TD. [redacted] First, Visa sets minimum reward requirements in relation to each credit card product and attaches a certain Default Interchange Rate for that product that is associated with the features and benefits. [redacted]

[redacted] Second, Card Issuers compete against each other for Cardholders based in large part on the rewards and benefits that they offer within each credit card category.

42. [redacted] I provide below the average weighted Default Interchange Rate earned by TD on the total transaction volume flowing from TD's Visa Cards between 2005-2010:

Fiscal Year	[redacted]
2005	[redacted]
2006	[redacted]
2007	[redacted]
2008	[redacted]
2009	[redacted]
2010	[redacted]

43. TD has been successful in [redacted] because of the superior value that I believe we provide to our Cardholders. In my opinion, the rewards and benefits offered by the Infinite Card is one of the richest in the industry for Visa cards. Among other things, TD has designed the Infinite Card to provide consumers with a highly transparent redemption process. Consumers are able to redeem their rewards with ease and with very few exceptions (such as black out periods).

44. Since its launch, the Infinite Card has become a very successful credit card product for TD. [redacted] These statistics reinforce TD's belief that there is strong consumer demand for compelling "premium card" products with a strong value proposition.

45. Similarly, Infinite Cardholders spend more on their credit cards than other TD Visa Cardholders. [redacted]

46. That Cardholders with premium cards spend more than cardholders without premium cards is not surprising. In my experience, Cardholders with a premium card like the Infinite Card spend more than they usually may in the circumstances because of the return they are getting from rewards and benefits. At its simplest, the theory which we base the rewards aspect of our issuing business on is that Cardholders feel good about spending money on their credit cards because of the rewards they earn, and will therefore spend more. When grocery shopping for example, a Cardholder may well purchase a fancier, more expensive kind of ice cream if she receives an attractive rewards package. Likewise, Cardholders will also feel good about redeeming or spending the rewards they accumulate. TD's business model for the Infinite Card relies on driving increased transaction volume from Cardholders behaving in this manner and this is part of the value that a Cardholder with a premium card offers Merchants.

(c) It is Difficult to Predict the Outcome of the Proposed Order

47. It bears noting at the outset that it is very difficult to foresee the precise nature of the impact of the Proposed Order for two reasons. First, the issuing business is very complex and

highly dynamic. Second, the introduction of the Voluntary Code of Conduct for the Credit and Debit Card Industry in Canada (the "**Voluntary Code of Conduct**") is in the process of modifying the issuing business. The full impact of the Voluntary Code of Conduct can only be properly appreciated over time. Attached hereto as **Exhibit "D"** is a true copy of the Voluntary Code of Conduct.

48. I agree with Mr. van Duynhoven's comments in paragraphs 127 to 143 of his Witness Statement regarding the Voluntary Code of Conduct, and in particular, the significance of the ability of Merchants to provide Cardholders with a discount for using Other Payment Forms. I agree with Mr. van Duynhoven that discounting provides Merchants with an important tool to steer Cardholders to Other Payment Forms and to provide Cardholders with clearer signals regarding the costs of accepting credit cards.

49. The Voluntary Code of Conduct has addressed many of the concerns voiced by Merchant groups in relation to credit cards. However, it is early days and the full impact of the Voluntary Code of Conduct cannot yet be properly assessed.

50. In addition to Mr. van Duynhoven's comments I would note that the Voluntary Code of Conduct contains a highly significant change for the issuing business. The Voluntary Code of Conduct now spells out specific requirements for the issuance of premium cards to Cardholders which ensure that Merchants are provided with greater value when accepting premium credit cards. The Voluntary Code of Conduct specifies that premium cards must only be given to Cardholders who "apply for or consent to such cards" and the Cardholders must be "a well-defined class of cardholders based on individual spending and/or income thresholds". In particular, for Visa Cards, the Infinite Card can only be issued to consumers who have a minimum annual income of $60,000 or a minimum household income of $100,000 or those who spend an annual amount of $30,000 or more on their Visa Card product.

51. Notably, TD had complied with these standards even prior to the Voluntary Code of Conduct, as a result of requirements under the Visa Manual. To the extent that other Card Issuers were not acting like TD, the Voluntary Code of Conduct should now stabilize the payment industry by ensuring that premium cards are only issued to consumers who meet strict income or spend requirements.

(d) The Honour All Cards Rule is Fundamental to the Issuing Business

52. The payment industry has always strived to ensure that acceptance is not a barrier faced by Cardholders. Accordingly, the Honour All Cards rule is fundamental to the operation of the issuing business. If this rule is abolished, this would cause a "sea-change" in the issuing business and TD would be hard pressed to adapt to this change. It would certainly have to reconsider a number of its policies and practices which would in turn significantly change the way that credit cards operate for TD's Cardholders.

53. The Honour All Cards rule ensures that Merchants do not unfairly or arbitrarily target specific Card Issuers' cards and thus impact the Cardholders of those issuers. It allows Card Issuers to compete with each other on a level playing field and to offer the best and most competitive cards to Cardholders who are assured that all their cards, regardless of issuer, will be accepted and treated like all other cards. Historically, this rule enabled TD to compete with larger Card Issuers [redacted]

54. The discretionary acceptance of credit cards by a Merchant is presently not factored into the issuing business. In particular, TD does not consider Merchant acceptance as a barrier when designing its TD Visa Cards. Similarly, Cardholders do not consider Merchant acceptance as a barrier before using their TD Visa Cards. Allowing Merchants to, at their complete discretion, discriminate against certain credit cards (and conversely prefer other credit cards) would cause confusion amongst Cardholders sufficient to deter them from using both TD Visa Cards, and in my belief, any form of credit card.

55. Cardholders will be uncertain about whether their credit card will be accepted by a Merchant. I have no doubt that if discretionary acceptance by Merchants becomes widespread it will lead to consumer frustration and decreased transaction volume. A Merchant's denial would have particularly harsh consequences for a Cardholder with only one credit card in their wallet or one credit card period.

56. Similarly, the negative consequences of merchant denial are most evident in "use first, pay later" scenarios such as when a Cardholder attempts to use their credit card after making use of the Merchant's product or service (for instance, eating at a restaurant or buying gas).

57. To hedge against such outcomes, it is likely that Cardholders will carry more than one credit card. An unintended consequence is that Cardholders would risk increasing their credit exposure. Cardholders could also increasingly rely on Other Payment Forms that may have more risk (for example, carrying more cash and cheques). Overall, not only may the TD Visa Card become less attractive, but credit cards as a payment form will likely decrease in usage.

58. Card Issuers like TD could have to redesign TD Visa Cards in order to ensure their widespread acceptance in the marketplace. This would be very challenging in an environment in which a Merchant's acceptance was discretionary. I see three implications flowing from this:

(a) TD as a Card Issuer cannot make any concession to Merchants about the Default Interchange Rate for other Card Issuers. At most, TD could enter into negotiations regarding Interchange Fees on its own cards. However, TD as a Card Issuer has no control over the prices actually charged by other Acquirers to their Merchant customers and thus no ability to ensure that its concession on Interchange Fees impacts the price actually charged to the Merchant by an Acquirer. Bilateral negotiations of this kind, with all of its limitations would at best result in a fragmented pricing structure that would be exceedingly difficult to manage for all parties in the system;

(b) Second, although bilateral arrangements are not typically entered into between Card Issuers and Merchants, Card Issuers will likely be motivated to negotiate "most favoured card" arrangements with larger Merchants. These arrangements are unlikely to benefit consumers and will almost certainly not be made with smaller merchants (as described below in (c)). Moreover, in negotiating favourable arrangements with larger Merchants, Card Issuers will incur costs that will, at least in part, be passed on to cardholders; and

(c) Third, as a practical matter, Card Issuers will be unable to negotiate with tens of thousands of Merchants across Canada. Even if such negotiations were possible (and they are not), they would cause an undue administrative burden on Card Issuers which would in turn drive up costs and translate into higher prices charged to Merchants.

59. Merchants could refuse to accept TD's Visa Cards (or for that matter surcharge) because of unrelated business disputes with TD, or merely to put pressure on TD for numerous reasons (including if they wished to promote one issuer's card over another) which would cause unpredictable fragmentation in the payment industry. In turn, Cardholders might re-evaluate their credit card and associated banking relationship with TD. TD Visa Cards are a product highly associated with TD's brand.

60. In my opinion, Cardholders will likely associate a Merchant's denial of a particular credit card with their Card Issuer and not with the Merchant. For instance, if an Infinite Card is not accepted by a Merchant, the Cardholder's opinion of the TD "brand" will be negatively impacted. More concretely, the Proposed Order will lead to increase costs for TD. For instance, TD will face increased costs when Cardholders inevitably contact TD's call centre or seek online support following a credit card being denied or surcharged. I estimate that each call to a TD call centre costs TD [redacted] per call. It is my view that there will be significant spike in such

calls. Increased costs of this nature will put increased pressure on the profitability of TD's issuing business.

61. Any dramatic change to the economics of the issuing business will adversely impact innovation. Emerging payment forms such as mobile payments and contactless payment cards rely on credit card networks. Designing emerging payment forms requires the intensive investment of capital which TD will be reluctant to undertake if the economics of the issuing business are destabilized. Further, selective card acceptance and surcharging by themselves will likely impede the development of emerging payment forms.

62. Recent technological innovation in the payment industry has been focused on increasing card usage while making security a priority for Cardholders. The Proposed Order would erect barriers to innovation in the payment industry and could make Cardholders more vulnerable to fraud and theft when they revert to Other Payment Forms.

(e) The No Surcharging Rule is Significant to the Economics of the Issuing Business

63. The No Surcharging Rule is also fundamental to the issuing business. If unfettered surcharging becomes a widespread practice then this would fundamentally alter the economics of a credit card transaction.

64. For the reasons given by Mr. van Duynhoven at paragraph 144 and following of his Witness Statement, if the Proposed Order were granted, and assuming that a sizeable proportion of small, medium and large Merchants in Canada began to engage in acceptance practices that were previously prohibited by the Honour All Cards and/or No Surcharging Rules, the following concerns set out below would arise.

65. Since surcharging is completely at the discretion of the Merchant, there is no assurance that the Merchant will surcharge a Cardholder proportionately to the card acceptance fee paid by that Merchant for the Cardholder's *specific* credit card. Consequently, as in other

jurisdictions, Merchants may charge all Cardholders an arbitrary "average" or blended fee that has no relation to the underlying charges incurred the Merchant. Similarly, Merchants may charge Cardholders of premium cards the same (or a proportionately different) surcharge as that charged to Cardholders of non-premium cards. Most troubling is that Merchants may apply a surcharge over existing retail prices rather than first reducing retail prices and then surcharging. This will have the effect of raising retail prices for Cardholders being surcharged.

66. I do not believe that the surcharge fees that Merchants will collect from Cardholders will be passed on to or otherwise benefit Cardholders. The net result is that Merchants will be enriched at the expense of Cardholders.

67. I strongly believe that if surcharging became widespread, TD would lose sizeable market share to Other Payment Forms. In turn, this would lead to lower volumes of credit card transactions, which in turn will affect the profitability of TD and other Card Issuers.

68. Leaving aside the economic impacts of surcharging, from a practical perspective, surcharging makes the purchasing process more cumbersome for Cardholders (and presumably, Merchants) as it adds one additional step to the purchasing process. This is counterintuitive to the most fundamental tenet of marketing credit cards which is to make the purchasing process with a credit card as convenient and efficient as possible for all parties. I have no doubt that if the Proposed Order led to widespread surcharging this would lead to a longer and less efficient purchasing process, consumer frustration, decreased transaction volume and eventually, a drag on the Canadian economy.

69. As surcharging would operate as a tax on purchases made by Cardholders, Cardholders will naturally respond to Merchant surcharging by seeking out a Merchant who does not surcharge, switching to or favouring Other Payment Forms, and possibly reconsidering their purchasing habits altogether. To mitigate against the unpredictability of surcharging, and to avoid surcharging fees, Cardholders may switch to or increasingly depend on Other Payment

Forms. As I previously mentioned, the Credit Card Group has always viewed Other Payment Forms as competitive alternatives to payment by a TD Visa Card. I strongly believe that widespread surcharging would cause TD to lose sizeable market share to Other Payment Forms. In turn, this will lead to lower volume of credit card transactions, which in turn will affect the profitability of TD's issuing business and cause TD to reconsider aspects of its business as set out further below.

70. Surcharging will almost certainly increase the cost of goods and services for Cardholders. As the Bank of Canada's "*Why Is Cash (Still) So Entrenched*" study indicates (at page 25), ease of use and cost rank very highly among Canadian consumers as a factor which determines the choice of method of payment. The importance of cost in the choice of a payment method is supported by the Bank of Canada's "*How You Pay*" study. Attached hereto as **Exhibit "E"** is a copy of the Bank of Canada's "*Why Is Cash (Still) So Entrenched*" study. Attached hereto as **Exhibit "F"** is a copy of the Bank of Canada's "*How You Pay*" study.

71. Should surcharging be permitted, consumers who use credit cards as a source of credit, rather than merely as a payment mechanism, will suffer most. These Cardholders, who find themselves at the lower end of the socio-economic spectrum, have no choice but to use credit cards in order to meet their expenses on a monthly basis. Unlike other consumers, they cannot switch to Other Payment Forms in response to the imposition of surcharging and will simply have to bear the additional expenses imposed upon them by Merchants or elect not to complete the transaction at all.

72. Any lowering of credit card transaction volume will have profound implications for the payments industry. I believe that smaller Card Issuers and potential new entrants will be disproportionately affected by these circumstances as they are least likely to have the resources to survive the market volatility created by such drastic changes.

73. Similarly, as noted above, Merchant surcharging will affect the economics of issuing credit cards which will in turn impact innovation in the payment industry, leading to a focus on promoting Merchant acceptance rather than on improving card features, security and ease of use for Cardholders and Merchants.

74. TD would likely need to respond to Merchant surcharging by redesigning their credit card products. This will be difficult to accomplish given the unpredictability with which Merchants will surcharge Cardholders. With surcharging at the Merchant's complete discretion, Card Issuers will be unable to understand, manage and respond to surcharging. It would be impossible to negotiate effectively with tens of thousands of Merchants.

75. It is unclear how, if at all, the payment networks will respond to Merchant surcharging. In my opinion, the payment networks will be loathe to lower the Default Interchange Rate as this would decrease the ability of Card Issuers like TD to offer attractive credit card products able to persuade Cardholders to keep using their credit cards in the face of selective acceptance and surcharging by Merchants. All things being equal, Card Issuers will be unable to offer credit card products with the same rewards and benefits as presently provided to Cardholders at a lower Default Interchange Rate.

76. To the extent that the payment networks adjust the Default Interchange Rate, TD would have no say in any such adjustment. TD would be forced to react to whatever decision is made by the payment networks regarding the Default Interchange Rate.

77. If Default Interchange Rates increase then TD would have to seek to design a product which would appeal to a cardholder enough to overcome the turn-off of Merchants surcharging.

78. [redacted]

[redacted] As already described, Interchange Fees constitute an important source of revenue for the TD Credit Card Group. [redacted]

(a) **Bad Debt/Write Offs:** [redacted]

(b) **Rewards and Benefits:** [redacted]

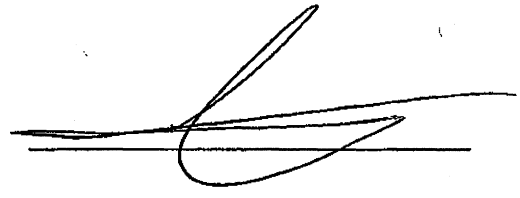
(c) **Fees:** [redacted]

79. If widespread surcharging occurs and the Default Interchange Rate stays the same, this will likely cause decreased credit card transaction volumes which will in turn reduce profits. If profits are impacted significantly, [redacted]

[redacted]

80. In sum, I feel that the existing industry rules, strengthened by the Voluntary Code of Conduct, balances the myriad of interests of Cardholders, consumers, Card Issuers, Merchants, payment networks and Acquirers. For the reasons discussed in this statement, allowing the Proposed Order would have negative effects on all the parties mentioned above.

Signed: April 9, 2012



Chris Hewitt

[redacted]

EXHIBIT "A"

TO THE WITNESS STATEMENT OF CHRIS HEWITT DATED APRIL 9, 2012

Execution Copy

SERVICES AGREEMENT

[redacted]

Between

VISA CANADA ASSOCIATION

("Visa")

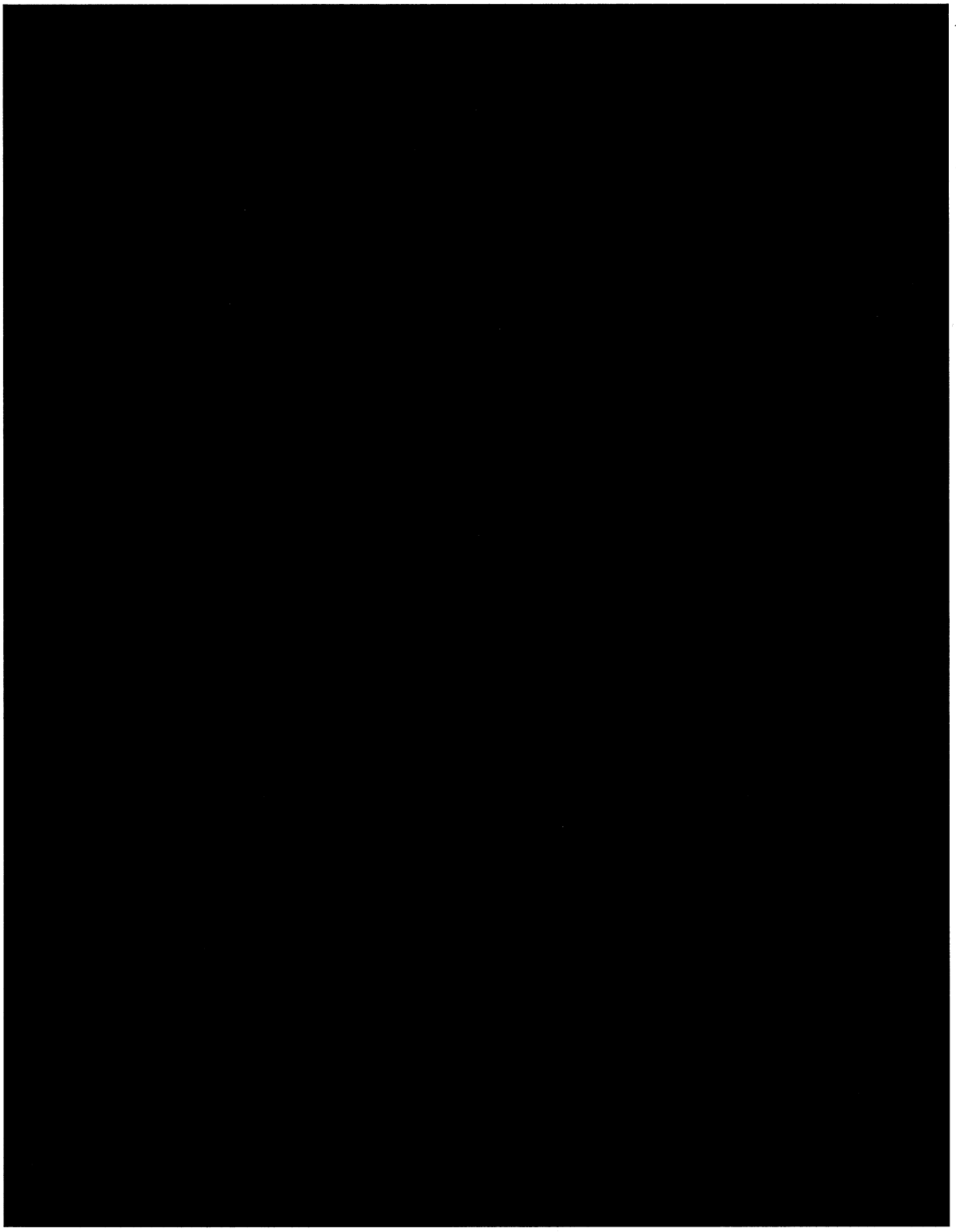
and

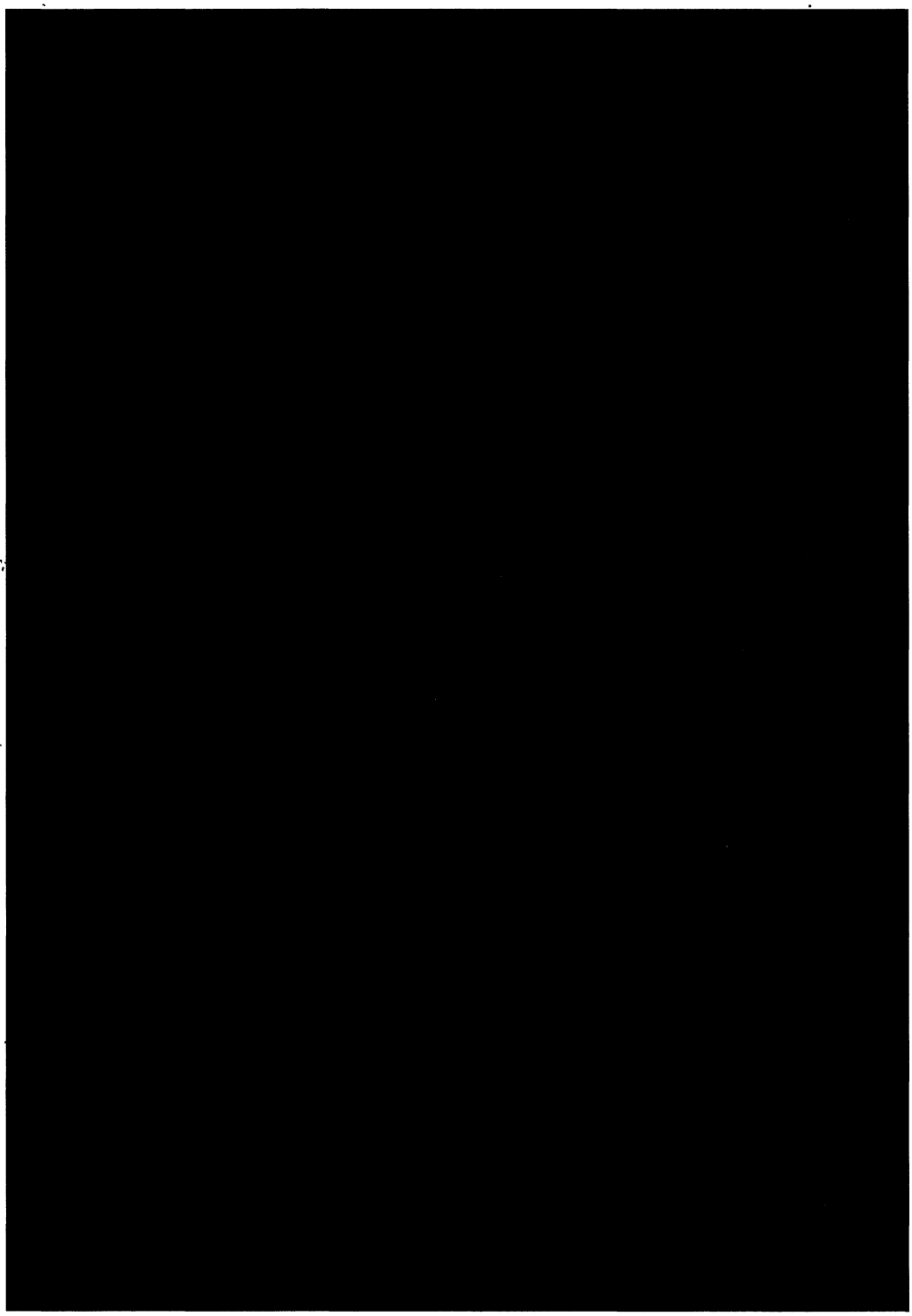
THE TORONTO-DOMINION BANK

("Customer")

[redacted]

[redacted]





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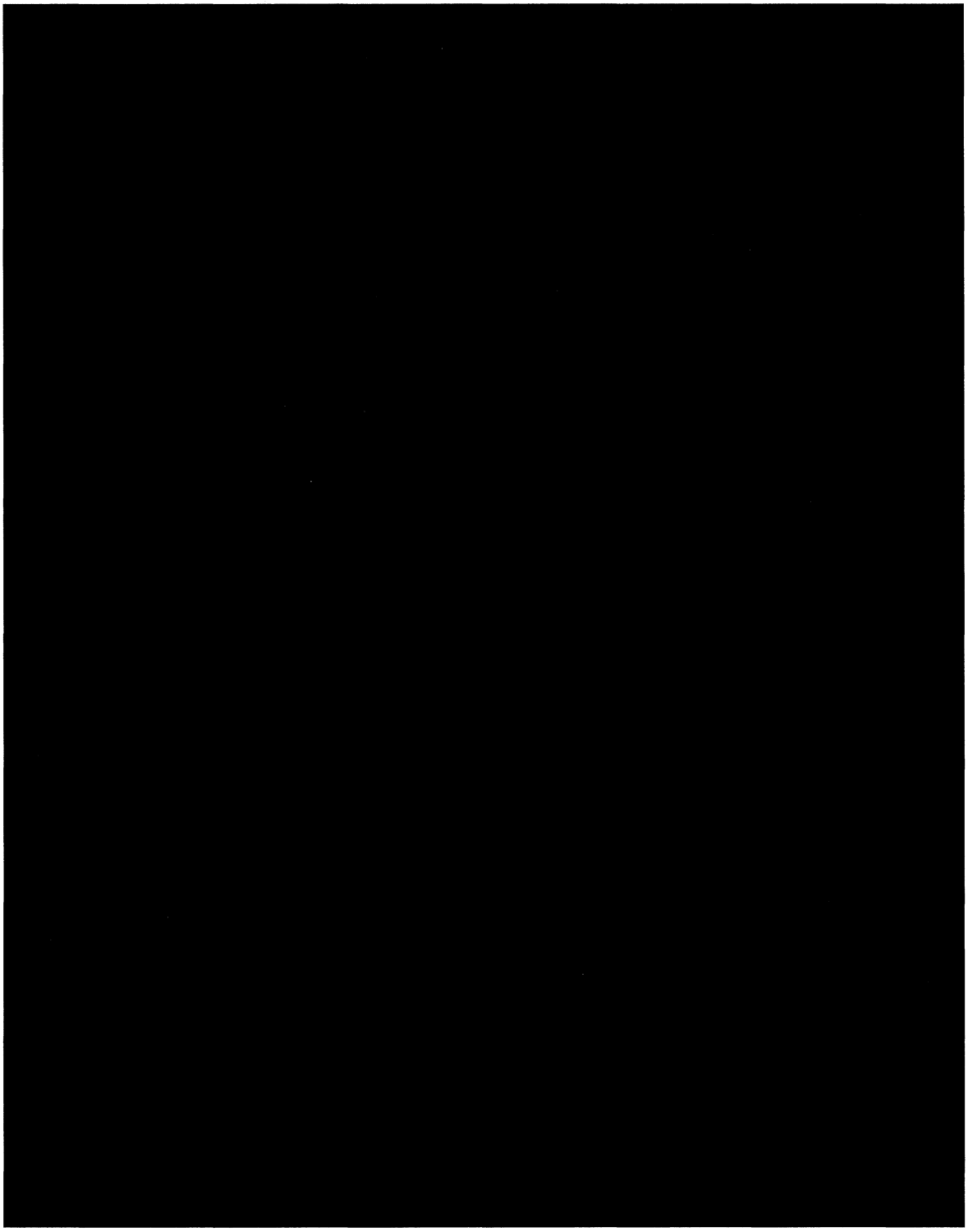

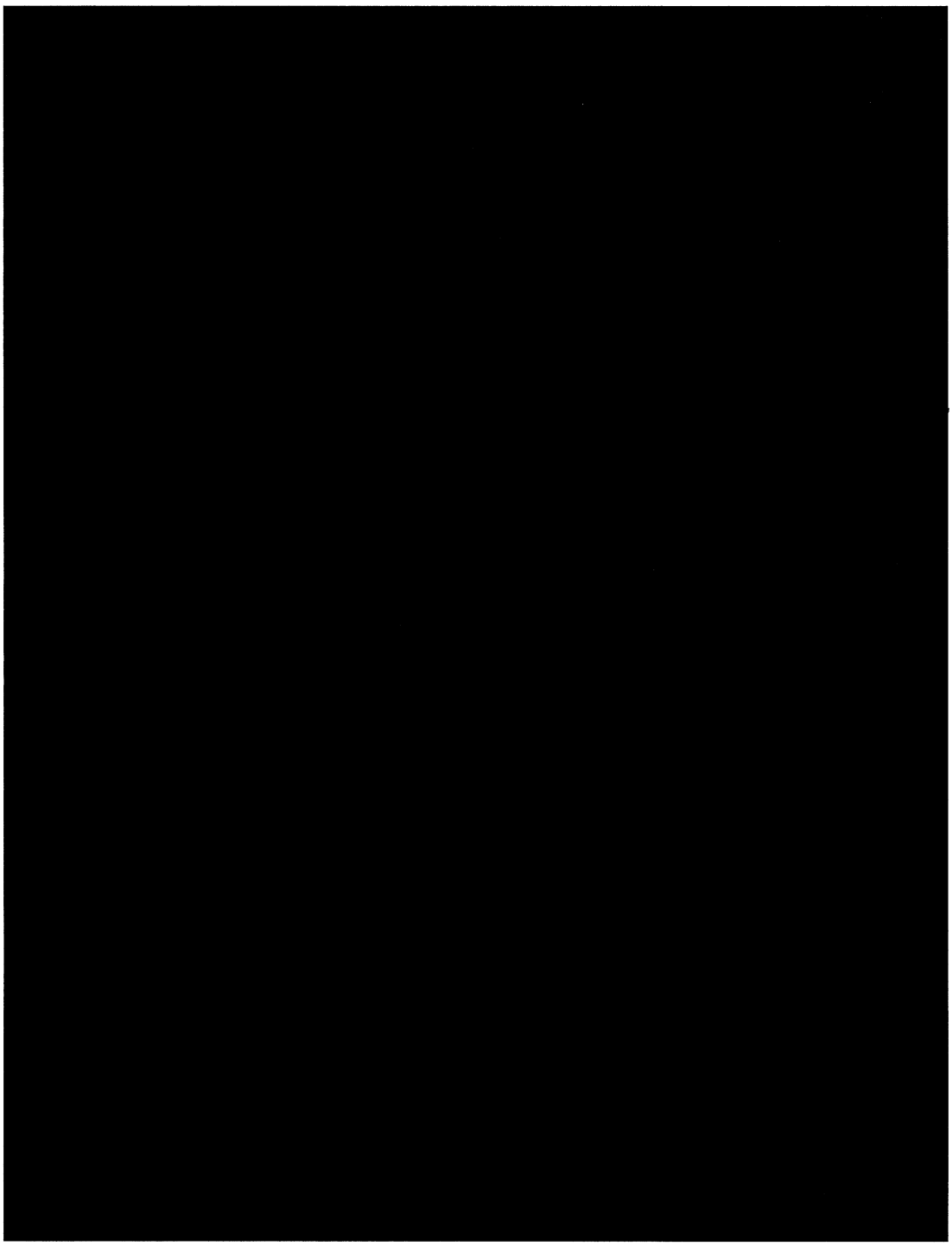

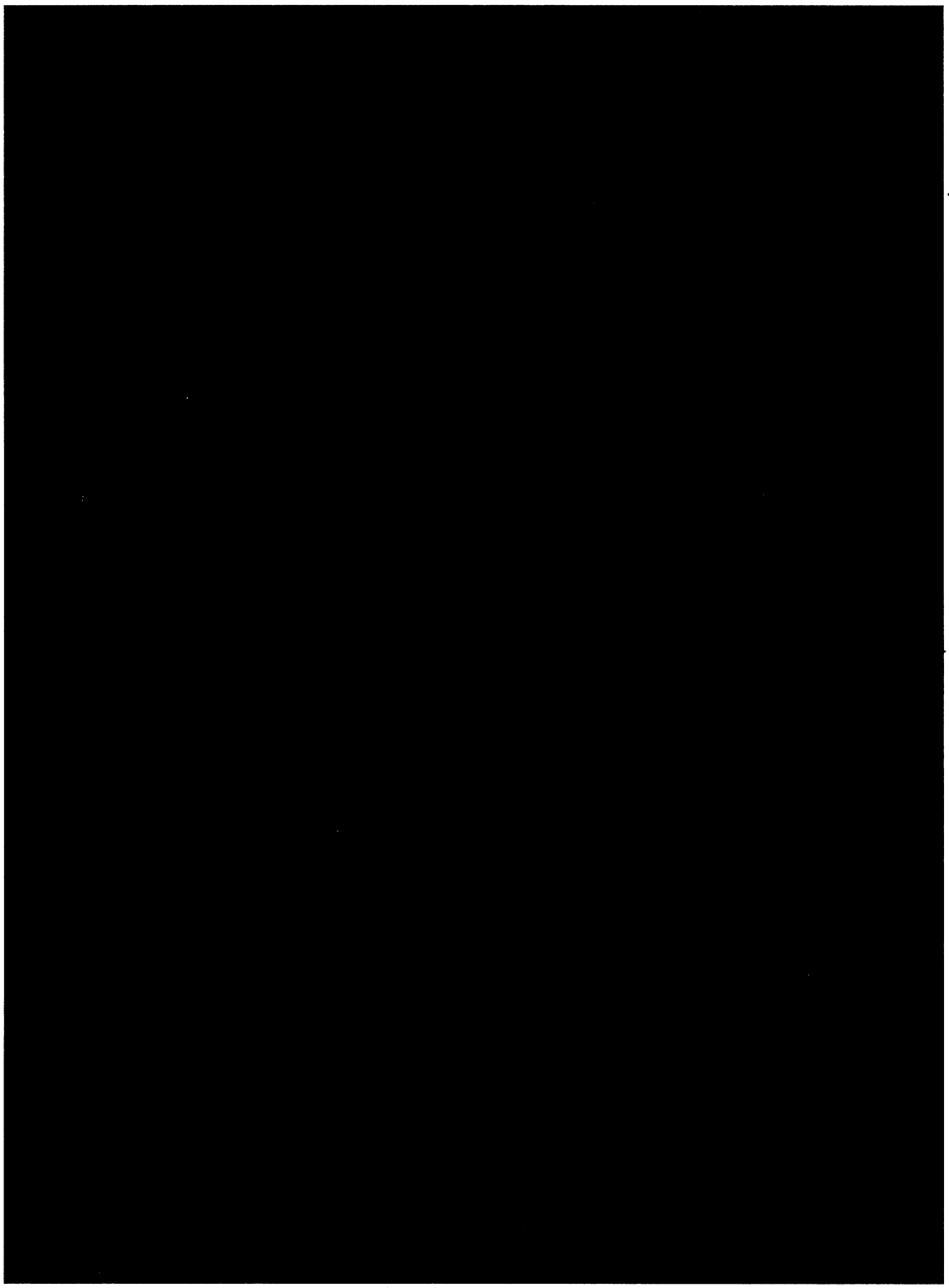

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EXHIBIT "B"

TO THE WITNESS STATEMENT OF CHRIS HEWITT DATED APRIL 9, 2012

VISA

Visa International Operating Regulations

15 October 2011

Chapter 6: Payment Acceptance

Core Principle 6.1

Display of Marks

Accepting Visa Products for Payment

Visa merchants displaying Visa acceptance marks at payment locations agree to accept corresponding Visa-branded products for payment. If the customer indicates that he or she wants to pay with a Visa product, a merchant must complete and process the Visa transaction as defined in the Visa Operating Regulations.

ID#: 160210-150210-0007777

Core Principle 6.2

Honor All Cards Properly Presented

Honoring All Visa Cards

Visa merchants may not refuse to accept a Visa product that is properly presented for payment, for example, on the basis that the card is foreign-issued[39], or co-branded with the Merchant's competitor's mark. Merchants may attempt to steer customers who initially present a Visa card to an alternative method of payment, such as by providing discounts for cash, but may not do so in a confusing manner that denies consumer choice. Merchants may also consider whether present circumstances create undue risk, for example if the sale involves high-value electronics, but the card signature panel is not signed, and the cardholder does not have any other identification.

ID#: 111011-150210-0007778

39 In the US, Canada, and Australia, merchants may decline to accept certain categories of Visa products for domestically issued cards.

Core Principle 6.3

No Surcharging Unless Required by Law

Charging for the Advertised Price

Visa merchants agree to accept Visa cards for payment of goods or services without charging any amount over the advertised or normal price as a condition of Visa card acceptance, unless local law requires that merchants be permitted to engage in such practice.

ID#: 111011-150210-0007781

Core Principle 6.4

Merchant Qualification Standards

Participating in the Visa System

Participants in the Visa system agree to follow the standards established by Visa for technologies that are used at the point of transaction to ensure systems work together to provide seamless transaction and data processing. For example, magnetic-stripe and chip reading terminals must follow compatible standards and specifications to guarantee global interoperability and payment acceptance.

ID#: 160210-150210-0007782

Merchant Agreement

General Merchant Requirements

Merchant Qualification Standards

Before entering into a Merchant Agreement, an Acquirer must determine that the prospective Merchant is financially responsible and ensure that the Merchant will comply with the substance of the *Visa International Operating Regulations* as well as applicable law.

The Acquirer must also determine that there is no significant derogatory background information about any of the Merchant's principals. The Acquirer may obtain this information through:

- Credit reports

Maximum Transaction Amount - U.S. Region

Effective 21 July 2010, a U.S. Merchant must not establish a maximum Transaction amount as a condition for honoring a Visa Card or Visa Electron Card, except for a Transaction conducted with a Visa credit Card issued in the U.S. or a U.S. Territory.

Only the following Merchants may establish a maximum Transaction amount for the Card type specified above:

- An agency of the U.S. federal government
- A Merchant properly assigned one of the following Merchant Category Codes:
  - 8220, "Colleges, Universities, Professional Schools, and Junior Colleges"
  - 8244, "Business and Secretarial Schools"
  - 8249, "Trade and Vocational Schools"

Any maximum Transaction amount imposed must not be discriminatory between Issuers or between Visa and another payment network.

ID#: 151011-210710-0026411

Postcard with Account Data - U.S. Region 5.2.F

A U.S. Merchant must **not** require a Cardholder to complete a postcard or similar device that includes the Cardholder's Account Number, Card expiration date, signature, or any other Card account data in plain view when mailed.

ID#: 010410-010410-0006960

Surcharges 5.1.C

A Merchant must **not** add any surcharges to Transactions, unless local law expressly requires that a Merchant be permitted to impose a surcharge. Any surcharge amount, if allowed, must be included in the Transaction amount and not collected separately.

A variance applies in the U.S. Region for the Visa Tax Payment Program.

A variance applies in the AP Region for New Zealand under certain terms and conditions, as communicated to Members in New Zealand. Further information is available from Visa.

A variance applies in the AP Region for government payments in Australia.

ID#: 111011-010410-0006948

Chapter 10: Pricing, Fees and Interchange

Core Principle 10.1

Fees for Access and Use of Visa Products and Services

Establishing Fees for Access

Visa system participants pay fees to Visa for access to and use of Visa products and services. Visa establishes certain fees between issuers and acquirers for specific participant actions such as rewards paid to store clerks for card recovery or the fulfillment of sales receipt copies.

ID#: 010410-010410-0007825

Core Principle 10.2

Participants Pay or Receive Interchange for Transactions

Paying or Receiving Interchange

Participating acquirers and issuers pay or receive interchange every time a Visa product is used. For example, acquirers pay interchange to issuers for purchase transactions and issuers pay interchange to acquirers for cash transactions and credit vouchers. In the case of a credit or a chargeback, interchange flows in reverse.

ID#: 010410-010410-0007826

What is Interchange?

Interchange reimbursement fees help to make electronic payments possible by enabling Visa to expand card holding and use, increasing the places consumers can use their cards and providing a financial incentive for all parties to pursue system-wide improvements, such as rewards, innovation and security. An interchange reimbursement fee is a default transfer price between acquirers and issuers within the Visa system. Merchants pay what is known as a merchant discount fee or merchant service fee negotiated with their acquirer which may take into account the interchange fee, processing costs, fees for terminal rental, customer services, and other financial services. The merchant discount fee or merchant service fee is negotiated individually with the merchant's acquirer; each acquirer sets its fees independently, in competition with other acquirers, competing payment systems, and other forms of payment.

Interchange is consistently monitored and adjusted - sometimes increased and sometimes decreased - in order to ensure that the economics present a competitive value proposition for all parties. Interchange reimbursement fees must encourage card holding and use, as well as expansion in the number and types of businesses that accept cards. If rates are too high, retailers won't accept cards; if rates are too low, issuers won't issue cards. Visa may establish different interchange reimbursement fees in order to promote a variety of system objectives, such as enhancing the value proposition for Visa products, providing incentives to grow merchant acceptance and usage, and reinforcing strong system security and transaction authorization practices.

ID#: 010410-010410-0024115

Core Principle 10.3

Visa Determines Interchange Reimbursement Fees

Visa Determines and Publishes IRF

Interchange reimbursement fees are determined by Visa and provided on Visa's published fee schedule, or may be customized where members have set their own financial terms for the interchange of a Visa transaction or Visa has entered into business agreements to promote acceptance and card usage.

ID#: 010410-080210-0024122

Global Interchange

Interchange Overview

Interchange Reimbursement Fee Rate Sheets and Guides

The Interchange Reimbursement Fee (IRF) is based on several factors. These primarily include Card type, Merchant type, and Transaction type. Interchange Reimbursement Fee rates are available to Members through regional online resources or Visa account executives. Interchange requirements are contained in the *Visa International Operating Regulations* and the applicable domestic or regional Interchange Qualification Guide. In addition, there are many other types of Visa transactions, such as Original Credits, ATM inquiries, etc., that are detailed in the Operating Regulations.

ID#: 010410-010410-0006577

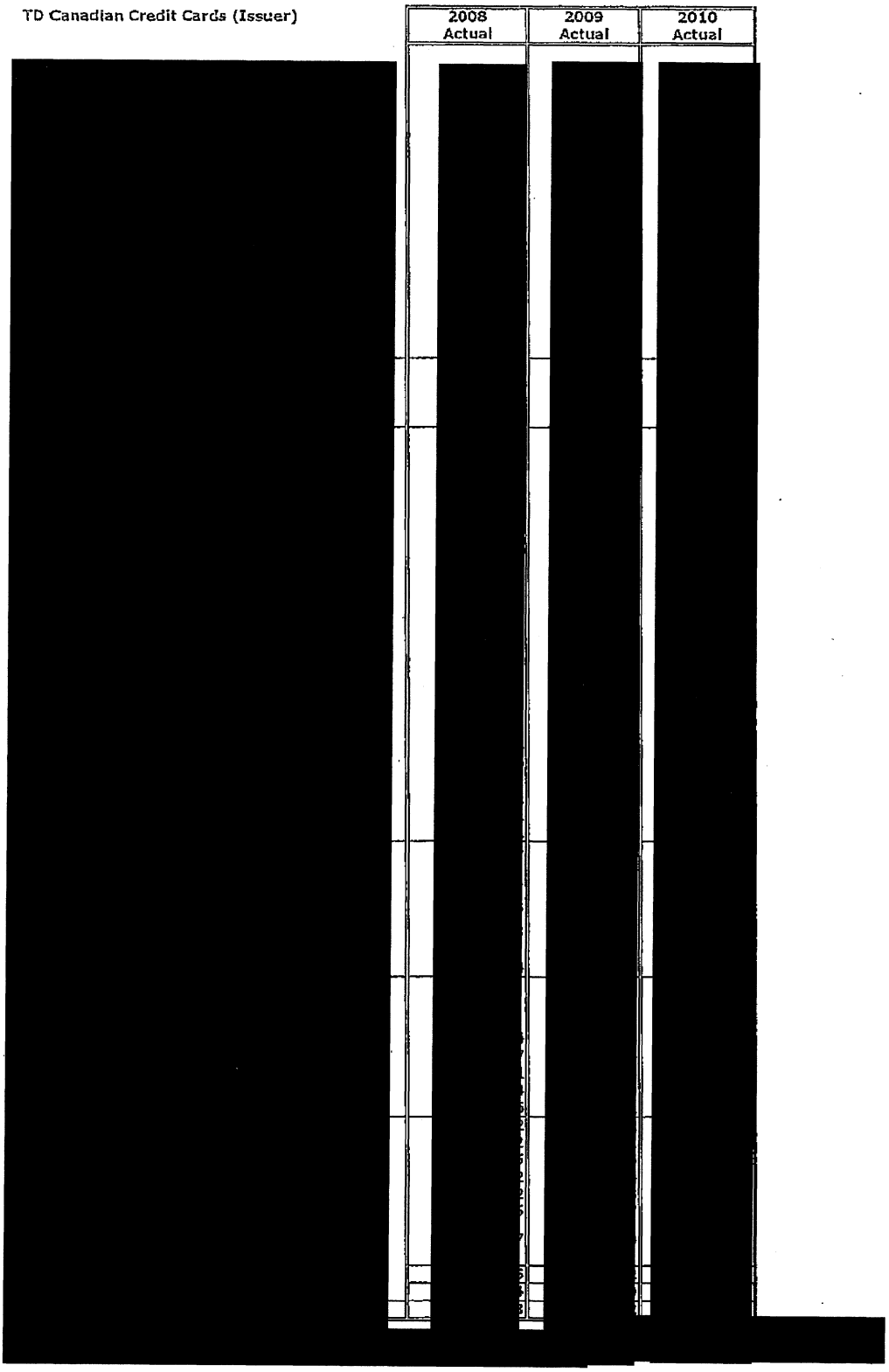
EXHIBIT "C"

TO THE WITNESS STATEMENT OF CHRIS HEWITT DATED APRIL 9, 2012

TD Canadian Credit Cards (Issuer)

2005 Actual	2006 Actual	2007 Actual

[redacted]


TD Canadian Credit Cards (Issuer)
2008 Actual
2009 Actual
2010 Actual

[redacted]

PUBLIC

TD Visa YTD Product Profitability
F2010 Performance Review

All figures in thousands unless otherwise noted

[redacted]

[redacted]

PUBLIC

TD Visa YTD Product Profitability
F2009 Performance Review

All figures in thousands unless otherwise noted

[redacted]

[redacted]

PUBLIC

TD Visa YTD Product Profitability
F2008 Performance Review

All figures in thousands unless otherwise noted

EXHIBIT "D"

TO THE WITNESS STATEMENT OF CHRIS HEWITT DATED APRIL 9, 2012

CODE OF CONDUCT FOR THE CREDIT AND DEBIT CARD INDUSTRY IN CANADA

PURPOSE

The purpose of the Code is to demonstrate the industry's commitment to:

1. Ensuring that merchants are fully aware of the costs associated with accepting credit and debit card payments thereby allowing merchants to reasonably forecast their monthly costs related to accepting such payments.
2. Providing merchants with increased pricing flexibility to encourage consumers to choose the lowest-cost payment option.
3. Allowing merchants to freely choose which payment options they will accept.

SCOPE

The Code applies to credit and debit card networks, (referred to herein as payment card networks), and their participants (e.g. card issuers and acquirers[1]).

The payment card networks that choose to adopt the Code will abide by the policies outlined below and ensure compliance by their participants. The Code of Conduct will be incorporated, in its entirety, into the payment card networks' contracts, governing rules and regulations.

The Code will apply within 90 days of being adopted by the card networks and their participants. Networks and acquirers will have up to nine months to implement Element 1. Issuers will have up to one year to re-issue cards already in circulation that contravene Element 6 or 7.

REQUIREMENTS FOR PAYMENT CARD NETWORKS

By adopting the Code, payment card networks agree to provide any requested information regarding actions taken by themselves or participants to the Financial Consumer Agency of Canada, for the purpose of monitoring compliance with the Code. In addition, payment card networks agree to pay for the fees associated with monitoring compliance with the Code, as determined by the Financial Consumer Agency of Canada.

POLICY ELEMENTS

1. Increased Transparency and Disclosure by Payment Card Networks and Acquirers to Merchants

The payment card networks and their participants will work with merchants, either directly or through merchant associations, to ensure that merchant – acquirer agreements and monthly statements include a sufficient level of detail and are easy to understand. Payment card networks will make all applicable interchange rates easily available on their websites. In addition, payment card networks will post any upcoming changes to these fees once they have been provided to acquirers.

Payment card network rules will ensure that merchant statements include the following information:

- Effective merchant discount rate[2] for each type of payment card from a payment card network;
- Interchange rates and, if applicable, all other rates charged to the merchants by the acquirer;
- The number and volume of transactions for each type of payment transaction;
- The total amount of fees applicable to each rate; and,
- Details of each fee and to which payment card network they relate.

This information must be presented in a manner that is clear, simple and not misleading.

[redacted]

2. Payment card network rules will ensure that merchants will receive a minimum of 90 days notice of any fee increases or the introduction of a new fee related to any credit or debit card transactions. Payment card networks will provide at least 90 days notice to acquirers for rate and / or fee changes and at least 180 days notice for structural changes[3].

Notification is not required for fee changes made in accordance with pre-determined fee schedules, such as those based on merchant sales volume, provided that the schedules are included in the merchant's contract.

3. Payment card network rules will ensure that following notification of a fee increase or the introduction of a new fee, merchants will be allowed to cancel their contracts without penalty.

By signing a contract with an acquirer, a merchant will have the right to cost certainty over the course of their contract. As a result, in the event of a fee increase or the introduction of a new fee, merchants will be allowed to opt out of their contracts, without facing any form of penalty, within 90 days of receiving notice of the fee increase or the introduction of a new fee.

Merchants may not cancel their contracts in relation to fee increases made in accordance with pre-determined fee schedules, such as those based on merchant sales volume, provided that the schedules are included in the merchant's contract.

4. Payment card network rules will ensure that merchants who accept credit card payments from a particular network will not be obligated to accept debit card payments from that same payment card network, and vice versa.

Payment card networks will not require merchants to accept both credit and debit payments from their payment card network. A merchant can choose to accept only credit or debit payments from a network without having to accept both.

5. Payment card network rules will ensure that merchants will be allowed to provide discounts for different methods of payment (e.g. cash, debit card, credit card). Merchants will also be allowed to provide differential discounts among different payment card networks.

Discounts will be allowed for any payment method. As well, differential discounting will be permitted between payment card networks.

Any discounts must be clearly marked at the point-of-sale.

6. Competing domestic applications from different networks shall not be offered on the same debit card. However, non-competing complementary domestic applications from different networks may exist on the same debit card.

A debit card may contain multiple applications, such as PIN-based and contactless. A card may not have applications from more than one network to process each type of domestic transaction, such as point-of-sale, Internet, telephone, etc. This limitation does not apply to ABM or international transactions.

7. Payment card networks will ensure that co-badged debit cards are equally branded.

Payment card network rules shall ensure that the payment networks available on payment cards will be clearly indicated. Payment card networks will not include rules that require that issuers give preferential branding to their brand over others. To ensure equal branding, brand logos must be the same size, located on the same side of the card and both brand logos must be either in colour or black and white.

8. Payment card network rules will ensure that debit and credit card functions shall not co-reside on the same payment card.

Debit and credit cards have very distinct characteristics, such as providing access to a deposit account or a credit card account. These accounts have specific provisions and fees attached to them. Given the specific

features associated with debit and credit cards, and their corresponding accounts, such cards shall be issued as separate payment cards. Consumer confusion would be minimized by not allowing debit and credit card functions to co-reside on the same payment card.

9. Payment card network rules will require that premium credit and debit cards may only be given to consumers who apply for or consent to such cards. In addition, premium payment cards shall only be given to a well-defined class of cardholders based on individual spending and/or income thresholds and not on the average of an issuer's portfolio.

Premium payment cards have a higher than average interchange rate. They must be targeted at individuals who meet specific spending and/or income levels.

10. Payment card network rules will ensure that negative option acceptance is not allowed.

If payment card networks introduce new products or services, merchants shall not be obligated to accept those new products or services. Merchants must provide their express consent to accept the new products or services.

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[1] "Acquirers" are entities that enable merchants to accept payments by credit or debit card, by providing merchants with access to a payment card network for the transmission or processing of payments.

[2] The effective merchant discount rate is calculated as the total fees paid by the merchant to an acquirer, related to the processing of a specific type of payment card from a payment card network, divided by the total sales volume for that type of payment card.

[3] Structural changes are significant changes to the fee structure for a payment card network. This includes the introduction of new types of interchange or other fees, a change to the interchange rate structure or the introduction of a new type of credit or debit card.

[redacted]

EXHIBIT "E"

TO THE WITNESS STATEMENT OF CHRIS HEWITT DATED APRIL 9, 2012

BANK OF CANADA
BANQUE DU CANADA

Discussion Paper/Document d'analyse
2012-2

Why Is Cash (Still) So Entrenched? Insights from the Bank of Canada's 2009 Methods-of-Payment Survey

by Carlos Arango, Dylan Hogg and Alyssa Lee

www.bank-banque-canada.ca

Bank of Canada Discussion Paper 2012-2

February 2012

Why Is Cash (Still) So Entrenched? Insights from the Bank of Canada's 2009 Methods-of-Payment Survey

by

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Abstract

The authors present key insights from the Bank of Canada's 2009 Methods-of-Payment survey. In the survey, about 6,800 participants completed a questionnaire with detailed information regarding their personal finances, as well as their use and perceptions of different payment methods. In addition, about 3,500 participants completed a 3-day diary recording information on each transaction, including the value and the payment instrument chosen. One of the main findings from the diaries is that, even though debit and credit cards account for close to 80 per cent of all transactions in terms of total value, cash is still the predominant payment method in terms of volume, accounting for 54 per cent of all transactions. Using the payment records from the diaries, the authors estimate a simple model of choice between cash and other payment methods. The results suggest that the main reasons why cash is still a popular payment instrument in Canada, especially for small-value transactions, are its wide acceptance among merchants, high ease of use or speed, low handling costs, simplicity as a tool to control spending, and anonymity.

JEL classification: E41, D12, L81
Bank classification: Bank notes; Financial services

Résumé

Les auteurs présentent les points clés de l'enquête sur les modes de paiement menée par la Banque du Canada en 2009. Environ 6 800 participants ont alors répondu à un questionnaire détaillé sur leurs finances personnelles ainsi que sur leur usage et leurs perceptions de diverses méthodes de paiement. En outre, quelque 3 500 participants ont tenu un journal où ils ont consigné pendant trois jours des renseignements sur chacun de leurs achats, notamment sa valeur et l'instrument de paiement employé. L'analyse de ces journaux fait ressortir que même si les règlements par cartes de débit et de crédit représentent près de 80 % des transactions en valeur, l'argent comptant domine toujours pour ce qui est du volume, puisque 54 % des transactions sont réglées en espèces. À l'aide des informations contenues dans les journaux d'achats, les auteurs estiment un modèle simple dans lequel les acheteurs ont le choix entre l'argent liquide et d'autres méthodes de paiement. D'après les résultats du modèle, le règlement en argent comptant reste un mode de paiement populaire au Canada, surtout pour les transactions de faible montant, parce qu'il est bien accepté par les commerçants, qu'il est commode, rapide, peu coûteux et anonyme et qu'il facilite la gestion d'un budget.

Classification JEL : E41, D12, L81
Classification de la Banque : Billets de banque; Services financiers

1. Introduction

The payments landscape in Canada has changed markedly over the past two decades. Cash was the most important instrument for retail payment in the first half of the 1990s (Chart 1). However, the way Canadians pay has changed since then, and cash now accounts for only a fifth of total payments in terms of value. The decline in the use of cash can be attributed to a number of factors. First, the introduction of debit card payments at the point of sale (POS) during the 1990s provided consumers with a safe and convenient substitute for cash. As a result, the number of debit card transactions experienced rapid growth well into the early 2000s. During the past decade, the share of credit cards has grown strongly as more merchants have begun to accept them and more consumers make use of credit cards with increasingly generous rewards programs.

New innovations are part of the changing payments landscape and many of them possess features that could further reduce cash usage. Examples include the increased ease of use or speed at the checkout with stored-value cards or contactless[1] card payments; the enabling of debit and credit payments through mobile phones[2] for both POS and person-to-person transactions; and the growth of e-commerce, where paper-based payment methods such as cash may become increasingly irrelevant.

These developments are of particular interest to the Bank of Canada. As the sole issuer of Canadian bank notes, the Bank seeks to understand how cash is used, how efficient it is relative to alternative methods of payment (MOP) and the likely evolution of cash usage in the future. Answering these questions is vital for the Bank's long-term planning and, more broadly, for payments system policy. New developments in the retail payment system raise important issues related to efficiency, safety, financial soundness and competition. To better understand these issues, the Bank has commissioned a number of surveys to gather information about key players in retail payments, such as consumers and merchants.[3] The latest effort is the 2009 MOP survey, which includes a shopping diary where consumers record their purchases and payment instruments used over a 3-day period. One of the main findings from the survey is that cash is still the predominant payment instrument in terms of volume, accounting for 53.8 per cent of all transactions recorded in the diaries.

This paper uses the 2009 MOP survey data to study the main factors underlying the high frequency of cash usage for day-to-day payments. More specifically, we estimate a discrete-choice model of cash versus other payment methods. The results suggest that cash is still

[1] Contactless refers to a feature that can be found on some debit and credit cards, where a consumer simply waves or taps the card over a terminal to pay for a purchase without the need to swipe, enter a PIN or sign anything.
[2] Payment through a mobile phone is often linked ultimately to a person's credit card or bank account.
[3] See Taylor (2006) and Arango and Taylor (2008–09, 2009a).

frequently used in Canada because of the following factors:

1. Cards are perceived by consumers as not being widely accepted. Indeed, where cash, debit and credit are *all* accepted, consumers are 30 per cent less likely to use cash. Cash use is especially high for transactions below $25, where perceived card acceptance is substantially lower.
2. Cash has several characteristics that make it more appealing to consumers than other payment methods. In particular, consumers prefer to use cash because they find it fast, cheap, safe against fraud and convenient for budget-control purposes. Ease of use or speed, in particular, accounts for at least a third of the share of cash payments for transactions below $25.

However, consumers are quite sensitive to cash withdrawal costs. We show that the more cash individuals hold at the beginning of the 3-day shopping period, all things equal, the more likely they are to use cash. Yet, the higher the value of the transaction relative to the initial cash holdings, the more likely it is that people will hold on to their cash. Clearly, consumers dislike the possibility of running out of cash, since they may incur costs in terms of time, effort and fees to get more.

The results suggest that one main reason for paying with cash is because "consumers have to," since they perceive that other payment alternatives are not accepted. However, another reason is that "consumers like to" use cash because they find it convenient and safe.

This paper is organized as follows. In the next section we provide a brief description of the 2009 MOP survey. In section 3 we provide a detailed account of the survey results and stylized facts on consumers' payment instrument use. Section 4 presents a model of cash usage at the point of sale.[4] Section 5 discusses the empirical results. Section 6 concludes.

2. The 2009 Methods-of-Payment Survey

In 2004, the Bank of Canada conducted its first consumer payments survey to study the public's perceptions and use of cash and other payment instruments. This phone survey provided valuable information regarding people's cash-handling behaviour and the factors influencing payment demand. Taylor (2006) finds that cash was the most frequently used payment method: 73 per cent of survey respondents indicated using cash at least once a week, followed by debit cards (64 per cent) and credit cards (36 per cent). Using the same survey, Arango and Taylor (2009b) show that differences in perceptions of convenience and risk of cash relative to cards were

[4] In this paper, point of sale is used loosely to mean purchases where there is a buyer and a seller involved but there is not a need for a physical location or particular trading technology to finalize a transaction.

significant determinants of cash use. However, the authors acknowledge that more precise information would be required to determine how and why Canadians use cash the way they do.

The 2009 MOP survey builds on the results obtained from the 2004 public survey. The Bank commissioned Ipsos Reid to conduct the 2009 survey. It focuses on methods of payment used for personal day-to-day purchases of goods and services, excluding bill payments and work-related activities. The sample was drawn from Ipsos Reid access panels (directories of people willing to participate in surveys on a regular basis) using stratified random sampling[5] of 18- to 75-year-old Canadian residents. The 2009 MOP survey's main features are:

1. A survey questionnaire of 52 questions to collect information about individuals' personal finances, socioeconomic characteristics, payment habits, and their perceptions and attitudes toward different payment attributes such as speed, record keeping, privacy, safety and access to credit.[6]
2. A 3-day shopping diary to collect information about the frequency of use of different payment instruments and various transaction characteristics (e.g., transaction values; type of goods and services purchased; type of payment instruments accepted by merchants).[7]

The survey was administered over the course of November 2009, so the diaries represent a month's worth of transactional data.[8] The final data set includes about 6,800 survey questionnaires, 3,500 diaries, and 16,000 transactions.

3. Drivers of Cash Usage: Survey Highlights

One of the most salient results from the diaries is that, although credit cards dominate household retail payments in terms of value (accounting for 40.1 per cent), cash is still the predominant payment instrument in terms of volume (i.e., the number of transactions), accounting for 53.8 per cent of all transactions in the diaries (Chart 2). However, Table 1 shows that the prevalence of cash is concentrated in lower-value transactions. In fact, the average cash transaction in the diaries is $16.9, whereas it is $51.3 and $84.4 for the average debit and credit card transactions, respectively.

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[5] Stratified sampling involves dividing the population into homogeneous, mutually exclusive groups called "strata," and then taking independent samples from each stratum.

[6] Some of the questions in the questionnaire are based on the Survey of Consumer Payment Choice of the Federal Reserve Bank of Boston, which collaborated with the Bank of Canada in the development of the survey instruments (Foster et al. 2010).

[7] Such methodology has been used by a handful of central banks (including those for Austria, the Netherlands, Germany and Australia) as a key tool for estimating the volume and value shares of cash use in their economy and to monitor developments in retail payment usage (Mooslechner, Stix and Wagner 2006; Jonker and Kosse 2009; Hoffmann et al. 2009).

[8] See Arango and Welte (forthcoming) for a detailed discussion of the survey methodology and main results.

Using the survey results, a back-of-the-envelope calculation of the volume of cash payments in the Canadian economy yields 7.7 billion transactions compared with the card networks data of 2.6 billion and 3.9 billion for credit and debit cards, respectively, in 2009.[9] Moreover, 81 per cent of this volume of cash payments, as estimated from the diaries, is for values of less than $25.

We use the rich data from the survey to study why cash is still so entrenched in terms of transaction volumes. To do so, it is useful to think of retail payment systems as two-sided markets: a payment service provider must attract consumers to use the payment instrument and merchants to accept it.[10] Suppliers of payment services therefore require both buyers and sellers to create the demand for their services. Consumers must find some benefit in the use of a payment instrument, while merchants must find it profitable to incur the costs of accepting it. Therefore, to understand why consumers pay the way they do at the point of sale, one has to control for the types of payment instruments available to consumers and their respective benefits and costs in different transactions.

3.1 Cash is still frequently used even where debit and credit cards are accepted

One important consideration in the use of a particular payment method is its degree of acceptance by merchants. As Arango and Taylor (2008–09, 2009a) show, cash is indeed cheapest for merchants in terms of variable costs at stores where the average transaction value is below $23. They also show that cash is preferred by those small merchants that tend to process high volumes of low-value transactions. These results are consistent with the 2009 MOP findings regarding payments acceptance. To gauge how restricted consumers feel about their use of different payment instruments, the 2009 MOP survey questionnaire asked about perceptions regarding levels of acceptance for different payment instruments on a scale from 1 (not accepted anywhere) to 5 (accepted everywhere). As Chart 3 shows, 83 per cent of survey respondents perceive that cash is accepted everywhere, whereas only half of the individuals perceive that credit and debit cards are accepted everywhere. Hence, consumers seem to face more uncertainty about merchants' acceptance of cards than of merchants' acceptance of cash.

Furthermore, in the diaries, respondents were asked to report on the payment methods they perceived were accepted at the time of purchase. Table 2 shows the proportion of transactions

[9] We can obtain two estimates of total payment volumes by dividing the debit and credit card volumes reported by the card networks by their shares estimated from the diaries; multiplying the average of these two volume estimates by the cash share yields 7.7 billion cash transactions.

[10] The two-sided market approach to payments has a long tradition in the literature. This approach highlights the issues associated with the coordination of buyers' and sellers' needs and incentives to participate in a payment system. Baxter (1983) and Rochet and Tirole (2002, 2003) set out the theoretical framework that has since been used extensively to study the important issues associated with the pricing of payment services (e.g., interchange fees), payment system participation, and competition and strategic interaction among participants (see Rochet and Tirole 2006 for a review of the two-sided markets approach, and Bolt and Chakravorti 2008 for a review of this approach applied to payments and its implications for government intervention).

where an individual thought cards were accepted, broken down by the dollar value of the transaction and the size of the merchant. We find that perceived card acceptance increases with both merchant size and transaction value.[11]

To gauge the extent to which cash usage could be explained by merchant acceptance, we compare the frequency of cash payments in the diary (all transactions) with the frequency of cash payments when respondents perceive that all payment methods are accepted. Chart 4 shows that the proportion of transactions made with cash is lower when it is perceived that all major payment instruments are accepted.

These results demonstrate that an understanding of cash usage is a complex matter. The fact that consumers are less likely to use cash when they perceive that all payment methods are accepted supports the idea that, in some cases, cash is used because of necessity rather than desire. However, even after acceptance is taken into account, cash is still frequently used for low-value transactions, which means that consumers still value some of the attributes that differentiate cash from cards. For example, roughly 50 per cent of the transactions below $25 are still paid for with cash, even though it is perceived that all MOP are accepted (Chart 4).

3.2 Demographics may mask more fundamental reasons for payment choices

Having controlled for the consumer perception of merchant acceptance, we next examine the consumer decision. The survey results confirm many of the demographic traits on cash usage found in previous studies. For example, those 55 years of age or older make 59 per cent of their transactions with cash, whereas those 34 or younger make only 48.9 per cent with cash. Those in the highest income bracket make about 47.4 per cent of their diary purchases with cash, compared with 65.2 per cent for incomes below $30 thousand (Table 3, column I). Therefore, the following question arises: Does the adoption and use of electronic alternatives to cash depend on demographic transitions, as new cohorts of individuals become more comfortable adopting and using them and real income levels rise?

Column II of Table 3 shows that the link between payment usage and income may be partly due to different shopping patterns. Columns I and II of Table 3 show that there is a negative correlation between average transaction values and cash payment shares. The fact that higher-income individuals undertake higher-value transactions may help explain why they use credit cards more intensively. Lower-income consumers, who make mostly smaller-value purchases, may shop more frequently at locations where only cash is accepted, becoming more cash intensive.

[11] Royston (2009) imputation techniques were used for about 10 per cent of the transactions in the diaries, to deal with missing values in the response to the diary question on which payment methods the individual believed were not accepted.

Column III of Table 3 shows that another reason for the differences in payment usage by income may be that low-income individuals have less access to alternative payment instruments, such as credit cards. An individual typically must meet a set of requirements based on their income and credit history before being accepted.[12] Moreover, column IV of Table 3 shows that higher-income individuals are more likely to have credit cards with rewards and, hence, have stronger incentives to make more intensive use of such cards.

In summary, there are underlying structural reasons that help explain why people with differing demographic traits have different payment patterns.

3.3 Beyond demographics: relative benefits and costs of alternative payment methods

One of the key features of the 2009 MOP survey is that it explores in detail the factors that could be considered as building blocks of consumers' preferences for different payment instruments. Chart 5 shows that security (in terms of fraud/theft/counterfeiting), as well as ease of use at the time of payment (in terms of time spent and the nuisance of having to make change, remember a PIN or sign for a purchase), are the top considerations for consumers when choosing a payment method. This is followed by costs (in terms of fees) and overall acceptance. A second set of attributes could be associated with cash flow and tracking expenditures such as anonymity, record keeping and the possibility of delaying the actual payment. Finally, controlling overspending and the potential to earn rewards rank near the bottom in terms of overall importance.

The survey also asked participants to rate different payment methods on a scale from 1 to 5 in terms of ease of use, costs, tracking spending and risks. As Table 4 shows, cash ranks highest in terms of ease of use and lowest costs, but lower in terms of record keeping (tracking). Debit and credit cards rank similarly, in most respects.

More importantly, we find a significant correlation between consumers' cash perceptions relative to alternative payment methods and payment intensity. Respondents who perceive that cash is relatively easier to use, better at tracking spending and cheaper than cards use relatively more cash compared to other payment instruments. The perceptions regarding cash relative to those regarding cards across demographic groups also provide clues about the demographic payment traits found in the literature. Table 5 reports the share of cash payments by demographic categories together with the average perception responses of cash relative to cards by payment instrument attribute. Numbers above (below) one represent measures above (below) the sample average. The table presents the puzzling result that older people use cash more intensively than

[12] In contrast, debit card ownership usually requires only that a person have a bank account. The percentage of people with at least one debit card did not vary to a significant degree by income in the survey.

younger people, despite the fact that older people have a relatively less favourable opinion about cash in terms of ease of use, risk of theft and acceptance. This may imply that older people pay with cash because they have to, rather than because they like cash relative to cards. In contrast, for high-income individuals, the limited record keeping capabilities and the higher risks of cash seem to weigh more heavily than the relatively higher costs and lower acceptance they associate with cards.

4. A Logit Model of the Choice of Cash at the Point of Sale

Simple bivariate correlations are illustrative, but as the previous section suggests, it is hard to draw firm conclusions from them. Age and income, for example, are associated with higher transaction values, which favour the use of cards as opposed to cash. Hence, in this section we use a simple logit model to analyze the determinants of an individual's choice of whether to use cash at the point of sale. The logit model exploits the information revealed in consumers' actual payment choices shown in the diaries to infer the underlying structure of their preferences.[13] The logit model allows us to separate the age and income effects from other factors such as payment instrument attributes, perceptions and transaction characteristics.

4.1 The logit model

The logit model starts with the assumption that consumers obtain a certain level of utility or satisfaction, y^*, by using cash in a given transaction. This utility is derived from the benefits that consumers experience using cash, such as speed and wide acceptance, net of the handling costs relative to other payment instruments. By using cash, for instance, consumers incur withdrawal costs and face certain risks of theft or loss.[14] In contrast, by using other payment methods, consumers may earn rewards and have access to credit, but may still be subject to certain risks of fraud.

However, instead of y^*, the data provide information on only the actual payment instrument choices made for a transaction, y. If $y = 1$ cash is used, this implies that the net benefit of cash relative to its alternatives is positive ($y^* > 0$). Otherwise, $y = 0$; i.e., consumers are better off choosing one of the alternatives to cash available to them, mainly credit or debit cards.[15]

If the utility function is of the form

[13] In the context of binary choices, the results of models such as the probit one produce very similar predictions.

[14] We do not consider the opportunity cost of holding cash balances, since the survey does not provide data for interest rates on savings accounts. However, this opportunity cost is likely to have been low in 2009, since Canadian short-term interest rates were close to zero in 2009 and cash holdings on hand were low ($70, on average; see Arango and Welte forthcoming).

[15] Although any MOP could be recorded in the diaries (e.g., cheques, stored-value cards, travellers cheques or online PayPal), 98 per cent of the transactions were conducted using either cash, debit or credit cards.

$$y^* = X'\beta + \varepsilon, \tag{1}$$

with an unobservable component ε that follows a logistic distribution $F(\varepsilon)$, and $X'\beta$, which are observable factors that shift consumers' utility, then the probability that an individual chooses cash for a particular purchase is

$$\Pr(y = 1|X) = \Pr(y^* > 0|X) = \Pr(\varepsilon > -X'\beta) = \frac{e^{X'\beta}}{1+e^{X'\beta}}. \tag{2}$$

We estimate the model using the maximum likelihood function of the logit model, modified to use the survey weighting factors. This function is called the pseudomaximum likelihood function (Archer and Lemeshow 2006):

$$\ln L(\beta|x_i) = \sum_{i=1}^{n}\{(1-y_i)(w_i)\ln\left[1 - \frac{EXP(x_i'\beta)}{1+EXP(x_i'\beta)}\right] + y_i(w_i)\ln\left(\frac{EXP(x_i'\beta)}{1+EXP(x_i'\beta)}\right)\},$$

where w_i is the weight associated with observation i.

4.2 Factors associated with payment behaviour

We consider several sets of factors that may be associated with the probability of paying with cash in the model of payment choice. The first set controls for consumer socioeconomic characteristics including age, income, education, gender, and marital and employment status.

The second set of variables are characteristics of the debit and credit card plans people have when they begin to complete the diary. We control for consumers' access to debit and credit cards, debit card fixed and per transaction fees, credit card rewards, and whether individuals pay their credit cards in full at the end of the month. The estimation results reported below focus on the individual's choices at the time of making a purchase. Hence, we assume that the features of the debit and credit cards consumers are holding are fixed, since consumers first shop around for banking services and seldom change their financial arrangements after making their decision. As for cash, we include cash holdings at the beginning of the 3-day diary.

The third set of variables controls for specific features of the transaction environment. In particular, we include the transaction value, the type of good or service purchased, the transaction venue (e.g., at a store or person-to-person), whether the transaction took place on a weekend, whether consumers perceived that debit and credit cards were accepted by the merchant, and the two most important reasons for choosing the payment instrument used.

Finally, we exploit the rich array of questions ranking the importance/usefulness of different payment instrument attributes such as ease of use, record keeping, security and budget control.

4.3 Marginal effects

Since the coefficients on a logit model are difficult to interpret, we report marginal effects or the change in the probability of using cash given a small change in an explanatory variable. In general, the marginal effect of a change in a variable in a logit model will depend on the value of $x \in X$ (see Train 2009).

For a continuous variable in a logit model, the marginal effect of a change in the jth explanatory variable x_j is

$$\frac{d\Pr(y = 1|X;\beta)}{dx_j} = \frac{EXP(X'\beta)}{[1 + EXP(X'\beta)]^2}\beta_j.$$

For a factor variable such as a dummy, which takes only the value 1 or 0, the marginal effect is

$$\Pr(y = 1|x_j = 1;\beta) - \Pr(y = 1|x_j = 0;\beta),$$

which is simply the difference between the model-predicted probabilities of paying with cash when the dummy variable is true versus when it is false, holding all other variables constant.

5. Results

Table 6 shows the average marginal effects (AME) of the logit regression.[16] AME calculates the marginal effect of a variable for every transaction in the sample and takes the overall average of these marginal effects. The appendix provides definitions of the variables included in the model. The following are the most salient results, organized by sets of factors impacting cash usage at the point of sale.[17]

5.1 Participants' socioeconomic characteristics

The results reported in Table 6 under *Socioeconomic factors* show that income and age are both significantly associated with the use of cash at the point of sale. However, the differences in cash

[16] To test for model specification error, we use the link test by Pregibon (1980). The idea is that if the model is correctly specified, then an auxiliary logit model of cash with the linear prediction of $X'\beta$ from the original model and the prediction squared as regressors should show that the squared prediction has no explanatory power. The coefficient on the prediction squared is 0.01 with a p-value of 0.4. We therefore have no evidence that the coefficient on the prediction squared has any explanatory power; hence, there is no evidence of model misspecification.

[17] Strictly speaking, our results should be interpreted as deriving from a model of conditional probabilities, since we do not claim that some of the factors associated with the probability of paying with cash are direct drivers of consumers' payment decisions.

usage between income and age groups depend importantly on whether the individual has access to a credit card.

To see this, note that the age and income categorical dummies enter the regression both alone and through interaction with the credit card ownership dummy. The stand-alone AMEs show the differences between individuals without access to a credit card. Those in the middle-income bracket ($50K–$80K) use significantly more cash than those in the other income brackets (AME = 0.109, or an 11 percentage-points-higher probability of using cash).[18] Also, the oldest individuals (AME = 0.102) use more cash than the youngest age group.

For individuals with access to a credit card, however, there is no significant difference in cash usage between the different age and income groups. Among those with a credit card, the difference in the probability of using cash between age and income categories depends on the sum of the stand-alone coefficients on the age/income categories and the coefficient on the interaction of the age/income category and the credit card ownership dummy. For example, the AME on cash usage for an individual who earns between $50K and $80K and owns a credit card is (0.109) + (-0.100) = 0.009, which is negligible. Performing the same exercise for the other age and income groups produces similar results.[19]

It could be argued that the lack of significance of age and income is due to the collinearity between them and the other explanatory variables in the model. For example, the perceived ease of use of cash may be correlated with age. Correlation analysis, however, shows that even though there is some correlation between income and age, and participants' perceptions and attitudes toward different payment instrument attributes, such correlations are relatively low.[20] Furthermore, the results may not be surprising given that the markets for debit and credit cards are relatively mature in Canada. Therefore, personal differences in perceived benefits and costs of alternative payment instruments, regardless of demographics, would have more weight in consumer payment choices among those with access to all payment methods.

Less than 5 per cent of participants do not have a debit card, and their probability of paying with cash is about 5 percentage points higher than for those carrying a debit card. This is shown in Table 6, where the AME of the dummy on debit card ownership is -0.048.

[18] As we present the results, a good point of reference regarding the magnitude of the AME is to compare them with the actual proportion of transaction volumes in the sample done with cash, which is 54 per cent.

[19] Tests on the linear hypothesis that the coefficient on an age or income category plus the coefficient on its interaction with credit card ownership equals 0 fail to reject this hypothesis at the 5 per cent significance level.

[20] Arango and Taylor (2009b) and Schuh and Stavins (2010) highlight the weak correlation between perceptions of payment instrument attributes and demographics.

All things equal, other socioeconomic factors such as education, gender, employment status, urban/rural, financial knowledge and whether the individual is active in the household finances are not statistically significant.

5.2 Debit/credit card plans and access to cash

The results reported in Table 6 under *Card plans and cash holdings* show that the use of cash varies significantly with the type of debit or credit card and the amount of cash consumers have on hand at the beginning of their diary.

As would be expected, the results of the logit model show that the probability of using cash for those participants holding debit cards with either more than 20 or unlimited free transactions (AME = -0.066) is about 7 percentage points lower than those with fewer free transactions.[21] In fact, unlimited debit transactions are often offered by plans that charge monthly fees or are subject to minimum bank account balances. By having this type of plan, consumers have stronger incentives to use debit cards than those who pay per-transaction fees.[22]

Having a credit card with rewards also influences the probability of using cash.[23] In the model, we include the product of a dummy on whether a person's credit card has rewards and transaction value. This specification follows from the fact that most credit card rewards are proportional to the transaction value.[24] We can see from the results in Table 6 that a marginal increase in credit card rewards decreases the probability of using cash (AME = -0.001). However, the effects are small relative to other dimensions of the payment choice. This is illustrated in Chart 6, which uses the logit model to estimate predicted probabilities[25] across transaction values for individuals with no rewards on their credit card (dotted red line) versus a base case (blue line) that considers individuals with rewards. For Charts 6 through 10, the base case involves fixing consumer characteristics at their average value across all transactions. For variables that change with transaction values, the average values across each transaction value range are used.[26]

We interpret cash balances at the beginning of the diary as a proxy for the marginal cost that consumers face in paying with cash. The more cash an individual has on hand, the lower the

[21] 69 per cent of survey participants own debit cards with 20 or more free transactions per month.
[22] These results are consistent with those found by Borzekowski, Kiser and Shaista (2008).
[23] As will be discussed later, other credit and debit card attributes, such as ease of use at some transactions, payment delay in the case of credit cards, and record keeping have a larger effect than rewards on the choice between cash and cards.
[24] 70 per cent of survey participants who own a credit card have an associated reward plan.
[25] Predicted probabilities are calculated based on equation (2) using the parameter estimates of the logit model β and specific values for the variables included in X.
[26] In a multinomial discrete-choice model of cash, debit and credit, Arango, Huynh and Sabetti (2011) look closer into the substitution patterns between the three payment methods and find that, although credit card rewards reduce the use of both cash and debit cards, the effect is significantly larger on the latter payment instrument.

probability of having to make a trip to get cash or of missing a purchase, as, for example, when consumers do not have enough cash and cannot pay with another payment instrument. The model indicates that having greater cash balances on hand increases the probability of using cash for all transactions (AME = 0.001 for cash holdings at the beginning of the diary). However, if the value of the transaction is high relative to cash holdings, consumers tend to hold on to their liquidity and therefore it is less probable that they will pay with cash. This can be seen through the coefficient on the ratio of the transaction value and initial cash holdings (AME = -0.013).

Chart 7 shows the total effect of cash holdings on the probability of using cash as the transaction value rises. In contrast to Chart 6, the dotted red line represents the alternative case of having very low cash balances ($5 in our simulation) at the beginning of the diary. Having low initial cash on hand reduces the probability of using cash, and the reduction (the ratio between the two lines) increases with higher transaction values. For transaction values between $25 and $50, it could be almost half as likely that consumers with low cash holdings would use their liquidity or withdraw additional cash to complete the transaction, compared to the base-case situation.

5.3 Transaction characteristics

Transaction characteristics matter: the value of a payment attribute may depend on them. As shown earlier, card acceptance varies by transaction value, while speed may also be at a premium in places with high shopping traffic. Safety may be perceived as greater in high-transaction-value stores. Paying with cards at the gas pump may save a trip inside the station, compared to paying with cash.

The results reported in Table 6 under *Transaction characteristics* show that the two most important variables explaining why cash is frequently used in low-value transactions are the lack of acceptance of alternatives to cash and ease of use or speed. However, other cash attributes, such as anonymity, also matter at the POS.

Indeed, the probability of paying with cash decreases almost 30 percentage points, on average, when consumers perceive that both debit and credit cards are accepted by merchants (AME = -0.308 on the dummy for cash, debit and credit perceived as accepted in Table 6). Chart 8 shows the baseline scenario with the observed card acceptance levels versus the predicted probability of using cash across transaction amounts when an individual believes cards are accepted. For the latter scenario, the purchaser is less likely to use cash and the reduction in the probability of using cash is greatest for low-value transactions.[27]

[27] Future work should analyze the formation of consumers' acceptance beliefs. By obtaining data on actual acceptance by geographic codes, as in Rysman (2007), one could measure the level of consumers' choice "inefficiencies" due to misinformation. Note, however, that even if merchants accept a payment method, they could, in principle, dissuade consumers from using it either through fees or minimum transaction restrictions.

The diary also asked for the two most important reasons for choosing a particular payment instrument. Reasons included were: ease of use or speed, avoid fees, delay payment and avoid fraud/theft/counterfeiting. The model results show that for transactions where the most important reason for choosing a payment instrument was ease of use or speed, the probability of paying with cash is about 20 percentage points higher (AME = 0.204). Chart 9 illustrates the importance of ease of use in the probability of using cash as we alter the transaction value. Again, this chart plots the base case against an alternative case, this time setting the variable ease of use as the top reason equal to 0 (see the appendix for a description of this variable). Note that making ease of use unimportant for choosing a payment method in the model substantially reduces the use of cash, particularly in lower-value transactions.[28]

The results in Table 6 also show that for transactions where avoiding fees and avoiding fraud were the top reasons for choosing a payment method, the probability of paying with cash is substantially higher (AME = 0.111 and AME = 0.079, respectively). These results highlight the unique advantages of cash in terms of anonymity, and point to a substitution toward cash where consumers might face merchant surcharging if using a payment card.[29] However, when delaying the payment is the main reason behind making a payment instrument choice, the probability of paying with cash drops by some 20 percentage points (AME = -0.207).

The type of good purchased also influences a person's decision on whether to use cash. Using groceries/drugs as the base category, the model estimates show that the probability of using cash falls when the good type is gasoline (AME = -0.045), and travel/parking (AME = -0.147), but increases when it is entertainment/meals (AME = 0.059). The model results also show that cash is predominant in transactions where the buyer and the seller are physically present, such as at a store or person-to-person.

5.4 Participant perceptions and attitudes toward payment instrument attributes

The previous section analyzed why cash usage varies across transaction types. In this section, we analyze why cash usage varies among consumers. The model shows that differences in perceived benefits and costs of paying with cash among consumers are strongly associated with differences in their payment behaviour.

We add measures of respondents' perceived overall satisfaction with the ease of use, costs and ability of cash to track spending relative to debit and credit cards. We also include participants' attitudes toward record keeping, security and control of overspending. The estimates reported in Table 6 under *Perceptions and attitudes* show that differences in consumers' perceived costs of

[28] Klee (2008) also finds speed to be a significant factor in the use of cash and alternative payment instruments.
[29] For example, some retailers charge a card payment fee if transactions are below a certain threshold.

using cash (AME = -0.141), ease of use (AME = 0.318) and record keeping capabilities (AME = 0.185) are significant factors explaining the probability of using cash with the expected signs. Furthermore, cash seems to play an important role as a way to keep spending within budget, since those consumers particularly worried about overspending use cash more intensively (AME of importance of controlling overspending = 0.041).

There are various reasons why consumers may differ in their perceptions of the benefits and costs of using cash. Those who are more careful about checking change, worry about currency counterfeiting or do not like coins may find cards easier to use. For some, accessing cash may be more costly in terms of ATM access and fees. Some individuals see cash as being good for tracking expenses, since cash balances can be checked at any time; alternatively, some may have a strong aversion to leaving a record of their transactions or personal information, or may not wish to keep track of small-value purchases. Others may find it more difficult to check card statements online or handle personal credit lines.[30]

We use the model to specify a scenario where cards are accepted everywhere, are as easy to use as cash and cash withdrawals are considered costly (proxied by low cash balances). Such a scenario could resemble the case where debit, credit or contactless payments (where a payment instrument can be simply waved over a terminal without the need for a signature or PIN) become ubiquitous and where cash access is made costly by, for example, increasing withdrawal fees. Chart 10 shows that, in such a scenario, the probability of paying with cash would be less than a fourth of that in the current environment. The chart also highlights the explanatory power of our model: it helps explain most of the high probability of paying with cash in low-value transactions.[31]

6. Conclusion

In this paper, we use the Bank of Canada's 2009 Methods-of-Payment survey to study why cash is still so frequently used. We find that about 6 out of 10 cash transactions are undertaken because of either speed or lack of acceptance of alternatives to cash, or because cash is easily available. These factors are especially relevant in explaining why cash accounts for about 70 per cent of the payment volume for transactions below $25. Debit cards and credit cards, on the other hand, dominate in higher-value transactions, where they are generally accepted by merchants, speed is not as relevant, credit card rewards are more generous, delaying a payment is more attractive and people prefer to hold on to their cash balances.

[30] The significance of consumer heterogeneity in preferences for cash due to its budgeting and overspending control properties, as well as its lack of tracking records, is consistent with the results found in von Kalckreuth, Schmidt and Stix (2011) and Schuh and Stavins (2010).

[31] The effect of transaction value on payment choices is documented in other studies such as Klee (2008) and Bounie and Francois (2006).

However, consumers differ in the way they perceive cash attributes. We find that there are consumers who are more cash intensive, since they use cash to avoid fraud, and because of its simplicity as a tool in controlling spending.

The results suggest that payment innovations that are easy to use and widely accepted may cause substantial reductions in cash usage, especially for transactions below $25, where we estimate that annual cash volumes are 6.2 billion transactions, about the same as the current combined volume of debit and credit card payments.

One example of such an innovation is the contactless feature (where a payment instrument can be simply waved over a terminal without the need for a signature or PIN) in some Interac debit cards (Flash) and Visa (payWave) and MasterCard (PayPass) credit cards. Such payment cards would be more competitive with cash in terms of speed and ease of use. Although contactless card features were just introduced in Canada a few years ago, there is already evidence of their effect on cash usage (Fung, Huynh and Sabetti 2011). More recent innovations allow debit and credit payments through mobile phones, as well as make credit card payments quicker for low-value transactions by eliminating the requirement to provide a signature. However, merchants, especially those with high transaction volumes and low transaction values, must be given the right incentives to accept these innovations, since it may involve the upgrading of existing equipment or the purchase of new equipment.

Future work with the 2009 MOP survey should allow researchers to develop more elaborate models of payment instrument usage. For example, to explore competition between debit and credit cards at the point of sale, it is important to understand the factors underlying both consumer selection of different debit and credit card plans and merchants' decisions regarding payment card acceptance.

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Table 1
Point-of-Sale Transaction Value by Payment Method – 2009 MOP Survey[a]

Method of payment	Median value	Average value
Cash	$8.0	$16.9
Credit	$40.0	$84.4
Debit	$29.0	$51.3
Cheque	$60.0	$195.6
Stored-value card	$4.8	$26.8

a. Based on 15,784 transactions from the 3-day diaries.

Table 2
Perceived Acceptance of Cards by Merchant Size and Transaction Values (survey diaries)[a]

	Transaction values			
Merchant size (number of cashiers)	$0-$15	>$15-$25	>$20-$50	>$50
1	41.1%	65.6%	76.5%	81.4%
2 to 5	57.3%	71.6%	80.4%	86.9%
>6	68.4%	76.1%	84.8%	87.5%

a. Based on 15,784 transactions. Proportion of transactions where individuals thought cards were accepted.

Table 3
Household Income and Payment Choices

	I	II	III	IV
Income	% of cash transactions in the diaries[a]	Mean transaction value in the diaries ($)[b]	% of people with at least 1 credit card[b]	% of credit card owners with rewards[b]
<$30K	65.2%	$33.23	53.1%	54.5%
$30K-<$60K	56.5%	$34.86	77..0%	63.8%
$60K-<$100k	52.8%	$39.47	85.3%	70.1%
$100K+	47.4%	$47.43	94.0%	78.2%
	15,795	*6,868*	*6,868*	*5,753*

a. Based on the 3-day survey diaries (15,776 transactions). b. Based on the survey questionnaires.

Table 4
Consumer Perceptions of Various Payment Instrument Attributes (share of respondents with highest rating)[a]

Method of payment	Ease of use (% very easy to use)	Tracking spending (% very useful)	Cost (% not at all costly)	Potential financial loss (not at all significant)
Cash	79.0%	26.8%	71.8%	17.3%
Debit card	72.4%	50.5%	32.1%	10.1%
Credit card	75.6%	53.6%	28.9%	12.2%
Stored-value card	45.0%	18.6%	45.8%	31.3%

a. Based on 6,868 respondents. Numbers show the share of respondents who chose the highest rating for each attribute.

Table 5
Consumer Perceptions of Cash Relative to Debit and Credit Cards by Payment Attribute

	% of cash transactions in the diaries[a]	Ease of use[b]	Tracking spending[b]	Costs[b]	Risk of theft/fraud[b]	Potential financial loss[b]	Acceptance
Overall	53.8	1.00	1.00	1.00	1.00	1.00	1.00
Age							
18 - 34	48.9	1.18	1.00	1.00	0.86	1.05	1.12
35 - 54	53.9	0.97	0.99	1.06	0.97	0.99	0.99
55- 75	59.0	0.84	1.02	0.92	1.21	0.96	0.87
Income							
<30 K	65.2	1.33	1.16	1.11	0.88	0.87	0.95
30 to 60 K	56.5	0.76	1.04	1.09	1.13	0.98	0.90
60 to 100 K	52.8	0.95	0.98	1.02	0.96	1.01	1.00
100 K plus	47.4	1.11	0.89	0.84	0.98	1.08	1.13
Gender							
Female	54.1	0.84	1.00	1.07	0.94	0.95	0.99
Male	54.3	1.18	1.00	0.93	1.07	1.05	1.01
Density							
Urban	53.9	0.96	0.99	1.00	1.01	1.00	1.03
Rural	55.2	1.13	1.04	1.00	0.98	0.99	0.91
Responsible for household finances							
Not responsible	53.6	1.11	1.03	0.96	1.07	1.02	1.05
Responsible	54.6	0.93	0.98	1.02	0.95	0.99	0.97

a. Based on the survey diaries (15,776 transactions). b. Based on the 6,868 participants' questionnaires.

Table 6
Logit Model

	Average marginal effects	*p*-value
Socioeconomic factors		
Household income (less than $30K comparison group)		
$30K-$50K	-0.045	0.166
$50K-$80K	0.109***	0.002
$80K plus	0.000	0.992
Age (less than 35 comparison group)		
35 to 55 years old	0.001	0.966
55 or older	0.102***	0.006
Interactions of income and credit card ownership dummy		
$30K-$50K) and credit card ownership	0.047	0.180
$50K-$80K) and credit card ownership	-0.100***	0.006
$80K plus) and credit card ownership	0.032	0.453
Interactions of age and credit card ownership dummy		
35 to 55 years old and credit card ownership	0.008	0.779
55 or older and credit card ownership	-0.104***	0.005
Credit card ownership	0.013	0.666
Debit card ownership	-0.048***	0.008
Education (finished high school comparison group)		
Some technical school/university	-0.005	0.719
University or graduate degree	-0.020	0.176
Family Size	-0.010*	0.041
Male	0.010	0.318
Rural	0.006	0.643
Not Married	0.014	0.332
Renter	0.074***	0.000
Interaction of renter and not married	-0.088***	0.000
Full time employed	0.004	0.685
Home access to internet	-0.013*	0.429
Responsible for household finances	0.009	0.377
Financial knowledge	0.004	0.565

Note: ***, ** and * statistically significant at 1 per cent, 5 per cent and 10 per cent, respectively. Likelihood estimation accounting for survey weights using Stata survey environment. Marginal effects calculated as the average of the marginal effect across all observations. Transactions above $1,000 excluded as outliers.

Table 6 (continued)
Logit Model

	Average marginal effects	*p*-value
Card plans and cash holdings		
Debit card with more than 20 or unlimited free transactions	-0.066***	0.000
Debit card monthly fee	-0.001	0.925
Credit card with contactless feature	-0.010	0.431
Reward dummy multiplied by transaction value	-0.001**	0.003
Reward dummy multiplied by transaction value squared	0.000**	0.016
Credit card revolver (does not pay credit card balances in full)	-0.015	0.192
Cash holdings at beginning of the diary	0.001***	0.000
Cash holdings squared	-0.000***	0.005
Transaction value divided by cash holdings	-0.013**	0.001
Transaction value divided by cash holdings squared	0.000***	0.008
Transaction characteristics		
Transaction value	-0.003***	0.000
Transaction value squared	0.000***	0.000
Transaction channel (at a store comparison group)		
By mail	-0.287***	0.004
By phone/Internet	-0.232***	0.000
Person to person (not at a store)	0.126***	0.000
Other (e.g. at a bus, booth)	0.045*	0.106
Type of good/service (groceries comparison group)		
Gasoline	-0.045***	0.015
Personal attire/ Hobby or sporting goods/ durable goods	-0.023**	0.109
Health Care	-0.066	0.121
Professional/personal services	-0.057*	0.206
Travel/parking	-0.147***	0.000
Entertainment/meals	0.059***	0.000
Other	0.044***	0.004
Cash, debit and credit cards perceived as accepted	-0.308***	0.000
Ease of use/speed as top reason	0.204***	0.000
Avoid fees as top reason	0.111***	0.000
Delay payment as top reason	-0.207***	0.000
Avoid fraud as top reason	0.079***	0.000
Weekend	-0.007	0.469

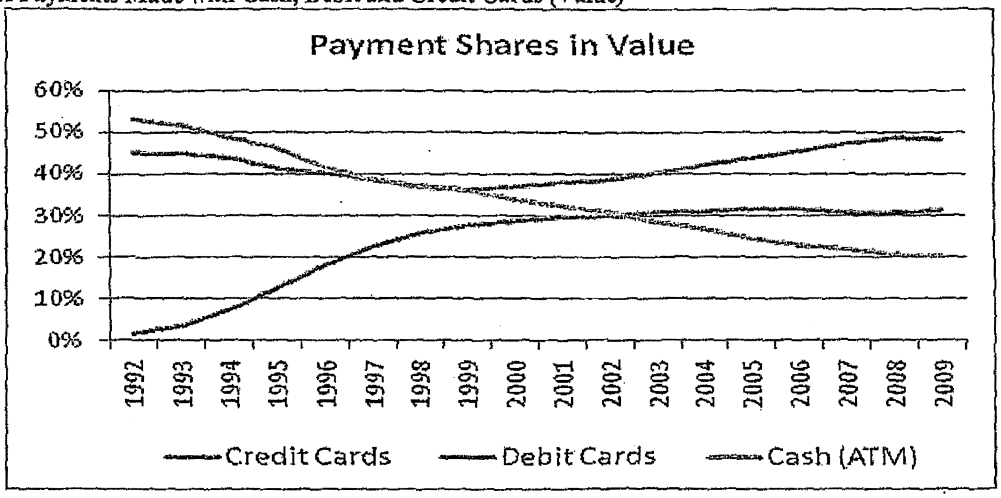
Note: ***, ** and * statistically significant at 1 per cent, 5 per cent and 10 per cent, respectively. Likelihood estimation accounting for survey weights using Stata survey environment. Marginal effects calculated as the average of the marginal effect across all observations. Transactions above $1,000 excluded as outliers.

Table 6 (continued)
Logit Model

	Average marginal effects	*p*-value
Perceptions and attitudes toward payment instrument attributes		
Perceived ease of use of cash relative to cards	0.318***	0.005
Perceived cost of cash relative to cards	-0.141**	0.004
Perceived record keeping ability of cash relative to cards	0.185***	0.000
Importance of payment attributes relative to ease of use		
Importance of costs	-0.041**	0.015
Importance of record keeping	-0.015	0.454
Importance of acceptance	0.001	0.965
Importance of controlling overspending	0.041***	0.003
Importance of anonymity	0.022	0.146
Importance of security	-0.011	0.592
Constant	NA	
Number of observations	14,372	
F test (*p*-value)	23.318	0.000

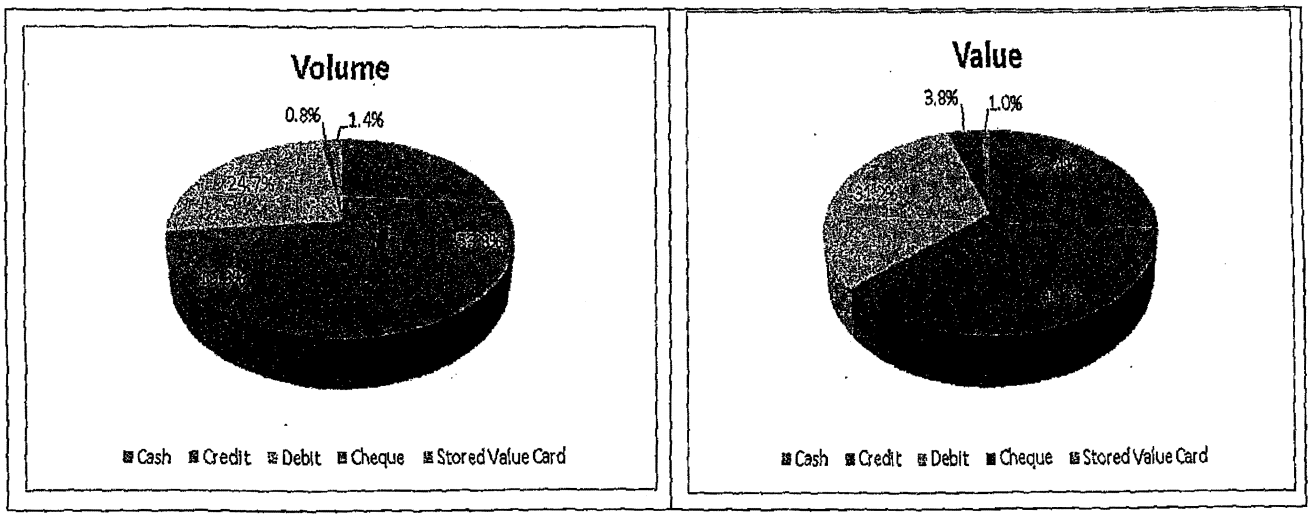
Note: ***, ** and * statistically significant at 1 per cent, 5 per cent and 10 per cent, respectively. Likelihood estimation accounting for survey weights using Stata survey environment. Marginal effects calculated as the average of the marginal effect across all observations. Transactions above $1,000 excluded as outliers.

Chart 1
Share of Payments Made with Cash, Debit and Credit Cards (Value)[a]



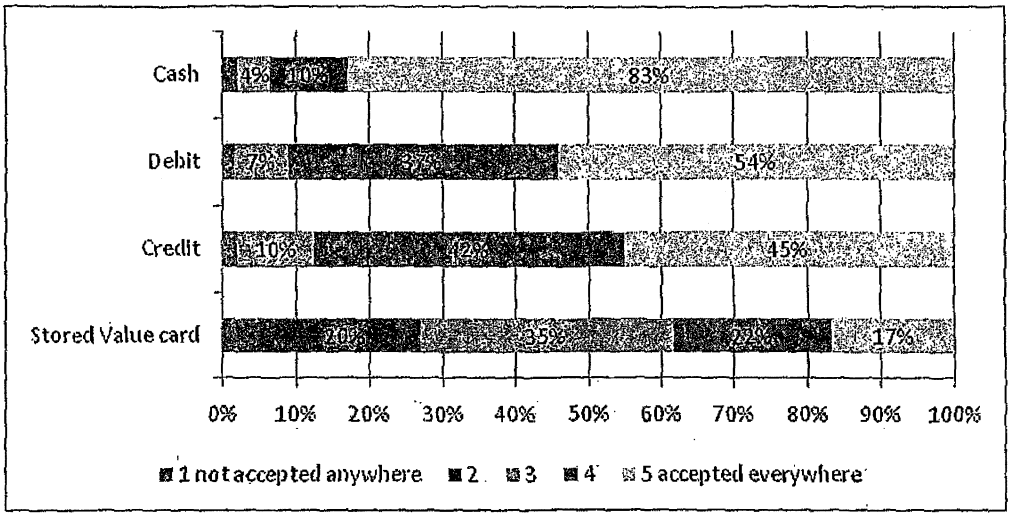
a. Cash values based on ATM withdrawals. Values of debit and credit card transactions are based on annual public statistics provided by Interac, Visa and MasterCard.

Chart 2
Aggregate Volume and Value Shares by Payment Method – 2009 MOP Survey[a]



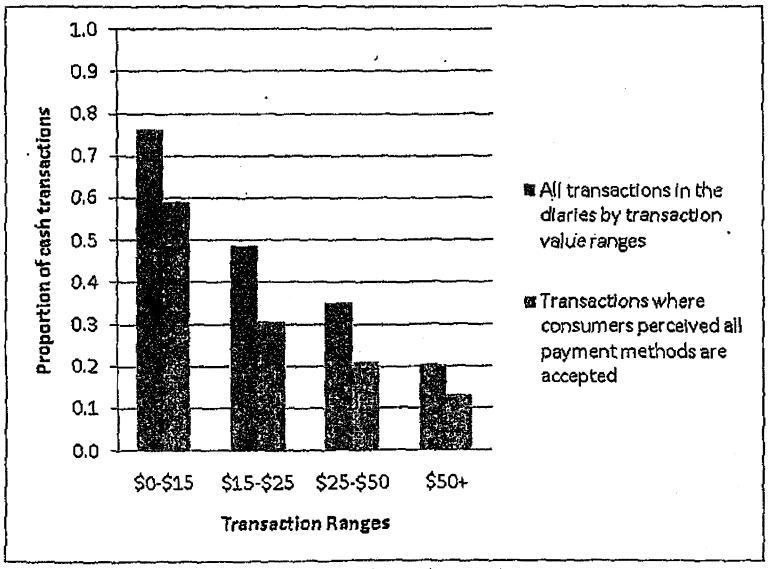
a. Based on 15,891 transactions. Taken from the 3-day diaries.

Chart 3
Perceived Acceptance for Cash, Debit and Credit Cards[a]



a. Percentages indicate share of respondents answering for each acceptance level (1 to 5). Based on the 6,868 survey questionnaires.

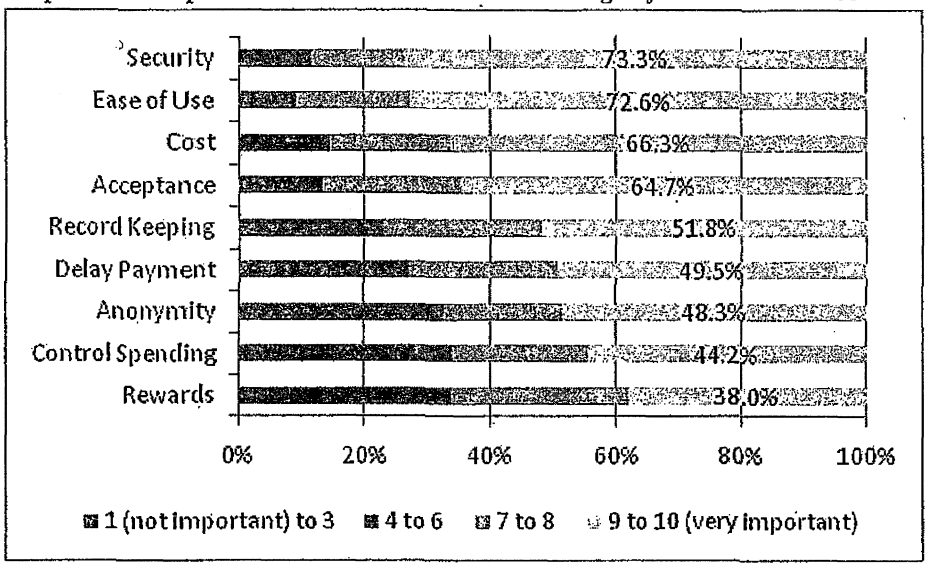
Chart 4
The Effect of Acceptance on Cash Use[a]



a. Based on 15,913 transactions from the 3-day diaries.

Chart 5

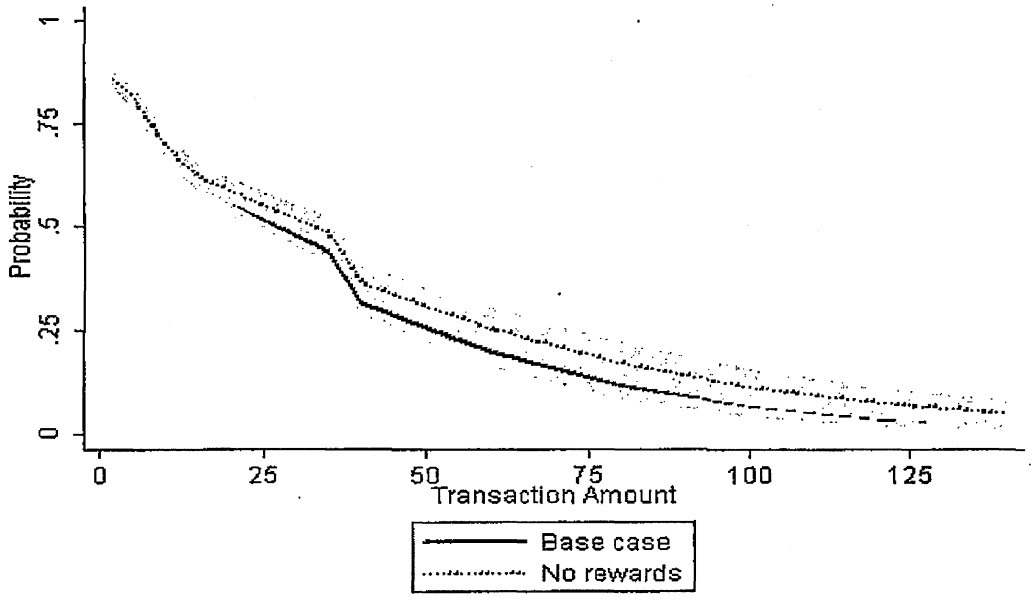
Responses on Importance of Various Factors in Choosing Payment Method to Use[a]



a. Individuals were asked in the survey questionnaire to rate a list of attributes in terms of their importance when considering what type of payment method to use. The chart shows the breakdown of responses for each attribute.

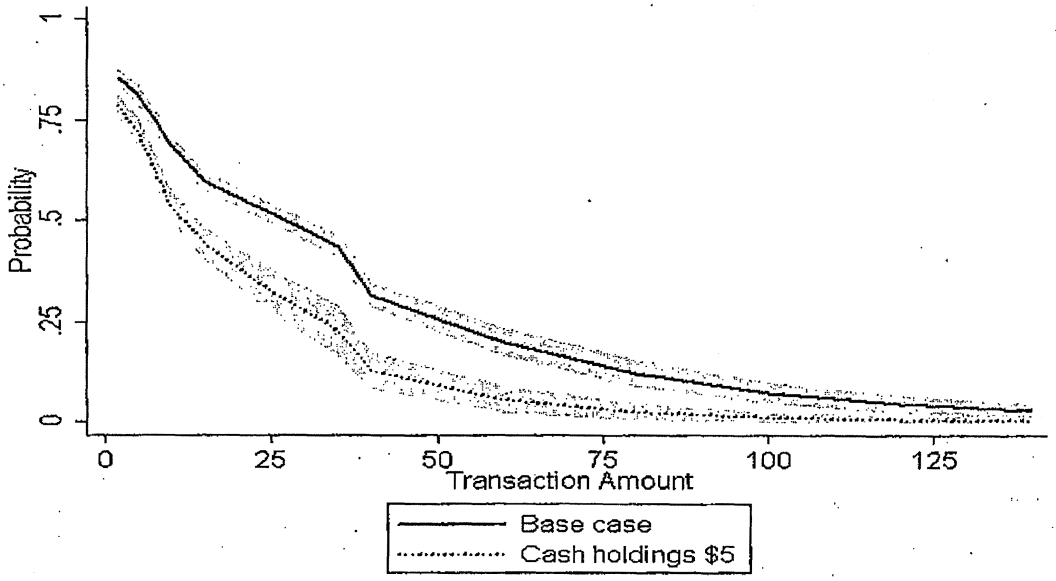
Chart 6

The Effect of Credit Card Rewards on the Probability of Using Cash[a]



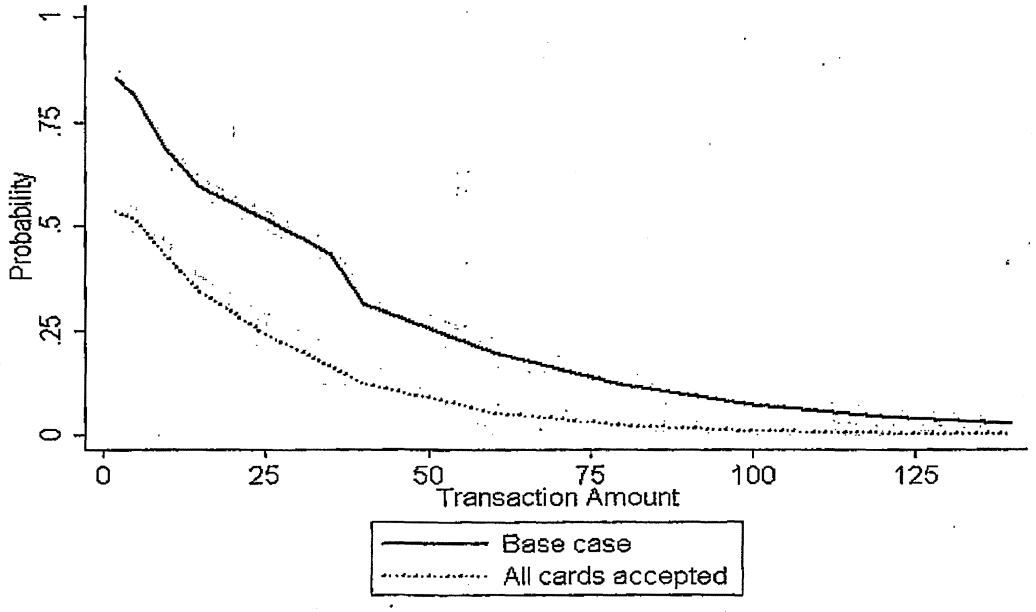
a. Shaded area represents 95 per cent confidence interval. Base case represents average value of regressors, including a 0.75 per cent rebate on credit card purchases

Chart 7
Costly Access to Cash and Cash Usage[a]



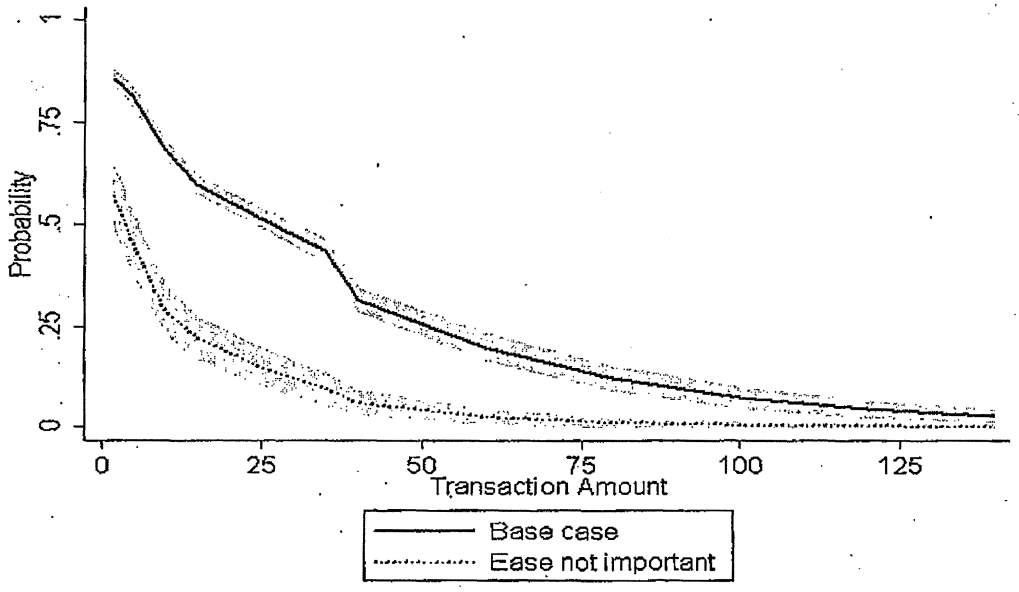
a. Shaded area represents 95 per cent confidence interval. Base case represents average value of regressors, including the average starting cash balance at day 1 of the shopping diary.

Chart 8
The Effect of Acceptance on the Probability of Using Cash[a]



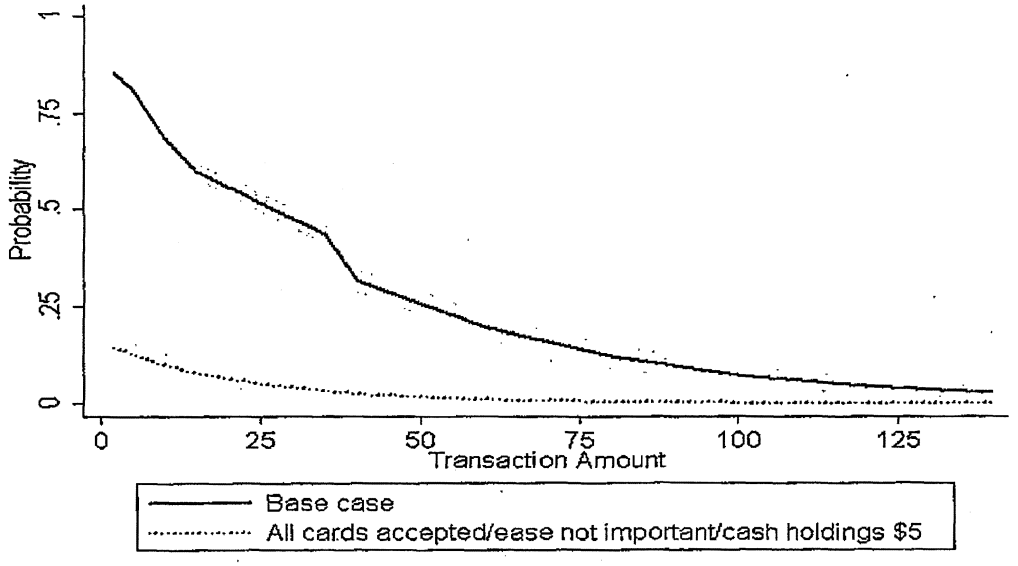
a. Shaded area represents 95 per cent confidence interval. Base case represents average value of regressors, including the proportion of places that accept all cards at different transaction values.

Chart 9
Ease of Use or Speed and the Probability of Using Cash[a]



a. Shaded area represents 95 per cent confidence interval. Base case represents average value of regressors, including the proportion of transactions where ease of use was the top reason by transaction ranges.

Chart 10
The Effect of Acceptance, Ease of Use and Costly Access to Cash Combined (model estimates)[a]



a. Shaded area represents 95 per cent confidence interval. Base case represents average value of regressors.

Appendix – Variable List

Socioeconomic factors

- Household income: a series of dummy variables indicating annual household income group before tax.
- Age: a series of dummy variables indicating age group based on year of birth.
- Interaction of income group with credit card ownership dummy: a dummy that equals 1 if the individual belongs to the income group and indicated they had at least 1 credit card in their wallet at the beginning of the diary.
- Interaction of age group with credit card ownership dummy: a dummy that equals 1 if the individual belongs to the age group and indicated they had at least 1 credit card in their wallet at the beginning of the diary.
- Credit card ownership dummy: a dummy variable that equals 1 if the individual indicated they had at least one credit card in their wallet at the beginning of the diary.
- Debit card ownership dummy: a dummy variable that equals 1 if the individual indicated they had at least one debit card in their wallet at the beginning of the diary.
- Education: a series of dummy variables indicating the highest level of education the respondent completed.
- Family size: the number of individuals living in the household (including the respondent).
- Gender (male): a dummy variable that equals 1 if the respondent is male.
- Rural: a dummy variable that equals 1 if the respondent lives in a rural area.
- Marital status (not married): a dummy variable that equals 1 if the respondent indicated that they are single or separated.
- Renter: a dummy variable that equals 1 if the individual indicated they rented their home.
- Interaction of renter and not married: a dummy variable that equals 1 of the individual is both a renter and not married.
- Works full time: a dummy variable that equals 1 if the individual works full time.
- Home Internet access: a dummy that equals 1 if the individual has access to the Internet or online services at home.
- Financial manager: a dummy variable equal to 1 if the person indicated they are responsible for managing most of the household finances.
- Personal financial knowledge: the survey questionnaire asked individuals about their level of knowledge regarding a number of financial products and services, ranging from 1 "never heard of it" to 5 "very knowledgeable." With this information we created an index of an individual's level of financial knowledge.

Card plans and cash holdings

- Debit card free transactions: a dummy variable that equals 1 if an individual indicated they have 20 or more free transactions a month with their bank account package.
- Debit card monthly fee: a dummy variable that equals 1 if the individual pays a monthly fee on their bank account.
- Contactless: a dummy variable that equals 1 if the individual indicated that their credit card has a contactless feature.

- Credit card rewards and transaction value: a variable that takes the transaction value and multiplies it by a dummy variable that equals 1 if the individual has a credit card with rewards and 0 otherwise. We also include this variable squared.
- Revolver: a dummy variable that equals 1 if the individual had an unpaid balance on their last credit card statement.
- Beginning cash balances: the amount of cash an individual has on hand at the beginning of the diary to make transactions. Also included is the amount squared.
- Transaction value divided by cash holdings: the transaction amount divided by the beginning of the diary cash balances. We also include the squared value of this term.

Transaction characteristics

- Transaction amount: the total amount of the transaction in dollars. We also include this amount squared
- Transaction channel: dummy variables indicating the location where the transaction took place; for example, by phone or online. The base category is "at a store."
- Main type of good or service: a series of dummy variables indicating the main type of good or service purchased; for example, durable goods or gasoline. The base category is "groceries/drugs."
- Perceived acceptance: in the survey, we asked respondents what payment methods they thought were not accepted for each transaction. We then used this information to construct a dummy variable that equals 1 if a respondent thought all payment methods were accepted in the transaction.
- Reason for choosing main payment method: a series of binary variables taking on the value of 1 if a person indicated them as a reason for choosing their payment method. The reasons we include are ease of use, avoiding fees, delaying payment and avoiding fraud/theft/counterfeiting.
- "Weekend": a dummy variable that equals 1 if the transaction took place on a weekend.

Perceptions and attitudes toward payment instrument attributes

- Relative ease of use of cash: respondents were asked to rate on a 5-point scale (from "not at all easy to use" to "very easy to use") the ease of use of cash and other payment instruments. The score for cash was then divided by the score for the three major payment instruments to come up with a relative measure.
- Relative cost of cash: respondents were asked to rate on a 5-point scale (from "not at all costly" to "very costly") the cost of cash and other payment instruments. The score for cash was then divided by the score for the three major payment instruments to come up with a relative measure.
- Relative record keeping of cash: respondents were asked to rate on a 5-point scale (from "not at all useful" to "very useful") the usefulness of cash and other payment instruments for helping to keep a record of transactions. The score for cash was then divided by the score for the three major payment instruments to come up with a relative measure.
- Relative ranking of payment attributes: the survey asked respondents to rate attributes in terms of their importance when considering what payment instrument to use on a 10-point scale. We then weighted the score of the following attributes by the score of ease of use: cost, record keeping, acceptance, controlling spending, anonymity and security.

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2011-23

How Do You Pay? The Role of Incentives at the Point-of-Sale

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EXHIBIT "F"

TO THE WITNESS STATEMENT OF CHRIS HEWITT DATED APRIL 9, 2012

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October 2011

How Do You Pay? The Role of Incentives at the Point-of-Sale

by

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Abstract

This paper uses discrete-choice models to quantify the role of consumer socioeconomic characteristics, payment instrument attributes, and transaction features on the probability of using cash, debit card, or credit card at the point-of-sale. We use the Bank of Canada 2009 Method of Payment Survey, a two-part survey among adult Canadians containing a detailed questionnaire and a three-day shopping diary. We find that cash is *still* used intensively at low value transactions due to speed, merchant acceptance, and low costs. Debit and credit cards are used more frequently for higher transaction values where safety, record keeping, the ability to delay payment and credit card rewards gain prominence. We present estimates of the elasticity of using a credit card with respect to credit card rewards. Reward elasticities are a key element in understanding the impact of retail payment pricing regulation on consumer payment instrument usage and welfare.

JEL classification: E41, C35, C83
Bank classification: Bank notes; Econometric and statistical methods; Financial services

Résumé

Les auteurs font appel à des modèles de choix discrets pour quantifier le rôle des traits socioéconomiques des consommateurs, des attributs des instruments de paiement et des caractéristiques des opérations dans la probabilité d'usage de l'argent comptant, des cartes de débit et des cartes de crédit au point de vente. À cette fin, ils se servent des données de l'enquête sur les modes de paiement menée par la Banque en 2009 auprès des Canadiens d'âge adulte – sondage à deux volets comprenant un questionnaire détaillé et un journal d'achats tenu pendant trois jours. Ils constatent que l'argent comptant est *encore* beaucoup utilisé pour les petits achats parce que ce mode de paiement est rapide et peu onéreux et qu'il est bien accepté par les marchands. Les cartes de débit et de crédit sont plus souvent choisies pour les transactions de plus grande valeur où la sécurité, l'enregistrement de l'opération et la possibilité, dans le cas des cartes de crédit, de différer le paiement et d'obtenir des récompenses ont plus d'importance. Les auteurs donnent des estimations de l'élasticité de l'utilisation de la carte de crédit par rapport aux récompenses offertes. Les élasticités-récompenses constituent un élément clé pour examiner les effets de la réglementation relative à la tarification des paiements de détail sur l'usage des différents instruments de paiement par les consommateurs et sur le bien-être de ces derniers.

Classification JEL : E41, C35, C83
Classification de la Banque : Billets de banque; Méthodes économétriques et statistiques; Services financiers

1 Introduction

Debit and credit cards have changed how consumers pay for for every day retail transactions. As a result, there has been a significant shift from cash into debit and credit cards. To better understand the current tradeoffs between payment instruments, this paper investigates consumers' use of cash, debit and credit cards for everyday transactions using the 2009 Bank of Canada Method of Payment (MOP) survey. The dataset is a rich micro survey of adult Canadians who completed a household survey questionnaire and a three-day shopping diary of personal transactions.

One of the key stylized facts in retail payments is the strong relationship between transaction value and payment instrument choice. Table 1, illustrates the dominance of cash as a payment choice, in terms of volume and value, for transaction values below 25 dollars. However, above 25 dollar debit and credit cards dominate in terms of volume and value.

The contribution of our paper is to understand the underlying factors governing the transaction value and payment choice relationship. Previous work such as Bounie and Francois (2006) and Klee(2008) have found that transaction value is a good predictor of payment choice. Our study is similar in spirit to Klee (2008) as she focuses on point-of-sale data from scanners in grocery stores. She finds that payment patterns vary significantly by consumer demographics such as income and age. However, this relationship could be driven by unobservable factors such as: the consumers' weighting of convenience and cost of alternative payment methods. Another drawback of her study is that the demographic data is at the census-tract level, therefore, the results cannot be directly translated into consumer characteristics.

The novelty of our study is that we can estimate a discrete-choice model that accounts for the effects of consumer demographic characteristics, payment attributes, perceptions and transaction features on the probability of using cash, debit and credit cards at the point-of-sale (POS). Our results show that payment choices are a function of incentives derived from payment instrument attributes such as fees, rewards, interest rates, speed and security. Demographics and transaction values play a limited role once these factors, which are correlated with transaction value, are taken into consideration. We briefly summarize our findings as follows:

1. Cash dominates at the lower transactions below 25 dollars. We find that this result is

driven by: one, the perception that there is a limited acceptance for alternative payment methods; two, the high premium consumers place on ease of use/speed; and three, how much cash is on hand. However, debit cards compete closely with cash due to security, record keeping, and costs.

2. Above a transaction value threshold of 25 dollars, there is a strong substitution effect from debit cards to credit cards due to credit card rewards. For example, at transactions between 25 and 100 dollars, those with credit card rewards are 3.6 to 12.8 percent more likely to pay with credit cards relative to those without rewards. However, most of the rewards effect is due to the change in monetary rewards as they are proportional to the transaction value (e.g. rebates, miles, etc.). We compute the elasticity of the credit card probability with respect to rewards and find that consumers are relatively inelastic to credit card monetary incentives. Our elasticity calculation reveals that a 10 percent increase in dollar incentives raises the likelihood of paying with credit card by about 1.2 to 3.7 percent depending on the transaction value and the rewards plan. Our results are consistent with those found by Simon, Smith, and West (2010) and Ching and Hayashi (2010) who also investigated the effect of monetary incentives on payment choice.

3. Other monetary incentives are significantly associated with different payment behaviour. Debit cards are the predominant payment method among consumers who have a debit card plan that does not charge per-transaction fees. Furthermore, credit card convenience users (those who pay credit card charges due in full) are more likely to use their credit card than revolvers (those who do not pay their balance in full), indicating that revolvers are sensitive to the higher marginal costs of credit card liquidity.

Overall, consumers prefer to use cash because it is easy to use and widely accepted. The effects of credit card reward plans induce substitution away from debit into credit while the effect on cash is small. However, innovations in debit and credit card that make them *easy to use* along with *increased acceptance* may diminish the use of cash. Our elasticity estimates can be used to provide empirical insights to the theoretical literature on ad-valorem fees and how rewards can be used to exercise price discrimination in payment networks as in Shy and Wang (2011). Also, these insights may also help us to understand the interplay between market structure and

regulation as discussed in a cross-country comparison by Hayashi and Wiener (2006) and more recently in the US by Prager, Manuszak, Kiser, and Borzekowski (2009), inter alia.

The rest of the paper is organized as follows: Section 2 provides a brief description of the 2009 Bank of Canada MOP survey while section 3 briefly discusses the discrete-choice methodology utilized in this paper. The empirical results are presented in section 4 while Section 5 concludes.

2 2009 Method of Payments Survey

The Bank of Canada commissioned the survey to a market research firm which constructed the sample from access panels. Access panels are databases of people that sign up to participate in surveys on a regular basis. The sample was drawn from two access panels; an online panel of about 200,000 households, from which 2,000 diaries were targeted, and an offline *mail out* panel with close to 50,000 households, from which 1,000 diaries were targeted. The inclusion of an offline panel improved coverage of segments of the population without internet access and who may have significant differences in payment instruments use.

The 2009 MOP survey focuses on payment choice for day-to-day purchases of goods and services, abstracting from bill payments and purchases associated with work or self-employment activities. Stratified random samples of adults 18 to 75 years old were drawn from both panels in order to meet quota targets towards a national representative sample. The surveys were sent out in waves spread out across different days of November 2009, so that the diaries could be representative of a month's worth of transactional data.

Respondents were asked to complete two survey instruments: a survey questionnaire (SQ) and a three-day diary survey instrument (DSI). The SQ contained 52 questions similar to the 2004 Bank of Canada survey and the 2008 Survey of Consumer Payment Choices of the Federal Reserve Bank of Boston and Dove Consulting, further details are available in Foster, Meijer, Schuh, and Zabek (2010) and Arango and Welte (2011). The SQ was divided into four major sections:

1. Banking information on debit and credit cards, their respective types and features.

2. Consumer perceptions on payment instrument attributes such as: ease of use, record

keeping, risks, costs, and acceptance.

3. Cash holdings and cash management choices such as frequency of cash withdrawals.
4. A comprehensive set of socioeconomic questions including knowledge of personal finance and behavioral attitudes on shopping behavior.

The DSI collected retail information about payment behavior and transaction characteristics as follows:

1. The front section collected information about cash and card holdings, to be completed by respondents prior to starting the diary.
2. Participants were then asked to record the following information about each purchase of goods or services:
   - Core transaction attributes such as payment amount, type of good or service purchased, type of merchant, day of week, and payment instrument used.
   - The two top stated reasons for a particular payment instrument choice.
   - Which payment instrument, if any, was not accepted by the merchant to settle the transaction.

The respondents from the online panel were allowed to opt-out of participating in the diary resulting in roughly 40 percent of online SQ respondents completing the DSI. The combination of the online and the offline subsamples provided a total of 6,800 questionnaires, 3,190 diaries and about 15,000 transactions. Appropriate weights were designed to combine the online and offline subsamples, using the demographic profile of the Statistics Canada 2009 Canadian Internet Use Survey (CIUS) and a random digital dialing telephone survey that included five questions on payment instrument ownership, usage and attitudes towards payment instrument attributes as benchmarks. The CIUS is a national representative sample of 23,178 residents of Canada 18 years of age or older.

Table 2 shows the final distribution of the survey before and after weighting both the SQ

sample and the DSI sample. The last column represents the distribution of the Canadian population based on CIUS. The weighed samples better match the CIUS sociodemographic profile compared to the unweighted samples.

2.1 Payment Instrument Perceptions

Perceptions about payment attributes, such as convenience, costs and risks, have been used extensively in payments survey design to understand what could explain differences in payment use. They are convenient measures of underlying costs and benefits that vary by consumers but are hard to observe by researchers. For instance, how difficult is it to remember pin numbers; or do online banking to keep track of expenditures, or sign up for a credit card; or, how risky it is for people to hold or withdraw cash or be exposed to identity theft? Including perceptions in the econometric analysis of payment behaviour has proven very useful in terms of model fitness and also in terms of an explicit account of the unobservable components of consumer preferences and a better understanding of substitution among choices (e.g. Ching and Hayashi (2010) and Schuh and Stavins (2010)).

The survey provides a rich set of questions on perceptions about different means of payment attributes. Respondents were asked to rank their perceptions of cash, debit cards, credit cards, stored-value cards and personal cheques in terms of ease of use, record keeping, risk of financial loss, acceptance by merchants, and costs, with five possible categorical levels. The rankings were done on a *Likert* scale from one to five, where five was associated with the strongest view. The survey respondents also answered attitudinal questions, ranking the importance of several key payment attributes, such as: ease of use, security, anonymity, fear of overspending and speed of transaction. The ranking of importance was based on a scale from one to ten.

Table 3 presents summary statistics of perceived payment method attributes based on our estimation sample. On average, cash is perceived as the least costly, most accepted and safest. Credit cards on the other hand are perceived as the easiest to use but most costly, and risky; although they rank better than debit cards in terms of record keeping and acceptance. Ease of use was deemed the most important attribute on average followed by security, speed, anonymity and potential to control overspending.

In the models below we work with relative measures of perceived attributes. Following Arango and Taylor (2009), relative measures of participant i perceived payment attributes are calculated as:

$$RCHAR_{kji} \equiv \frac{CHAR_{kji}}{\sum_{j=1}^{m} CHAR_{kji}}, \quad (1)$$

where k indexes the five characteristics and j indexes over the m payment instruments. In this way, perceptions of a particular attribute are normalized by the individual's overall absolute perceived levels of satisfaction across payments. This index allows for standardized levels of satisfaction across payment attributes and individuals. We normalize the rating of importance of attributes by the ranking of importance for ease of use.

2.2 Debit and Credit Card Account Plans

The survey provides detailed information on the types of bank and credit card accounts held by survey respondents. In terms of debit card fees, consumers are mostly divided into two schemes. One which resembles a pay-as-you-go plan with limited free debit transactions and likely a monthly fee. The other with a large or unlimited number of free debit transactions and either a monthly fee or no fee in the case it is waived by holding minimum bank account balances. In particular, 60 percent pay monthly fees, 72 percent have more than 20 free debit transactions and 66 percent of those paying monthly fees have more than 20 free transactions.

In terms of credit card plans, the data shows that consumers are divided into those with no annual fees but high interest rates, many whom use their credit cards for convenience as they pay their credit card balances in full at the end of the month. In particular, 62 percent of the survey respondents do not pay annual fees, 63 percent face 15-20 percent interest rates or higher and 59 percent have paid their balance in full at the time of the survey. Finally, among those that have access to a credit card, 71 percent have some type of reward program.

These differences in debit and credit card plans clearly bring different sets of incentives that would impact significantly the likelihood of choosing a particular payment instrument at the POS. As an illustration, the information in the diaries show that the proportion of credit card payments for those that do not have reward programs associated with their credit cards are three times lower than the proportion of credit card payments of those with reward programs. In the next section we describe credit card reward plans in detail.

2.3 Credit Card Rewards Plans

The survey identifies whether respondents earn rewards on their credit cards but does not explicitly identify the respective reward plan. However, using the name of the credit card which the respondent provides, we are able to match the rewards program associated with their credit card using publicly available information directly from the financial institution or from the Financial Consumer Agency of Canada (FCAC).[1] Although Canada is noted for a highly concentrated banking sector with a relatively small number of financial institutions, amongst the respondents there were 178 different credit card types. Of these, roughly 50 percent are associated with some sort of *ad valorem* reward program which either falls in the broad category of: cash-back, reward points redeemable for a selection of merchandise, travel or gift cards, and air miles principally for travel, but which may also be converted to merchandise. In the event that the credit card name is not provided or cannot be identified, we use the stated features as the most precise measure.

In order to have various rewards on the same scale, we convert points and miles to an equivalent percentage cash-back. However, the reward structure is often non-linear when converting points to a monetary value. For example, an American Express AIR MILES credit card user receives one air mile per 20 dollars spent. However, the value obtained in merchandise or travel certificates as a share of miles depends on the number of miles redeemed. Air tickets are hard to value given the volatility of pricing. To provide a direct measure, we focus on branded gift certificates which translate into an exact monetary value. For example, in the Summer of 2011, a Toys R Us© 20 dollar gift certificate required 175 air miles which translates into roughly 0.67 percent rewards. Due to the ambiguity of the reward schedule we impute 0.5 percent. Placing a lower bound on the equivalent measure of percentage cash back is to prevent an overestimate of the rewards effect. This ambiguity is especially acute when the reward incentive is tiered depending on aggregate annual credit card expenditures. In this case, we estimate the respondent's total credit card expenditures since the start of 2009 up to the beginning of the diary based on their last month's new credit card purchases, provided in their SQ. We also vary the rewards appropriately when reward plans vary by transaction type, for example, increased

[1]The FCAC website is www.fcac-acfc.gc.ca/eng/index-eng.asp.

reward incentives for gasoline purchases.[2]

Table 4 highlights the average value and volume shares of cash, debit and credit purchases by level of rewards. Higher levels of rewards are associated with higher shares of credit card purchases in both value and volume terms relative to the case of no-rewards. The decrease in average value and volume shares for debit cards are more pronounced than for cash.

2.4 DSI Payment Choices

On average, participants in the diaries made five transactions during the three day period; with 60 percent of the diaries containing between one and five transactions, 30 percent between six and 10 transactions, and 10 percent over 10 transactions. In terms of type of good or service, 36 percent of the transactions were grocery stores, 24 percent entertainment services, 12 percent on durable goods/retail (e.g. appliances, furniture, personal attire), eight percent at gas stations and the remaining on services, hobby/sports, and other.

Several elements reduced the sample size used in the econometric analysis. We use the following criteria to exlcude observations: One, observations where payment choice or transaction amount are unanswered. Two, individuals without access to either credit or debit cards. Three, transactions that are not exclusively undertaken at some type of store, in particular, those conducted online, by phone or to a person. Fourth, transaction values above $400 were eliminated to remove any outliers that may bias the results. As a result, our sample size comprises 2,351 diaries and 10,228 transactions. The final dataset used in the econometric analysis combines the information collected in the SQ with the transactional data collected at the DSI level. This dataset allowed us to control for consumer characteristics, payment instrument attributes and transaction characteristics on payment instrument choices at the POS. A full list of variables used in the estimations is included in the Appendix together with their description.

Table 5 presents estimates of the probability of choosing cash, debit and credit cards obtained from the DSI by key demographic variables. Additionally, the average and median transaction values of purchases are displayed by demographic strata. The results confirm the findings by other surveys both in Canada and elsewhere with respect to the correlation between demographics and payment instrument use. As expected, young, urban, high-income individu-

[2]More details about the rewards imputation are available upon request.

als are more card intensive than their older, rural, lower income counterparts. These results are usually quoted to claim that the shift towards electronic payments may take long as it depends on demographic and income dynamics.

However, Table 5 also shows that there is a strong association between the average transaction values purchased by strata and the share of cash payments in total volumes. The fact that younger and poorer individuals (living in low income households) conduct purchases of lower transaction values on average may well explain why they tend to use cash more frequently. In addition, the correlation between demographics and payment usage could reflect different underling incentives associated with card fees and rewards.

These results show the importance of controlling for transaction characteristics at the POS as well as payment instrument attributes to isolate pure demographic effects as suggested in Arango and Taylor (2009). For example, as pointed out by Arango, Hogg, and Lee (2011), households with older adults and higher incomes are more likely to sign up for both credit card ownership and credit card reward. Furthermore, choices may be limited by what is accepted at the POS. Table 6 presents perceived card acceptance in the diaries. It shows the percentage of transactions where respondents perceived credit and debit cards to be accepted by retail type and transaction values. Acceptance rates climb rapidly for transactions over 25 dollars.

Table 6 presents a table on perceived acceptance at the POS. These perceptions percentage of respondents who perceive both credit and debit to be accepted by retail type across the transaction space. Acceptance rates climb rapidly for transactions over 25 dollars.

3 Empirical Methodology

We utilize discrete-choice models to understand a consumer's choice of payment methods at the POS. The next section discusses the discrete-choice methodology.

3.1 Discrete-Choice Models

A household has m-choices with regards to the payment instrument used in a transaction and the utility of payment instrument j is denoted as:

$$U_j = V_j + \epsilon_j, \quad j = \text{Cash, Debit Card (DC), or Credit Card (CC).} \tag{2}$$

Let V_j be the observed utility of choice j and ϵ_j be the random choice variation. By definition, for payment instrument j to be chosen, it must yield the highest utility relative to other choices:

$$\begin{aligned} \text{Prob[Payment} = j] &= \text{Prob}(U_j > U_k), \forall \quad j \neq k \\ &= \text{Prob}(V_j + \epsilon_j > V_k + \epsilon_k), \\ &= \text{Prob}(V_j - V_k > \epsilon_k - \epsilon_j). \end{aligned}$$

If the density of $F(\epsilon_j) = e^{\epsilon_j} \exp(-e^{\epsilon_j})$ and $V_j = \mathbf{x}_j'\beta_j$ then we have Multinomial Logit (MNL):

$$\text{Prob[Payment} = j] = \frac{\exp(\mathbf{x}_j'\beta_j)}{\sum_{l=1}^{m} \exp(\mathbf{x}_l'\beta_l)}. \tag{3}$$

The MNL is considered the standard workhorse model in the discrete-choice literature, see Train (2003). It is tractable and can be implemented in standard software packages. One of the major disadvantages of MNL models is the assumption of independence of irrelevant alternatives (IIA). The IIA assumption allows for the choice probabilities to have a closed-form solution and therefore the log-likelihood is easy to compute. However, if the IIA assumption is violated the MNL leads to unrealistic predictions i.e. the famous Red-Bus Blue-Bus problem mentioned in Train (2003). In technical terms the MNL error structure assumes an extreme value distribution that is independently distributed from each other, i.e. the covariance matrix is restricted to a diagonal form.

To avoid the IIA assumption, the covariance matrix must allow for the errors to be correlated with each other. One possible alternative model is the Multinomial Probit (MNP) which assumes that the error terms are multivariate normally distributed or $\epsilon \sim MVN(0, \Omega)$. The variance-covariance matrix Ω allows for correlation across choices.

3.2 Model Specification

We model the decision of the consumer at the POS using the merged SQ-DSI data. The choice set of the consumer is Cash, Debit Card (DC), or Credit Card (CC). We relate the latent utility, U_j, of choosing payment instrument j to four sets of factors: consumer demographics, payment attributes, perceptions, and transactions characteristics.

The set of demographic variables includes: income, education, age, gender, employment status, choice of housing, region of Canada, and family size. Payment attributes includes the

features associated with consumer bank and credit card plans such as: whether the respondent pays a monthly debit card fee, receives unlimited free debit card transactions, earns credit card rewards, pays an annual credit card fee, and pays credit card balances in full at the end of the month or revolves on their credit card debt. As for cash, we include the starting cash balance at the beginning of the diary.

Perceptions include: relative measures of perceived costs, acceptance, record keeping, ease of use, risk of financial loss and fear of fraud as defined in section 2.1. We also include relative measures of the respondent's stated preference for avoiding overspending and security. Transaction characteristics are features of the transaction environment at the POS. The latter includes the transaction value, the type of good, day of the week, perceived card acceptance and top reasons for choosing the payment method used to finalize the transaction.

To understand what matters at the POS for payment instrument choices, we abstract from the adoption decision of debit and credit card features as part of their personal financial portfolio. Therefore, the estimates in this paper are based on consumers that held both debit and credit cards during the completion of the diary. We also do not explicitly model the amount of cash they had in their wallet before undertaking the three-day diary transactions. We leave these issues for future work.

3.3 Marginal/Partial Effects

Coefficients are difficult to interpret in a nonlinear model, therefore, we compute marginal effects, see Train (2003) for further details. For example, the marginal effect on the probability of choice j (p_{ij}) of a small change in the observed factor ($\mathbf{x}_i$) is:

$$\frac{\partial p_{ij}}{\partial \mathbf{x}_i} = p_{ij}[\beta_j - p_{ij}\sum_{l=1}^{m} p_{il}\beta_l]. \quad (4)$$

The first part of the marginal effect is the direct effect of choice j and the second part consists of p_{il} and β_l are the probabilities and coefficient of the alternative choices. The marginal effects are estimated by calculating the effect in the choice probabilities of a change in a regressor for a given individual and then averaged over individuals to produce what is commonly referred to as average marginal effects. The marginal effects also decompose the effects of a change in a regressor on the probabilities across choices and allows for a more informed analysis of

substitution patterns.

Note that this definition is only valid for continuous variables. Our study contains many discrete and categorical variables therefore we make use of average partial effects which is defined as:

$$\frac{\Delta p_{ij}}{\Delta \mathrm{x}_i} = p_{ij}(\mathrm{x}_i' = x_A) - p_{ij}(\mathrm{x}_i' = x_B), \tag{5}$$

where x_A, x_B denote the values for category A and B, respectively. Due to the number of variables, the marginal effects are split into blocks. The first block contains the demographic effects followed by perceptions, portfolio and POS characteristics. Finally, the presentation of the results that follows is based on the MNL model estimations as there are no quantitative differences with the MNP specifications in terms of marginal effects and elasticities. A technical appendix containing details on the comparison between MNL and MNP is available upon request.

3.4 Predicted Probabilities

To evaluate the effects of different observed factors in the model we compute the predicted probabilities or the probability of choice j conditional on a set of covariates (x_g) evaluated at profile g:

$$\widehat{P}_{gj} = \frac{\exp(\mathrm{x}_g'\hat{\beta}_j)}{\sum_{l=1}^{m}\exp(\mathrm{x}_g'\hat{\beta}_l)}. \tag{6}$$

The predicted probabilities, $\widehat{P}_{gj}$, could be computed over a range of possibilities. In this paper, we consider the following demographic profile g described as: an urban, married, Canadian, male, employed, homeowner in Ontario, earning 30-50K/year, with average perceptions.

4 Results

The results of the MNL are contained in Table 7. This table lists the coefficients of debit and credit card choices with cash as the base outcome. Figure 1 plots the payment frequencies observed in the data for those who pay with cash, debit and credit cards across transaction values. The picture portrays an average payment profile where cash dominates for payments below 25

dollars. Above this range, credit and debit cards are the preferred payment instruments but neither dominates.

4.1 Credit and Debit Card Plan Effects

Table 8 displays the average partial effects for various portfolio features. We find strong commitment effects for subscribers of debit card monthly fees and credit card annual fees, respectively. In particular, the probability of paying with debit cards for those who both pay a monthly debit card fee and receive unlimited free transactions increases by roughly 12 percent (adding the two effects). Paying a credit card annual fee increases the probability of paying with credit by roughly five percent. Although both debit and credit fees are fixed costs, they are also highly correlated with accrued marginal advantages such as free debit transactions, and credit card rewards.[3]

We also include dummy variables for different ranges of credit-card-debt to credit-card-limit ratio conditional on being a revolver to distinguish between credit card convenience users and credit card revolvers. The credit card debt-to-limit ratios measure the individual's credit availability and their preference for avoiding further debt. Table 8 shows that the probability of using credit cards decreases by roughly seven percent if the consumer is revolving up to 50 percent of their limit. The effect is increasing in debt ratio but in a non-linear fashion as individuals become closer to their limit. Consumers are either paying in full their credit card balances at the end of the month (known as convenience credit card users) or those who carry a balance on their credit card debt (credit card revolvers). Although, this feature is not a choice of the credit card plan, it becomes a given at the POS and would imply different marginal costs. In fact, someone with revolving debt will pay a financial fee on each credit card transaction whereas the one paying in full at the end of the month would actually receive a free loan. These results are in line with those found in Zinman (2009).

Cash holdings also play an important role. Our proxy for the cost of using cash is cash holdings at the beginning of the diary. The higher the amount of cash held by diary participants the less likely the need to obtain cash but also entails the costs of holding cash. On the

[3]Scholnick, Massoud, Saunders, Carbo-Valverde, and Rodríguez-Fernández (2008) offers a thorough review of the industrial organization literature on card pricing and market structure.

other hand, with a low cash balance an individual must rely on the availability of card payments or otherwise forego or postpone a purchase. As seen in Figure 2, higher initial cash holdings leads to higher probability of paying with cash. The result is especially pronounced for transactions below 25 dollars. The probability of paying with cash for an individual carrying 150 dollars could be twice as large compared with that of someone with only 5 dollars. However, as transaction value increases the marginal cost of paying with cash goes up reducing the difference in probabilities between high and low cash holders.[4]

Figure 3 depicts the predicted probabilities of payment choices across transaction values for a typical demographic profile who is an *uncommitted individual.* This type of individual does not pay any debit or credit fees, nor gains from obtaining free debit transactions or credit card rewards and is not revolving. Debit dominates for larger transaction values while cash dominates for lower transactions. The figure offers a different perspective than the raw payment frequencies in Figure 1. In contrast, Figure 4 is the same type of individual but with the added benefit of credit card rewards. As can be seen, credit cards now compete more heavily with debit for larger value transactions.

Figure 5 portrays the case of a typical demographic profile who is a *debit card intensive user.* The individual has free debit card transactions, pays a debit monthly fee, but does not earn credit card rewards, nor pays an annual credit card fee, and is not a credit card revolver. The predicted probability of using a debit card rises sharply to about 50 percent when the transaction value is above 10 dollars. The debit card individual trades off cash with respect to debit while the usage for credit card is relatively flat. These results are similar to the findings of Borzekowski, Elizabeth, and Shaista (2008) for the US which finds the likelihood of paying with debit cards decreases due to debit card transaction fees.

Figure 6 shows the case where the individual is a *credit card intensive user* who pays credit card annual fees, earns rewards but does not pay a debit monthly fee and does not receive free debit transactions. Relative to debit, credit card usage is higher than that of the debit-intensive user. Credit card usage starts to increase at transaction values as low as 25 dollars.

Finally, Figure 7 illustrates the case of a *credit card intensive user* who has rewards but is

[4]Arango, Hogg, and Lee (2011) contains a detailed discussion of what drives cash payment choices based on the 2009 MOP survey.

also a revolver. In this case, the consumer still uses credit cards but not as intensively as before. Again the revolvers do not have a strong preference for either debit or credit. Interestingly, this result highlights the dual role of credit cards. With rewards, credit cards become a viable means of payment and competes with debit. However, in the case of revolvers, credit cards are perhaps relied upon as a financing vehicle for consumption-smoothing purposes, these results are similar to Telyukova and Wright (2008).

4.2 Factors at the Point-Of-Sale

Table 9 highlights some of the supply side effects arising from the transaction type, and limited acceptance of cards.[5] Furthermore, we include the individual's stated top reasons for payment choice. *Availability constraints from the point of view of the merchant will tilt the balance* between paying with cash versus paying with debit or credit cards. The probability of using cash is 32 percent lower at a POS where all payment methods are accepted. These results highlight some of the features of the two-sided market nature of payments. Consumers most likely would like to pay with cash at low transaction values because of its convenience, which coincides with lower levels of merchant acceptance of alternatives to cash. This finding is similar to the feedback effect previously studied by Rysman (2007). These types of transaction purchases also pick up supply side constraints. For example, relative to grocery purchases, gasoline and goods/retail purchases are heavily transacted with credit cards while cash is less frequently used for services. *Entertainment purchases tend to be in cash relative to grocery* purchases. Finally, the top reasons for payment choice yield additional information from the individual about the motivations for payment choice. Ease of use is principally a factor in paying with cash while avoiding fees favors cash and debit. Delay payment, as expected, is heavily associated with paying with credit cards.

Finally, the top reasons for payment choice yield additional information from the individual about the motivations for payment choice. Ease of use is principally a factor for paying with cash, while avoiding fees favours cash and debit. Delay payment as expected is heavily associ-

[5]Time effects such as day of the week, or whether the transaction was made in the first second or third day of the diary were not statistically significant. This result highlights the importance of diary design, as it shows that a three-day diary may be a good compromise between the tendency to over-report in a one-day diary and the fatigue effect observed in a seven-day diary. This result is in line with a seven survey pilot study completed by Jonker and Kosse (2009).

ated with paying with credit cards. The fact that ease of use/speed increases the likelihood of paying with cash supports the results in Borzekowski and Kiser (2008). Their analysis shows that the faster contactless features on cards could significantly displace cash in the US. This result is particularly relevant in the Canadian case now that the card networks are introducing this feature nationwide for debit, credit and mobile payments.

4.3 Rewards and Transaction Values

One key fact about credit cards is that most reward programs are associated with the value of the transaction (e.g. rebates, air miles, point rewards). This feature allows us to estimate quite accurately the dollar value of the rewards obtained by each survey respondent in each credit card transaction. In particular, in the model we specify that the per-transaction rewards are of the following functional form:

$$\beta_1 RW_i + \beta_2 RW_i \times TV_i, \tag{7}$$

where $RW_i = RP_i \times 1\{(RP_i > 0\} \times TV_i$, and RP_i denotes the reward points that consumer receives from their credit card plan, $1\{(RP_i > 0\}$ is a binary variable that is one if the consumer has a rewards plan and zero otherwise while TV_i denotes transaction value. The interaction with transaction value in the last term is added to test for differentiated reward effects at different transaction values.

Other empirical studies by Carbó and Linares-Zegarra (2009) and Agarwal, Chakravorti, and Lunn (2010) have calibrated RP to one percent. Recall from Table 4 that provides the descriptive statistics on the matched reward plans. There is substantial heterogeneity in rewards with an average RP of about 0.78 percent. We exploit this heterogeneity to estimate a rewards elasticity.

There is one complication in calculating the elasticity of rewards. Some households do not earn rewards so the discrete and continuous nature make it difficult to interpret the effect of rewards on credit card usage. Therefore, to understand the pattern of substitution due to rewards we propose two measures: one, based on predicted probabilities and second based on marginal effects or an elasticity. The predicted probability measure provides the difference in probabilities by whether you have rewards or not (the extensive margin). The second measure

provides an elasticity measure due to a marginal increase in the monetary value of credit card rewards (the intensive margin).

4.3.1 Extensive Margin of Rewards

The extensive margin of rewards is equivalent to the average partial effect of adopting a rewards feature on the probability of using a credit card. For simplicity the subscript i will be suppressed in the rest of the discussion. Specifically, we define the extensive margin of rewards as the difference in the predicted probability due to having a rewards credit card, holding all other characteristics similar such as the consumer profile and the transaction value:

$$EXT[RW, \bar{x}_g] = \widehat{P}_{gj}(RW = 0.78 \times TV, \bar{x}_g) - \widehat{P}_{gj}(RW = 0, \bar{x}_g), \tag{8}$$

the RP is set to the average value of rewards points, transaction value is set at Q-dollars and $\bar{x}_g$ is the typical profile of the consumer. The extensive margins are computed to illustrate the substitution patterns due to having a credit card with rewards across transaction values. The results are summarized in Table 12. The decompositions show that the extensive margin of rewards is small at transaction values less than 25 dollars increasing the probability of using credit cards between 0.58 to 3.61 percent; mostly at the expense of cash usage. However, as transaction value increases (above 50 dollars) the extensive margin is large, as having a reward plan increases the probability of paying with credit cards by 12.81 percent at 100 dollar transaction value; at the expense of debit card market shares.

4.3.2 Rewards Elasticity

The second measure of the response in the credit card probability with respect to rewards is a marginal effect calculation evaluated at the means or a credit card reward elasticity. It is based on the following formulation:

$$E_{P_{CC},RW} = \frac{\partial P_{CC}}{\partial RW} \frac{\widehat{RW}}{\widehat{P}_{CC}}. \tag{9}$$

The results of the calculation is available in Table 13. There are four corresponding levels of RP : 0.5, 0.78, 1.0 and 1.5 percent. As expected, the elasticity is the smallest for low reward plan of 0.5 percent. At low transaction values (five dollars) the elasticity is quite small 0.03

to 0.08 but it increases with the transaction values. At a transaction value of 100 dollars the elasticity is in the range of 0.19 to 0.37 implying that a ten percent increase in monetary rewards leads to an increase in the probability of using a credit card by 1.9 to 3.7 percent depending on the RP that consumer receives. These elasticities highlight that the effect of rewards on credit card usage is inelastic.

4.4 Demographics

Table 10 contains the average partial/marginal effects of demographic variables. Overall, demographic characteristics play a muted role in influencing the probability of payment choice. The most salient result is that income and age effects are not significant. This result is in contrast with previous empirical findings which stress strong differences in payment behavior across age and income groups. Second, being a male induces a preference for credit cards over debit card relative to being a female. Third, levels of education have the similar expected signs as established in the literature and demonstrate that highly educated people have a preference for credit cards. There is also a tendency for part-time or unemployed workers to rely more on credit cards, perhaps due to a consumption-smoothing effect.

4.5 Perceptions

Table 11 presents average marginal effects for perceptions and individuals' attitudes towards payment methods. These perceptions are answered prior to the diary and so we can assume these attitudes are predetermined. Therefore, they remain constant across the POS. First, individuals tend to prefer debit cards and avoid cash when security in terms of fraud, theft or counterfeiting is an important factor, a similar finding as in Schuh and Stavins (2010). Paradoxically, anonymity seems to favour credit cards, as it is possible the use of credit cards leads one to become more concerned about identity theft.

Second, the importance of speed of payment favours cash over debit cards with no effect on credit cards. However, consumers seem to differ in other dimensions of convenience with those finding credit cards easy to use having a substantial shift towards credit cards (0.76 marginal effect on the probability of paying with credit cards), other things equal. In terms of relative costs, debit cards seem to play a central role. They are a closer substitute to cash for those who

find debit cards not so costly but a closer substitute to credit cards for those finding credit cards particularly costly.

Finally, budgeting issues also seem to divide consumers in their preferences for cash, debit and credit. Those who use their debit cards as a tracking device substitute significantly more from cash. This substitution may reflect the fact that some consumers are more comfortable with "a glance into their pocket" (and their ATM withdrawal receipts) to monitor their liquidity; similar to the results found in von Kalckreuth, Schmidt, and Stix (2011). As per those comfortable with credit cards as a tracking device (controlling for credit card debt) they tend to substitute relatively more from debit payments. However, those individuals concerned about overspending tend to stay away from credit cards and rely more on cash, but not so on debit cards, which contrast with the results found by Fusaro (2008).

The results for relative perceptions are all in line with expectations. The more favourable a perception is for a means of payment then the more likely that payment method is used. Record keeping plays an important role and portends to individuals relying on a particular type of method of payment relative to other payment methods for the reasons of simplifying their records. Overall, these perceptions are mostly significant even after controlling for all the variables in the model, alluding to the presence of idiosyncratic factors that provide additional benefits and costs of using a payment instrument. The results confirm the importance of including perceptions and attitudes to help take into account heterogeneous preferences.

5 Conclusion

Using discrete-choice methods with rich microdata drawn from the 2009 Bank of Canada Method of Payments survey yield an informative picture of why consumers choose alternative payment instruments. We estimate the probability of using cash, debit, and credit cards at the POS and find that:

1. Bank and credit card account plans as well as perceptions of payment instrument attributes play a major role on how consumers pay at the POS. The richness of the data allows us to model payment decisions at the POS to

2. The models significantly explain the relationship between transaction value and payment

shares in terms of key payment instrument attributes. We find that cash dominates at low transaction values due to limited acceptance of alternatives to cash and ease of use/speed. In addition, there is strong relationship between credit card rewards and credit card payment choices for transaction values beyond 25 dollars.

3. Consumers are relatively inelastic to credit card rewards. However, the probability of using a credit card increases with transaction value due to the proportionality of credit card reward plans.

An interesting extension would consider the negotiation of consumers of bank and credit card account plans with the issuers. Shedding light on this issue would help policymakers to understand, for example, the effect of interchange fees on these plans and their impact on payment instrument demand.[6] Future work will also investigate the factors that drive consumer choices of different bank and credit card account plans as well as the optimal cash holding strategies used by consumers holding different card instruments.

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Table 1: Payment Frequencies, Volume and Value

	Frequency				Total Value			
TV	< 15	15-25	25-50	50+	< 15	15-25	25-50	50+
Cash	72.8	42.0	24.9	16.7	59.6	37.7	21.6	10.9
Debit	18.1	31.9	40.0	36.3	25.4	33.1	37.7	37.0
Credit	9.5	26.4	35.7	48.0	15.0	29.2	40.7	52.1

Note: Sample statistics are computed from the SQ-DSI dataset using 10,228 transactions. Maximum transaction value is $ 400. Numbers displayed are in percentage terms. Frequency represent share of number of transactions conducted using a certain method, conditional on transaction belonging to specific range. Value represents share in dollar amount of transactions conducted using a certain method, conditional on transaction belonging to specific range. Sample weights used.

Table 2: Effect of Sample Weights on SQ and DSI

	SQ-U	SQ-W	DSI-U	DSI-W	CIUS
Age					
18-34	26.5	30.2	27.5	30.2	30.6
35-54	41.8	40.9	42.1	40.9	40.8
55-75	31.7	29.0	30.5	29.0	28.7
Income					
Less than 30K	26.3	17.1	26.8	16.9	16.8
30K-60K	33.3	28.0	32.7	27.9	27.5
60K-100K	24.9	28.5	24.8	28.6	28.4
more than 100K	15.5	26.4	15.8	26.6	27.3
Gender					
male	46.9	48.8	48.5	48.8	48.9
female	53.1	51.2	51.5	51.2	51.1

Note: Survey Questionnaire Unweighted (SQ-U), Survey Questionnaire Weighted (SQ-W), Survey Design Unweighted DSI-U, Survey Design Weighted (DSI-W), and Canadian Internet Usage Survey (CIUS).

Table 3: Perceptions

	Cash	DC	CC
Ease of Use	4.64	4.65	4.75
Cost	1.48	2.23	2.57
Record keeping	2.81	4.08	4.29
Acceptance	4.82	4.34	4.47
Fraud	2.04	2.53	2.72
Financial loss	3.11	3.58	3.70

Note: Numbers displayed are average perceptions are computed from SQ dataset based on sample of 2,351 individuals who completed diaries included in our estimation sample using SQ-DSI dataset. Each perception is ranked on a scale from 1 to 5. Sample weights used.

Table 4: Credit Card Reward Plans

RP	None	(0,0.5)	[0.5, 1.0)	[1.0, 5.0)
Cash				
Value	38.5	35.1	29.5	30.3
Volume	51.2	48.4	43.3	44.8
Debit				
Value	42.2	31.2	27.0	20.9
Volume	35.3	27.4	24.8	19.4
Credit				
Value	19.3	33.7	43.4	48.8
Volume	13.5	24.2	31.8	35.8
Households	949	249	683	470

Note: Based on 2,351 individuals with access to a credit card in DSI. Value represents share of purchases by payment method in dollars. Volume represents share of purchases by payment method in frequencies. Shares do not add up to one due to other payment categories such as cheques and stored-value cards.

Table 5: Descriptive Statistics

	Probability of Usage			Transaction Value		
	Cash	Debit	Credit	Mean	Median	S.E
Less than 30K	0.562	0.303	0.141	26.227	15.055	1.626
30K-50K	0.516	0.289	0.198	28.906	16.870	1.329
50K-80K	0.463	0.323	0.221	33.345	18.505	1.308
More than 80K	0.461	0.251	0.293	34.810	19.820	1.232
18-25 years	0.502	0.301	0.217	24.069	15.000	1.605
26-35 years	0.425	0.337	0.246	32.410	15.000	1.891
36-45 years	0.482	0.253	0.267	31.995	18.305	1.268
46-55 years	0.490	0.270	0.244	36.466	19.945	1.601
56-65 years	0.505	0.254	0.246	31.857	17.590	1.857
65-75 years	0.516	0.271	0.217	33.366	21.180	2.161
Male	0.479	0.268	0.257	31.778	17.490	1.054
Female	0.482	0.294	0.232	33.601	17.490	1.018
Homeowner	0.541	0.288	0.175	34.108	19.875	0.874
Renter	0.469	0.274	0.263	27.916	14.665	1.272

Note: Sample statistics are computed from the SQ-DSI dataset and the number of observations is 10,288 which corresponds to participants holding both debit and credit cards as they start the diary. The first three columns compute the probability of using cash, debit card, and credit card for each transaction. The mean, median, and standard error of the transaction value is computed. Sample weights used.

Table 6: Point-Of-Sale Acceptance

TV	< 15	15-25	25-50	50+
Groceries	68.9	81.1	84.2	87.7
Gasoline	77.4	79.8	84.8	86.7
Goods/retail	70.6	85.5	94.4	88.3
Services	56.4	68.7	83.7	95.1
Hobby/sports	49.0	72.0	89.3	88.7
Entertainment	51.5	69.1	86.2	78.7
Other	43.9	78.0	81.0	86.6

Note: Sample statistics are computed from the SQ-DSI dataset based on 10,288 transactions. Numbers displayed represent percentage of transactions where both credit and debit card were perceived to be accepted, conditional on transaction belonging to certain range and displayed across types of purchases.

Table 7: Multinomial Logit Estimates

	Debit Card	Credit Card
Transaction Value (TV)	0.009	0.037*
	0.02	0.02
Transaction Value^2	-0.000***	-0.000***
	0	0
Fraud	0.645***	0.136
	0.170	0.21
Ease	-1.25	8.779***
	1.51	1.87
Ease × TV	0.089**	-0.06
	0.03	0.03
Recordkeeping	2.695***	3.164***
	0.79	0.62
Recordkeeping × TV	-0.027	0.024*
	0.02	0.01
Cost	-1.426***	-0.939*
	0.41	0.450
Fear of Overspending	-0.540**	-0.981***
	0.2	0.25
Overspending × TV	0.00	0.005
	0.01	0.01
Speed	-0.562**	-0.26
	0.19	0.23
Debit Fee	0.301**	
	0.1	
Debit Free Trans	0.590***	
	0.12	
CC Annual Fee		0.527***
		0.11
Rewards		1.471***
		0.31
Rewards^2		-0.006***
		0
CC and DC accepted	2.313***	3.226***
	0.14	0.26
Cash beginning of diary (bod)	-0.006***	-0.005***
	0	0
Cash bod × TV	-0.043*	-0.024**
	0.02	0.01
Reason for MOP: Ease	-0.515*	-2.531***
	0.2	0.2
Reason for MOP: Avoid fees	-0.256*	-1.591***
	0.12	0.18
Reason for Mop: Delay payment	0.49	3.271***
	0.43	0.35
0 < CC Debt < 0.5	0.239	-0.625***
	0.13	0.17
0.5 < CC Debt < 0.8	0.349*	-0.925**
	0.18	0.28
CC Debt > 0.8	0.188	-0.528**
	0.14	0.19
Constant	-0.978	-5.505***
	0.95	1.17

Note: The MNL model are estimated using survey weights. Cash is the base outcome and the sample size is 10,288 transactions. For brevity, results from demographics, type of transaction, online/offline dummy, and day of week dummies are omitted. The 1, 5, and 10 percent level of significance are denoted via ***, **, *, respectively.

Table 8: Average Partial Effects of Portfolio Features

	Cash	DC	CC
DC monthly fee	-0.026**	0.041**	-0.015**
	0.01	0.01	0.00
DC free transactions	-0.051***	0.081***	-0.030***
	0.01	0.02	0.01
CC annual fee	-0.019***	-0.027***	0.046***
	0.00	0.01	0.01
$0 <$ CC Debt < 0.5	0.002	0.065***	-0.067***
	0.01	0.02	0.01
$0.5 \geq$ CC Debt < 0.8	0.004	0.096***	-0.100***
	0.02	0.02	0.02
CC Debt ≥ 0.8	0.003	0.053**	-0.056***
	0.02	0.02	0.01

Note: This table calculates the average partial effect of various portfolio features (either yes or no). The 1, 5, and 10 percent level of significance are denoted via ***, **, *, respectively.

Table 9: Average Partial Effects of POS characteristics

	Cash	DC	CC
Both CC and DC accepted	-0.320***	0.154***	0.166***
	0.01	0.02	0.02
Gasoline	-0.061**	-0.031	0.093***
	0.02	0.02	0.02
Goods/retail	-0.037	-0.031	0.067***
	0.02	0.02	0.02
Services	-0.092*	0.034	0.059
	0.04	0.03	0.03
Hobby/sports	-0.053	0.010	0.044*
	0.03	0.03	0.02
Entertainment	0.062***	-0.072***	0.010
	0.01	0.02	0.01
Other purchases	0.005	-0.029	0.025
	0.02	0.02	0.02
Weekend	0.005	0.011	-0.016
	0.01	0.01	0.01
Top reason: ease of use	0.138***	0.059**	-0.197***
	0.02	0.02	0.01
Top reason: avoid fees	0.081***	0.046**	-0.127***
	0.01	0.02	0.01
Top reason: delay payment	-0.164***	-0.100*	0.263***
	0.05	0.05	0.02

Note: This table calculates the average partial effect of various POS characteristics (either yes or no). The 1, 5, and 10 percent level of significance are denoted via ***, **, *, respectively.

Table 10: Average Partial Effects of Demographics

	Cash	DC	CC
30K-50K	0.025	-0.003	-0.021
	0.02	0.02	0.02
50K- 80K	0.005	0.016	-0.022
	0.02	0.02	0.02
More than 80K	0.044*	-0.057*	0.013
	0.02	0.02	0.02
Technical/some college	-0.022	-0.017	0.039**
	0.01	0.02	0.01
Post secondary	-0.037*	-0.035*	0.072***
	0.02	0.02	0.01
West	-0.009	-0.001	0.010
	0.01	0.01	0.01
Quebec	-0.003	-0.015	0.018
	0.02	0.02	0.01
Atlantic	-0.013	0.011	0.002
	0.01	0.02	0.01
Age	0.001	0.000	-0.001**
	0.00	0.00	0.00
Family Size	-0.007	0.003	0.004
	0.01	0.01	0.00
Male	0.001	-0.027*	0.026**
	0.01	0.01	0.01
Rural	-0.002	-0.003	0.005
	0.01	0.02	0.01
Ethnicity	0.015	0.009	-0.024*
	0.01	0.01	0.01
Manages finances	0.008	-0.030*	0.022*
	0.01	0.01	0.01
Not Married	-0.015	0.006	0.009
	0.01	0.01	0.01
Employed full-time	0.016	0.032*	-0.049***
	0.01	0.01	0.01
Renter	0.032*	-0.028	-0.004
	0.01	0.01	0.01
Access online	-0.054*	0.061**	-0.007
	0.02	0.02	0.02
Online access panel	0.062***	-0.062***	0.001
	0.01	0.01	0.01

Note: This table calculates the average partial effect of various demographic features (either yes or no). The only exceptions are Age and Family size which are continuous variables and in this case it is the marginal effect. The 1, 5, and 10 percent level of significance are denoted via ***, **, *, respectively.

Table 11: Marginal Effects of Perceptions

	Cash	DC	CC
Security	-0.061**	0.082***	-0.021
	0.02	0.02	0.02
Speed	0.058**	-0.064**	0.006
	0.02	0.02	0.02
Ease CC	-0.271***	-0.290**	0.561***
	0.06	0.09	0.14
Ease DC	-0.071	0.253	-0.182*
	0.11	0.17	0.07
Record CC	-0.139***	-0.229***	0.368***
	0.02	0.03	0.04
Record DC	-0.178**	0.240**	-0.062
	0.06	0.09	0.04
Cost DC	0.123***	-0.197***	0.073***
	0.04	0.06	0.02
Cost CC	0.035*	0.048*	-0.083*
	0.02	0.02	0.04
Overspending	0.072***	-0.022	-0.050***
	0.02	0.02	0.01
Anonymity	-0.021	-0.022	0.043**
	0.02	0.02	0.02

Note: This table calculates the marginal effect of various perceptions. The 1, 5, and 10 percent level of significance are denoted via ***, **, *, respectively.

Table 12: Substitution Patterns Due to the Rewards Extensive Margin

TV	Cash	DC	CC
5	-0.37	-0.21	0.58
25	-1.82	-1.78	3.61
50	-2.76	-5.12	7.87
100	-2.10	-10.71	12.81

Note: The *extensive margin* of rewards as the difference in the predicted probability due to rewards holding all other characteristics similar such as the profile and transaction value:

$$EXT[RW, \bar{x}_g] = \widehat{P}_{gj}(RW = 0.78 \times TV, \bar{x}_g) - \widehat{P}_{gj}(RW = 0, \bar{x}_g), \tag{10}$$

where $RW = RP \times 1\{(RP > 0\} \times TV$. Let RP denote the reward points that consumer receives from their credit card plan and $1\{(RP > 0\}$ denote a binary variable that is one if the consumer has a rewards plan and zero otherwise. TV denotes the transaction value and $\bar{x}_g$ is the typical profile of the consumer.

Table 13: Rewards Elasticity

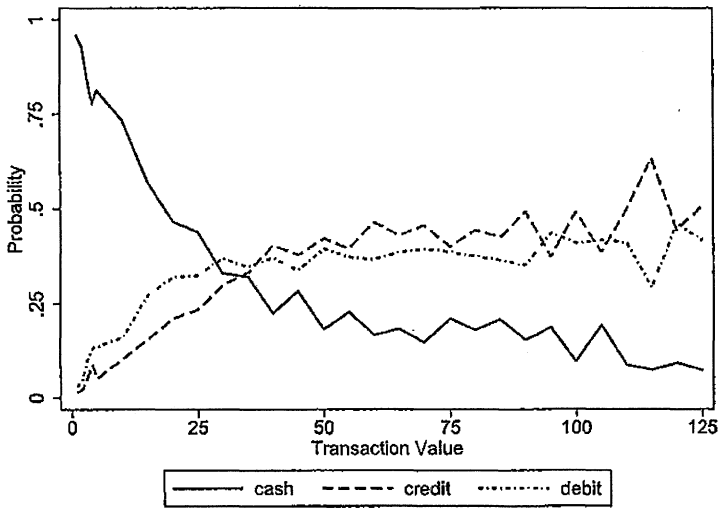
TV	RP = 0.5%	RP = 0.78%	RP = 1.0%	RP = 1.5%
5	0.03	0.04	0.06	0.08
	(0.006)	(0.010)	(0.012)	(0.018)
25	0.12	0.18	0.22	0.32
	(0.026)	(0.039)	(0.049)	(0.068)
50	0.17	0.26	0.32	0.43
	(0.041)	(0.058)	(0.069)	(0.085)
100	0.19	0.27	0.32	0.37
	(0.053)	(0.070)	(0.077)	(0.081)

Note: The elasticity of the probability of using credit cards with respect to rewards or:

$$E_{P_{CC},RW} = \frac{\partial P_{CC}}{\partial RW} \frac{\widehat{RW}}{\widehat{P}_{CC}}. \tag{11}$$

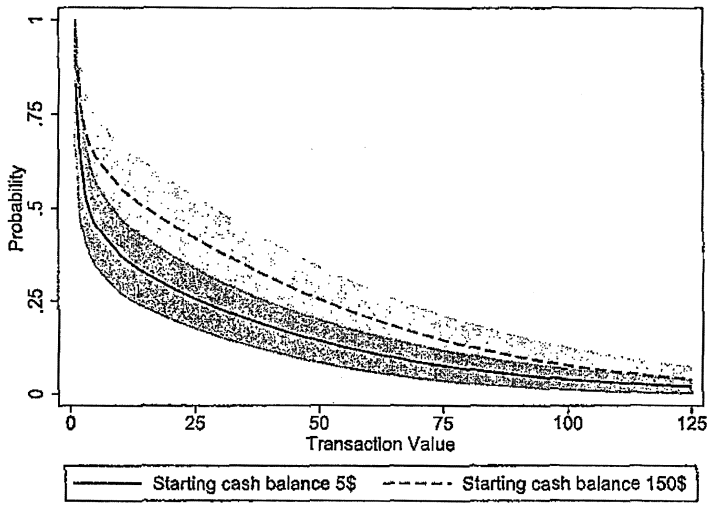
Standard errors are in parentheses.

Figure 1: Payment Frequencies



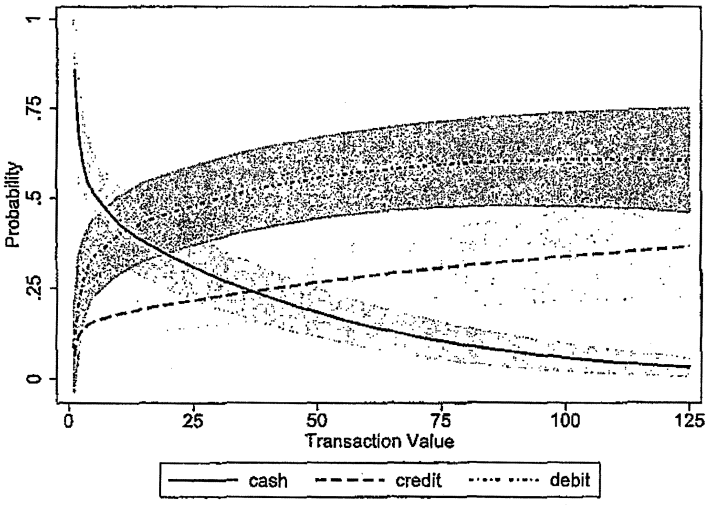
Note: This graph illustrates the choice frequency of cash, debit and credit over the transaction range of 1 to 125 dollars. These frequencies are calculated based on a sample of 10,288 transactions in diary using sample weights.

Figure 2: Initial cash holdings



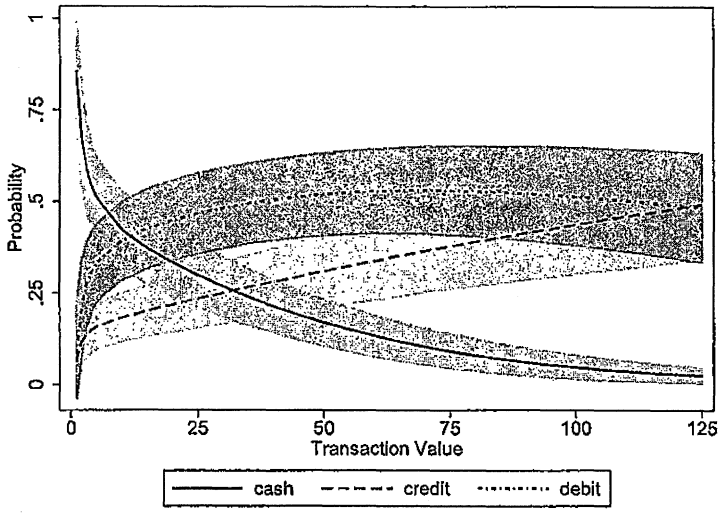
Note: Calculated for a typical demographic profile. Earns rewards, no DC free transactions, no DC monthly fee, no CC annual fee, and not CC revolver. Shaded areas represent 95 percent confidence intervals.

Figure 3: Baseline Consumer



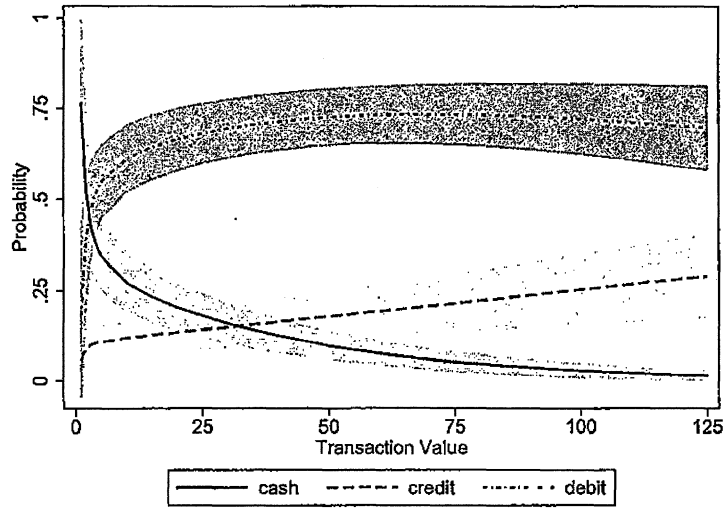
Note: Calculated for a typical demographic profile but with no rewards, no DC free transactions, no DC monthly fee, no CC annual fee, and not CC revolver. Shaded areas represent 95 percent confidence intervals.

Figure 4: Baseline Consumer with Rewards



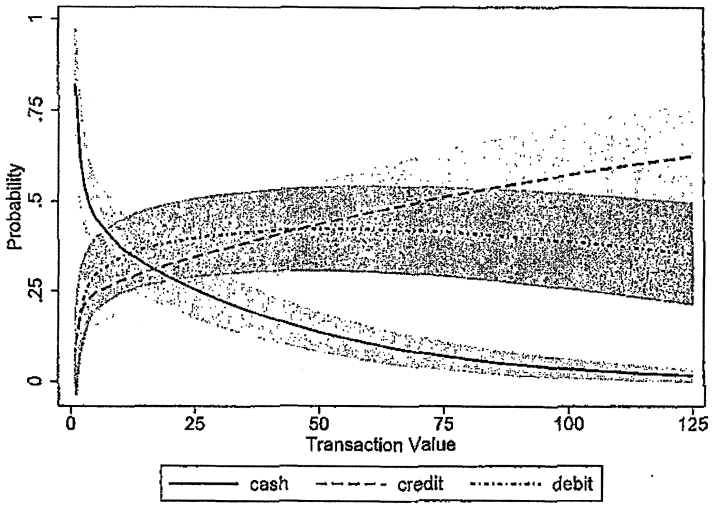
Note: Calculated for a typical demographic profile but earns rewards, no DC free transactions, no DC monthly fee, no CC annual fee, and not CC revolver. Shaded areas represent 95 percent confidence intervals.

Figure 5: Debit Card Intensive User



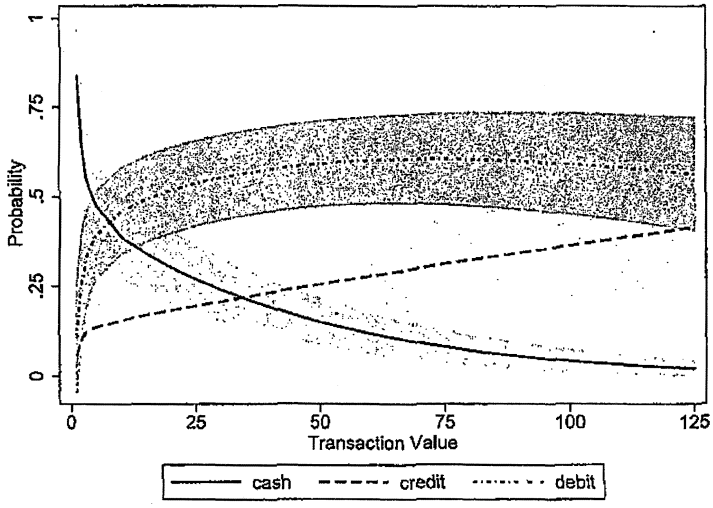
Note: Debit Card User with free DC transactions, pays debit monthly fee, no CC annual fee, not CC revolving. Calculated for average demographic profile. Shaded areas represent 95 percent confidence intervals.

Figure 6: Credit Card Intensive User



Note: Credit card intensive user with rewards, no free DC transactions, no debit monthly fee, pays CC annual fee, not CC revolving. Calculated for average demographic profile. Shaded areas represent 95 percent confidence intervals.

Figure 7: Credit Card Intensive User & Revolving



Note: Credit card intensive user with rewards, no free DC transactions, no debit monthly fee, pays CC annual fee, and CC revolving. Calculated for average demographic profile. Shaded areas represent 95 percent confidence intervals.

A Appendix

A.1 Variable List

- *Transaction Amount:* The questionnaire asks the respondent "What was the total amount of the transaction?" The value is deflated by 100.
- *Ease of Use:* The questionnaire asks the respondent "When making a payment, in your opinion how easy is it for you to use each of the following methods of payment? Please use a scale from '1' to '5', where '1' means it is "not at all easy to use" and '5' means it is 'very easy to use.'
- *Record Keeping:* The questionnaire asks the respondent "In your opinion how useful are (or would be) the following methods of payment in terms of helping you to keep a record of your spending. Please use a scale from '1' to '5', where '1' means it is "not at all useful" and '5' means it is 'very useful.'
- *Cost:* The questionnaire asks the respondent "Taking into consideration costs such as withdrawal fees, account fees, and interest paid, in your opinion how costly is it (or would it be) to make a payment using the following methods of payment. Please use a scale from '1' to '5', where '1' means it is "not at all costly" and '5' means it is 'very costly.'
- *Security, Speed, Fear of Overspending, Anonymity:* The questionnaire asks the respondent, "Thinking about the different methods of payment you could use for a variety of expenditures, please rate each of the following attributes in terms of their importance to you when considering what type of payment method to use. Please use a scale from '1' to '10', where '1' means it is "not at all important" and '10' means it is 'very important.' The attributes include 'Ease of Use', 'Speed', 'Security', 'Potential to control overspending' and 'Anonymity in terms of not having to provide your name or other personal information.' We then weight the attributes by importance of ease of use.
- *Cash beginning of diary:* This variable is constructed based on respondents' answers to a series of questions on the number of bills and coins in their wallet.
- *Debit Monthly Fee:* The questionnaire asks the respondent, "Do you pay a fixed monthly fee such as service charge or account fee on your main bank account?" The possible answers are, "Yes, every month", "Yes, but only some months", "No", "Not sure." We define a variable for Debit monthly fee that takes a value equal to one based on the answer "Yes, every month." We impute answers for "Not sure."
- *Debit Free Transactions:* The questionnaire asks the respondent, "How many free debit transactions are permitted from your main bank account?" The possible answers are: "0," "1 -4","5-9", "10-19","20+ or unlimited", "Not sure." We define a variable for debit monthly fee that takes a value equal to one if they answer "20+ or unlimited." We impute answers for "Not sure."

- *Rewards:* The questionnaire asks the respondent "Does your main credit card offer any rewards?" If they do not state what type of rewards they receive we impute it by matching the credit card name to information from FCAC and/or the retail bank information at their website.

- *Credit card annual fee:* The questionnaire asks the respondent, "What is the annual fee you pay for that card?" The answers are again categories but we construct a dummy variable equal to one to indicate whether the respondent pays a fee and zero otherwise.

- *Credit Card debt limit:* We construct dummy variables indicating whether the respondent's ratio of revolving credit card debt to credit card limit is above zero percent but less than twenty five percent, between twenty five percent and fifty percent, and over fifty percent. The base category holds that the respondent is not revolving. We construct this variable using the former question on the unpaid credit card balance and the following question, "What is the credit limit on your main card?"

- *Top reason for payment choice:* For every transaction, the questionnaire asks the respondent to provide the top two reasons for which they chose a certain method of payment from the following list: ease of use, avoid fees, delay payment, avoid fraud, gain rewards/points, or get cashback. We construct indicator variables for whether the first reason was either ease of use and avoid fees.

- *Perceived card acceptance:* For every transaction, the questionnaire asks the respondent, "What method of payment would not have been accepted?". From this information we construct indicators of perceived payment acceptance for both credit and debit cards.

- *Type of Transaction:* For every transaction, the questionnaire asks the respondent, "What was the main type of goods or service purchased during this transaction?" We construct dummy variables for the following categories: gasoline, goods/retail, services, hobby/sports, entertainment, other. The base category is groceries.

- *Weekend:* We include a dummy variable for whether the transaction occurred between Friday and Sunday, based on the reported day on which the transaction occurred.

- *Demographics:* We include dummy variables for a set of demographics. For income, the base category is under 30K. For education, the base category is Post-Secondary which includes either completing a college degree or graduate studies. Ontario is the base category for region. Family size is a continuous variable representing number of individuals living in the respondent's household. We include a dummy for whether the respondent claims to manage the household finances. We include dummies for Male, Rural, Not Married, Full-Time, Renter and Offline.