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Abstract

Using the results of a survey on accepted means of payment, the authors examine merchant preferences and perceptions of retail payment reliability, risk, and costs; the share of each type of payment method over total sales; and the costs involved in accepting payments. Models are developed for each means of payment in order to determine how merchant characteristics may influence their responses. The authors find that the average transaction value, total transaction volume, and/or number of point-of-sale terminals influence merchant perceptions. The authors confirm that merchant preferences are determined by their perceptions and that the intensity of payment use is also important. Furthermore, the authors find that, aside from the initial decision to accept a payment method, merchants have little influence over the payment decisions made by consumers. These last two findings are indicative of the two-sided nature of payments. The marginal costs of accepting payment methods are also estimated and compared, and payment card processing fees are examined.

JEL classification: E41, L2
Bank classification: Bank notes

Résumé

À partir des résultats d'une enquête menée sur les moyens de paiement acceptés, les auteurs étudient les préférences des commerçants et leurs perceptions à l'égard de la fiabilité, du risque et du coût des divers modes de paiement de détail. Ils étudient également la part de chacun de ces modes dans le chiffre d'affaires des répondants, de même que les frais liés aux instruments de paiement acceptés. Pour chaque méthode de paiement, ils construisent un modèle qui leur permet d'évaluer comment les caractéristiques des commerçants influent sur leurs réponses. Les auteurs constatent que le montant moyen et le volume total des transactions ainsi que le nombre de terminaux aux points de vente ont une incidence sur les perceptions des commerçants. Ils confirment que, sur le plan des préférences, les perceptions des commerçants sont déterminantes et que la fréquence d'usage d'un instrument de paiement joue aussi un rôle important. Qui plus est, sauf par la décision initiale d'accepter un mode de paiement, il apparaît que les commerçants ont peu d'influence sur l'instrument que choisira leur clientèle. Ces deux dernières observations témoignent de la nature bilatérale du paiement. Les auteurs estiment et comparent par ailleurs les coûts marginaux des différents instruments acceptés et analysent les frais de traitement des cartes.

Classification JEL : E41, L2
Classification de la Banque : Billets de banque

Highlights of the Bank's 2006 National Survey of Merchants on Their Accepted Means of Payment for Point-of-Sale Transactions

According to the survey sample:

(n=500; +/-4.4 per cent margin of error, 19 times out of 20)

- All retailers accept cash, 93 per cent accept debit cards, and 92 per cent accept credit cards.
- In terms of annual gross revenue, credit cards represent 31 per cent of transactions, followed by cash (29 per cent) and debit cards (26 per cent).
- Debit cards are most preferred by 53 per cent of merchants, followed by cash at 39 per cent and credit cards at only 5 per cent.
- Debit cards are rated the least risky payment method to accept at the point of sale.
- Cash is rated the cheapest and most reliable to accept at the point of sale.
- Credit cards are the least preferred and rated the most costly and least reliable in terms of the ease and dependability of processing at the point of sale.
- On average, retailers pay 12 cents for every debit card transaction and 2 to 4 per cent for every credit card transaction.

1 Introduction

The Bank of Canada is interested in understanding methods of retail payment as they are used by the public and accepted by merchants. These research objectives are motivated by the Bank's mandate to provide Canadians with bank notes as a viable form of payment. Retail payments research, particularly by surveys, provides insight into the underlying aspects of payment demand that is otherwise difficult to obtain. Looking forward, this type of research is increasingly important to understanding how innovations in alternative payment methods affect the use of bank notes. In this regard, the Bank commissioned a survey in 2004 on the perceptions and payment habits of the general public (Taylor 2006). The survey revealed that the relative use of payment instruments by consumers is a function of demographics and of consumers' views on risk and convenience (Arango and Taylor 2007).

However, looking only at the consumer side ignores the intricacies of two-sided markets. In payments, the two sides of the market are merchants and consumers.[1] The demand for a payment service depends on the decisions made by both merchants and consumers. Recognizing that merchants face unique implications when they accept payments and that they may therefore view payments differently from consumers, the Bank commissioned a national survey of merchants on their accepted means of payment (MOP) for point-of-sale (POS) transactions in 2006. The survey focused on how merchants perceive payment methods, the share of each payment method by annual sales, and the associated costs of accepting payments.

Of the merchants who responded to the survey, 89 per cent accept cash, debit, and credit card payments simultaneously. Despite the high acceptance rate, merchants perceive each MOP very differently. For example, while 53 per cent of respondents prefer debit cards the most (followed by cash at 39 per cent), only 5 per cent say they prefer credit cards the most.

In this paper, we analyze the survey results on acceptance, preferences, and perceptions. First, we investigate how merchant characteristics influence their perceptions of reliability, risk, and costs. We find that, as the average transaction value increases, merchants view card payments as less costly and more reliable. Cost perceptions of card payments also decrease by transaction volume, which indicates economies of scale. Second, we find that merchant preferences are shaped by their own perceptions, as well as by relative payment usage. This implies that, as consumers use a payment instrument more intensively, merchants increasingly value their choice. Moreover, models on payment shares reveal that merchants have little influence over the

1. See Appendix A for a description of retail payments in Canada and two-sided markets.

payment method used by consumers, aside from the initial decision to accept the method. Third, our study goes beyond perceptions and addresses the actual costs of accepting payments. We find that a merchant's average transaction value and total transaction volume are significant factors underlying payment card processing fees. Lastly, we calculate the variable cost of each payment method using the survey data and anecdotal information. Given some reasonable assumptions, we find that cash is the cheapest MOP for merchants when the transaction is below $12.

Our study contributes to the literature on retail payments by revealing how merchants in Canada vary by their perceptions of retail payments and by the actual costs they face. Many of our findings give insight into the nature of two-sided markets and the relationship between consumer use and merchant acceptance of payments. We are not aware of other studies that empirically address merchant acceptance and perceptions of retail payments. An empirical study similar to ours was done in Malaysia, but it concentrates on the probability of credit card acceptance (Loke 2007). Otherwise, most of the literature on retail payments and merchants focuses on costs (Garcia-Swartz, Hahn, and Layne-Farrar 2004; Humphrey et al. 2003), or on the theoretical aspects of acceptance (Masters and Rodriguez-Reyes 2005; Chakravorti and To 1999; Hayashi 2006; Guthrie and Wright 2007).

The paper is organized as follows. Section 2 describes, from the merchant's perspective, the implications of accepting retail payments. Section 3 describes the survey methodology and key results. Sections 4 and 5 report the empirical findings on the factors that underlie merchant perceptions, preferences, and payment instrument shares. Section 6 goes beyond merchant perceptions and addresses the actual costs of accepting payments. Section 7 offers some conclusions.

2 Why Merchants Accept Payments: A Review of Costs and Benefits

From the merchant's perspective, payments are a necessary part of business. Transactions occur only if the merchant and consumer agree on a particular payment method. In a competitive sales environment, merchants must consider what consumers demand and what nearby competitors accept. The extent to which a merchant will accommodate consumer demand, however, is based on the costs and benefits associated with each payment method. Table 1 lists some of the implications a merchant may consider when deciding which methods to accept. We describe these implications in this section.

Table 1
Cost-Benefit Implications for Merchants

	For all payments	Unique to cash	Unique to cards
Costs	• Bank account fees • Tender time at the POS • Access to funds (float) • Risk of fraud or loss • Set-up costs	• Back-office reconciliation and deposit-preparation time • Deposit/ordering fees • Transportation • Secure storage • Security measures/insurance	• Processing fees • Network reliance • Equipment, software, and telecommunications • Chargebacks • Rules and regulations • Payment non-finality
Benefits	• Facilitate transactions • Accommodate consumer choice • Reliability/convenience • Competitiveness	• Liquidity • No explicit per-transaction fees	• Increased sales • Electronic bookkeeping • Loyalty programs • Cashback service • Funds transfer

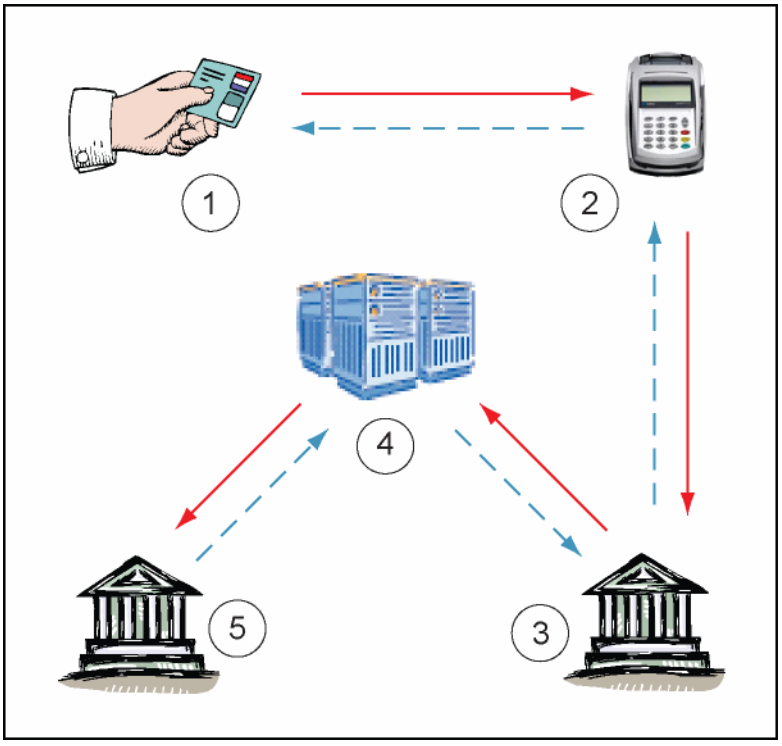
Bank account fees: Regardless of payment type, a merchant must hold an account at a financial institution and incur fees for payment-related services. These fees are bundled into service packages that financial institutions usually customize. Merchants pay a monthly package fee in fixed or variable terms, depending on activity levels (such as the number or value of deposits), and are often required to hold a minimum reserve. Standard packages include detailed bank statements, cash deposits, bank note and coin ordering, and electronic payment processing services. Electronic payment processing services are provided either by the financial institution or a third party.

Back-office duties/Deposits: Merchants must consider the labour costs involved in back-office duties, such as preparing cash registers, reconciling payments at the end of the day, and preparing for cash deposits. Smaller merchants have employees deliver cash deposits to their bank, while larger merchants often require armoured transportation services to make deposits on their behalf. Smaller merchants may sometimes delay their cash deposits and deposit only once or twice a week. After cash is physically deposited at a bank, merchants typically wait one to two business days to receive credit in their account. This is an opportunity cost known as float.

Processing: When accepting any payment, a merchant considers the time it takes to process the transaction at the POS and how reliable it is in terms of its ease and dependability. Time lost to front-end processing or malfunction can result in longer line-ups and loss of sales.

As was mentioned, in order to process electronic payments, a merchant requires the processing services of a financial institution or third party. In this role, the payment service provider is known as the acquirer. Chart 1 illustrates the processing of a transaction between a merchant and a consumer at the POS, taking Visa or MasterCard, for example (see http://www.visa.ca/en/merchant/acceptingvisa/transactions.cfm).

Chart 1
Transaction Flows at the POS



1. Consumer presents credit card for payment.
2. Merchant swipes card through POS terminal. An electronic message, including card information and authorization request, is sent to the merchant's acquirer.
3. Acquirer sends authorization request to the card network.
4. The card network contacts card issuer.
5. Card issuer verifies whether sufficient funds are available, whether security levels are checked, and whether the transaction is within cardholder limits. Authorization response is routed back along the same path to complete transaction. Consumer signs receipt.

Transaction fees: Merchants incur a set fee for every debit card transaction and a percentage fee for every credit card transaction. The credit card fee, known as the merchant discount rate (see Box A in Appendix A), is applied to the total value of the transaction. In addition to the discount rate, some merchants pay a flat transaction fee. Merchants may also face a minimum monthly charge if their credit card fees do not reach a certain threshold.

Set-up costs: Accepting cash requires the set-up cost of cash registers, while electronic payments require the installation of POS terminals. Merchants often rent their POS terminals and pay for maintenance and upgrades. Some of the larger retail chains, such as department stores, own POS terminals and customized software. POS equipment also requires the monthly costs of telecommunication lines, whether dial-up, high speed, or satellite.

Risk and finality: Each payment instrument is associated with a certain amount of risk of fraud or loss and varies in the degree of payment finality. Cash is the most final and liquid means of payment, because the funds are settled and received during the transaction. However, to receive funds directly exposes the merchant to the risk of theft (internal or external) and counterfeiting, as well as to the risk of human error during the exchange. Security measures (e.g., surveillance cameras and security guards) and secure storage (e.g., vaults and cash registers) are required.

The finality and security of accepting debit cards is rarely an issue for merchants. Authorization by personal identification number (PIN) ensures that sufficient funds are available at the time of sale. The funds are debited from the consumer's account in real time and transferred to the merchant, usually by the next business day. In the case of fraudulent activity, it is usually the card issuer who will absorb the loss, since the authentication relies solely on the technology and has little to do with the merchant.

In contrast, credit cards represent the least payment finality relative to debit cards and cash, because of the consumer's deferred payment advantage and limited liability against fraud. Though merchants receive funds within one to two business days, consumers have a certain number of days to dispute a credit card transaction, whether it is because of an unresolved dispute with the merchant or because there is a fraudulent claim (i.e., the card was used without the cardholder's consent). In these cases, the transaction will be reversed through a chargeback. The chargeback amount is deducted from the merchant's account by the acquirer while the dispute is under review. Merchants have a limited number of days to provide the information in their defence (i.e., prove they followed proper procedures). Thus, chargebacks can be costly to merchants, since they are charged for the process and also risk losing the transaction funds.

Card rules: After signing a contract to accept debit or credit cards, the merchant has limited influence over which payment method a consumer can use. As Levitin (2007) puts it, "Card acceptance is an all-or-none proposition." The most notable rules for credit cards include:

- *Honour all cards:* merchants must accept all credit card products under the card's brand[2]
- *No surcharging:* merchants are forbidden to impose extra fees for consumer use of cards, though some acquirers apparently allow surcharging on debit cards[3,4]
- *Non-discrimination:* merchants cannot dissuade consumers in any way from using their card of choice

Benefits: Despite the costs and regulations associated with electronic payments, merchants may value their unique benefits. One of the main advantages of card acceptance is the opportunity for consumers to spend without necessarily having the funds on their person, allowing for purchases that may not otherwise occur and increased sales.[5] Satisfying consumer demand for payment options and attaching loyalty/reward programs to card payments is especially important if the merchant is operating in a competitive environment: the acceptance of cards by nearby competitors cannot be disregarded.

3 The Survey

3.1 Survey methodology and sample characteristics

Over 500 merchant representatives across Canada were interviewed by telephone over the period March–May 2006.[6] The 20-minute interviews were conducted by an independent research firm that contacted senior-level employees familiar with the payment methods accepted.

The survey sample, though relatively small, was stratified by employee size, region, and subsector, to reflect the diversity of the retail trade sector in Canada.[7] Other dimensions, such as

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2. A 2003 class action lawsuit in the United States, which settled outside of court, resulted in a modification of Visa USA and MasterCard International's rules to honour all cards, including signature debit cards. This is not necessarily the same issue in Canada, since debit cards are currently PIN-based and not offered by credit card companies.
3. Anecdotal evidence suggests that, in reality, some smaller merchants may surcharge or set payment minimums for debit or credit card transactions, which may violate their agreements. However, in some cases, debit card surcharging is actually permitted by processors.
4. See Monnet and Roberds (2007) for a theoretical discussion of the rationale for the no-surcharge rule.
5. Untracht (1996) reports that 83 per cent of merchants in an Ernst and Young 1995 survey stated that acceptance of credit cards does lead to increased sales. Most respondents claimed that it led to higher profits, but 24 per cent felt that profits actually lowered because of related expenses.
6. Prior to the national survey, a pilot study was conducted to gauge the feasibility of proposed questions. After the national survey, 35 respondents participated in follow-up interviews. The interview results are used in section 6.

corporate structure (i.e., chain versus franchise versus independent stores), were considered.[8] Because most merchants in Canada are small independent businesses, roughly half of the sample consists of small merchants and three-quarters are independently owned and operated.[9] The median retail outlet in the survey consists of only one POS terminal and eight employees, and processes 53 transactions per day worth $1,667 in gross sales.

Although participants represented a wide variety of subsectors (from gas stations to groceries, restaurants and general merchandise), those without a physical store were excluded, as were businesses that were not hypothetically able to accept all three main payment methods. For that reason, this sample is not necessarily representative of the retail trade industry as a whole.

Lastly, the survey results, though informative, should be interpreted with caution, since the margin of error is relatively high at +/- 4.4 per cent and is even greater if generalizations are made for a particular size, region, or subsector. It should be noted that the refusal rate was 46 per cent, which is high but not unusual for this type of survey.

3.2 Survey results

Acceptance: Of the merchants who responded to the survey, 89 per cent accept cash, debit cards, and credit cards simultaneously. All merchants accept cash, followed closely by debit cards at 93 per cent and credit cards at 92 per cent. In addition, 16 per cent of respondents issue their own self-labelled credit card. Cheques and gift cards have lower acceptance levels, at 70 per cent and 55 per cent, respectively. The smallest merchants (measured either in terms of number of employees or sales volume) are the least likely to accept electronic payments. Credit cards are less likely to be accepted at restaurants and food, general merchandise, and personal services stores,[10] but are fully accepted at gas stations and in the furniture, health, and apparel trades. Debit card acceptance is practically uniform across sectors. Cheques are most likely to be accepted at furniture, electronics, building and materials, and health stores.

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7. Firms in each stratum (e.g., size, region, and subsector) were randomly selected using the sample frame provided by the Info Canada database.
8. Statistics Canada defines a retail chain as one that operates four or more of the same type of store under common ownership, and a franchise as one that is part of a group of stores that sell the same products and operate similarly but is independently owned. An independent store generally operates less than four locations.
9. According to Statistics Canada, 72 per cent of merchants have fewer than 10 employees. Independent merchants characterize the industry, representing 56 per cent of retail activity in 2005. However, chain merchants have recently been gaining ground. See http://www.statcan.ca/Daily/English/070327/d070327a.htm.
10. Personal services include movie theatres, video rental shops, dry cleaning, personal care, photofinishing, and repair and maintenance services.

Of those merchants who do not accept debit cards, 52 per cent said that set-up and processing costs are the main barriers to acceptance. Of those not accepting credit cards, lack of demand (29 per cent) and costs (16 per cent) were the main barriers. Risk was mentioned as a main barrier by 73 per cent of those not accepting cheques.

Merchant preferences: In spite of the overwhelming acceptance of cash, debit cards, and credit cards, merchant acceptance levels do not necessarily reflect their relative preferences. For example, of those merchants who accept all three MOP, 60 per cent said they very much prefer debit cards, 52 per cent said they very much prefer cash, and 21 per cent said they very much prefer credit cards. Yet, when merchants were asked which one of the three accepted methods they prefer consumers to use *the most often*, 53 per cent favoured debit cards, 39 per cent favoured cash, and only 5 per cent favoured credit cards.

Merchant perceptions: The survey asked all merchants about the perceived ease and dependability (or reliability) of processing payments at the point of sale, as well as perceived risk and cost.[11] Cash was rated as "totally reliable" by 67 per cent of respondents, while 56 per cent gave this top rating to debit cards, and 38 per cent to credit cards. Debit cards were viewed as the least risky MOP and 42 per cent rated them as "not at all risky." Cash was seen as "not at all costly" by 63 per cent of respondents, compared with the 19 per cent who gave this rating to debit cards and the 3 per cent who gave the rating to credit cards.

Payment shares: According to the survey results, there is no single payment instrument that dominates total transactions. Table 2 shows that each major payment instrument represents about a third of the value and volume of total sales for the median merchant in the survey. The table also reports the median transaction value by payment instrument.

11. Questions on perceptions were asked of all merchants, regardless of acceptance.

Table 2
Payment Instrument Shares and Transaction Value by Sample Median

Payment instrument	Value (%)	Volume (%)	Trans. value ($)
Cash	25	35	36.50
Debit card	30	34	50.00
Credit card	30	25	62.50
Cheque	5	3	150.00
Self-labelled credit card	5	4	67.50

Note: Shares do not add to 100 per cent, because each cell corresponds to the survey median calculated independently for each MOP. Therefore, the median observation for cash may not be the same as the median observation for other MOP. Median transaction values are estimated based on merchant responses to the following question: *In your store(s), what is the average transaction value for each of the following payment methods?*

Costs: The cost of accepting payment instruments comprises monthly and per-transaction fees charged by payment service providers. More than half of the merchants in the survey receive their electronic payment services from payment processors; the remaining merchants receive them directly from their financial institution.

According to the survey, merchants pay around $45 to $53 a month for their banking and payment processing services, which may include terminal leasing.[12] Although questions about communication costs were not asked, the survey reveals that 56 per cent of the respondents use dial-up lines and 30 per cent use high-speed lines, and the majority of respondents use only one connection.

Merchants were also asked about their per-transaction fees for debit and credit cards. The median per-transaction fee for debit cards in the survey is 12 cents and the median discount rate for credit cards is 2 per cent of the value of the transaction.[13] However, debit card fees may vary from 7 cents in the lower quartile of the distribution to 25 cents in the upper quartile. Similarly, credit card discounts range from 1.75 per cent in the lower quartile to 2.5 per cent in the upper quartile.

12. Among those who accept credit/debit cards, approximately half said they lease their POS equipment and 24 per cent said they own the equipment; the rest either did not know or did not respond.
13. This is based on an average credit card discount rate calculated for each merchant judging by the credit cards they accept at their stores.

4 Merchant Perceptions and Preferences

In this section, we examine how merchant characteristics, such as transaction value and volume, can affect merchant perceptions of MOP reliability, risk, and costs. We then examine how much weight perceptions may have on merchant preferences compared with other factors.

Because survey responses are categorical rankings, we use ordered probit models, which are estimated by maximum likelihood (Greene 2000). The ordered probit model is based on the assumption that there is a latent factor y_i^*, which is considered by individuals in their categorical response. For example, merchants might have a series of measures of transaction failure, risk of loss, or per-transaction costs by MOP. However, due to time constraints or confidentiality issues, merchants may be reluctant to provide these measures, and the surveyor has to rely on an ordered categorical response, $y_i \in \{1,2,...,G\}$.

In general, letting y_i^* be a linear function of a set of regressors x_i,

$$y_i^* = \beta' x_i + \varepsilon_i,$$

and assuming that the error term ε_i follows a normal distribution, then

$$P(y_i = g) = P(\mu_{g-1} < y^* \leq \mu_g) = \Psi_g(\beta' x_i),^{14} \qquad (1)$$

where μ_i are thresholds to be estimated. Ordered probit models allow us to estimate the parameter vector β.

4.1 Merchant perceptions of reliability

The survey asked merchants to rate cash, debit, and credit card payment methods, in terms of the ease and dependability of processing the payments at the POS, using a scale from 1, "completely unreliable," to 5, "totally reliable." We model the score for merchant i for MOP j, E_{ij}, as an ordered probit with the following regressors:

- ATV_i: average transaction value weighted by payment instrument share.
- POS_i: number of terminals.

14. Ψ_g is a functional form that varies with category g and derives from the normality assumption of ε_i.

- $SALES_i$: total sales volume or, alternatively, total sales value.[15]
- $CHAIN_i$: dummy that differentiates chain-owned stores ($CHAIN_i = 1$) from independent stores.
- $SHARE_{im}$: MOP shares, excluding the j payment instrument share.
- $SECTOR_{im}$: $m = 1,...,S$ retail subsector dummies.
- $REGION_{im}$: $m = 1,...,R$ regions in which the merchant has a presence. Each regional variable is equal to 1 if the merchants respond that they have outlets at least in that province.

Table B1 in Appendix B shows that both ATV and transaction volume play a significant role in explaining merchant perceptions of reliability. The lower the ATV, the more merchants find cash reliable to process. The opposite applies for debit and credit cards: they are found to be more reliable by merchants in higher-ATV stores. This is expected, since paying with cash can be more cumbersome in high-value transactions – counting, verification, and change handling would be more time consuming and less dependable for both the cashier and the consumer.

Our results show that merchants with high-volume stores find cash more reliable, controlling for the number of terminals and ATV. This is in part due to the fact that cash has the fastest tender time,[16] followed by PIN debit cards and signature credit cards,[17] which is critical in high-volume stores. However, sales volume has no significant effect on merchant perceptions of debit and credit card reliability.

We also examine *relative* perceptions of reliability between cash and debit, debit and credit, and cash and credit by estimating the ratio of the scores for MOP j and k, $E_{i,(j,k)} = E_{ij} / E_{ik}$.[18] Analyzing perceptions in relative terms allows us to identify those characteristics that cause merchants to have more contrasting views of payment instruments.

15. We test several measures of merchant overall payment operations: total sales volume, total sales value, and number of employees (which enter in dummies, each for a different size range). We also test the significance of $SALES_i$ entered in squared terms. In some models, transaction volumes for debit and credit cards are also used, since merchants may look at MOP individually.
16. Tender time is defined as the time elapsed from the moment the total amount is displayed on the cash register to the moment the payment is consummated.
17. See Working Group on Costs of POS Payment Products (2004).
18. Each MOP response has five possible categories. Therefore, the ratio of two MOP responses would have 5^2 possible values.

The results in relative terms (Table B2) reveal how ATV, total sales, and number of terminals may influence how merchants score each pair of payment instruments. Cash is perceived to be more reliable than credit cards by merchants with a lower ATV, higher transaction volume, and smaller number of terminals. Debit cards are considered more reliable compared with cash as the total value of sales increases. Also, debit cards are more reliable than cash the larger the number of terminals. Only the number of terminals significantly explains relative perceptions between debit and credit cards, with the latter perceived to be less reliable the higher the number of terminals. In summary, debit cards are perceived to be relatively more reliable as ATV and the merchant's overall operation increase.

4.2 Merchant perceptions of risk

The survey asked merchants to rate cash, debit cards, and credit cards in terms of the risk of counterfeiting, theft, or fraud. As in section 4.1, we estimate ordered probit models both in absolute and relative terms, denoted R_{ij} and $R_{i(j,k)}$, respectively. In this case, the five possible risk scores are on a scale of from 1, "not at all risky", to 5, "very risky." We use the same regressors as specified in section 4.1.

Table B3 shows the results in absolute terms. For cash, the main drivers of risk perceptions are total transaction volume and province of operation. The bigger the total sales volume, the higher the perception of risk. This result is consistent with the fact that merchants with larger overall cash operations are more exposed to theft, employee error, and counterfeits. In addition, the larger the total value of cash sales, the larger the size of the expected loss. Merchants operating in Ontario perceive cash to be more risky and those operating in Alberta see it as less risky, compared with merchants operating elsewhere in Canada.

Debit cards are perceived to be less risky the bigger the total transaction volume. This result is puzzling, since merchants are, in general, not liable for debit card fraud and, therefore, debit risk should not depend on merchant size.[19] Also, merchants in Ontario and Quebec seem to consider debit and credit cards to be more risky than do merchants operating elsewhere. Finally, the bigger the merchant, in terms of the number of terminals, the higher the perception of risk for credit cards. Average transaction value is not significant in any of these models.

ATV, however, is significant in explaining *relative* risk perceptions (Table B4). Cash is perceived to be less risky compared with debit as the ATV increases, whereas credit cards are

19. The result may be an indication that merchants use cash as a reference point for their debit risk ratings.

perceived to be less risky compared with debit cards as the ATV increases. These results are apparently counterintuitive: expected losses from cash should increase with ATV, debit cards essentially pose no risks to merchants, and credit card risk actually may increase with ATV, since chargebacks are proportional to the value of the transaction.[20] We conjecture that the effect of larger expected losses associated with higher ATV from payments with cash and credit cards is more than offset by the higher security standards that merchants may impose on their high-ATV stores.[21] Yet, transaction volume increases the perceived risk of cash relative to debit cards and credit cards.[22] Also, merchants processing a higher volume of credit card transactions perceive credit cards to be riskier than debit cards. The number of terminals increases the perceived risk of credit cards relative to debit cards.

4.3 Merchant perceptions of cost

The survey also asked merchants to rate cash, debit cards, and credit cards in terms of the costs to handle and process payments. In this case, the five possible scores are on a scale of from 1, "not at all costly", to 5, "very costly." For each payment instrument, we estimate ordered probit models of cost responses in absolute and *relative* terms, C_{ij} and $C_{i(j,k)}$, respectively, in the same fashion as in section 4.1.

There are, however, two considerations that should be kept in mind as we present the results. First, not all merchants recognize the full cost of accepting payments. For example, some merchants approached in the pilot study prior to the national survey did not recognize cash processing as an incremental cost to their business. They claimed that it is just a part of "doing business" and is covered in their overall set-up cost. Therefore, these merchants may answer differently than those who see cash processing as an incremental cost to their operations. This may bias some of the results. For example, the relationship between cost perceptions and payment volume may be weakened, since those merchants who think cash is part of doing business would not associate their cost perceptions with volume. Second, some merchants may think in total costs, whereas others may think in per-transaction costs.

The results in absolute terms (Table B5) confirm that merchants responded in per-transaction terms when revealing their cost perceptions of debit and credit cards. This is evident from the negative relationship between transaction volume and debit and credit card cost perceptions,

20. We try different specifications but the results do not change, and no outlier effects appear, either.
21. This result could also be consistent with merchants in higher-ATV stores being less risk averse.
22. The chi-squared test in Table B4 shows, however, that the model for relative risk between cash and credit cards has no overall significance.

after controlling for the number of terminals. This is not surprising, since the strong fixed-cost component should drive significant economies of scale. We also find a significant negative effect of ATV on debit card cost perceptions, which is consistent with the fact that debit card fees are set independent of the value of the transaction. Yet, it is not clear why credit card cost perceptions decrease with ATV. If credit card discount fees are constant from one merchant to another, credit card per-transaction costs in dollar terms should increase with ATV, since credit card fees are *ad valorem*. One plausible reason, which we examine in section 6, is that payment providers may offer lower credit card discount fees to higher-ATV merchants.

Cost perceptions of cash do not appear to vary by transaction volume and ATV. The merchant's overall operation, measured by the number of employees, is also non-significant. Annual sales is the only size measure to be positively and highly correlated with cost perceptions. However, this result is driven by merchants with the highest annual sales. The results again suggest that merchants respond on a per-transaction basis, and may imply that merchants do not perceive any economies of scale in handling cash payments.

Table B6 shows cost perceptions in *relative* terms. It shows that merchants in high-ATV stores perceive cash to be more costly than debit cards, compared with merchants in low-ATV stores. Yet, the higher the number of terminals, the more likely that debit is perceived to be more costly than cash. Perhaps this is because leasing costs increase with the number of terminals. All things equal, merchants with large transaction volumes perceive cash to be relatively more costly than debit cards. Furthermore, cost perceptions between debit and credit cards are associated only with the ATV. Merchants in higher-ATV stores perceive debit cards to be less costly than credit cards. Neither the transaction volume nor the number of terminals seems to affect relative cost perceptions between debit and credit cards. The relative results confirm that ATV, the number of terminals, and the transaction volume tilt perceptions in favour of card payments as cash processing and opportunity costs increase.

4.4 Merchant preferences

We estimate ordered probits of merchant i responses for preference ratings of payment j, P_{ij}, as a function of $RBLTY_{ij}$, $RISK_{ij}$, $COST_{ij}$, $SHARE_{im}$, $SECTOR_{im}$, and $REGION_{im}$, where $RBLTY_{ij}$, $RISK_{ij}$, and $COST_{ij}$ are the merchant's responses of reliability, risk, and costs for MOP j, respectively, and the other variables are as defined in section 4.1.

Table B7 shows that reliability and costs are significant factors underlying merchant preferences for all MOP. Risk, on the other hand, only plays a role in the preference for cash, but is non-significant for debit and credit cards. Moreover, as consumers use a payment instrument more intensively, merchants increasingly value their choice. For example, merchants in intensive debit/credit card stores tend to rank cash lower in their preferences, the effect being strongest in debit-intensive stores. Likewise, the more cash-oriented a merchant's business, the lower it will rank debit and credit cards.

We also estimate ordered probits of preferences in *relative* terms between MOP j and k, $PR_{i(j,k)} = P_{ij} / P_{ik}$, as a function of $RL_{i(j,k)}$, $RK_{i(j,k)}$, $RC_{i(j,k)}$, $SHARE_{im}$, $SECTOR_{im}$, and $REGION_{im}$, where $RL_{i(j,k)}$, $RK_{i(j,k)}$, and $RC_{i(j,k)}$ are relative reliability, risk, and cost scores, respectively.

In *relative* terms, Table B8 confirms that reliability and costs are significant drivers of merchant preferences among the three instruments. Risk, however, matters only in the relative preference between cash and debit cards.

We also examine how merchant characteristics influence preferences. By doing so, we describe preferences in terms of objective measures of merchant heterogeneity, rather than the more subjective ones based on perceptions as above. We estimate ordered probits of *relative* preferences as a function of all the regressors defined in section 4.1.[23]

Table B9 shows the results in *relative* terms. Merchants with relatively higher transaction volumes and a higher number of terminals are more likely to prefer electronic payments to cash, except for those merchants with the highest transaction volume per terminal. Credit card preference, relative to debit cards, increases with ATV and transaction volume, but decreases with the number of terminals.

There are also strong sector-specific effects. Cash is preferred to debit cards in gas stations, bars and restaurants, and personal service sectors. Credit cards are preferred to debit cards by merchants in the health, apparel, bars and restaurants, and personal service sectors.

In summary, this section shows that debit cards emerge as the more reliable, less risky, and less costly payment instrument as the size of a merchant's operation increases. The ATV at the POS also plays a significant role in explaining perceptions. Merchants in high-ATV stores perceive

23. We also estimate order probits of preference ratings by payment, but we do not find any significant merchant characteristic effects.

cash to be more costly and less reliable than electronic payments compared with merchants in low-ATV stores. As expected, merchants in higher ATV stores perceive debit cards to be less costly than credit cards. Merchants with relatively higher transaction volumes and a higher number of terminals are more likely to prefer electronic payments to cash. In addition, preferences are shaped by the MOP most used at the POS, as measured by payment instrument shares.

5 Payment Instrument Shares

In this section, we investigate the hypothesis that, once a merchant decides whether to accept a payment instrument, it has little influence over the consumer's choice of MOP, which determines the outcome at the POS.[24] We test this hypothesis by estimating payment instrument shares as a function of merchant perceptions regarding cost, risk, and reliability. Subsequently, we extend the model by including variables that would reflect consumer MOP behaviour, and test their significance in explaining market shares. The results in this section show that merchants have little influence over payment shares aside from initial acceptance, and that consumer MOP decisions govern payment shares at stores that accept all MOP.[25] In particular, we find evidence suggesting that consumers may choose to use cash more intensively relative to cards at stores with low ATV and high transaction volumes.

Table B10 shows that costs, reliability, and risk do not have any significant effect in explaining payment shares after controlling for acceptance. Most of the explanatory power in these regressions depends on the merchant's subsector and region. We extend this model by adding total sales, the number of terminals, and ATV as additional factors underlying payment instrument shares.[26] These variables are our proxies for consumer payment behaviour. For example, we expect cash payment shares to decrease with ATV because cash tends to be inconvenient for high-value payments – the risk of loss and opportunity costs increase with transaction value.[27] Also, consumers may find electronic payments more convenient for high-transaction values, not only because such payments avoid the hazards associated with handling large amounts of cash, but also because they enable the consumer to use funds not available at

24. None of the 35 merchants interviewed in the pilot survey reported any type of practice to dissuade customers from paying with any of the payment instruments surveyed.
25. Sample selection bias due to acceptance decisions is not a major issue in the Canadian environment, since 89 per cent of survey participants accept cash and debit and credit cards.
26. ATV in payment share models is an unweighted average of each MOP transaction value, to avoid endogeneity issues.
27. Transaction value is often a main variable in determining the relative demand for different payment methods (Whitesell 1989, 1992; Prescott 1987; Klee 2004; Bounie and François 2006).

hand.[28] Record keeping provided by electronic MOP would also be more desirable the higher the transaction value, by providing proof of payment and aiding cash-flow management. Total transaction volume, controlling for the number of terminals, proxies for waiting times in line. Consumers in busy stores with long lines may be more impatient and may prefer to use cash. Subsectors proxy for the type of goods being purchased. For example, consumers may be more inclined to pay with credit cards for durable goods (Santomero and Seater 1996).

Table B11 shows that, all things equal, ATV is statistically significant: the higher the ATV, the lower the cash and debit card payment shares and the higher the credit card share. Another observation is that subsectors that are less cash intensive tend to be significantly more credit card intensive. That is the case in the furniture, apparel, hobby, and health care trades. However, there are no particular differences across sectors for debit card shares. Stores that have a higher transaction frequency tend to have significantly higher cash shares, as captured by transactions per terminal.[29]

Table B12 shows the results of *relative* payment shares. Cash is used more intensively than debit cards as total sales increase. Also, consumers use credit cards relatively more than debit cards the larger the number of terminals. Note the orders of magnitude of the ATV coefficient across equations. Relative payment shares between debit and credit, and cash and credit, are much more sensitive to changes in the ATV than are relative payment shares between cash and debit. This may indicate that, in stores that accept all payment instruments, the higher the ATV, the higher the likelihood that people will turn to credit card payments rather than debit cards (due in part to strong incentives given by credit cards in terms of the grace period and rewards). This conjecture deserves further investigation, since the survey studied herein is not best suited to test this type of hypothesis.

Subsector dummies are also significant in explaining relative payment shares. Cash is more intensively used relative to debit in the food, gas, restaurants, and general merchandise subsectors. Credit card shares are particularly higher than debit card shares in sectors associated with durable goods, such as the furniture, apparel, and hobby sectors. One sector that stood out as highly credit card intensive relative to other sectors, all things equal, is gas stations. This may reflect the convenience of using credit cards for payment at the pump. It also may reflect the wide acceptance of credit cards in this trade, where self-labelled credit cards are common.

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28. See Arango and Taylor (2007) for a detailed discussion of the factors involved in consumers' choices between alternative MOP at the POS.
29. Transactions per terminal are calculated as the total sales volume divided by the number of POS.

6 Costs of Accepting Cash, Debit Cards, and Credit Cards

In this section, we examine whether payment processor fees are associated with merchant characteristics. We also examine merchants' per-transaction costs of accepting all MOP. In particular, we want to determine whether the finding that cash is perceived as the cheapest payment instrument is consistent with an accounting exercise in which we try to include all variable costs. The results for payment processor fees show significant volume discounts for both debit and credit cards. We also find that debit cards are less costly than cash for the median cash transaction value in the survey.

6.1 Per-transaction fees for debit and credit cards

We examine various models of debit and credit card fees as a function of merchant characteristics. Although we test whether different merchant attributes affect fees, only ATV and transaction volume are consistently significant across specifications. Table B13 shows conditional median regressions of debit and credit card fees as a function of ATV and transaction volume.[30]

We find that both debit and credit card fees decrease with transaction volume. The fact that larger merchants are able to negotiate lower per-transaction fees is consistent with stronger competition among payment processors in this segment of the market.

We also find that debit card fees increase with ATV, while credit card fees decrease with ATV. Lower debit card fees for merchants with low ATV suggest that payment processors may compensate for the competition between cash and debit cards at low transaction values. Yet, credit card payment processors may give lower rates to high-ATV merchants, to compensate for the competition between debit and credit card fees, which becomes more pronounced as the ATV increases, given the different fee structures.

To determine the order of magnitude of the ATV effect, we compare per-transaction fees of a high-ATV merchant versus those of a low-ATV merchant based on our estimates. For example, a merchant with an ATV of $100 would pay 3 per cent more in debit card per-transaction fees than a merchant with an ATV of $10. In contrast, a merchant with an ATV of $100 would pay credit card discount rates that are about 4 per cent lower than those for a merchant with an ATV of $10. However, in absolute-dollar terms, the credit card fee paid by a merchant with an ATV of $100

30. We estimate a conditional median model instead of conditional mean, because of the strong weight that outliers have in the mean, and also because of the rather skewed distribution shapes of card fees.

is about 9 times the amount paid by a merchant with an ATV of $10. Even though credit card providers seem to decrease their discount rates for higher-ATV merchants, this does not compensate for the increase in the dollar amount that results from applying the discount rates to higher transaction values.

The regressions also suggest that a merchant with large transaction volumes (i.e., at 500 transactions per day) pays 7 per cent lower debit card fees and 4.1 per cent lower credit card discount rates than a small merchant (i.e., at 100 transactions per day). These may sound like small differences in per-transaction fees, but they represent significant savings to the merchant in aggregate costs.

6.2 Cash, debit, and credit: a comparison of variable costs

Based on data obtained from follow-up interviews with 35 merchants (a subset of the survey), it is possible to derive some of the back-office costs associated with handling cash. The participants provided more detailed information on the number of transactions by payment method, the number of cash deposits per week, the value and frequency of coin ordering, the reconciliation and deposit preparation time, the average cash deposit value, and deposit fees. This information, together with the information on debit and credit card fees, allows us to compare merchant per-transaction variable costs across payment methods. We account for the following cost items:

- For all payment instruments, the labour cost associated with tender time is included, which is based on the average cashier wage in the national survey ($9.60 per hour). Tender time estimates are taken from the Dutch National Bank as follows: 19 seconds for cash, 26 seconds for debit cards, and 28 seconds for credit cards (Working Group on Costs of POS Payment Products 2004).
- For cash, we calculate the labour cost of the reconciliation and deposit preparation time per transaction.
- We include the value of time spent delivering the cash deposit to the bank, which we assume is 20 minutes per deposit. According to anecdotal information, most merchants still make their deposits during business hours, although after-hours drop-off chutes are available. (We exclude the cost of armoured transportation services due to lack of data.)
- Cash deposit fees and coin-ordering fees are taken from one of the major Canadian commercial bank's public brochures, as published at the time of the survey.
- For debit and credit cards, we take the median per-transaction fees from the survey.
- For cash theft, we use the results of a Retail Loss Prevention Survey conducted by the Retail Council of Canada and the Royal Bank of Canada in 2007, which provides

information about the types of criminal activity faced by merchants.[31] Losses due to counterfeiting are calculated based on the annual average value of counterfeits passed in 2004–06 divided by average total cash sales in the same period.

- The cost of a credit card chargeback is derived from Garcia-Swartz, Hahn, and Layne-Farrar (2004).
- Float is the opportunity cost of funds in transit, based on short-term interest rates. For cash, we not only consider the time it takes for the financial institution to credit the merchant's account, but also the average time that total cash sales remain in the store before being deposited at a financial institution, based on deposit frequency.[32]

Table 3 summarizes our calculations. Results are reported for a transaction value of $36.50, which is the median cash transaction value in the survey. The estimations reveal that debit card payments are the least costly at 19 cents, followed by cash at 25 cents and credit cards at 82 cents.

Since many cost items would vary by the value of the transaction, a sensitivity analysis is performed to identify the threshold at which cash may be the cheapest to accept. We calculate the per-transaction costs for different transaction values. For cash, we assume that all cost items increase with transaction value, except tender time, deposit time at the bank, and coin ordering. For debit cards, only the opportunity cost of funds availability would increase with transaction value. For credit cards, all cost items, except tender time, would increase with transaction value. Given these assumptions, the sensitivity analysis suggests that cash would be the least costly payment instrument for transactions below $12.6 among merchants in the lower range of debit card fees (7 cents), the least costly for transactions below $23.4 at stores that pay 12 cent debit fees, and the least costly for transactions below $51.3 among merchants in the higher range (25 cents).[33]

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31. This survey finds that 35 per cent of merchants face theft by an employee within a year, and that 23 per cent face an intrusion (such as break-and-enter or armed robbery). In the first case, the cash loss would be a portion of total sales, whereas in the second it is reasonable to assume a total loss of the transaction proceeds. We calculate the daily probability of a cash-theft event based on a 29 per cent annual frequency, an average of the above frequencies, and a 75 per cent cash-sale loss.
32. Merchants in the survey differ by how frequently they deposit cash at their financial institution. Only 18 per cent of merchants deposit cash on a daily basis, while approximately half deposit either once per week (27 per cent) or twice per week (22 per cent). We find that merchants of larger operations, either measured by sales or transaction volume, deposit cash more frequently. However, merchants with a higher number of terminals to manage and reconcile tend to deposit cash less frequently.
33. We focus our discussion on comparisons between cash and debit cards, since the marginal cost of credit cards (the merchant discount rate) combines transactional as well as lending costs transferred to the merchant. Since cash and debit cards do not have lending attributes, the comparison with credit cards may not be valid.

Table 3
Merchant Variable Per-Transaction Costs

	Base case for a $36.50 transaction		
Cost item	Cash	Debit	Credit
Tender time	0.051	0.070	0.080
Deposit reconciliation time	0.033		
Deposit preparation time	0.033		
Deposit time at the bank	0.025		
Payment processing fees		0.120	0.730
Cash deposit fees	0.078		
Coin ordering	0.006		
Theft/counterfeit	0.025		
Chargebacks			0.016
Float	0.006	0.001	0.001
Total	$0.25	$0.19	$0.82

Although these are back-of-the-envelope calculations, our estimate of the threshold transaction value between cash and debit cards seems reasonable, since low-ATV stores, such as convenience stores and fast food restaurants, are more likely to not accept electronic payments. Note, however, that we are considering the survey median values in some of our estimates. Our results show that costs may vary among merchants for a variety of reasons, including size, technology used, and geographical location.

Our calculations contrast with the perceived view of merchants that cash is the cheapest payment instrument to accept. This may be a result of the way merchants perceive cash. It is possible that those merchants who perceive cash as part of doing business would not consider some of the costs in Table 3, such as deposit reconciliation and deposit preparation, as variable costs of processing cash. Alternatively, as the results in section 4.3 suggest, merchants may consider both variable and fixed costs in their cost perceptions; therefore, both ATV and merchant's size will be important in their ranking.

7 Conclusion

Our empirical results permit a thorough understanding of the merchants' perspective of MOP acceptance that has been only marginally explored in the literature. First, we find that merchant preferences are shaped by both costs and the relative intensity of MOP use at the POS. This implies that, as consumers use a payment instrument more intensively, merchants increasingly value their choice. Second, we find that merchants have little influence, aside from acceptance, in the relative usage of MOP at the POS. Finally, the survey shows that cash, debit, and credit cards compete equally in terms of payment shares at POS that accept all MOP; therefore, the decision to reject a payment instrument may imply significant losses of sales.

As for the costs of acceptance, our rough estimates show that cash is actually more costly than debit cards at the survey's median cash transaction value of $36.50, and may cost less only at transaction values lower than $12. Therefore, a further shift away from cash and towards electronic payments is beneficial for most of the merchants in the survey who have average transaction values above this $12 threshold. The gains are probably larger among merchants with large scales, as our work shows evidence that debit and credit card fees decrease with merchant size, and that merchants profit from economies of scale in electronic payments.

These results are consistent with the two-sided nature of payment services markets. Although merchants might find it costly to adopt a particular payment instrument, they still might find it profitable in that it either enhances the demand for their goods or prevents a loss of customers to their competitors.

References

Arango, C. and V. Taylor. 2007. "Means of Payments Usage and Perceptions in Canada: A 2004 Survey of the Public." Bank of Canada. Photocopy.

Bank for International Settlements (BIS). 2008. "Statistics on Payment and Settlement in Selected Countries – Figures for 2006." Available at < http://www.bis.org/publ/cpss82.htm >.

Bolt, W. and A. F. Tieman. 2005. "Social Welfare and Cost Recovery in Two-Sided Markets." IMF Working Paper No. 05/194.

Bounie, D. and A. Francois. 2006. "Cash, Check or Bank Card? The Effect of Transaction Characteristics in the Use of Payment Instruments." Telecom Paris Economics and Social Sciences Working Paper No. ESS-06-05.

Canadian Bankers Association. Available at <http://www.cba.ca>.

Chakravorti, S. and T. To. 1999. "Toward a Theory of Merchant Credit Card Acceptance." Federal Reserve Bank of Chicago Working Paper No. WP-99-16.

Diamond Consultants. 2005. "Banking on Payments: Protecting and Extending Banks' Electronic Payments Franchise." Diamond Management and Technology Consultants.

_____. 2006. "A New Business Model for Card Payments." Diamond Management and Technology Consultants.

Eisenmann, T., G. Parker, and M. W. Van Alstyne. 2006. "Strategies for Two-Sided Markets." *Harvard Business Review* 84 (10): 92–101.

Garcia-Swartz, D. D., R. W. Hahn, and A. Layne-Farrar. 2004. "The Move Toward a Cashless Society: A Closer Look at Payment Instrument Economics." AEI-Brookings Joint Center Working Paper No. 04–20.

Greene, W. 2000. *Econometric Analysis*. 4th Edition. Upper Saddle River, NJ: Prentice-Hall, Inc.

Hayashi, F. 2006. "A Puzzle of Card Payment Pricing: Why Are Merchants Still Accepting Card Payments?" *Review of Network Economics* 5 (1): 144–74.

Humphrey, D., M. Willesson, T. Lindblom, and G. Bergendahl. 2003. "What Does it Cost to Make a Payment?" *Review of Network Economics* 2 (2): 159–74.

Interac Association. Available at <http://www.interac.ca>.

Klee, E. 2004. "How People Pay: Evidence from Grocery Store Data." Board of Governors of the Federal Reserve System. Photocopy.

Levitin, A. J. 2007. "Priceless? The Costs of Credit Cards." *UCLA Law Review* 55 (2).

Loke, Y. J. 2007. "Determinants of Merchant Participation in Credit Card Payment Schemes." *Review of Network Economics* 6 (4): 474–94.

Markose, S. M. and Y. J. Loke. 2003. "Network Effects on Cash-Card Substitution in Transactions and Low Interest Rate Regimes." *The Economic Journal* 133 (487): 456–76.

Masters, A. and L. R. Rodriguez-Reyes. 2005. "Endogenous Credit-Card Acceptance in a Model of Precautionary Demand for Money." *Oxford Economic Papers* 57 (1): 157–68.

Monnet, C. and W. Roberds. 2007. "Optimal Pricing of Payment Services When Cash is an Alternative." Federal Reserve Bank of Philadelphia Working Paper No. 07-26.

Prescott, E. 1987. "A Multiple Means-of-Payment Model." In *New Approaches to Monetary Economics*, edited by W. Barnett and K. Singleton, 42–51. Cambridge and New York: Cambridge University Press.

Santomero, A. and J. Seater. 1996. "Alternative Monies and the Demand for Media of Exchange." *Journal of Money, Credit and Banking* 28 (4): 942–60.

Shy, O. and J. Tarkka. 2002. "The Market for Electronic Cash Cards." *Journal of Money, Credit and Banking* 34 (2): 299–314.

Statistics Canada. 2005. "2005 Survey of Financial Security." Available at <http://www.statcan.ca/english/Dli/Data/Ftp/sfs.htm>.

Taylor, V. 2006. "Trends in Retail Payments and Insights from Public Survey Results." *Bank of Canada Review* (Spring): 25–36.

Untracht, R. 1996. "Do You Really Know Your Customers?" *Chain Store Age* 72 (1): 6A–10A.

Whitesell, W. 1989. "The Demand for Currency versus Debitable Accounts: A Note." *Journal of Money, Credit and Banking* 21 (2): 246–57.

_____. 1992. "Deposit Banks and the Market for Payment Media." *Journal of Money, Credit and Banking* 24 (4): 483–98.

Working Group on Costs of POS Payment Products. 2004. "Survey on the Costs Involved in POS Payment Products." National Forum on the Payments System, De Nederlandsche Bank.

Zhang, Y. 2005. "Provincial Retail Trade Since the Turn of the Millennium." Statistics Canada No. 11-621-MIE2005032-No. 32.

Appendix A: Retail Payments in Canada

Of the $425 billion worth of goods and services sold by merchants in 2006,[1] the vast majority were paid for by cash, PIN-based debit cards, and credit cards (mainly Visa and MasterCard, but also American Express). Gift cards and cheques are also used at the POS, but to a lesser extent.

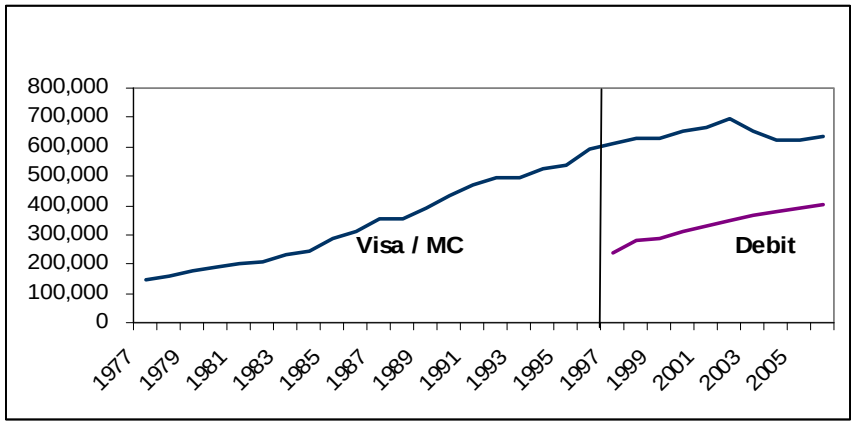
Debit and credit card use in Canada is extensive and growing. Statistically, the average adult is likely to have at least one debit card and more than two credit cards. Though not restricted to only POS payments, in 2006 Canadians made 3.3 billion debit card transactions, worth $149 billion, and 2.2 billion credit card transactions, worth $230 billion.[2] In value, this represents an average growth rate of 9 per cent and 14 per cent, respectively, over the past five years. While data on the share of POS payments by each method, especially for cash, are not precise, it is possible that debit and credit cards account for three-quarters of the value of POS transactions and 40 per cent of the volume.[3]

The extensive use of card payments by consumers coincides with broad acceptance by merchants. While merchant acceptance of cash at the POS is practically universal, acceptance of payment cards has expanded into most, if not all, retail trades.[4] Currently, over 400,000 retail locations accept debit cards and close to 700,000 locations accept credit cards. As Chart A1 illustrates, debit card acceptance has grown at an annual average of 6 per cent since its national establishment in 1997 (with a 19 per cent jump in 1998). Acceptance of Visa or MasterCard (a more mature market) has grown at an annual average of 5 per cent since 1977. [5]

1. Statistics Canada data include annual sales from restaurant/food services and the retail trade.
2. Data on credit cards can include transactions made abroad and non-POS payments. Data on debit cards can include cashback withdrawals. Source: Bank for International Settlements (2008).
3. A rough estimation of POS payment shares for cash, debit cards, and credit cards is provided in Taylor (2006) using ATM withdrawal data.
4. Debit card acceptance by retail trade can be viewed at <http://www.interac.org/en_n3_31_idpstats.html#a6>. Supermarkets stand out as having the highest number of debit card terminals and transactions, by value and volume. The number of merchants accepting Visa and MasterCard can be viewed at <http://www.cba.ca>.
5. American Express is also widely accepted by Canadian merchants, but such data are not readily available from them.

Chart A1

Number of Retail Locations Accepting Visa/MC and Accepting Debit



Sources: Canadian Bankers Association and Interac Association

The impressive growth in payment card use and acceptance can be attributed to a variety of factors. First, the technological infrastructure for card payments is well established and rapid advances in telecommunications have made payments faster, more efficient, cost-effective, and secure. Second, the acquiring business in Canada, which facilitates merchant acceptance of card payments, has undergone significant restructuring and has become more streamlined and competitive.[6] This has made it more appealing to merchants, from a variety of subsectors, to accept cards. Third, over the past decade, consumer spending in retail stores has been fairly robust due to increased wealth and income (Zhang 2005). The developments in retail payments have made access to disposable funds and credit easier than ever, and consumers appreciate the advantages of cards, including the convenience of not needing to carry cash to make everyday or unexpected purchases. The "buy now, pay later" appeal of credit cards, in particular, and the rewards, discounts, and other incentives affiliated with them, have certainly encouraged consumers to spend more and incur additional debt.[7]

6. Over the past ten years, the acquiring business in Canada has become more efficient as many of the financial institutions have outsourced their processing services to third parties who can better achieve economies of scale and invest in technology. Such restructuring was necessary given growing transaction volumes and the threat of much larger American competitors entering the Canadian market.
7. According to a Statistics Canada (2005) survey of financial security, consumer debt from credit cards, including all major credit cards, retail store credit cards, gasoline credit cards, etc., and deferred payment plans, amounted to $26 billion – a 60 per cent increase over their 1999 survey.

A.1 Payment card networks

Payment card networks, such as those of debit and credit cards, are examples of two-sided markets.[8] Two-sided markets bring together two distinct groups of "end-users" in a network of products and services called platforms (Eisenmann, Parker, and Van Alstyne 2006). In the payment card industry, platform providers include card issuers, who provide services to consumers, acquirers, who provide processing services to merchants, and the card companies or associations.[9]

Payment networks, like all two-sided markets, are initially characterized by the "chicken and egg" problem, where sufficient adoption by both sides of the market is critical to the overall success of the product or service. Once the network is established, continued growth is important, because the value of the network increases (known as positive externalities). Because sensitivity to cost by either side can differ substantially, the network provider often subsidizes one side of the market at the expense of the other through differential pricing.

The credit card industry, in particular, subsidizes consumers over merchants, because they add the most value to the network and they are viewed as the most price sensitive. Aggressive competition among credit card issuers has meant that consumers actually pay zero or even negative transaction fees because of rewards, discounts, and other programs. The purpose of these incentives is to encourage consumer spending and increase card issuer revenue. Thus, the merchant bears most of the cost, as explained in Box A.

8. Other common examples of two-sided markets include newspapers (linking readers and advertisers), video game consoles (linking players and game developers), and PC operating systems (linking consumers and software developers). See Shy and Tarkka (2002), Markose and Loke (2003), and Bolt and Tieman (2005), and the literature cited therein, for further discussion of pricing and agent behaviour in retail payment markets.
9. While card issuers are financial institutions, acquirers are either financial institutions or third-party payment processors. Note that the same financial institution can simultaneously be both issuer and acquirer.

Box A: Merchant Discount Rate

The ad valorem fee on credit card transactions is called the merchant discount rate (MDR). Acquirers offer merchants certain rates based on their monthly sales volumes and risk assessment. As such, higher credit card sales volumes are often associated with lower rates (encouraging economies of scale), while higher risk, as perceived by the acquirer, is associated with higher rates.

Because of liability arrangements, acquirers face three types of risk: credit risk, chargeback risk, and contingent liability risk. Credit risk refers to the risk of not receiving the fees owed by the merchant. Chargeback risk refers to the risk of transaction reversal due to fraud or discrepancy, which can occur within a certain number of days after the purchase was made. When a chargeback occurs, the acquirer's account is debited by the card issuer and the acquirer must recoup funds from the merchant or bear the loss. Contingent liability risk refers to the risk of chargebacks specific to transactions processed in advance of the consumer receiving the goods or services (for example, an airline ticket). This liability is extended a certain number of days *after* the purchase is fulfilled. While the first risk represents the financial worthiness of the merchant, the last two risks illustrate how the acquirer must consider the merchant's worthiness to honour the goods and services that were agreed upon and the chances of fraud.

In determining the MDR, the acquirer must therefore assess the nature of the business and the credit history of the merchant. Certain types of merchants, such as online or mail-order businesses, are considered more risky, as are less reputable industries, such as telemarketing. Transaction security is also an issue for these types of businesses, since they are processed without the consumer being physically present.

While the MDR covers the acquirer's processing and card association fees, not to mention its profit, a large part of the MDR is composed of the interchange rate, as shown in Figure A (Diamond Consultants 2005). The interchange rate is a set percentage fee paid by the acquirer to the card issuer for every transaction. The exception is American Express, which does not pay interchange, since it is both the issuer and the acquirer.

Interchange rates are determined by the card association, but how they are set is not publicly available. In principle, they reflect the card issuer's cost of issuance, verification, and advancement of funds to the acquirer while bearing the credit risk of extending uncollateralized credit to consumers. Given the consumer's zero liability, it also reflects the issuer's exposure to fraud and chargebacks if the merchant is able to successfully dispute the claim.

According to a report by Diamond Consultants (2006), only 13 per cent of interchange fees go towards the cost of processing, while as much as 44 per cent go towards the costs of rewards and other perks that consumers enjoy (Figure B). The remainder go to the issuer for other transactions costs and profit, and to the network for branding, servicing, and rewards.*

Figure A

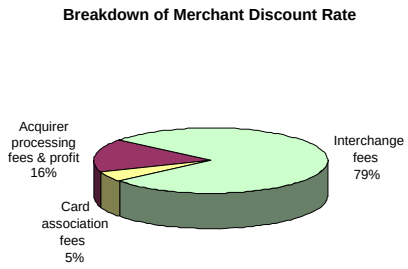
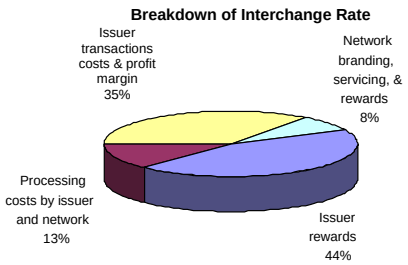


Figure B



* Diamond issued a disclaimer for these results. See <http://www.diamondconsultants.com/PublicSite/company/press/news/Others/Interchange_6-12-08.pdf>.

Appendix B: Econometric Models

Although all regressors are tested for statistical significance in each set of models, each column in the tables in this appendix should be seen as an independent model. Therefore, different specifications are possible. Robustness checks are performed by testing different measures of merchant size, including number of employees and total sales. However, annual transaction volume is preferred. Variables not included in some of the models are dropped because of their lack of joint significance. Different procedures for outlier effects are performed. The auto parts, accessories, and tires sector is excluded from the estimations. The highest-frequency stores, measured in annual transaction volumes per POS, are taken into account by including a dummy variable in the models. The retail sector of reference, or left-out sector, is food (e.g., grocery and convenience stores). The reference group for the set of dummies under the title “Provinces of presence” in the following tables are those merchants that have operations nationwide. One of the payment shares is excluded to avoid singularity. Further details are provided in the notes to each table.

Table B1
Merchants' Perceptions of Reliability

	Reliability		
	Cash	**Debit card**	**Credit card**
Weighted avg transaction value[1]	-0.112 **	0.258 **	0.291 ***
High-frequency stores (volume per POS >37,500)	0.324 **	-0.058	
Total number of terminals[2]	-0.002	0.022	-0.011
Total annual transactions	-0.056 [2]	-0.002 [3]	-0.025 [3]
Total annual transactions (sq)		0.046	
Cash share		-0.013	0.027
Credit share	-0.072	0.287	
Debit share	-0.765 **		0.303
Corporate/Franchised	-0.124	-0.026	-0.039
Furniture		0.276	0.732 ***
Electronics		0.270	0.295
Bldg materials		0.367	0.749 ***
Health care		0.279	0.560 **
Gas station		0.122	0.435 *
Apparel		0.263	0.487 *
Hobby		0.274	0.412
General merchandise stores		0.255	0.169
Miscellaneous merchants		0.457 *	0.583 **
Bars and restaurants		-0.052	0.389 *
Personal services		0.005	0.374
Provinces of presence[a]			
Ontario			0.291 **
Manitoba			-0.677 **
Quebec	-0.385 ***		
Observations	456	457	461
Wald chi2(p)	36.990	37.980	72.870
Prob > chi2	0.002	0.150	0.000
Log pseudolikelihood	-471.06	-466.30	-587.50
Pseudo R2	0.028	0.028	0.043

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively.
[1] Measured in logarithms; [2] Per 1,000 terminals; [3] Per 100,000 transactions.
[a] Significant at 10% or less.

Table B2
Merchants' *Relative* Perceptions of Reliability

	Relative reliability		
	Cash/ Debit	**Debit/ Credit**	**Cash/ Credit**
Weighted average transaction value[1]	-0.076	-0.004	-0.120 **
Total annual transactions[2]			0.024 ***
Total annual sales[3]		0.023	
Annual sales (ln)	-0.069 **		
Annual sales squared		-0.010	
Total number of terminals[1]	-0.021 **	0.029 ***	-0.005
Cash payment share	0.077	0.112	0.167
Credit card payment share	-0.054		
Debit share		0.302	-0.421
Corporate/Franchised	-0.079	0.038	-0.107
Furniture	-0.152	-0.492 *	-0.505 *
Electronics	0.086	-0.195	0.003
Bldg materials	-0.339	-0.511 *	-0.730 ***
Health care	-0.023	-0.407 *	-0.245
Gas station	0.252	-0.316	0.056
Apparel	-0.017	-0.312	-0.202
Hobby	-0.028	-0.321	-0.154
General merchandise stores	-0.077	0.051	-0.027
Miscellaneous merchants	-0.291	-0.266	-0.269
Bars and restaurants	0.289	-0.365 *	-0.023
Personal services	0.150	-0.522	-0.118
Provinces of presence[a]			
Alberta		-0.269 **	
Ontario			-0.314 ***
Manitoba		0.699 ***	0.644 **
Quebec	-0.279 **	0.334 ***	
Observation	457	452	461
Wald chi2(d)	55.45	61.15	60.57
Prob > chi2	0.002	0.000	0.000
Pseudo R2	0.021	0.029	0.023
Log pseudolikelihood	-830.75	-713.76	-915.44

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [1] Per $1,000. [2] Per 1 million transactions. [3] Per $100 million. [a] Significant at 10% or less.

Table B3
Merchants' Risk Perceptions of Counterfeiting, Theft, or Fraud

	Risk perceptions					
	Cash		Debit card		Credit card	
Debit transaction value (ln)			-0.034			
Average transaction value[1]	-0.004				0.034	
Total number of terminals[2]	0.029		-0.294		0.147	**
Annual transactions	0.050	*	-0.070 [4]	**	-0.006 [3]	
Credit share	-0.515	*	-0.249			
Cash share			0.268		0.356	
Debit share	-0.237				-0.090	
Corporate/Franchised	0.094		0.049		0.118	
Furniture	0.431	*	-0.007		0.021	
Electronics	-0.135		-0.669	**	-0.093	
Bldg materials	0.154		0.091		-0.341	
Health care	-0.100		-0.338		-0.656	***
Gas station	0.096		0.182		0.111	
Apparel	0.447	*	-0.157		-0.074	
Hobby	0.298		0.037		0.151	
General merchandise stores	-0.027		-0.376		-0.239	
Miscellaneous merchants	0.082		-0.505	*	-0.183	
Bars and restaurants	0.023		-0.430	*	-0.386	*
Personal services	-0.146		-0.333		-0.319	
Provinces of presence[a]						
Alberta	-0.378	**				
Ontario	0.427	***	0.310	**		
Quebec			0.260	*	0.320	***
Observations	467		427		465	
Wald chi2(p)	38.020		41.280		59.740	
Prob>chi2	0.098		0.051		0.000	
Pseudo R2	0.026		0.035		0.025	
Log pseudolikelihood	-717.444		-590.776		-698.955	

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1] Per $1,000. [2] Per 10,000 terminals. [3] Per $1 million. [4] Measured in logarithms. [a] Significant at 10% or less. Both ATV as defined in the text and the transaction value specific to each MOP were alternatively tested, but were not significant.

Table B4
Merchants' *Relative* Risk Perceptions of Counterfeiting, Theft, or Fraud

	Relative risk		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Weighted average transaction value	-0.024 ***		-0.0001 *
Total annual transactions[1]		0.002 *	
Total annual transactions (in log)	0.087 ***		0.050 **
Total number of terminals[3]	0.001	-0.003 ***	-0.001
Cash payment share	-0.517 **	0.198	-0.193
Debit share	-0.099	-0.221	-0.082
Debit average transaction value [2]		-0.007	
Credit average transaction value [2]		0.007 **	
Credit transaction volume[1]		-0.031 **	
Corporate/Franchised	0.049	-0.061	-0.028
Furniture	0.353	0.018	0.351
Electronics	0.337	-0.337	0.006
Bldg materials	-0.127	0.493 **	0.257
Health care	0.225	0.201	0.388 **
Gas station	-0.224	0.134	-0.095
Apparel	0.349	0.019	0.298
Hobby	0.105	0.044	0.053
General merchandise stores	0.285	-0.170	0.138
Miscellaneous merchants	0.251	-0.056	0.160
Bars and restaurants	0.264	-0.006	0.246
Personal services	0.127	0.120	0.135
Provinces of presence[a]			
British Columbia	0.349 **		
Manitoba		-0.397 *	
Ontario			0.266 ***
Observation	465	463	465
Wald chi2(d)	50.650	77.320	32.180
Prob > chi2	0.006	0.000	0.267
Pseudo R2	0.023	0.018	0.012
Log pseudolikelihood	-1,093.60	-990.108	-1138.576

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [1] Per 100,000 transactions. [2] Per $100. [3] Per 100 terminals. [a] Significant at 10% or less.

Table B5
Merchants' Cost Perceptions of Accepting a Payment Instrument

	Cost perceptions		
	Cash	**Debit card**	**Credit card**
Weighted transaction value[1]	0.004	-0.761 [4] ***	-0.132 **
Total number of terminals[2]	-0.014	0.030 ***	0.045 **
Annual sales	0.074 **		
Transaction volume[3]		-0.082 *	-0.200 *
Cash share		0.438	-0.104
Credit share	-0.097	0.150	
Debit share	0.138		-0.261
Corporate/Franchised	0.149	-0.184	-0.159
Furniture	-0.334	0.013	-0.130
Electronics	-0.216	-0.149	0.131
Bldg materials	-0.122	-0.215	-0.178
Health care	-0.302	-0.172	-0.265
Gas station	0.115	0.355 *	0.249
Apparel	-0.025	0.179	0.196
Hobby	-0.143	-0.037	0.217
General merchandise stores	-0.294	-0.522 *	0.228
Miscellaneous merchants	0.085	0.275	-0.165
Bars and restaurants	-0.076	0.347 *	0.214
Personal services	-0.466	0.102	-0.093
Provinces of presence[a]			
Alberta	-0.368 *		-0.328 **
British Columbia	0.383 **		-0.271 *
Ontario	0.360 **		-0.220 *
New Brunswick	0.707 ***		
Nova Scotia		0.436 ***	
Quebec	0.340 **		
PEI		-0.772 ***	
Observations	467	462	460
Wald chi2(p)	63.840	80.210	56.270
Prob >chi2	0.000	0.000	0.001
Pseudo R1	0.047	0.048	0.531
Log pseudolikelihood	-558.218	-659.507	-628.921

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1] Per $10,000. [2] Per 1,000 terminals. [3] Per $1 million. [4] Debit average transaction value. [a] Significant at 10% or less.

Table B6
Merchants' *Relative* Cost Perceptions of Accepting a Payment Instrument

	Relative cost		
	Cash/ Debit	**Debit/ Credit**	**Cash/ Credit**
Weighted average transaction value (in log)	0.092 **	-0.107 **	0.091 ** [3]
Total annual transactions (in log)	0.068 **		0.047 **
Total annual transactions[1]		0.012	
Annual transactions squared		-0.004	
Total number of terminals[2]	-0.003 **	-0.001	-0.004
Corporate/Franchised	0.193 *	-0.071	0.190 *
High transaction volume per terminal	-0.173		
Cash payment share	-0.376	0.203	0.031
Credit card payment share	-0.396		
Debit share		-0.092	0.270
Provinces of presence[a]			
British Columbia	0.320 **		0.358 **
Ontario	0.249 **	0.201 *	0.346 ***
New Brunswick	0.527 ***		0.478 **
Newfoundland	-0.487 **		
Nova Scotia		0.315 **	
Observation	462	458	460
Wald chi2(18)	62.230	24.740	56
Prob > chi2	0.000	0.132	0.000
Pseudo R2	0.022	0.009	0.018
Log pseudolikelihood	-1,045.442	-996.291	0.000

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. Sectors of presence were not significant and seem to bring strong collinearity effects. [1] Per 1 million transactions. [2] Per 100 terminals. [3] Per $1,000. [a] Significant at 10% or less.

Table B7
Cash, Debit Card, and Credit Card Payment Preferences

	Preferences		
	Cash	**Debit card**	**Credit card**
Reliability	0.394 ***	0.436 ***	0.332 ***
Risk perception	-0.130 ***	-0.029	0.043
Cost perception	-0.177 ***	-0.120 **	-0.280 ***
Credit share	-0.861 ***	-0.015	
Cash share		-0.703 **	-0.923 ***
Debit share	-1.496 ***		-0.107
Corporate/Franchised	-0.096	0.229 *	0.192 *
Furniture	-0.540 **	-0.237	-0.273
Electronics	-0.307	0.003	-0.196
Bldg materials	0.218	-0.107	-0.189
Health care	0.106	-0.433 *	0.155
Gas station	0.184	-0.687 ***	-0.086
Apparel	-0.209	-0.201	0.325
Hobby	0.032	-0.300	-0.122
General merchandise stores	-0.406	-0.927 ***	-0.252
Miscellaneous merchants	-0.217	0.050	0.424
Bars and restaurants	0.204	-0.701 ***	0.165
Personal services	0.379	-0.699 **	0.003
Provinces of presence[a]			
Newfoundland	0.840 **		
Quebec			0.437 ***
Observations	467	436	436
Wald chi2 (p)	204.590	96.840	106.890
Prob > chi2	0.000	0.000	0.000
Log pseudolikelihood	-554.923	-420.418	-617.779
Pseudo R2	0.127	0.105	0.084

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [a] Significant at 10% or less.

Table B8
Merchant Cash, Debit Card, and Credit Card *Relative* Preferences: Merchants' Perceptions

	Relative Preference		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Relative reliability			
Cash/Debit	1.043 ***		
Debit/Credit		0.515 ***	
Cash/Credit			0.527 ***
Relative risk			
Cash/Debit	-0.123 **		
Debit/Credit		0.144	
Cash/Credit			0.007
Relative cost			
Cash/Debit	-0.209 ***		
Debit/Credit		-1.157 ***	
Cash/Credit			-0.386 ***
Cash payment share	1.396 ***	0.536 *	1.153 ***
Credit card payment share	0.170		
Debit share		0.572 *	-0.171
Corporate/Franchised	-0.193 *	-0.085	-0.184 *
Furniture	0.023	-0.063	-0.093
Electronics	0.298	0.030	0.134
Bldg materials	0.464 **	-0.105	0.172
Health care	0.471 ***	-0.452 *	-0.052
Gas station	0.608 ***	-0.261	0.189
Apparel	0.223	-0.577 **	-0.373
Hobby	0.282	-0.091	0.084
General merchandise stores	0.362 *	-0.234	-0.119
Miscellaneous merchants	-0.004	-0.269	-0.307
Bars and restaurants	0.475 **	-0.617 ***	-0.075
Personal services	0.702 ***	-0.568 *	0.020
Provinces of presence[a]			
Alberta		-0.317 **	
Newfoundland	0.532 **		
Territories	-1.141 **		
Quebec		-0.341 ***	-0.306 ***
Observation	434	417	434
Wald chi2(28)	176.940	100.560	100.390
Prob > chi2	0.000	0.000	0.000
Pseudo R2	0.087	0.061	0.056
Log pseudolikelihood	-844.036	-827.367	-1,065.000

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [a] Significant at 10% or less.

Table B9
Merchant Cash, Debit Card, and Credit Card *Relative* Preferences: Merchants' Characteristics

	Relative preference		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Weighted average transaction value (in log)	-0.082 *		-0.110 **
Weighted average transaction value [1]		-0.015 **	
High transaction volume per terminal	0.270 **	0.039	0.248 *
Total annual transactions	-0.068 **	-0.099 ***	-0.116 ***
Total number of terminals [2]	-0.015 **	0.014 **	-0.004
Corporate/Franchised stores	-0.214 *	0.082	-0.147
Furniture	-0.292	-0.365	-0.472 *
Electronics [1]	0.012	-0.073	-0.123
Bldg materials	0.251	-0.241	-0.130
Health care	0.200	-0.630 ***	-0.350 *
Gas station	0.444 *	-0.417 *	-0.041
Apparel	-0.137	-0.726 ***	-0.628 ***
Hobby	-0.024	-0.322	-0.295
General merchandise stores	0.300	-0.183	-0.062
Miscellaneous merchants	-0.370 *	-0.704 ***	-0.759 ***
Bars and restaurants	0.567 ***	-0.765 ***	-0.106
Personal services	0.495 **	-0.753 **	-0.282
Provinces of presence [a]			
Alberta		-0.335 **	
Newfoundland	0.503 **		
Territories	-1.337 ***		
Quebec		-0.256 *	-0.288 **
Observation	436	419	436
Wald chi2(27)	125.590	71.480	116.990
Prob > chi2	0.000	0.000	0.000
Pseudo R2	0.036	0.032	0.028
Log pseudolikelihood	-896.196	-859.408	-114.500

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [1] Per $100. [2] Per 1,000 terminals. [a] Significant at 10% or less.

Table B10
Cash, Debit Card, and Credit Card Payment Shares of Total Sales Value: Merchants' Perceptions of Reliability, Risk, and Cost

	Payment share		
	Cash	**Debit card**	**Credit card**
Constant	-1.287 ***	-1.629 ***	-2.102 ***
Relative reliability	0.561	1.003 *	0.785
Relative risk	-0.133	0.187	0.106
Relative cost	0.267	0.094	0.036
Corporate/Franchised	0.048	0.018	-0.028
Furniture	-1.489 ***	-0.374 **	0.871 ***
Electronics	-0.824 ***	-0.135	0.355 **
Bldg materials	-0.733 ***	-0.240	0.356 **
Health care	-0.367 ***	-0.046	0.310 **
Gas station	-0.191	0.012	0.608 ***
Apparel	-0.973 ***	0.086	1.010 ***
Hobby	-0.633 ***	0.083	0.773 ***
General merchandise stores	-0.153	0.017	-0.068
Miscellaneous merchants	-0.674 ***	0.081	0.752 ***
Bars and restaurants	-0.005	-0.319 ***	0.381 **
Personal services	-0.095	0.241 *	0.099
Accept cash only	0.783 ***		
Accept cash and debit	0.537 ***		
Accept cash and credit	-0.379		
Provinces of presence[a]			
Alberta	-0.336 ***		0.218 **
Ontario		-0.130 *	
Quebec		-0.190 **	
Nova Scotia	0.346 ***		
PEI	0.650 ***		-0.483 ***
Territories	-1.158 ***	0.802 *	
Observations	414	358	417
F(p,q)	11.250	1.790	5.860
Prob > F	0.000	0.011	0.000
R-squared	0.374	0.113	0.214
Root MSE	0.745	0.595	0.715

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [a] Significant at 10% or less.

Table B11
Cash, Debit Card, and Credit Card Payment Shares of Total Sales Value: Merchants' Characteristics and Perceptions

	Payment share		
	Cash	**Debit card**	**Credit card**
Constant	-0.553 **	-0.944 ***	-2.750 ***
Unweighted avg transaction value (ln)	-0.179 ***	-0.131 ***	0.154 ***
Transactions per terminal[1]	0.141 ***		
5-9 employees	-0.190	-0.147	0.004
10-19 employees	-0.187 *	-0.042	-0.032
20-49 employees	-0.238 *	-0.032	0.014
50-99 employees	-0.285 ***	-0.077	0.147
100+ employees	-0.303 *	-0.092	0.216
Relative reliability	0.561	0.683	0.479
Relative risk	-0.132	0.492	0.252
Relative cost	0.424	0.225	-0.069
Corporate/Franchised	0.100	0.042	-0.026
Only accepts cash	0.707 ***		
Accepts only cash or debit	0.497 ***		
Accepts only cash and credit	-0.360		
Furniture	-1.069 ***	-0.225	0.679 ***
Electronics	-0.600 ***	-0.058	0.284
Bldg materials	-0.470 **	-0.238	0.330 *
Health care	-0.392 ***	-0.199	0.489 ***
Gas station	-0.242 *	-0.125	0.808 ***
Apparel	-0.782 ***	0.109	1.019 ***
Hobby	-0.568 ***	-0.007	0.850 ***
General merchandise stores	-0.151	-0.161	0.043
Miscellaneous merchants	-0.745 ***	-0.093	0.928 ***
Bars and restaurants	0.028	-0.515 ***	0.506 ***
Personal services	-0.192	-0.025	0.326
Provinces of presence[a]			
Alberta	-0.271 **		0.183 *
British Columbia		-0.173 *	
New Brunswick			-0.432 **
Ontario		-0.145 *	
Quebec		-0.190 **	
Nova Scotia	0.253 **		
PEI	0.474 ***		-0.387 *
Territories	-1.113 ***	0.925 **	
Observations	414	342	396
F(p,q)	11.170	2.150	6.390
Prob > F	0.000	0.001	0.000
R-squared	0.423	0.177	0.285
Root MSE	0.722	0.576	0.680

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1] Per 1 million transactions. [a] Significant at 10% or less. Number of employees, instead of total transaction volumes, is used in these models, to avoid endogeneity due to the fact that market shares are a function of total transaction volumes. Also, unweighted ATV is used, since the payment share weights are the dependent variables in these models.

Table B12
Relative Payment Shares: Merchants' Characteristics

	Relative share		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Constant	-0.243	1.369 ***	2.003
Unweighted avg transaction value (ln)	-0.102 **	-0.274 ***	-0.360 ***
Total number of terminals[1]		-0.002 **	0.000
5-9 employees		-0.193	-0.078
10-19 employees		-0.087	-0.043
20-49 employees		-0.172	-0.226
50-99 employees		-0.405 *	-0.518 **
100+ employees		-0.628 **	-0.623 **
Total annual sales[2]	0.090 ***		
Relative ease and dependability	0.223 *	0.088	0.126
Relative risk	-0.036	0.141	-0.005
Relative cost	-0.084	0.002	0.085
Corporated/franchised	-0.102	0.108	0.176
gas+bar & rest.+general+food (dummy)	0.622 ***		
Furniture		-0.652 **	-1.741 ***
Electronics		-0.197	-0.796 **
Bldg materials		-0.107	-0.535
Health care		-0.291	-0.825 ***
Gas station		-0.533 **	-1.038 ***
Apparel		-0.499 **	-1.745 ***
Hobby		-0.341	-1.344 ***
General merchandise stores		0.404	-0.109
Miscellaneous merchants		-0.655 ***	-1.601 ***
Bars and restaurants		-0.707 ***	-0.396
Personal services		-0.168	-0.524
Provinces of presences [a]			
Alberta	-0.2714 *		-0.525 ***
British Columbia		-0.313 *	
Nova Scotia	0.42555 ***		
Ontario	0.32221 ***		
Saskatchewan	0.35858 *		
Territories	-1.9581 **		-1.512 **
New Brunswick			0.828 ***
Prince Edward Island			0.658 **
Observations	366	303	303
F(17, 347)	4.700	4.150	4.150
Prob > F	0.000	0.000	0.000
R-squared	0.215	0.281	0.281
Root MSE	0.925	0.854	0.854

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively.[1] Per 100 terminals. [2] Per $100 million annual sales.

Table B13
Debit and Credit Card Per-Transaction Fees

	Fees					
	Debit card			Credit card		
Constant	-1.687		***	-3.664		***
Transaction volume (ln)	-0.055		*	-0.028		***
Average transaction value	0.032	[1]	***	-0.024	[2]	***
Observations	253			312		
Pseudo R2	0.015			0.033		

Notes: Median regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1] Per $100. [2] Measured in logarithms.