

Assessing the Impact of Proposed Federal Reserve Debit Interchange Policy

William A. Longbrake and Clifford Rossi

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This study concludes that:

- 1) Regulation of debit card interchange fees is warranted only if a market failure exists; however, a correct understanding of economic theory indicates that a failure has not occurred.
- 2) Results from a simulation analysis applied to the theory of the functioning of a two-sided market, which correctly describes the structure of a debit card network, show that the interchange fee is a mechanism for allocating costs collectively across both consumers and merchants in a way that maximizes participation and value. Growing transactions volumes amplify the efficiency and effectiveness of the market; there is no evidence of card overuse or market failure.
- 3) The simulation analysis also shows that imposing a cap on interchange fees would introduce economic distortions benefiting merchants and harming consumers and would lead to overall suboptimal levels of economic and social benefits.
- 4) There is insufficient empirical evidence to support the need for regulation of debit interchange fees as mandated in Section 920 of the Electronic Fund Transfer Act.
- 5) The narrow definition of “allowable costs” in the Federal Reserve’s proposal to cap debit card interchange fees, which limits them principally to direct variable costs of production, will exacerbate the negative and potentially far-reaching consequences of market pricing intervention for consumers and small businesses and could slow down the economic recovery at a time when the economy is still fragile.
- 6) Further study of economic benefits and consequences is warranted before any form of regulatory intervention is implemented.

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² William A. Longbrake is Executive-in-Residence at the Robert H. Smith School of Business, University of Maryland; Clifford Rossi is Executive-in-Residence and Tyser Teaching Fellow, Robert H. Smith School of Business, University of Maryland.

SUMMARY

On May 13, 2010, the Senate passed the Durbin amendment with little debate and no vote in the House of Representatives³. The amendment became new Section 920 of the Electronic Fund Transfer Act (EFTA Section 920), added by Section 1075 of the Dodd Frank Act, which President Obama signed into law on July 21, 2010. The text of the amendment is attached in Appendix 1. The Durbin amendment directs the Board of Governors of the Federal Reserve System (Board) to issue rules relating to debit card interchange fees, network exclusivity, and transaction routing. The Board adopted a notice of proposed rulemaking on December 16, 2010; comments on the proposed rule were due February 22, 2011; and the Dodd Frank Act directs the Board to issue final rules for interchange fee standards by April 21, 2011, which are to be implemented on July 21, 2011, and final rules on network exclusivity and routing by July 21, 2011.

This study demonstrates that restricting debit card interchange fees is based on an incorrect understanding of debit card market economics, and if interchange fee restrictions are implemented as proposed, consumers, small businesses and the economy will be harmed. It is a cardinal tenet of public policy that market and price regulation should be imposed only when a market failure has occurred or in limited circumstances, such as regulation of monopoly utilities, where a market failure could occur. In the absence of clear proof that a market failure exists, government intervention will interfere with the efficient allocation of goods and services and will have unintended impacts on competition which will favor some, who can guide regulatory intervention to serve their individual interests, to the detriment of others. Neither the framers of EFTA Section 920 nor the Board has offered convincing proof that a market failure exists for debit cards. Rather, proponents of price regulation have asserted that a market failure has occurred because issuers are charging excessive interchange fees to acquirers, which are unjustified by issuer costs, and also because issuers are incenting consumers to overuse debit cards. This study examines the economic theory of how a debit card market functions. Theory indicates that it is likely that government intervention will result in a less efficient debit card market with adverse consequences for the payments systems. Based on a rigorous simulation model of two-sided markets, introduction of a cap on debit interchange fees

³ The entire text of the Durbin Amendment to the Dodd-Frank Act is provided in Appendix 1 of this study.

will also harm consumers and could lessen the combined benefits, net of costs, for consumers and merchants (or aggregate consumer and merchant economic welfare, as economists refer to it in economic theory).⁴

HOW DEBIT CARDS WORK

Debit card transactions have dramatically transformed and increased the efficiency of payments systems. Over the last 15 years, technological advances in payment systems capabilities and marketing have facilitated widespread adoption and usage of debit cards by consumers and merchants. Since 1990 debit card transactions have grown at an annual rate of approximately 20 percent, and by 2005, accounted for approximately 50 percent of all retail purchase transactions. By comparison, the use of checks as payment for services declined approximately 5 percent per year between 2000 and 2006.⁵ In recent years, as debit transactions volume has skyrocketed, data provided by MasterCard Worldwide to the U.S. House of Representatives indicate that the amount of the interchange fee as a percentage of the dollar amount of each transaction has remained relatively constant between 1.23% and 1.29% between 2004 and 2010.⁶

Both consumers and merchants have benefited from the use of debit cards. For consumers, debit cards are significantly more convenient than writing checks. The consumer is not burdened by having to show identification to the merchant and can readily receive cash back as part of the transaction because the consumer's checking account balance is immediately debited. The consumer need not carry as much cash when shopping and this reduces the consequences of potential theft. Moreover, debit cards provide numerous advantages for the customer over checks, such as the ability to shop when convenient and not only when a store is open. Self-serve kiosks for a variety of purchases, such as gas and entertainment-related items among others, provide great flexibility and convenience to customers.

⁴ A theoretical model of debit card interchange and a numerical simulation is contained in Appendix 2.

⁵ Prager et al., *Interchange Fees and Payment Card Networks: Economics, Industry Developments, and Policy Issues*, Finance and Economics Discussion Series, Federal Reserve Board, 2009-23., pp. 24-25.

⁶ Data provided by MasterCard Worldwide to the House Financial Services Subcommittee on Financial Institutions and Consumer Credit for a hearing entitled "Understanding the Federal Reserve's Proposed Rule on Interchange Fees: Implications and Consequences of the Durbin Amendment" held on February 17, 2011.

Debit cards also provide customers and merchants alike with peace of mind knowing that fraud protections by issuers are part of the service benefits. Likewise, merchants benefit from debit cards. Cards reduce the cost of verifying the consumer's identity and eliminate the risk that a check will be returned insufficient funds with the attendant collection costs and loss. Of course, it is possible for consumers to commit fraud with debit cards, but issuers assume the responsibility for fraud detection and correction and bear the majority of losses that might be incurred. Merchants who accept debit cards typically experience higher average sales transactions amounts than when cash is used by consumers. In addition, merchants enjoy other benefits such as faster transaction speeds at check-out and savings from moving to more electronic payments (e.g., pay at the pump, costs of check handling). Smaller businesses may benefit to an even greater extent than larger businesses because they can agree to accept debit cards on worldwide payments systems giving them the same access as large businesses. These plug-and-play systems require little additional set up for the small business and hence provide greater opportunity to reach well beyond their actual retail footprint.

Debit card transactions occur in a two-sided market, typically involving four sets of participants who are interconnected through payment networks. The four parties include the institution issuing the debit card (*issuer*), the cardholder (*consumer*), the *merchant* and the merchant's financial institution (*acquirer*). The two sides of the market are issuers and consumers on one side and merchants and acquirers on the other side. Payment network providers facilitate transactions between the four parties. Because there are numerous payment networks, a high degree of competition exists among these entities. They establish interchange fees and the rules governing participation in the network.

A highly effective and efficient debit card market requires broad consumer card adoption and usage and broad merchant participation in accepting cards to create substantial economies of scale. Investment in establishing and operating, on an on-going basis, a broad-based consumer and merchant card platform and supporting operating systems through which debit cards are distributed and managed is extensive and costly. Consequently, a successful

network is one that builds substantial transactions volume so that large scale economies can be realized.

To increase usage of debit cards, issuers and networks provide additional benefits relative to alternative payment mechanisms such as cash, checks and credit (e.g., rental car insurance). Building transactions volume also requires a pricing system in which consumers typically do not incur a transaction fee on debit card use or an annual maintenance fee. In addition, although used less frequently for debit cards than for credit cards, consumers may be offered rewards programs designed to encourage greater use. Without such incentives, consumer adoption and use of debit cards would have progressed much more slowly and critical scale economies might have taken longer to achieve or might not have been achieved at all.

Moreover, as many merchants as possible must participate so that it is convenient for consumers to use debit cards. Merchants quickly realized that participation was in their own best interest because not to do so would involve loss of some sales revenue to other merchants. Greater payment convenience and flexibility for the consumer and higher transactional activity for merchants increased the efficiency of the debit card market, thus benefiting both consumers and merchants. In addition, small issuers can benefit from payment networks, just as small merchants do, by enabling these companies to easily set up debit programs and thus compete against large issuers for customers.

The Federal Reserve's proposed pricing policy will not cover an issuer's total costs which will result in reduced debit card service for consumers and merchants and higher costs to consumers. Currently, merchants are charged a merchant discount fee by the acquirer. The portion that is the interchange fee is passed from the acquirer through the network to the issuer. The merchant receives a deposit in their bank account from the acquirer for the total dollar amount of the transaction with the customer, net of the merchant discount fee. The interchange fee serves as the primary mechanism for allocating costs of setting up and operating debit card payment systems and transactions processing between consumers and merchants. The design of the interchange fee encourages consumer and merchant adoption of cards and has had a substantial favorable impact on increasing the overall size and success of the debit card market.

The Federal Reserve's proposed pricing policy would limit issuer allowable costs to the amount of the cap on interchange fees. Moreover, the definition of allowable cost is narrowly framed and does not appear to be broad enough to capture all costs associated with facilitating debit card transactions but is limited just to those directly associated with authorization, clearance and settlement. If issuers cannot recover costs through the interchange fee, they are likely to respond by reducing service levels, charging customers explicitly for debit card use and, possibly, charging higher fees for other services they provide to customers currently at little or no cost.

While assertions of anticompetitive behavior by networks might lead one to assume that interchange fee pricing might not be optimal and that some parties benefit at the expense of others, there is no evidence that this is the case. First, many payment networks exist, suggesting that this is a highly competitive market. Also, the overall objective of a network is to set the interchange fee at a level which maximizes the size of the market in a way that optimizes aggregate benefits to consumers and merchants net of costs. Although it is difficult to ascertain exactly what level of pricing accomplishes this objective, on-going growth in the number of cards and card usage and an increasing merchant participation rate, strongly implies that interchange pricing is reasonable.

Nevertheless, merchants have asserted that interchange pricing places an unfair burden on them which is caused by unwarranted pricing power by issuers. In other words, merchants claim that the fees more than compensate issuers for the costs associated with operating their networks plus a fair return on their investment. In response to these concerns, Congress included a section in the Dodd-Frank Act requiring the Federal Reserve to regulate interchange fees.

REGULATION OF INTERCHANGE FEES WILL DO MORE HARM THAN GOOD

Section 920 of the Electronic Fund Transfer Act (EFTA section 920) requires the Board of Governors of the Federal Reserve System (Board) to adopt regulations that fees charged by issuers must be reasonable and proportionate to the underlying costs of the transaction.

Section 1075 of the Dodd-Frank Act amended the Electronic Funds Transfer Act regarding payment systems transactions fees and rules. A key provision of EFTA section 920 is that

transactions fees charged by debit card issuers must be “reasonable and proportionate” to the issuer’s cost incurred with respect to the transaction. The new regulations focus on issuers with assets over \$10 billion because EFTA section 920 exempts smaller issuers.

The Board has proposed two alternatives for addressing the pricing of interchange fees. Alternative 1 allows issuers to establish interchange fees subject to a safe harbor amount of no more than 7 cents per transaction, or an amount that does not exceed the issuer’s allowable costs up to a cap of 12 cents per transaction. *Allowable costs* are defined to include those costs associated with authorization, clearance and settlement. Each issuer would calculate their total allowable costs divided by their total transactions to arrive at an average variable cost per transaction. Fixed costs associated with the debit card transaction are not included as part of the allowable cost calculation. Alternative 2 simply imposes a cap on interchange fees of 12 cents per transaction. The Board staff derived this amount from a survey of issuers showing that average variable cost was 13 cents per transactions across all issuers, but was only 4 cents per transaction when weighted for differences in issuers’ volumes. By comparison, the Board survey revealed that average interchange fees received by issuers was 44 cents per transaction. Based on the survey, the Board staff asserts that 80 percent of issuers would be able to recover their variable costs under the proposed interchange cap fee regulation.

Regulating interchange fees is not a new concept. In 2003, Australia’s central bank, the Reserve Bank of Australia (RBA), acting on the recommendations of a Payments System Board study of interchange fees and access, determined that interchange fees for cards were set above certain cost levels. This lead RBA to impose restrictions on interchange fees including caps, which reduced fees by about one-half.

The Australian experience indicates that reducing and capping interchange fees resulted, as theory indicates, in redistributing benefits from one group to another. While it was expected that much of the reduction in fees would be passed on to consumers, there is no clear evidence that that happened. However, there is evidence that issuers were able to offset revenue reductions due to reduced fees partially, by about one-third to one-half, by charging higher fees to customers. Merchants benefited from the lower fees, issuers were made worse off than before

and consumers experienced increased fees and no measurable reduction in the cost of goods or services.

ECONOMIC THEORY OF THE MULTI-PARTY MARKET FOR DEBIT CARDS

Why have previous initiatives to restrict interchange fees been unsuccessful in achieving purported objectives? Policies that restrict interchange fees are based on an incorrect understanding of the difference in how two-sided, multi-party markets function compared to standard one-sided, two-party markets. Standard markets are composed of two parties – a buyer and a seller. Such markets achieve optimum efficiency when no one buyer or seller can influence the price. Furthermore, the price reflects the cost of production plus an appropriate (means not excessive) return on capital. A market failure occurs if a participant can control the price and in so doing benefits at the expense of other market participants. A market failure can also occur if participants are denied access or experience discriminatory treatment of some sort.

But the debit card market is a multi-party, not a standard one-sided, market. In a multi-party market, the optimum outcome depends on the benefits and costs that all participants experience, but it also depends very importantly on the overall size of the market. Application of standard two-party market economic theory of aligning revenues and costs for each group of market participants can result in reducing the combined benefits, net of costs, for all groups collectively in a multi-party market. If the economics of standard markets were applied to each group of participants in the multi-party debit card market, then each group – issuers, consumers, merchants and acquirers – would have benefits/revenues aligned with costs. While one might think this would be fair and would result in an optimal outcome, it is clear from an understanding of multi-party market economics that this would likely not be the case. This can be understood intuitively by asking whether consumers would adopt and use debit cards without incentives. Introduction of incentives clearly changes the value proposition for consumers and unambiguously stimulates much greater use. Greater use of an efficient payments mechanism benefits society as a whole and to the extent that large scale economies are involved, greater use also reduces transactional costs.

What of the issuer who appears to be benefiting at the expense of the merchant? Competition among payments networks to seek issuers and merchants to build cardholder market share leads them to provide ancillary benefits to cardholders, such as payment protection and rewards programs. Such programs provide additional benefits to consumers which helps increase card usage. These markets are very competitive. Many payment networks exist, competing among each other for both issuers and merchants. Likewise, acquirers compete to bring the broadest number of merchants to participate in the market and issuers compete for customers that will carry their card.

If issuer revenues are limited to recovery of operating costs, issuers will jettison programs that provide additional benefits and attempt to recover some of the cost by levying fees on consumers. In both cases the consumer will bear some of the burden and card usage likely will be less than it would have been without curtailment of programs and changes in pricing terms. A simulation of debit interchange markets under alternative economic conditions (see Appendix 2) shows regulatory intervention can do more harm than good.

SIMULATIONS OF THE DEBIT CARD INTERCHANGE MARKET

To grasp a better understanding of how a cap on debit interchange fees would affect consumers, merchants and the economy, an economic model of an interchange market was developed, which is described in detail in Appendix 2. Using this model, a set of scenarios was examined.

Scenario One: Single Issuer, Single Acquirer

This scenario is referred to by economists as a bi-lateral monopoly. Theory indicates in this case that there is a unique interchange fee that maximizes profits, issuer and acquirer utility, output and total economic welfare (total benefits net of costs for issuers and acquirers). In other words, there is a single fee that is best for everybody.

Scenario Two: Multiple Issuers, Multiple Acquirers

Scenario two extends economic theory to markets where there are multiple issuers and acquirers. In this scenario, there is no single value for the interchange fee that aligns the optimum values of profits, output, utility and economic welfare. These results are significant for several reasons. First, under the general condition where multiple issuers and acquirers exist, which is exactly the case for the debit card market, underlying consumer and merchant demand functions, along with other key structural aspects of the model, imply a multiplicity of possible outcomes for the interchange fee where maximization of economic welfare and profits are not aligned. A key point of the theory and numerical simulation is that it would be extremely difficult for regulators to know exactly at what level to establish the interchange fee so as to maximize economic welfare (total benefits net of costs) collectively for all participants in the market.

Another important implication of scenario two is the tradeoff that occurs between consumer and merchant utility. If interchange fees are capped at a low level, this has the impact of improving the utility of merchants at the expense of consumers. What this means is that if the objective of policy is to maximize overall card usage, that will not happen if the interchange fee is set too low.

Economic Theory and Numerical Simulation Conclusions

The numerical simulation results, derived from applying the theory of interchange markets by Schmalensee⁷, suggest that regulators would be misguided to establish caps on interchange fees without more detailed empirical analysis of how the various components of the debit card multi-party market would respond to changes in the interchange fee. The interchange fee which optimizes economic welfare (aggregate benefits of all parties less costs) may not be the same as the interchange fee that maximizes merchant utility or consumer utility. Further, it is shown in the simulation that setting an interchange fee that is substantially lower could reduce the aggregate level of consumer and merchant economic welfare. The implication of this finding is that the Federal Reserve's proposed rule to cap the debit card interchange fee at a fraction of its current level could reduce aggregate benefits, net of costs, of all market participants. **Regulators do not currently have the kind of information necessary to accurately establish the optimal level of interchange fees. Further, while merchant utility may be improved by lowering**

⁷ Richard Schmalensee, Payment Systems and Interchange Fees, The Journal of Industrial Economics, Vol. 50, No., 2, June 2002, pp. 103-122.

the interchange fee, it is likely to come at the expense of consumers whose utility would decrease under a cap that lowers the interchange fee.

CONSEQUENCES OF INTERCHANGE REGULATION

In the absence of clear proof that a market failure exists, government intervention will interfere with an efficient allocation of goods and services to the detriment of consumers, small businesses, and the economy. Practically speaking, this means in multi-party markets, such as that for debit cards, maximization of economic welfare may result in unequal treatment of individual groups of participants. A large and efficiently functioning debit card market requires high consumer card adoption and usage and this is best accomplished through incentives. That means by definition that at least one party in a multi-party market will bear the burden of these incentives. In the case of debit cards, merchants bear the burden of providing the incentive. EFTA section 920 and the Federal Reserve's proposed interchange fee cap regulation will reduce the burden for merchants but in so doing will harm consumers and probably decrease the aggregate economic benefits of today's debit card market and lessen the efficiency of the payments systems.

Consumers would be negatively affected by the proposed cap on interchange fees. A likely outcome, should the Federal Reserve's proposed regulation be implemented, is that cardholders will be charged explicitly for card usage. Some cardholders will respond by shifting their choice of payment means toward transaction types that are less convenient and flexible and that are more costly from an overall system standpoint, but explicitly less costly to the customer than using a debit card. In addition, issuers are likely to charge for other kinds of banking services or raise fees in an effort to cover costs that can no longer be fully recovered through a regulated interchange fee. Some argue that higher customer costs will be offset because merchants will pass reduced interchange fees through to consumers. First, there is no definitive empirical evidence that this has happened in other countries that chose to limit interchange fees. Second, even if some kind of pass through were to occur, it would be opaque to consumers. In other words, it is highly unlikely that consumers would understand the linkage between higher explicit debit card charges and lower prices for goods and services they consume. Consumers will

respond to what is explicit, not what is implicit. This means that consumers will respond to explicit debit card charges by seeking to reduce the expense to them.

Another potential casualty in capping debit interchange fees would be small businesses, assuming consumers reduce their usage of debit cards in response to increases in costs and/or to decreases in services associated with debit card transactions. Smaller merchants are more susceptible to a reduction in consumer spending behavior than larger merchants. While the redistributive effects of a cap on debit interchange fees may benefit merchants on average, it could result in negative consequences for small business via consumer reaction to higher costs and lower services associated with debit transactions under a cap on fees.

Merchants generally would face higher costs associated with fraud, credit loss, and check verification and processing services as consumers react to the policy and diminish use of debit cards. For example, fees for check verification average 1.85% of the transaction plus a 35-50 cent fee per transaction.⁸ In 2008, check fraud losses were estimated at over \$1 billion and have risen over the last few years.⁹ Furthermore, cash and checks involve greater administrative and manual processes for merchants than do debit cards, resulting in greater costs. Finally, merchant costs associated with cash theft are high. And, because of more limited resources to handle the added administrative burden, smaller merchants would be adversely affected to a much greater degree.

Additionally, the stringent nature of the Federal Reserve's proposed rule and the negative shock effect that it might spawn for consumer spending would be unwelcome at a time when a still weak economy is struggling to gather forward momentum. The prospect of negative impacts on U.S. consumers and small businesses stemming from implementation of the proposed interchange fee cap is coming at a time when the fragile US economy is just beginning to emerge from the ravages of the recent financial crisis. Rather than helping the economy recover, implementation of an interchange fee cap would be a procyclical policy that would raise consumer costs, discourage spending and adversely impact small business owners. Collectively these consequences could slow economic recovery.

⁸ Todd J. Zywicki, The Economics of Payment Card Interchange Fees and the Limits of Regulation, ICLE Financial Regulatory Program White Paper Series, June 2, 2010.

⁹ American Bankers Association, 2009 ABA Deposit Account Fraud Survey, 2009.

CONCLUSIONS AND POLICY RECOMMENDATIONS

- 1) Regulation of debit card interchange fees is warranted only if a market failure exists; however, a correct understanding of economic theory indicates that a failure has not occurred.** The proposed Federal Reserve policy capping debit interchange fees presumes that some form of market failure has occurred. In the context of debit interchange fees the economic theory of the two-sided, four-party debit card market cannot definitively assert that a market failure has or has not occurred. What can be concluded from the theory is that a socially and economically optimal outcome is not likely through the implementation of a cap on debit interchange fees.
- 2) Results from a simulation analysis applied to the theory of the functioning of a two-sided market, which correctly describes the structure of a debit card network, show that the interchange fee is a mechanism for allocating costs collectively across both consumers and merchants in a way that maximizes network participation and value. Growing transactions volumes amplify the efficiency and effectiveness of the market; there is no evidence of card overuse or market failure.** In some sense it is incumbent on policymakers to provide evidence that the market has failed in some fashion either by providing too much or too little in the way of debit card transactions services. The pronounced growth in debit transactions does not imply that debit card usage has grown too much vis-a-vis other payment types at the expense of merchants.
- 3) The simulation analysis also shows that imposing a cap on interchange fees would introduce economic distortions benefiting merchants and harming consumers and would lead to overall suboptimal levels of economic and social benefits.** The Federal Reserve's proposed policy appears to be based on standard one-sided market economic theory rather than a two-sided market by focusing solely on interchange fees as a direct pricing mechanism to merchants rather than as a balancing mechanism between consumers and merchants in an effort to maximize value for both consumers and merchants to promote usage. Further, imposing a cap applicable to all issuers ignores

the variability in costs that can occur due to transaction size, merchant type/product and other considerations. The potential for unintended negative consequences is significant and as a result further analysis should be conducted before any rule is adopted. In this regard, the statutory mandate to issue a final interchange fee standards rule by April 21, 2011 is seriously misguided.

4) There is insufficient empirical evidence to support the need for regulation of debit interchange fees as mandated in Section 920 of the Electronic Fund Transfer Act.

The optimizing level of the interchange fee is dependent upon the sensitivity of debit card demand by consumers and merchants as well as upon any other associated benefits from debit card transactions to these groups. From a public policy perspective, empirically ascertaining the levels of each of these components in a two-sided market poses serious challenges and yet sound and sensible public policy which minimizes the risk of negative consequences, demands that such an effort be made. At this juncture, very little empirical evidence on these relationships has surfaced in the academic literature rendering it difficult, if not impossible; to determine the extent to which unregulated debit interchange fees create an economically inefficient outcome. Quantifying consumer and merchant demand behavior with respect to debit card use is fraught with data limitations. As a first step toward understanding the impact of interchange fees it is recommended that policymakers conduct analysis to quantify the underlying relationships in this market before implementing regulatory policies.

5) The narrow definition of “allowable costs” in the Federal Reserve’s proposal to cap debit card interchange fees, which limits such costs principally to direct costs of production, will exacerbate the negative and potentially far-reaching consequences of market pricing intervention for consumers and small businesses and could slow down the economic recovery at a time when the economy is still fragile. Under the law, flawed as it is, the Federal Reserve has an obligation to implement it. However, the Federal Reserve has chosen to define extremely narrowly the statutory term “allowable costs” to include only the directly variable costs associated with processing debit card transactions. This narrow interpretation, if implemented, surely will change dramatically

the way in which issuers price debit card services and the kinds of ancillary programs they provide. The consequences, although difficult to discern, could be significantly negative and far-reaching. Moreover, the proposed Federal Reserve policy is procyclical in nature which threatens the emerging recovery. By redistributing the benefits of debit interchange fees away from consumers toward merchants, it will impose higher costs onto consumers. This could further weaken consumer spending with negative implications for both businesses and the economy in general. Adverse impacts are likely to be greater for smaller than larger businesses.

6) Further study of economic benefits and consequences is warranted before regulatory intervention is implemented. The growth in debit card transactions over the last 15 years has brought significant benefits to consumers in the form of convenience, fraud protection and payment flexibility, to name but a few of the more prominent benefits. As debit cards have surpassed cash and checks as a primary payment method for consumers, this additional flexibility has benefitted merchants by increasing the volume of purchases. Because of the potential for severe negative consequences, prior to any regulatory intervention into this area, further study is warranted.

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Appendix 1

Text of Durbin Amendment from Dodd-Frank Act

“SEC. 920. REASONABLE FEES AND RULES FOR PAYMENT CARD TRANSACTIONS.

“(a) REASONABLE INTERCHANGE TRANSACTION FEES FOR ELECTRONIC DEBIT TRANSACTIONS.—

“(1) REGULATORY AUTHORITY OVER INTERCHANGE TRANSACTION FEES.—The Board may prescribe regulations, pursuant to section 553 of title 5, United States Code, regarding any interchange transaction fee that an issuer may receive or charge with respect to an electronic debit transaction, to implement this subsection (including related definitions), and to prevent circumvention or evasion of this subsection.

“(2) REASONABLE INTERCHANGE TRANSACTION FEES.—The amount of any interchange transaction fee that an issuer may receive or charge with respect to an electronic debit transaction shall be reasonable and proportional to the cost incurred by the issuer with respect to the transaction.

“(3) RULEMAKING REQUIRED.—

“(A) IN GENERAL.—The Board shall prescribe regulations in final form not later than 9 months after the date of enactment of the Consumer Financial Protection Act of 2010, to establish standards for assessing whether the amount of any interchange transaction fee described in paragraph (2) is reasonable and proportional to the cost incurred by the issuer with respect to the transaction.

“(B) INFORMATION COLLECTION.—The Board may require any issuer (or agent of an issuer) or payment card network to provide the Board with such information as may be necessary to carry out the provisions of this subsection and the Board, in issuing rules under subparagraph (A) and on at least a bi-annual basis thereafter, shall disclose such aggregate or summary information concerning the costs incurred, and interchange transaction fees charged or received, by issuers or payment card networks in connection with the authorization, clearance or settlement of electronic debit transactions as the Board considers appropriate and in the public interest.

“(4) CONSIDERATIONS; CONSULTATION.—In prescribing regulations under paragraph (3)(A), the Board shall—

“(A) consider the functional similarity between—

- “(i) electronic debit transactions; and
- “(ii) checking transactions that are required within the Federal Reserve bank system to clear at par;

“(B) distinguish between—

- “(i) the incremental cost incurred by an issuer for the role of the issuer in the authorization, clearance, or settlement of a particular electronic debit transaction, which cost shall be considered under paragraph (2); and
- “(ii) other costs incurred by an issuer which are not specific to a particular electronic debit transaction, which costs shall not be considered under paragraph (2); and

“(C) consult, as appropriate, with the Comptroller of the Currency, the Board of Directors of the Federal Deposit Insurance Corporation, the Director of the Office of Thrift Supervision, the National Credit Union Administration Board, the Administrator of the Small Business Administration, and the Director of the Bureau of Consumer Financial Protection.

“(5) ADJUSTMENTS TO INTERCHANGE TRANSACTION FEES FOR FRAUD PREVENTION COSTS.—

“(A) ADJUSTMENTS.—The Board may allow for an adjustment to the fee amount received or charged by an issuer under paragraph 25 (2), if—

“(i) such adjustment is reasonably necessary to make allowance for costs incurred by the issuer in preventing fraud in relation to electronic debit transactions involving that issuer; and

“(ii) the issuer complies with the fraud-related standards established by the Board under subparagraph (B), which standards shall—

“(I) be designed to ensure that any fraud-related adjustment of the issuer is limited to the amount described in clause (i) and takes into account any fraud-related reimbursements (including amounts from charge-backs) received from consumers, merchants, or payment card networks in relation to electronic debit transactions involving the issuer; and

“(II) require issuers to take effective steps to reduce the occurrence of, and costs from, fraud in relation to electronic debit transactions, including through the development and implementation of cost-effective fraud prevention technology.

“(B) RULEMAKING REQUIRED.—

“(i) IN GENERAL.—The Board shall prescribe regulations in final form not later than 9 months after the date of enactment of the Consumer Financial Protection Act of 2010, to establish standards for making adjustments under this paragraph.

“(ii) FACTORS FOR CONSIDERATION.—In issuing the standards and prescribing regulations under this paragraph, the Board shall consider—

“(I) the nature, type, and occurrence of fraud in electronic debit transactions;

“(II) the extent to which the occurrence of fraud depends on whether authorization in an electronic debit transaction is based on signature, PIN, or other means;

“(III) the available and economical means by which fraud on electronic debit transactions may be reduced;

“(IV) the fraud prevention and data security costs expended by each party involved in electronic debit transactions (including consumers, persons who accept debit cards as a form of payment, financial institutions, retailers and payment card networks);

“(V) the costs of fraudulent transactions absorbed by each party involved in such transactions (including consumers, persons who accept debit cards as a form of payment, financial institutions, retailers and payment card networks);

“(VI) the extent to which interchange transaction fees have in the past reduced or increased incentives for parties involved in electronic debit transactions to reduce fraud on such transactions; and

“(VII) such other factors as the Board considers appropriate.

“(6) EXEMPTION FOR SMALL ISSUERS.—

“(A) IN GENERAL.—This subsection shall not apply to any issuer that, together with its affiliates, has assets of less than \$10,000,000,000, and the Board shall exempt such issuers from regulations prescribed under paragraph (3)(A).

“(B) DEFINITION.—For purposes of this paragraph, the term “issuer” shall be limited to the person holding the asset account that is debited through an electronic debit transaction.

“(7) EXEMPTION FOR GOVERNMENT-ADMINISTERED PAYMENT PROGRAMS AND RELOADABLE PREPAID CARDS.—

“(A) IN GENERAL.—This subsection shall not apply to an interchange transaction fee charged or received with respect to an electronic debit transaction in which a person uses—

“(i) a debit card or general-use prepaid card that has been provided to a person pursuant to a Federal, State or local government-administered payment program, in which the person may only use the debit card or general-use prepaid card to transfer or debit funds, monetary value, or other assets that have been provided pursuant to such program; or

“(ii) a plastic card, payment code, or device that is—

“(I) linked to funds, monetary value, or assets which are purchased or loaded on a prepaid basis;

“(II) not issued or approved for use to access or debit any account held by or for the benefit of the card holder (other than a subaccount or other method of recording or tracking funds purchased or loaded on the card on a prepaid basis);

“(III) redeemable at multiple, naffiliated merchants or service providers, or automated teller machines;

“(IV) used to transfer or debit unds, monetary value, or other assets; and

“(V) reloadable and not marketed or labeled as a gift card or gift certificate.

“(B) EXCEPTION.—Notwithstanding subparagraph (A), after the end of the 1-year period beginning on the effective date provided in paragraph (9) his subsection shall apply to an interchange transaction fee charged or received with respect to an electronic debit transaction described in

subparagraph (A)(i) in which a person uses a general-use prepaid card, or an electronic debit transaction described in subparagraph (A)(ii), if any of the following fees may be charged to a person with respect to the card:

“(i) A fee for an overdraft, including a shortage of funds or a transaction processed for an amount exceeding the account balance.

“(ii) A fee imposed by the issuer for the first withdrawal per month from an automated teller machine that is part of the issuer’s designated automated teller machine network.

“(C) DEFINITION.—For purposes of subparagraph (B), the term ‘designated automated teller machine network’ means either—

“(i) all automated teller machines identified in the name of the issuer; or

“(ii) any network of automated teller machines identified by the issuer that provides reasonable and convenient access to the issuer’s customers.

“(D) REPORTING.—Beginning 12 months after the date of enactment of the Consumer Financial Protection Act of 2010, the Board shall annually provide a report to the Congress regarding —

“(i) the prevalence of the use of general-use prepaid cards in Federal, State or local government-administered payment programs; and

“(ii) the interchange transaction fees and cardholder fees charged with respect to the use of such general-use prepaid cards.

“(8) REGULATORY AUTHORITY OVER NETWORK FEES.—

“(A) IN GENERAL.—The Board may prescribe regulations, pursuant to section 553 of 22 title 5, United States Code, regarding any network fee.

“(B) LIMITATION.—The authority under subparagraph (A) to prescribe regulations shall be limited to regulations to ensure that—

“(i) a network fee is not used to directly or indirectly compensate an issuer with respect to an electronic debit transaction; and

“(ii) a network fee is not used to circumvent or evade the restrictions of this subsection and regulations prescribed under such subsection.

“(C) RULEMAKING REQUIRED.—The Board shall prescribe regulations in final form before the end of the 9-month period beginning on the date of the enactment of the Consumer Financial Protection Act of 2010, to carry out the authorities provided under subparagraph (A).

“(9) EFFECTIVE DATE.—This subsection shall take effect at the end of the 12-month period beginning on the date of the enactment of the Consumer Financial Protection Act of 2010.

“(b) LIMITATION ON PAYMENT CARD NETWORK RESTRICTIONS.—

“(1) PROHIBITIONS AGAINST EXCLUSIVITY ARRANGEMENTS.—

“(A) NO EXCLUSIVE NETWORK.—The Board shall, before the end of the 1-year period beginning on the date of the enactment of the Consumer Financial Protection Act of 2010, prescribe regulations providing that an issuer or payment card network shall not directly or through any agent, processor, or licensed member of a payment card network, by contract, requirement, condition, penalty, or otherwise, restrict the number of payment card networks on which an electronic debit transaction may be processed to—

“(i) 1 such network; or

“(ii) 2 or more such networks which are owned, controlled, or otherwise operated by —

“(I) affiliated persons; or

“(II) networks affiliated with such issuer.

“(B) NO ROUTING RESTRICTIONS.—The Board shall, before the end of the 1-year period beginning on the date of the enactment of the Consumer Financial Protection Act of 2010, prescribe regulations providing that an issuer or payment card network shall not, directly or through any agent, processor, or licensed member of the network, by contract, requirement, condition, penalty, or otherwise, inhibit the ability of any person who accepts debit cards for payments to direct the routing of electronic debit transactions for processing over any payment card network that may process such transactions.

“(2) LIMITATION ON RESTRICTIONS ON OFFERING DISCOUNTS FOR USE OF A FORM OF PAYMENT.—

“(A) IN GENERAL.—A payment card network shall not, directly or through any agent, processor, or licensed member of the network, by contract, requirement, condition, penalty, or otherwise, inhibit the ability of any person to provide a discount or in-kind incentive for payment by the use of cash, checks, debit cards, or credit cards to the extent that—

“(i) in the case of a discount or in kind incentive for payment by the use of debit cards, the discount or in-kind incentive does not differentiate on the basis of the issuer or the payment card network;

“(ii) in the case of a discount or in-kind incentive for payment by the use of credit cards, the discount or in-kind incentive does not differentiate on the basis of the issuer or the payment card network; and

“(iii) to the extent required by Federal law and applicable State law, such discount or in-kind incentive is offered to all prospective buyers and disclosed clearly and conspicuously.

“(B) LAWFUL DISCOUNTS.—For purposes of this paragraph, the network may not penalize any person for the providing of a discount that is in compliance with Federal law and applicable State law.

“(3) LIMITATION ON RESTRICTIONS ON SETTING TRANSACTION MINIMUMS OR MAXIMUMS.—

“(A) IN GENERAL.—A payment card network shall not, directly or through any agent, processor, or licensed member of the network, by contract, requirement, condition, penalty, or otherwise, inhibit the ability—

“(i) of any person to set a minimum dollar value for the acceptance by that person of credit cards, to the extent that —

“(I) such minimum dollar value does not differentiate between issuers or between payment card networks; and

“(II) such minimum dollar value does not exceed \$10.00; or

“(ii) of any Federal agency or institution of higher education to set a maximum dollar value for the acceptance by that Federal agency or institution of higher education of credit cards, to the extent that such maximum dollar value does not differentiate between issuers or between payment card networks.

“(B) INCREASE IN MINIMUM DOLLAR AMOUNT.—The Board may, by regulation prescribed pursuant to section 553 of title 5, United States Code, increase the amount of the dollar value listed in subparagraph (A)(i)(II).

“(4) RULE OF CONSTRUCTION:—No provision of this subsection shall be construed to authorize any person—

“(A) to discriminate between debit cards within a payment card network on the basis of the issuer that issued the debit card; or

“(B) to discriminate between credit cards within a payment card network on the basis of the issuer that issued the credit card.

“(c) DEFINITIONS.—For purposes of this section, the following definitions shall apply:

“(1) AFFILIATE.—The term ‘affiliate’ means any company that controls, is controlled by, or is under common control with another company.

“(2) DEBIT CARD.—The term ‘debit card’—

“(A) means any card, or other payment code or device, issued or approved for use through a payment card network to debit an asset account (regardless of the purpose for which the account is established), whether authorization is based on signature, PIN, or other means;

“(B) includes a general-use prepaid card, as that term is defined in section 915(a)(2)(A); and

“(C) does not include paper checks.

“(3) CREDIT CARD.—The term ‘credit card’ has the same meaning as in section 103 of the Truth in Lending Act.

“(4) DISCOUNT.—The term ‘discount’—

“(A) means a reduction made from the price that customers are informed is the regular price; and

“(B) does not include any means of increasing the price that customers are informed is the regular price.

“(5) ELECTRONIC DEBIT TRANSACTION.—The term ‘electronic debit transaction’ means a transaction in which a person uses a debit card.

“(6) FEDERAL AGENCY.—The term ‘Federal agency’ means—

“(A) an agency (as defined in section 101 of title 31, United States Code);
and

“(B) a Government corporation (as defined in section 103 of title 5, United States Code).

“(7) INSTITUTION OF HIGHER EDUCATION.— The term ‘institution of higher education’ has the same meaning as in 101 and 102 of the Higher Education Act of 1965 (20 U.S.C. 1001, 1002).

“(8) INTERCHANGE TRANSACTION FEE.—The term ‘interchange transaction fee’ means any fee established, charged or received by a payment card network for the purpose of compensating an issuer for its involvement in an electronic debit transaction.

“(9) ISSUER.—The term ‘issuer’ means any person who issues a debit card, or credit card, or the agent of such person with respect to such card.

“(10) NETWORK FEE.—The term ‘network fee’ means any fee charged and received by a payment card network with respect to an electronic debit transaction, other than an interchange transaction fee.

“(11) PAYMENT CARD NETWORK.—The term ‘payment card network’ means an entity that directly, or through licensed members, processors, or agents, provides the proprietary services, infrastructure, and software that route information and data to conduct debit card or credit card transaction authorization, clearance, and settlement, and that a person uses in order to accept as a form of payment a brand of debit card, credit card or other device that may be used to carry out debit or credit transactions.

“(d) ENFORCEMENT.—

“(1) IN GENERAL.—Compliance with the requirements imposed under this section shall be enforced under section 918.

“(2) EXCEPTION.—Sections 916 and 917 shall not apply with respect to this section or the requirements imposed pursuant to this section.”.

(b) AMENDMENT TO THE FOOD AND NUTRITION ACT OF 2008.—Section 7(h)(10) of the Food and Nutrition Act of 2008 (7 U.S.C. 2016(h)(10)) is amended to read as follows:

“(10) FEDERAL LAW NOT APPLICABLE.—Section 920 of the Electronic Fund Transfer Act shall not apply to electronic benefit transfer or reimbursement systems under this Act.”.

(c) AMENDMENT TO THE FARM SECURITY AND RURAL INVESTMENT ACT OF 2002.—Section 4402 of the Farm Security and Rural Investment Act of 2002 (7 U.S.C. 3007) is amended by adding at the end the following new subsection:

“(f) FEDERAL LAW NOT APPLICABLE.—Section 920 of the Electronic Fund Transfer Act shall not apply to electronic benefit transfer systems established under this section.”.

(d) AMENDMENT TO THE CHILD NUTRITION ACT OF 1966.—Section 11 of the Child Nutrition Act of 1966 (42 U.S.C. 1780) is amended by adding at the end the following:

“(c) FEDERAL LAW NOT APPLICABLE.—Section 920 of the Electronic Fund Transfer Act shall not apply to electronic benefit transfer systems established under this Act or the Richard B. Russell National School Lunch Act (42 U.S.C. 1751 et seq.).”.

Appendix 2

A Theoretical Model of Debit Interchange

To analyze how a cap on debit interchange fees would affect consumers, merchants and the economy, an economic model of an interchange market is developed below. Then numerical simulations are conducted to ascertain the impacts regulating the interchange fee has on consumers, merchants and the economy. The theoretical model is based on a theoretical paper written by Richard Schmalensee.¹⁰

The market for debit card transactions is two-sided, with consumers and merchants linked through a network provider. The existence of far reaching impacts (economists refer to these as externalities) in the debit card market has major implications for application of public policy as it turns out that the focus of policy in such markets ought to be on the total price charged collectively to both consumers and merchants rather than on the allocation of total price between parties. The interchange fee then acts as the mechanism for allocating costs of the debit card system between consumers and merchants so as to maximize participation in the network which in turn reflects the value assigned by the two parties due to externalities.

More importantly, economic theory in a two-sided market indicates that the interchange fee is not a vehicle for increasing a firm's market power, but is the primary means for maximizing the overall value of the debit card system for all participants. Underlying the debit card network and its pricing are externalities to consumers and merchants that interchange fees attempt to balance. Ignoring these benefits which accrue among users of the system vastly mischaracterizes the fundamental economics of the debit card market.

Over the last decade, interest in understanding the economic theory behind interchange markets has grown and is summarized in a review of the literature by Richard Schmalensee.¹¹ An article by William F. Baxter, written in 1983, presented the interchange market for the first time in the

¹⁰ Richard Schmalensee, Payment Systems and Interchange Fees, *The Journal of Industrial Economics*, Vol. 50, No., 2, June 2002, pp. 103-122.

¹¹ Richard Schmalensee, Interchange Fees: A Review of the Literature, *Payment Card Economics Review*, vol 1, no. 1, 2003, pp. 25-44

context of a two-sided market.¹² Specifically, he recognized that consumers and merchants drive the amount of transactions in the system. In Baxter's framework, both issuers and acquirers operated under perfectly competitive markets. In this context interchange fees were set, not to maximize profits, but rather to balance the demand and supply of card transactions.

However, interchange markets tend to operate under imperfect competition which can lead to differences between optimal economic welfare (aggregate benefits for all parties net of costs) and profitability. The assumption that markets are perfectly competitive in the Baxter analysis oversimplifies how interchange markets actually operate. Schmalensee extended Baxter's work by treating interchange markets as imperfectly competitive while other aspects of the economy were assumed to operate under perfect competition.¹³ As a result, Schmalensee was able to apply welfare theory to derive specific outcomes with respect to profits and economic welfare. Under specific conditions, as in the case of bilateral monopoly where there is only one issuer and one acquirer, Schmalensee was able to demonstrate that an interchange fee that maximizes profit also maximizes economic welfare and output in the system. Within this framework, regulation of interchange fees, Schmalensee argues, could only be harmful. In generalizing the model to multiple issuers and acquirers, he discovered that a unique interchange fee that maximizes profit, welfare and output was unlikely. As a result, Schmalensee contended that regulating interchange fees in a manner that does not introduce inefficient distortions into the system would be extraordinarily difficult.

Other studies have followed. In the seminal article by Rochet and Tirole, the authors assumed imperfect competition among merchants (applying the simplistic assumption that all are identical), and perfect competition for acquirers.¹⁴ Theirs is the first analysis of interchange in the form of a four-party arrangement. In their model, all profits are earned by the issuer and the profit maximizing interchange fee, while possible to be the same as the fee that optimizes economic welfare is likely to be higher due to merchants absorbing some of the benefits accruing to consumers through competition among merchants for cards. This result supports the

¹² William F. Baxter, Bank Interchange of Transactional Paper: Legal and Economic Perspectives, 26, *Journal of Law and Economics*, 1983.

¹³ Richard Schmalensee, Payment Systems and Interchange Fees, *The Journal of Industrial Economics*, Vol. 50, No., 2, June 2002, pp. 103-122.

¹⁴ Jean-Charles Rochet and Jean Tirole, Two-Sided Markets: An Overview, IDEI-CEPR conference paper, March 2004.

perspective that regulatory caps on interchange fees could enhance economic welfare. However, the results are highly dependent on the critical and overly simplistic assumption that merchants are identical. Others, such as Wright, have demonstrated that relaxing this assumption results in profit-maximizing interchange fees that may be above, at or below the economic welfare maximizing fee.¹⁵

Although the studies described above provide rigorous theoretical arguments for describing interchange markets, this study extends Schmalensee's work to simulate interchange fee outcomes on total system output, economic welfare, consumer and merchant utility and profits. The Schmalensee theoretical framework is used based on its ability to frame interchange fees in a four-party system under assumptions of imperfect competition in order to explore the implications of the level of the interchange fee for economic welfare, profit and output. The numerical simulation provides an opportunity to explore the implications of Schmalensee's theoretical results in the context of specific examples.

A two-sided market in economics is defined to be one where the number of transactions in the market is dependent not on aggregate price levels, but rather on the prices of buyers (consumers), keeping aggregate prices constant. A two-sided debit market, according to Schmalensee, can be characterized by imperfect competition among issuers of debit cards where consumers and merchants face their own set of demand for debit cards and prices for this payment type. Acquirers (A) charge merchants fixed fees known as merchant discounts P_A . Likewise, card issuers (I) charge consumers prices of P_I . Profits and economic welfare arising from a simple bilateral monopoly where there is a single issuer and acquirer is established. In this case, the total value associated with debit cards could be represented then as:

$$V_T = V_M(P_A) + V_C(P_I)$$

where V_M and V_C represent the value (desirability and use) of debit cards associated with merchants and consumers, respectively.

¹⁵ Julian Wright, The Determinants of Optimal Interchange Fees in Payment Systems, Journal of Industrial Economics, Vol. 52, No. 1, March 2004, pp. 1-26.

Further, the total economic welfare in the debit card market is comprised of the utility derived by both merchants and consumers, which are a function of the demand for debit cards by both parties, as well as the acquisition costs for acquirers and issuers.

$$W_T = U_M(V_T, V_M) + U_C(V_T, V_C) - (C_A - C_I)V_T$$

where W_T is total economic welfare, U_M and U_C are the utility of merchants and consumers, respectively; C_A and C_I represent acquirer and issuer costs, respectively; and all other terms are defined as above.

Embodied in the utility functions of consumers are non-pecuniary benefits from debit card transactions, such as convenience, as well as other pecuniary benefits, such as fraud and theft protection, relative to other payment alternatives, such as cash. The merchant's willingness to accept the debit card in part facilitates these positive externalities for consumers. Merchants also derive several benefits from debit card transactions including higher average sales transactions than when cash is used, fraud and credit risk protections, co-branding opportunities and payment guarantees, among others. The existence of such externalities in the debit card market has major implications for application of public policy because the focus of policy in a two-sided market such as that for debit cards ought to be focus on the total price charged to both consumers and merchants rather than on the allocation of total price between them. The interchange fee is the mechanism for allocating costs of operating the debit card payments system between consumers and merchants in order to maximize participation in the network which, in turn, reflects the value assigned by consumers and merchants to externalities.

Schmalensee extends this model to allow for multiple issuers and acquirers, resulting in a set of consumer and merchant demand functions (Q^M and Q^C , respectively) that can be parameterized for the simulation model:

$$Q^M = \frac{(D^M - B^M T)(B^M + \beta^M)}{2B^M + \beta^M}$$

$$Q^C = \frac{(D^C - B^C T)(B^C + \beta^C)}{2B^C + \beta^C}$$

where T is the interchange fee.

Total output in the system is then defined as:

$$Q^T = Q^M Q^C$$

To complete the framework, Schmalensee defines the following:

$$P^A = \frac{D^M - B^M T}{2B^M + \beta^M} + C^A + T$$

$$P^i = \frac{D^C - B^C T}{2B^C + \beta^C} + C^i - T$$

$$\beta^M = N^A (N^A - 1) \Theta^M$$

$$\beta^C = N^i (N^i - 1) \Theta^C$$

$$D^M = A^M - B^M C^A$$

$$D^C = A^C - B^C C^i$$

where A , B , Θ^M , Θ^C are parameters, N^A and N^i are the number of acquirers and issuers in the system, respectively, T represents the interchange fee, and all other terms are defined as above.

The parameter, Θ , describes the sensitivity of market share to differences in prices between one side of the market and the other. The higher the Θ , the greater the market share for a given difference in price.

The principal relationships to be studied in the numerical simulation include consumer and merchant utility, total economic welfare and total profit.

Consumer and Merchant Utility:

$$U^C = \left[\frac{A^M}{B^M} Q^T - \frac{1}{2B^M Q^C} (Q^T)^2 \right]$$

$$U^M = \left[\frac{A^C}{B^C} Q^T - \frac{1}{2B^C Q^M} (Q^T)^2 \right]$$

Economic welfare:

$$W = U^C + U^M - (C^A + C^i) Q^T$$

Total profit:

$$\Pi = \frac{\omega}{B^M} (D^C + B^C T)(D^M + B^M T)^2 + \frac{1-\omega}{B^C} (D^M + B^M T)(D^C + B^C T)^2$$

$$\omega = \alpha \frac{2 + \beta^C / B^C}{2 + \alpha(\beta^C / B^C) + (1-\alpha)(\beta^M / B^M)}$$

where α represents the portion of total profit accruing to acquirers, $1-\alpha$ is the amount accruing to issuers in the system such that $0 \leq \alpha \leq 1$.

Through numerical simulation, using this theoretical model, a cap on debit interchange fees can be directly compared to a market that has no such policy restriction. In this analysis it is important to understand how the desirability of debit cards changes with respect to policy as defined by merchant and consumer utility functions. It is also critical to understand how changes in debit fees increase or decrease the overall economic welfare of the market. Finally, the profitability of the issuer will be affected by changes in debit fees and the analysis is meant to identify these impacts as well.

Each scenario examined in the model requires a set of parameter assumptions that reflect the demand for debit cards by consumers and merchants, economic welfare, output and profitability. For purposes of the simulation, the following parameter assumptions were applied throughout all scenarios.¹⁶

Table A1: Parameter Assumptions

Parameter	Parameter Symbol	Assumed Value	Parameter Symbol	Assumed Value
Number of Participants	N^A	10	N^I	2
Market Share	Θ^M	.3	Θ^C	.8
	A^M	8	A^C	4

¹⁶ The parameter, Θ , describes the sensitivity of market share to differences in prices between one side of the market and the other. The higher the value of Θ , the greater the market share for a given difference in price. The values assumed in Table A1 for each parameter were tested over a range of values and did not appreciably change the direction or effect of the results in a material way.

	B^M	3	B^C	4
Costs	C^A	1.25	C^I	1

Superscripts: acquirers = A; issuers = i; merchants = M; consumers = C.

Scenario One: Single Issuer, Single Acquirer

Scenario One is a simple model with one issuer and one acquirer. It results in a unique interchange fee that maximizes profit, economic welfare and output.

The simulation starts by examining the simplest arrangement, namely bilateral monopoly. Such a scenario requires that β^M and β^C equal zero, thus Θ^M and Θ^C are set to zero. Further, for this scenario, α is set at .5 to be consistent with the bilateral monopoly model's assumptions. To understand how changes in the interchange fee, T , affects economic welfare, W , and value (profitability), V , in the bilateral monopoly scenario, T was increased from a starting value of 0 to .55 per transaction unit. The results from this scenario are shown in Table A2.

Schmalensee observed that the output optimizing interchange fee is determined as:

$$T^Q = .5 \left[\frac{D^M}{B^M} - \frac{D^C}{B^C} \right]$$

Using the assumed parameter values, this occurs at a value of T of .4583 shown in the shaded portion of Table A2. Turning back for a moment to the relationship defining economic welfare, Schmalensee rewrites that equation showing that it is a function of total output as follows:

$$W = \frac{Q^T}{2} (\delta + \lambda T)$$

Using the assumed parameter values, maximization occurs at a value of T of .4583, which is shown in the shaded portion of Table A2 below. In the case of bilateral monopoly, system output, Q , and economic welfare, W , are both maximized with the same interchange fee, T , as

shown in Table A2.¹⁷ Some other aspects of this model are revealing in terms of impacts to consumers and merchants. First, note that consumer utility, U^C , and merchant utility, U^M , are quadratic in the interchange fee, T . In the bilateral monopoly scenario, consumer utility is maximized at T^V but not merchant utility. In part this reflects the outcome that maximizing output occurs when price subsidies to some segments of the system (e.g., consumers) provide higher output at the expense of higher prices to others (e.g., merchants). Hence the sensitivity of demand (elasticity) for each segment; i.e., $\partial Q^C/\partial T$ and $\partial Q^M/\partial T$, is a critical factor in determining the optimal interchange fee, T .

Table A2: Scenario One – Simulation Results from Bilateral Monopoly

T	Q^T	U^M	U^C	W	V
Interchange Fee	Total Output	Merchant Utility	Consumer Utility	Economic Welfare	Total Value
0.00	2.13	2.92	4.91	3.05	8.15
0.10	2.37	3.20	5.54	3.41	9.09
0.15	2.47	3.30	5.80	3.55	9.47
0.20	2.56	3.39	6.04	3.67	9.79
0.25	2.63	3.45	6.23	3.77	10.06
0.30	2.68	3.48	6.40	3.85	10.27
0.35	2.72	3.50	6.53	3.91	10.43
0.40	2.75	3.50	6.62	3.95	10.52
0.4583	2.76	3.47	6.69	3.96	10.56
0.45	2.75	3.46	6.68	3.95	10.55
0.50	2.75	3.44	6.67	3.95	10.54
0.55	2.73	3.38	6.66	3.85	10.27

Scenario Two: Multiple Issuers, Multiple Acquirers

Scenario two, with multiple issuers and acquirers, shows that the optimal level of economic welfare, W , value (profit), V , and output, Q , do not necessarily coincide with a unique interchange fee, T .

Moving beyond the case of bilateral monopoly, the second scenario assumes that multiple issuers and acquirers exist and that issuing volumes comprise a greater share of profit in the system, or α

¹⁷ It also turns out that profit in the system is maximized at the same interchange fee when $\alpha = \omega = .5$ as is the case for the bilateral monopoly scenario. Schmalensee shows that under these assumptions the T that maximizes profit in the system is defined as $T^V=T^Q$.

= .15, which means that most of profit goes to issuers. Also for this scenario $\Theta^M = .4$ and $\Theta^C = .3$. The results from this more generalized scenario appear in Table A3 below.

In this scenario it is clear that the optimal interchange fee, T , is not the same for maximum values of economic welfare, W , value (profit), V , and output, Q . This result is significant for several reasons. First, under the general condition where multiple issuers and acquirers exist, which is exactly the case for the debit card market, underlying consumer and merchant demand functions, along with other key structural aspects of the model, imply a multiplicity of possible outcomes for the interchange fee, T , where maximization of economic welfare and profits are not aligned. A key point of the simulation shown in scenario two (Table 2) and theoretical discussion is that it would be extremely difficult for regulators to know exactly where to establish interchange fees so as to maximize social welfare. As an example of this difficulty, assume in Table A3 that a hypothetical interchange fee cap is imposed with a value of .20. Both economic welfare, W , and profits, V , are considerably below their maximum level, but merchant utility is not significantly below its maximum value.

Table A3: Scenario Two – Simulation Results from Generalized Case

TT	Q^T	U^M	U^C	W	V
Interchange Fee	Total Output	Merchant Utility	Consumer Utility	Economic Welfare	Total Value
0.00	4.22	5.77	8.48	4.75	4.46
0.10	4.71	6.31	9.68	5.39	5.87
0.20	5.08	6.66	10.67	5.91	7.29
0.30	5.32	6.85	11.44	6.31	8.67
0.40	5.45	6.87	11.97	6.57	9.92
0.50	5.46	6.73	12.24	6.69	10.98
0.60	5.35	6.46	12.25	6.66	11.78
0.70	5.13	6.04	11.96	6.47	12.25
0.80	4.77	5.51	11.37	6.13	12.33
0.90	4.31	4.85	10.46	5.61	11.95
1.00	3.73	4.09	9.21	4.92	11.04

If profit, V , is maximized at $T = .80$, this would result in a suboptimal level of economic welfare, but arbitrarily reducing the interchange fee to .20 would result in a level of economic welfare that is less than that established by the profit maximizing interchange fee of .80.

Another important implication of Scenario Two is the tradeoff that occurs between consumer and merchant utility. If interchange fees are capped at a low level of .20, this has the impact of improving the utility of merchants at the expense of consumers. The profit maximizing utility for merchants is 5.51 and for consumers 11.37. An interchange fee cap set at .20 results in merchant utility of 6.66 while consumer utility declines to 10.67. Once again viewing the interchange fee as a mechanism for maximizing overall usage based on underlying demand elasticities is of major consequence in considering public policy.

Scenario Three: Multiple Issuers, Multiple Acquirers

In Scenario Three, the parameters Θ^M and Θ^C are raised well above their initial settings in Scenario Two. The parameters Θ^M and Θ^C describe the sensitivity of market share to differences in prices between one side of the market and the other.

Compared to the results for the generalized case (Scenario Two) in Table A3, the level of the interchange fee that optimizes economic welfare and profit is higher as are the associated levels of economic welfare and profit.

Table A4: Simulation Results: $\alpha=.15$, $\Theta^M = .6$, $\Theta^C = .8$

T	Q^T	U^M	U^C	W	V
Interchange Fee	Total Output	Merchant Utility	Consumer Utility	Economic Welfare	Total Value
0.10	0.88	0.85	1.79	0.67	0.20
0.20	1.62	1.52	3.38	1.26	0.65
0.30	2.23	2.03	4.76	1.78	1.27
0.40	2.70	2.39	5.91	2.21	2.01
0.50	3.05	2.60	6.80	2.55	2.80
0.60	3.26	2.69	7.43	2.78	3.55
0.70	3.34	2.65	7.76	2.90	4.22
0.80	3.28	2.52	7.78	2.92	4.70
0.90	3.09	2.28	7.49	2.81	4.98
1.00	2.22	1.96	6.84	2.57	4.92

Scenario Four: Multiple Issuers, Multiple Acquirers

In Scenario Four, α is raised from .15 to .80, which means that merchants now receive a much larger share of profits than issuers. The higher the value of α is, the greater will be the market share for a given difference in price. Values for Θ^M and Θ^C are the same as they were in Scenario Two. In this case profit and welfare are both maximized at $T = .80$. Note that welfare and profits are both lower across interchange fee scenarios than for Scenario Two in Table A3.

Table A5: Simulation Results: $\alpha=.8$, $\Theta^M = .4$, $\Theta^C = .3$

T	Q^T	U^M	U^C	W	V
Interchange Fee	Total Output	Merchant Utility	Consumer Utility	Economic Welfare	Total Value
0.10	0.78	0.76	1.61	0.61	0.89
0.20	1.45	1.37	3.05	1.16	1.71
0.30	2.00	1.84	4.29	1.63	2.46
0.40	2.42	2.16	5.32	2.03	3.10
0.50	2.73	2.37	6.12	2.34	3.62
0.60	2.92	2.45	6.68	2.56	4.01
0.70	2.99	2.43	6.98	2.68	4.25
0.80	2.94	2.31	7.00	2.69	4.32
0.90	2.77	2.10	6.73	2.59	4.21
1.00	2.48	1.82	6.14	2.37	3.89

Policy Implications of Numerical Simulations

The simulation results, derived from the theory of interchange markets by Schmalensee, suggest that regulators would be misguided to establish caps on interchange fees without more detailed empirical analysis of how the various components of the debit card multi-party market would respond to changes in the interchange fee. The level of the interchange fee at which optimal economic welfare is realized may not be the same as the interchange fee at which profit is maximized. Further, it was shown in the simulation that setting an interchange fee that differs from current levels could lead to a level of economic welfare that is lower than today.

Regulators do not currently have the kind of information necessary to accurately establish optimal interchange fees. Furthermore, while merchant utility may be improved by lowering the

interchange fee, it is likely to come at the expense of consumers whose utility would decrease under a cap that lowers the interchange fee.