Recent Developments in Consumer Credit and Payments

On September 29 and 30, 2005, the Federal Reserve Bank of Philadelphia's Research Department and Payment Cards Center organized the fourth in a series of conferences exploring new academic research on the topic of consumer credit and payments. Nearly 100 participants attended the conference, which included seven research papers on topics such as the design of consumer bankruptcy law, predatory lending, consumers' choice of borrowing terms and indebtedness, the function of credit reporting agencies, and pricing in credit card and ATM networks.

Keynote speaker **Gary H. Stern**, president of the Federal Reserve Bank of Minneapolis and current chairman of the Federal Reserve System's Financial Services Policy Committee, opened the conference.

Stern began his remarks by pointing to the increasing quantity and quality of research on consumer credit

and payments. While the Federal Reserve System is a significant producer of research in this area, it is also an important consumer because it acts as a provider and, in some instances, a regulator of payment services. As with monetary economics, good research informs good policy decisions, and this can be especially important when research challenges the conventional wisdom.

Next Stern described some of the differences between the objectives of private providers of payment services (profit maximization) and the Fed, which is to maximize social welfare. In particular, the Fed's mission is to encourage the efficiency, accessibility, and integrity of the payment system. Its ability to make improvements along

these dimensions depends on the nature of competition in these markets, the significant network features of most payment systems, and any public-good aspects that arise in facilitating payments. Thus, one rationale for the Fed's involvement in a payment market might be the existence of significant market failure—too little competition or too little investment in security or reliability, for example—that cannot be more easily addressed by other means (such as regulation).[1] When such conditions no longer exist, however, perhaps the Fed should gradually exit the market.

Does economic reasoning inform the Fed's choice of which payment services to provide and on what scale? Stern argued yes, pointing to the Fed's recent decision to reduce its check-processing operations, which accounts for the majority of the System's staffing. The national check-processing market is declining about 10 percent each year. If the Fed does not downsize, it will account for an ever-growing share of the business. But the Fed has determined that there is no market failure in this market that would justify its becoming an increasingly important provider. Nor are there significant economies of scope between its check-processing operations and its other payment businesses.

In response, the Fed has decided to reduce its check-processing capacity

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[1] Stern pointed out an additional rationale would be the existence of significant economies of scope between the Fed's retail and wholesale payment business (Fedwire), but such economies must be rigorously demonstrated.

while adjusting its prices to ensure that it recovers the full cost of providing these services. The Fed also supported the recently enacted Check 21 law, which will facilitate the electronic presentment of checks, thereby reducing the need to process and ship paper checks.

The market for automated clearinghouse (ACH) transactions has also experienced significant change, and the Fed is adapting. On the one hand, demand has grown dramatically, a situation that requires significant ongoing investment. On the other hand, private-sector providers have consolidated and are now increasingly competitive. While the Fed remains a dominant provider, its market share has fallen over time. Improvements in information-processing technology, combined with significant economies of scale, have reduced the cost of ACH transactions, leading the Fed to reduce prices 66 percent over the past decade.

In each of these cases, economic research has aided the Fed's decision-making. Stern offered some examples of how economic research could influence the Fed's policy decisions in the payments arena in the future. First, what is the efficacy of alternatives to the Fed's provision of retail payment services when there are market failures? For example, should the Fed play a more significant role in standard setting, even where it is not an active service provider? Second, how will the electronification of checks affect the market structure and competitive conditions of the check processing business? Third, are the existing theoretical models of payment networks adequate for making policy decisions about whether and how to regulate interchange and other fees that arise in credit and debit card transactions? More economic research in each of these areas would help to inform policymakers and improve social welfare.

DO CONSUMERS CHOOSE THE RIGHT CREDIT CONTRACTS?

In the first paper presented, **Nicholas Souleles,** of the University of Pennsylvania, reported the results of a study (with Sumit Agarwal, Souphala Chomsisengphet, and Chunlin Liu) that examined consumers' choice between two credit card contracts and their subsequent borrowing decisions in the period 1997 to 1999.[2] A large

more than consumers who chose the card without the annual fee. Almost half of these borrowers (44 percent) paid interest on an average balance of $500 or more during the period studied. More than half of consumers choosing the no fee contract did not carry a balance at any time during the two-year period. On average at least, consumers would appear to be making rational choices about loan contracts.

Improvements in information-processing technology have reduced the cost of ACH transactions, leading the Fed to reduce prices 66 percent over the past decade.

U.S. bank offered consumers a choice between two credit cards: one with an annual fee (about $20) but a lower interest rate and another with no annual fee but a higher interest rate (about three percentage points higher). Consumers were free to switch from one contract to the other at any time.

To minimize their total borrowing costs, consumers expecting to borrow a large amount should choose the contract with the annual fee and a lower rate. Conversely, consumers who do not expect to borrow very much should choose the card without an annual fee. Did consumers choose rationally? When consumers chose a contract that turned out to be more expensive for them, how likely were they to switch contracts?

Souleles and his co-authors found that, on average, consumers who chose the card with an annual fee (and lower interest rate) subsequently borrowed

After the fact, however, some consumers would have done better had they chosen the other contract. For example, 24 percent of consumers who paid the annual fee never borrowed at all. Among consumers who did not pay the annual fee, 12 percent paid interest on an average balance of $1,200 a month or more. In total, about 40 percent of consumers chose a contract that turned out to be more expensive (56 percent paying the annual fee and 21 percent who didn't). Are these mistakes? Or is it that consumers' borrowing was not what they anticipated it would be?

To explore the possibility that consumers are making mistakes, Souleles and his co-authors examined a subset of consumers who also had substantial deposits at the bank. The idea is that these customers have ample liquid funds to help them manage an expense shock, so we would not expect them to borrow much on their cards or to pay the annual fee. Not surprisingly, only 22 percent of these consumers do pay the annual fee (compared to 55 percent for the entire sample). What is surprising, however, is that 10 percent

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[2] "Do Consumers Choose the Right Credit Contracts?," mimeo, University of Pennsylvania (2005). This paper was previously circulated under the title "How Well Do Consumers Forecast Their Future Borrowing?"

of these liquid customers who did not pay the annual fee also paid interest on an average balance of $1,200 a month or more. These customers chose a contract that turned out to be more expensive because they borrowed a significant amount, and yet it seems unlikely this was due to unanticipated shocks. The authors concluded that unanticipated borrowing does not explain all of the patterns in the data

Next, the authors explored whether consumers are likely to choose the more affordable contract when the cost of mistakes is higher. In particular, they calculated the interest consumers would have saved if they had paid the annual fee to benefit from the lower interest rate on their card. When the interest savings (net of the annual fee) was less than $26, about 37 percent of consumers chose the wrong contract. But when the interest savings exceeded $300, only 7 percent of consumers chose the wrong contract. Examining the small share of consumers who changed their contracts, the authors found that the majority of those initially chose a contract that turned out to be more costly than the alternative. They also found that the probability that a consumer changes his or her contract is significantly affected by the net savings that result after the switch.

The discussant, **John Leahy**, of New York University, suggested that Souleles and his co-authors present a formal model of consumers' contract choices to help interpret the pattern of mistakes they report. Leahy suggested that borrowers might choose the more costly contract to discourage themselves from borrowing in the future. This is an example of a commitment problem explored by other researchers in the literature. Leahy also noted that only 5 percent of borrowers' errors cost them more than $25 a year; only 1 percent made errors that cost them more than $100 a year; and even

less, 0.1 percent, made errors that cost more than $300 a year. Such low costs suggest that many errors may simply be due to consumers' inattention. It is even possible that some consumers forgot they had the option to switch. For those who did pay the annual fee, such costs are sunk until the fee comes due a year later.

EXPLAINING THE RISE IN CONSUMER BANKRUPTCIES IN THE U.S.

Igor Livshits, of the University of Western Ontario, presented the results of his research (co-written with James MacGee and Michèle Tertilt), which tested a variety of explanations for the dramatic rise in bankruptcy filings in the U.S. over the last quarter century.[3] The basic facts are as follows: (1) the number of filings increased from 1.4 per thousand adults in 1970 to 8.5 per thousand in 2002; (2) filers' ratio of unsecured debt-to-income has increased; and (3) the average real interest rate on unsecured credit hardly changed.

The authors constructed a life-cycle model of consumers who borrow and sometimes default and calibrated it to match the behavior of borrowers in the U.S. economy during the late 1990s. They used the model to explore the effects of many proposed explanations for the rise in the bankruptcy filing rate that occurred after 1980. They considered a variety of possible explanations for the rise in the bankruptcy filing rate and concluded that while no single explanation is fully consistent with the evidence, a combination of factors, including a decline in stigma associated with filing for bankruptcy, comes reasonably close.

Livshits and his colleagues first considered whether an increase in "uncertainty" can explain the patterns in the data. They found that increases in the magnitude or likelihood of expense shocks (such as out-of-pocket medical expenses) or income shocks (such as unemployment spells) would increase the bankruptcy filing rate, but it would also reduce the ratio of unsecured debt-to-income, which did not happen. The authors also considered shocks to family structure (such as divorce or an unplanned pregnancy) but found that these did not rise after the early 1980s. They did find that the decline in the share of the adult population that is married would explain a small part of the rise in the filing rate. They found no effect from changes in age structure of the population.

Livshits and his co-authors then turned to changes in the credit market environment. They rejected the potential effect of the changes in U.S. bankruptcy law introduced in 1978, arguing that Canada also experienced a rise in bankruptcy filings in the absence of a change in its laws. They found the relaxation of binding usury ceilings after 1978 can explain a significant rise in bankruptcy filings and an increase in the debt-to-income ratio, but it would also imply an increase in the real cost of unsecured credit that is not observed in the data.[4] They are also skeptical that in practice the usury ceilings are sufficiently restrictive to generate such effects.

They did find two factors that seem to be important in explaining the

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[3] "Accounting for the Rise in Consumer Bankruptcies," mimeo, University of Western Ontario (2005).

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[4] In *Marquette National Bank v. First Omaha Service Corp*, 439 U.S. 299 (1978), the Supreme Court determined that lenders could charge interest rates permitted under the laws of the state where they were located, rather than where their customers were located. Thereafter, states competed to attract lenders to their jurisdiction by raising their usury ceilings.

rise in bankruptcy filings but which cannot individually explain the patterns in the data. First, a decline in the cost of underwriting unsecured credit (perhaps due to rapid improvements in information technology) would increase borrowing but would have little effect on bankruptcy filing rates and is associated with a significant decline in average real interest rates. On the other hand, a decline in the stigma associated with filing for bankruptcy would indeed explain a significant share of the increase in filings but would also increase real interest rates and reduce the ratio of debt-to-income.[5]

In short, no single explanation seems to fit the trends observed in the U.S. economy over the last two decades. Livshits and his colleagues then asked what combination of factors would explain the observed trends. They argue that increases in both expense and income uncertainty, combined with a decline in underwriting costs and stigma, fit the data fairly well. In their simulation, increases in uncertainty play a relatively small role, while a decline in stigma is the primary driver of the rise in bankruptcy filings. At the same time, a decline in underwriting costs offsets the effect of stigma on interest rates and the ratio of debt-to-income. The authors concluded that a decline in stigma plays a very important role in the story and suggested that it should be the focus of future research.

The discussant, **Satyajit Chatterjee**, of the Federal Reserve Bank of Philadelphia, argued that the paper is an important advance but its results should be interpreted cautiously. For

example, when the model is calibrated to the data, the implied recovery rate for debt in bankruptcy is about 28 percent, which seems rather high for a model that seeks to explain filings under Chapter 7 (discharges) rather than Chapter 13 (workouts). In the paper, this is explicitly modeled as

> Predatory lending is less likely to occur as the lending market becomes more competitive.

a wage garnishment, but Chatterjee suggested that its high value probably reflects other costs omitted from the model, such as the nonexempt assets subject to liquidation by the court. He also wondered how the results would change if the assumption of a perfectly competitive loan market was relaxed.

PREDATORY LENDING

The next speaker, **Bilge Yilmaz**, of the University of Pennsylvania, presented the results of his research (with Philip Bond and David Musto) on the topic of predatory lending. They begin by offering a definition of the practice and investigating the conditions under which it can occur.[6]

The authors define predatory lending as a loan the lender knows will, on average, make the borrower worse off. But why would a borrower choose a loan that was likely to make him or her worse off? In their model of a rational loan market, it must be

the case that lenders know more about a borrower's future income prospects than does the borrower. Predatory lending has two obvious policy implications. First, if borrowers are choosing loans that are likely to make them worse off, credit is being misallocated in a way that may be socially wasteful. Second, predatory lending may increase the inequality in the distribution of wealth.

Yilmaz and his co-authors develop a model in which a borrower applies for a loan using his or her home as collateral. The lender has some information about whether the borrower is more likely a "good" or "bad" risk. Borrowers who are good risks are more likely to earn sufficient income in the future to repay the loan than are borrowers who are bad risks. Based on that knowledge, the lender makes a loan offer, which the borrower either accepts or declines. If the loan cannot be repaid, the lender recoups at least some of the proceeds by foreclosing on the borrower's home.

Their first insight, according to Yilmaz, is that in order for predatory lending to occur, it must be the case that good and bad risks receive the same loan terms. In other words, the equilibrium must be a *pooling equilibrium*. If that were not the case, the lender's superior information would be revealed by his offer: The bad risks would realize they faced a higher risk of defaulting on the loan than they originally thought. In that case, the bad risks would not take out the loan.

When is predatory lending likely to occur? Yilmaz and his co-authors show that several conditions are required. First, predatory lending requires that lenders be better informed than borrowers about the riskiness of the loan. Second, collateral values must be sufficiently high, so that lenders do not lose too much if they lend to bad borrowers who subsequently

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[5] In their calibrations, the level of stigma required to explain the filing rate of the early 1980s is equivalent to the welfare lost from a 28 percent decline in consumption.

[6] Philip Bond, David Musto, and Bilge Yilmaz, "Predatory Lending in a Rational World," Federal Reserve Bank of Philadelphia Working Paper 06-2 (2006).

default.[7] Third, predatory lending is less likely to occur as the lending market becomes more competitive because rival lenders tend to cherry-pick the best borrowers, unraveling the pooling equilibrium.[8]

The authors examine three policies that may affect predatory lending. They argue that interest-rate ceilings (usury laws) can sometimes help reduce predatory lending. If the ceiling is set sufficiently low, lenders cannot recoup the cost of their inefficient loans to the bad risks. Of course, such a benefit must be weighed against the other distortions usury ceilings can cause. Next, they consider the Community Reinvestment Act, which requires banks to lend in underserved and underprivileged areas. The authors suggest that this can also help break down predatory lending if it increases competition in the lending market in such areas. Note this might imply *less* actual lending in these areas, rather than more, because the bad risks choose not to borrow. Finally, they consider the Equal Credit Opportunity Act, which specifies that certain factors (for example, age, race, or gender) may not be considered in underwriting or pricing loans. If such restrictions do facilitate a pooling equilibrium, predatory lending may become more likely.

Discussant **Andrew Winton**, of the University of Minnesota, pointed to some alternative explanations of why a borrower might accept a predatory loan. For example, borrowers might not understand the "fine

print" of loan contracts, or lenders may misrepresent loan terms. Borrowers may exhibit excessive optimism or too heavily discount the costs of a loan contract that occur in the future. Each is an example of predatory lending in a less than rational world. Winton also suggested that, in addition to foreclosures, the authors should examine other costs of predatory loans, including excessive loan payments.

CREDIT BUREAUS, RELATIONSHIP BANKING, AND LOAN REPAYMENT

Martin Brown, of the Swiss National Bank, discussed his work with Christian Zehnder on the function and effects of credit reporting agencies.[9] In particular, they studied the extent to which credit registries improve repayment behavior, an idea that is widely accepted but has not been rigorously tested in empirical work. They also examined another mechanism for disciplining borrowers—relationship lending, which involves repeated interactions between a specific borrower and lender. One question they sought to answer was the degree to which these two mechanisms are substitutes or complements.

Brown and Zehnder developed an experiment in which multiple borrowers and lenders interact with each other in a computerized lending game. There are more lenders than borrowers, so the loan market is relatively competitive. The authors examined the performance of their experimental loan market along two dimensions: whether or not a credit bureau exists and whether or not borrowers and lenders can recognize each other. Note that if borrowers and lenders cannot

recognize each other, they cannot engage in relationship lending.

Suppose that borrowers and lenders cannot recognize each other. This is consistent with a lending market in which borrowers are highly mobile. If there is no credit bureau, borrowers are essentially anonymous. In that case, the experimental results show the market performs extremely poorly – borrowers frequently default so few lenders offer any funds. Next, Brown and Zehnder introduce a credit bureau. This consists of a list lenders receive in every period that documents each borrower's previous loans and repayment behavior (no other information is provided). With the bureau in place, the market functions dramatically better, for most rounds of the game. Repayment rates and lending volume are significantly higher.

Brown and Zehnder attribute this improvement in results to the disciplining effect of credit registries; borrowers are willing to repay in order to maintain reputations and hence retain access to future credit. As further evidence, they point to the following detail from their experimental results. In the final periods of the game, the market breaks down even in the presence of a credit bureau. Borrowers recognize that they have no further need to maintain their reputation and lenders, recognizing this, decline to lend.

Next, Brown and Zehnder considered the case where borrowers and lenders can recognize each other, which makes ongoing lending relationships possible between specific borrowers and lenders. They found that even in the absence of a credit bureau, the loan market functions very well. Thus lending relationships also appear to act as an effective mechanism for disciplining borrowers. When a credit bureau is introduced in this environment, there is a slight increase in performance, but the difference is

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[7] They point out that loans that increase the value of collateral, such as home-improvement loans, may therefore increase the prospects for predatory lending.

[8] Still, as long as loans are fully collateralized, the authors show that predatory lending remains a possibility even under highly competitive conditions.

[9] "Credit Registries, Relationship Banking, and Loan Repayment," IEW Working Paper 240, University of Zurich (2005).

not statistically significant. Brown and Zehnder conclude that credit bureaus and relationship lending are largely substitutes.

Discussant **Paul S. Calem** (LoanPerformance) argued that the paper raises several potential policy implications. It clearly provides evidence of the contributions that credit bureaus can make—they make it possible for consumers to invest in their reputations as good borrowers. This, in turn, increases the availability and pricing of credit.

But Calem pointed out that the experiment is highly stylized so it is important to place the results in the context of actual credit markets. For example, in the U.S. at least, there are markets in which credit bureaus dominate (consumer credit) and other markets where relationship lending is more important (small-business lending). In addition, he pointed out that while relationship lending may serve as another mechanism for enforcing repayment, it does have some drawbacks. For example, it may suffer from "lockin" where the cost of changing lending relationships results in less competitive pricing. Returning to Brown and Zehnder's experiment, Calem noted it would be interesting to know whether the presence of a credit bureau has a significant effect on the pricing of loans or whether the incremental contribution of credit bureaus depends on competitive conditions.

Finally, while the paper is silent on these questions, Calem pointed out that the actual content of credit bureau files may be important factors. Brown and Zehnder's credit bureaus include both positive and negative credit information, but many bureaus around the world include only negative information. In addition, the optimal length of credit histories included in bureau files is open to debate. If records are kept too long, marginal bor-

rowers may feel that their record can never be rehabilitated, and this would weaken the discipline that credit bureaus are supposed to enable.

THE EFFECTS OF INCOMPLETE INFORMATION ON CONSUMER CREDIT

Jonathan Zinman (Dartmouth College) presented the results of his work with Dean Karlan. They have designed an empirical study that seeks to identify adverse selection and moral hazard in loan markets.[10] In other words, do higher interest rate loans attract riskier clients? (This is known as adverse selection.) Do higher interest rate loans induce borrowers to take more risks (i.e., moral hazard)? How can the two be separately measured? Despite an abundance of theoretical work, there is remarkably little empirical research on these questions.

Karlan and Zinman implemented their experiment through a South African lender specializing in providing unsecured credit to the working poor. Their typical loans are small ($150) and the term is rather short (four months). Their experiment consisted of three stages. In the initial stage an interest rate (the *offer rate*) was randomly assigned to a pool of potential borrowers with similar observable characteristics. This rate could be either high or low. In the next stage,

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[10] "Observing Unobservables: Identifying Information Asymmetries with a Consumer Credit Field Experiment," Working Paper (2005).

among the clients who respond to the offer, approximately 40 percent were randomly given a low *contract rate* instead (the remainder received the original offer rate). Finally, half of the applicants were randomly given a *dynamic* repayment incentive—assuming the borrower repaid the current loan, he or she would receive a favorable interest rate on *subsequent* loans over the next year.

To test for adverse selection, Karlan and Zinman compared the repayment performance of two groups: borrowers who responded to the low offer rate and borrowers who responded to the high offer rate but subsequently received the lower contract rate. This is the test for adverse selection. Since both groups actually received the low interest rate in this experiment, there should be no effect of moral hazard. The question remains: Do higher interest rates attract riskier borrowers who care less about high rates because they are less likely to repay the loan?

Next, the authors constructed two tests for moral hazard. Recall that moral hazard exists when the terms of credit affect an individual's incentives to repay his or her loan. Karlan and Zinman begin by focusing only on those borrowers who responded to the high offer rate. This should remove the effects of adverse selection, because these borrowers should initially have the same expectations about their prospects for repaying the loan. In the first test, Karlan and Zinman compared the repayment performance of borrowers who actually received a

> Credit bureaus make it possible for consumers to invest in their reputations as good borrowers. This, in turn, increases the availability and pricing of credit.

lower contract rate with those who paid at the original offer rate. Moral hazard would then show up if the second group—that with the higher interest rate—is more likely to default.

Karlan and Zinman also considered a second, potentially cleaner test for the effects of moral hazard. Under the first test the fact that one group is paying a higher interest rate than the other implies there is a higher repayment burden, which in itself may lead to differences in subsequent repayment behavior, even in the absence of moral hazard. In their second test, Karlan and Zinman compared the repayment behavior of borrowers who were offered the favorable rate on *future* loans with those who were not.[11] If those offered this dynamic repayment incentive perform better, this would also provide evidence of moral hazard (since it reflects the effect of incentives on repayment behavior).

Karlan and Zinman found the problem of asymmetric information to be relevant in these loan markets. They estimate that about 20 percent of the overall default rate can be attributed to a combination of adverse selection and moral hazard. Moreover, the strongest evidence of moral hazard is identified when examining the effect of the dynamic repayment incentive—a one-percentage-point decrease in the cost of *future* loans reduces the default rate on the *current* loan by about 4 percentage points. Interestingly, they found that the particular type of information problem depended on the gender of the borrower. Lending to female borrowers appeared to suffer from the adverse selection problem, while lending to male borrowers appeared to suffer from the moral hazard problem.

The discussant, **Pierre-Andre Chiappori** (Columbia University), stated this was extremely important research. Distinguishing between adverse selection and moral hazard is important because each has distinct welfare implications and policy prescriptions. He suggested the analysis might benefit from a structural model. In particular, he wondered about how the competitive structure of the loan markets might influence the results

Do higher interest rate loans attract riskier borrowers? Do higher interest rate loans induce borrowers to take more risks?

and even the form of loan contracts. Some people might not respond to high rate offers because they receive better offers elsewhere. What alternatives are available to potential borrows? Do these depend on gender? Can that explain the differences in results for men and women?

PRICING IN CONSUMER PAYMENT NETWORKS

Alexander Tieman (International Monetary Fund) presented a paper co-authored with Wilko Bolt that examines pricing behavior in *two-sided* markets.[12] A two-sided market is one in which there are two distinct types of end users that derive benefits from interacting with each other, which is

typically facilitated by a network or platform. They focus on the concrete example of a consumer payment network, such as Visa or MasterCard, which facilitates transactions between merchants and consumers.

Two-sided markets often exhibit positive externalities. In the case of payment networks, the value of holding a card for consumers is increasing in the number of merchants willing to accept the card. Conversely, the value to merchants of agreeing to accept a payment card is increasing the number of consumers that are willing to use it. Thus participants on each side of the market would benefit from subsidies that increase demand among participants on the other side. One role of payment networks, then, is to coordinate the incentives offered to consumers and merchants.

Bolt and Tieman point out that in such markets there is both a *price* and a *price structure*. In this case, price refers to the total cost of transactions paid by the merchant and the consumer, while price structure refers to the share of the total price that is paid by each party. Both are set directly, or indirectly, by the network. The distinction is important because it is possible that one party, perhaps the consumer, may not pay anything for the transaction or may even receive a subsidy for using a payment card. This appears to be the case for debit cards in the Netherlands, for example. Such skewed pricing structures are receiving a good deal of scrutiny by antitrust authorities around the world and are the focus of a number of lawsuits in the U.S.

The economic literature on two-sided networks is relatively new and underdeveloped.[13] Tieman points out

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[11] Since both groups are currently paying the same interest rate, there is no difference in repayment burden that may cloud the interpretation of the results.

[12] "Skewed Pricing in Two-Sided Markets: An IO Approach," DNB Working Paper 2004/13, De Nederlandsche Bank, Amsterdam (2004).

[13] For an accessible review of the literature, see Bob Hunt's 2003 *Business Review* article at http://www.philadelphiafed.org/files/br/brq203bh.pdf.

that in many theoretical models of these markets, the equilibrium price structure does not look like what we often observe in consumer payment networks. Instead of skewed pricing, where one side of the market pays all (or more) of the cost of a transaction, these models tend to generate *interior* pricing, where each side of the market contributes to the cost of a transaction. In addition the share of total transaction costs paid by one side of the market is *inversely* related to the relative price elasticity of demand.[14] Put more simply, the side of the market whose demand is *most* sensitive to changes in price bears the larger share of the total cost of the transaction. This is exactly opposite the intuition learned from the microeconomic analysis of a traditional market.

In their paper, Bolt and Tieman report that such results follow from a particular assumption about the properties of the demand curves (log concavity). If a more traditional assumption about demand curves (constant elasticity of substitution) is used instead, the results are very different. In that case, the side of the market that is least sensitive to price changes will bear the larger share of total transaction costs. And if one side of the market (e.g., consumers) is sufficiently more sensitive to changes in prices than the other (e.g., merchants), it will bear none of the transactions costs. Indeed, a profit-maximizing network would choose to subsidize consumers, financing the subsidy at least in part by raising the price paid by merchants. In short, their model derives a price structure that looks like what is observed in many consumer payment networks.

Next, Bolt and Tieman turned to policy questions. How does the pricing strategy of a profit-maximizing network compare to that of a benevolent social planner? They found that a social planner would also choose a highly skewed price structure, but a lower total price than would a profit-maximizing network. Thus, a monopoly payment network would result in too few, rather than too many, transactions. In contrast, a social planner would run the network at a loss, which would require ongoing subsidies from

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some other part of the economy. If the network was required to break even, it is likely that all the costs would be recovered from prices charged on only one side of the network.

Bolt and Tieman concluded that the existence of skewed pricing in itself does not justify intervention by antitrust authorities, but a concern for the overall price charged might. This stands in contrast to the public debate, which focuses primarily on skewed pricing rather than on the total prices charged by consumer payment networks.

The discussant, **Rafael Rob** (University of Pennsylvania), distinguished between the two types of equilibria explored in models of this sort. Most papers in the literature focus on an *interior* equilibrium where not all consumers and merchants adopt the payment technology. Bolt and Tieman, on the other hand, focus on the *cor-*

ner solutions where there is universal adoption by one or both sides of the market. Rob pointed out that models in the existing literature can also generate corner solutions if the disparities in price elasticities are sufficiently great, but they may not have the same properties as the ones explored by Bolt and Tieman. Rob also pointed out that this is a model of a monopoly provider of payment services. While this is a good approximation of the Dutch debit card market, the U.S. credit and debit card networks are a duopoly. It would be interesting to explore whether the results are sensitive to this distinction.

ATM SURCHARGES AND CONSUMER WELFARE

Gautam Gowrisankaran (Washington University, St. Louis) presented his paper with John Krainer that explores the potential gains and losses associated with the introduction of ATM surcharges in the 1990s.[15] Surcharges are fees charged to consumers by owners of an ATM. Prior to 1996, ATM surcharges were extremely rare, but thereafter they became very common.

This change had two effects. On the one hand, ATMs became more profitable, which stimulated the deployment of ATMs and reduced the distance consumers must travel in order to access their deposit accounts. On the other hand, consumers were now required to pay for the privilege of using at least some ATMs. In addition, the increase in ATMs exceeded the increase in transaction volume so that the average number of transactions per machine fell. Since most of the cost of operating an ATM is fixed, the decline in transaction volume implies that the

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[14] By price elasticity, we mean the decline in transaction volume, expressed in percentage terms, induced by an increase in transaction price, also expressed in percentage terms.

[15] "The Welfare Consequences of ATM Surcharges: Evidence from a Structural Entry Model," Federal Reserve Bank of San Francisco Working Paper 2005-01 (2005).

average cost of each transaction rose significantly.

Gowrisankaran and Krainer asked whether, on balance, consumers and society were made better or worse off by the introduction of ATM surcharges. In practice, this simple question is very difficult to answer. To do so, Gowrisankaran and Krainer painstakingly gathered a data set of ATM locations, potential ATM locations (grocery stores and banks), and population in 32 counties along the border of two states, Minnesota and Iowa. They chose this area because, unlike Minnesota, Iowa enforced a no-surcharge law throughout the 1990s. In principle, differences in the deployment and use of ATMs in these border counties can be used to estimate the effects of a surcharge ban. But to do so, Gowrisankaran and Krainer also had to develop a structural model of the ATM market and some novel approaches to estimating the parameters of the model.

To estimate their model efficiently, the authors needed to avoid calculating equilibrium outcomes for every possible combination of parameter values. While this has been done for other models of entry, Gowrisankaran and Krainer were at a disadvantage—they did not know what the prices (surcharges) were in Minnesota. Their insight was to estimate the entry model using data from Iowa counties (where prices = 0) and, using those coefficients, estimate the effects of nonzero prices using data from Minnesota counties.

Assuming that the fixed cost of deploying ATMs and consumer preferences are similar in counties on either side of the Minnesota-Iowa border, the difference in the relative number

and geographic dispersion of ATMs between the two states can be used to infer something about the price elasticity of demand. All else equal, the greater these differences, the less elastic is the demand curve for ATMs. In the actual estimation, they found that the probability a consumer will use a given ATM falls equally as much if the

ATM is moved 1 kilometer away or she is required to pay 8 to 10 cents more to use it. They conclude that consumer demand for transactions at ATMs is price elastic.

Using estimates from their model, Gowrisankaran and Krainer calculated measures of consumer and producer surplus that result under a no surcharge regime and one that permits surcharging. They reported little difference in the total surplus generated but significant differences in its distribution. While fewer ATMs are deployed in a no surcharge regime, the estimated consumer surplus is about 10 percent higher (and producer surplus 10 percent lower) than in a regime that permits surcharging. Transaction volume is also about 16 percent higher in the no surcharge regime. They also derived the first best outcome, where consumers are charged only the marginal cost of a transaction and fixed costs are recovered via lump sum taxes. Compared to the surcharge regime, there are 50 percent more ATMs and 38 percent more transactions, and the

total surplus is 14 percent higher.

The discussant, **James McAndrews** (Federal Reserve Bank of New York), pointed to one of the simplifying assumptions of the paper—that the market for ATM transactions is independent of the market for other bank services. If that assumption is relaxed, differences in the market structure of

banking between the two states might influence ATM deployment and pricing decisions. It is then possible that at least some of the effects attributed to a surcharge ban might actually be driven by differences in banking structure.

McAndrews presented evidence that banking markets in the Minnesota border counties are indeed different from those in the Iowa border counties. He conjectured that Minnesota's single-office banks were likely to charge lower *foreign* fees.[16] On the other hand, he conjectured that since the banking market in Iowa was more concentrated, surcharges may be lower because competition for deposits is less intense.[17] The net effect, McAndrews argued, is that the benefits of surcharging may be exaggerated. **BR**

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[16] Foreign fees are fees a bank charges its *own* customers when they use an ATM the bank does not own.

[17] One reason banks may surcharge consumers that are not their own customers is to encourage them to become customers.

> **Since most of the cost of operating an ATM is fixed, the decline in transaction volume implies that the average cost of each transaction rose significantly.**