

SESSION F: CONSUMER CHOICE-CREDIT CARDS

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MR. EICHORN: I'm Mark Eichorn. I'm an advisor to Commissioner Jon Leibowitz. In the interest of full disclosure, which is our specialty here, I'll admit that I'm not an economist and though I've read these studies, I can honestly say that I can't understand them.

I do know that both of these studies are timely. Last Fall, a GAO study found that many credit card fees had more than doubled since 1995. In 2005, more than a third of the accounts surveyed were assessed late fees, and one in 8 were assessed over-limit fees. The GAO report pointed out that disclosure of these charges was poor and that many consumers did not understand when they would be charged for late payments or what events could trigger their banks to increase their interest rates.

Admittedly, the report blamed government regulations in part for the problem, but the bottom line is that few account holders learn about fees and penalties from the agreement. As memorably stated in John Driscoll's paper: "Once a naive customer is acquired, the consumer learns about these fees by paying them."

To learn more about learning - and forgetting - about fees, let me introduce Dr. Driscoll to present the paper, "Stimulus and Response: The Path from Naivete to Sophistication in the Credit Card Market," co-authored with Sumit Agarwal, Xavier Gabaix, and David Laibson. John is an economist in the Division of Monetary Affairs at the Federal Reserve Board, where he conducts research relating to macroeconomics, banking, and consumer finance issues. Before joining the Fed in 2002, he was a professor at Brown University and a research fellow at the National Bureau of Economic Research. He has also served as a senior economist at the Council of Economic Advisers and is an adjunct professor at Johns Hopkins.

MR. DRISCOLL: Thank you very much, and thank you for the opportunity to be here. As was just mentioned, this is a joint work with Sumit Agarwal, Chicago Fed, Xavier Gabaix of many places, and David Laibson, and I am obligated to add that these do not necessarily represent the views of either the Chicago Fed or the Federal Reserve Board except for me, of course.

So is motivation a question of interest to both economists and policymakers is whether a lack of sophistication, let's call it, among some consumers might affect the market equilibrium, and there are at least two reasons why consumer errors might in fact not matter, so the first is perhaps competition will protect the consumer and second perhaps consumers will learn.

Now, my co-authors Xavier and David have in previous work addressed or looked at the issue of whether competition protects the consumer, and their model, shrouded attributes, in equilibrium, naive consumers subsidized sophisticates, so if you get a hotel room and you use the bottled water in the mini bar and use the telephone for long distance rather than using your cell phone, you are likely subsidizing people who choose not to do that, and there are many other examples that have come up today.

Moreover, unfortunately there is a so-called curse of debiasing, which is that training consumers to be rational will make it harder for firms to win their business or profit from them, so there may be no incentive for a firm to educate consumers or to offer products without this kind of cross subsidy, and debiasing consumers or unshrouding them is not profitable in equilibrium, even in competitive markets, and inefficiencies associated with the shrouding may well persist.

In this paper we're going to look at the other question, which is consumers will learn. In the credit card market as well as other financial markets consumers may initiate new financial relationships without fully understanding the elements of the fee structure, and one might ask: Does learning over time about the fee structure produce convergence of the rational benchmark?

We're going to study actual learning in the field by using a

large data set and panel data. Our data sets consists of three years of credit card records representing 128,000 consumers and we have access to 100 million individual transactions, and we're going to study payment of late payment fees, over limit fees and cash advance fees to give some perspective, additional perspective in addition to which has already been said about the GAO report.

In our data set, fees are going to average about \$16 per month for new accounts, and moreover, that actually understates the costliness of these fees because things like late payment fees can trigger substantial interest rate changes so your interest can go up from 16 percent to 24 percent or above on your existing balance cause much higher costs.

What we find in our data when you preview our results is that controlling for a person's fixed effects, fee payments will fall by 75 percent during the first four years of account life. Moreover, this learning is driven by feedback in the sense that making a late payment, that is paying a fee, sharply cuts the probability of a late payment in the next month.

However, these credit card holders act as if their hard earned experiential knowledge is depreciating so a monthly probability of a fee payment increases as previous fee payments recede into the past, so paying a fee one month ago has a much bigger effect on your ability to pay the fee now than having paid

the same fee one year ago, and we're going to estimate this knowledge will depreciate at about a rate of 15 percent per month.

So in the end we'll conclude that learning is powerful, but depreciation or inattention or forgetting will partially offset this learning. Decision makers will learn best when the feedback was recent, and as yesterday's information recedes into the past we cease to notice it and our behavior tends to backslide.

There's a very large body of research on both credit cards and behavioral economics, and time constraints forbid me from mentioning more than a few of them. On credit cards there's a long history of working on various problems or issues with this market starting with a book by Larry Ausubel in the early '90s on rents and over optimistic consumers. David Gross and Nick Souleles more recently have worked on the causes of the rise in default rates in the mid 1990s and the responses of people spending to credit limits, and just skipping ahead, in some related work, the four of us have also documented a U-shaped pattern of fee payments and APRs by age, and recently Dellavigna Malmendier have looked at equilibrium in this market when there's a bias and naivety.

Let me begin by discussing our data. We have a representative credit card panel from a large bank from January of '02 to December '04, so three years of monthly data. We see

everything that the bank does over this period of time, so your individual expenses, your credit risk score, other data that the bank observes, and we're going to focus attention in our analyses on three kinds of fees: First the late payment fees, which were \$30 in the early part of our sample and rose to \$35 in the later part of our simple and moreover, these fees may induce penalty pricing, those APRs to 24 percent or greater if you pay late fees too much.

Second the over limit fee, that is fees that are imposed when you spend over your credit limits, that's also about \$30 at the beginning and \$35 near the end of the sample, and penalty pricing may also be imposed in this case. Finally we'll look at cash advance fees which is the greater of 3 percent of the amounts advanced or \$5. There's no penalty pricing associated with this, but there's a 16 percent APR in cash advances, so this is a relatively expensive way to get cash.

Let me show you some graphs from our data. This is a plot of a regression -- the fitted values from a regression fee frequency; that is, whether or not you pay a particular fee on a number of controls, including credit risk scores and behavior scores and a spline of account tenure; that is, how long the account has been open, starting from month four because we have credit risk data which is quarterly, and going through month 72, that is having had the account for six years.

And what we see is that all these kinds of fees show a very sharp downward sloping relationship so that by putting yours in, as I mentioned at the beginning, fee payment frequency is dropped by 75 percent or more, and that's robust over all three kinds of fees. We find a similar pattern which is shown in the paper for dollar amounts of fees, in addition to fee frequency.

What the second graph shows is the response of fee frequency payment to the time since last fee paid, and this is again fitted values of aggression. This time the fee frequency on the interaction of a spline of how long the fees was paid with a dummy for whether the fee was paid and/or the controls including credit risk scores.

The way to interpret this graph is that if you paid a fee one month ago, the propensity of paying a fee, for example, a late fee this month is about 22 or -- between 22 and 25 percent, but had you paid that same fee say eight months ago, that amount would have risen to about 30 percent, so it looks like there's a kind of recency bias where having paid a fee more recently has a bigger effect in your propensity to having to pay a fee now than having paid the same fee a year ago.

So these are just some motivating facts. We're actually going to try to present a little model of this and estimate it. Let me present a simple model of learning and forgetting or learning and back sliding or attention and inattention. There

are several different phenomena that could explain the pattern of behavior.

Capital F would be the stock of negative feedback and little f be the current feedback which is either zero or one. There's a dummy variable for fee payment, and let this capital F evolve as kind of a capital accumulation equation where capital F is equal to little f if you paid the fee in the current month plus some depreciated value of the stock of previous fees paid where δ which is between zero and one indexes depreciation of the stock of negative feedback.

And this effect will allow us to include things like recency biases, forgetting and other forms of backsliding. We're not really going to be able to distinguish between these various mechanisms.

We're going to assume that past fee payments drive down future fee payments through a reinforcement learning mechanism so that your expected probability of paying a fee this month is equal to a constant minus β times capital F divided by one plus capital F .

Now, the reason we choose this functional form rather than just having capital F , rather than just having a negative linear dependence is that by writing things this way, we're able to allow for the possibility that learning will saturate so, in other words, at some point when you've written your Ph.D. on

credit card fees you've learned as much as possible about fee payment and you simply can't learn anymore so we wanted to at least allow the possibility that this learning effect asymptotes.

Of course if we estimated that γ equals zero then learning will not saturate, and the beta parameter here is the other key parameter and that will capture the strength of learning.

Let's turn to the results. We're going to run a regression of fee payment on a constant, person or account fixed effects, time dummies, this sigmoid and capital F that I described earlier, a bunch of controls in the near term include.

The controls are going to include credit risk scores like the FICO score, the individual behavior score at the bank, debt over limit and activity dummies, and the key parameters of interest here are going to be beta, which will measure the rate of learning, delta will measure the rate of forgetting, and gamma which will measure the possible saturation of the learning effect.

In the interest of legibility, I won't show the tables. With 4 million observations, things are basically pretty much always statistically significant, and the issue is just economic significance.

So first for all our regressions, we're going to find that this gamma parameter saturation parameter is very small, so

there's not a lot of saturation of learning. First we're going to present a model in which we allow for just the learning and in which this depreciation effect is force equals zero, and we're going to find that this coefficient beta estimates show that paying an extra payment in the past reduces the cost or the probability of paying a late fee today at about 11 percent, and this is a monthly figure, so that's fairly substantial.

Now, if we allow for the possibility of a recency bias or allow for this depreciation, we find that the estimates of this beta parameter double, so that paying an extra fee in the previous month reduces the current propensity of paying a late fee by 20 percent. However, this learning is offset by this depreciation delta, which our estimates of delta imply a depreciation rate of over 15 percent per month, so a fee paid one year ago only has one/tenth the impact on the current fee payment as the fee paid last month.

As an extension, some of the psychology literature argue that there may be more than one memory process, a short term and a long term process. We just extend the associated models to allow for the possibility of two processes and run the same kind of estimates. We find first that the model does seem to fit better with this, so there is some evidence that the two memory model fits better than one memory one.

Having paid a fee last month reduces the propensity of

having to pay a fee next month by 3 percent, but this long term memory fades at 2 percent per month. The short term memory is actually rather similar to what we got before, having paid a fee last month reduced the propensity to pay a fee this month by 26 percent, but this fades by 17 percent per month.

So of course there are a number of possible alternative explanations. I don't have time to go into exactly how we tried to contend with them, but you might think that maybe there's a correlation in financial distress and tenure or correlation between purchases and tenure. When we tried doing correlations of either of these things of tenure or just simple plots, we find that things like FICO scores for example don't seem to vary much of account tenure nor do purchases.

It could be that maybe people stop using the credit card once they pay a fee. That generally doesn't seem to happen. It could be that people have negatively auto correlated financial needs, so maybe I have a big need one month and much less of a need the next month. We try tried to bound how much the negative correlation would have to be and find that it has to be more than three quarters or so, more than minus three quarters for some of the fees, which is a very big number and it's very different from the general positive auto correlations that you get from, for example, income processes or other such.

Finally there may be differences because we have an

imbalanced panel. People are entering or leaving the sample. If we just modify the sample to have a balance panel we get the same results.

To present a few more robustness results: We look at how fee payments frequency varies with payment of other fees. So, in other words, does paying a late payment fee effect your probability of paying a cash advance fees over limit fee, and we find that paying one type of fee has a negligible effect on current or future payment of another kind of fee, so hence modeling fee payment individually rather than jointly is valid, and we think that this casts further doubt on the hypothesis that fees are related to financial distress.

One might think of the financial distress to be associated with paying multiple kinds of fees, as you're both late and you get cash advances and you go over your limit.

Our behavior controls at I mentioned earlier do not show economic significant effects by account tenure, and finally there's interesting and no seasonality in fee payment. Fees do rise in December but by an economically and statistically insignificant amount.

I should also add we're also re estimating some of our main results using method to simulated moments which allows us for somewhat richer model structure, and so far the results seem to be qualitatively similar.

So to conclude, consumers do learn how to avoid fees. New account generates fees of about \$16 and induce penalty pricing in some cases, but through negative feedback, fee payment consumers learn to avoid paying such fees in the future and controlling for person fixed effects, fee payments fall by 75 percent during the first four years of account life.

However, this hardware knowledge depreciates at about 15 percent per month, and as your fee paying lessens in the past, consumers tend to backslide.

So like rational agents consumers do learn, but like people who are myopic, consumers respond to recent events far more than events that occurred just a few months ago, so I guess we have results that maybe make behaviorlists or rationalists happy or maybe it makes both of them happy. I will leave it to you say.

Thank you.

MR. EICHORN: Joel Schrag of the FTC will be commenting on Dr. Driscoll's paper. Dr. Schrag joined the FTC's Bureau of Economics as a staff economist in 2000. Since that time, he has worked on a variety of merger and non-merger investigations, many involving the pharmaceutical industry. Before joining the FTC, he taught in the Department of Economics at Emory University and published articles in the fields of law and economics, industrial organization, and behavioral economics. His current research interests lie in the areas of the economics of intellectual

property and the nature of competition in the pharmaceutical industry. Joel received his Ph.D. in economics from Berkeley.

Mr. SCHRAG: Thank you very much, Mark, and I would like to say that I thought that this was a really very interesting paper, although I was somewhat alarmed when I looked at figure 6, which looks at how the rate of learning and backsliding depends on age, and I think Alan Schwartz and I have similar concerns. I learned that I was well passed the point of maximal learning and that I was just entering the point where my backsliding rate was going to start increasing, so that was a little troubling.

Nevertheless, I do think that this research does have the potential for important implications for policy on disclosure. As my colleagues from the FTC, Pauline and Jan and Jim have talked about before, looking at disclosure issues is really an important aspect of what we do, and the FTC's disclosure work really hinges on a couple of ideas, namely the consumer will understand the implications of the information that they receive, both for their choices and for their welfare.

And second, that the consumers need to have that information at the point where it's relevant for their decisions, and if indeed consumers are very forgetful or find it difficult to understand the information contained in disclosures, then it may not be actually very useful to them. So that raises the question of whether there is a role for policy in improving those kinds of

disclosures.

In this context, critics seem to argue that these fees are too high or that consumers are paying too much in these fees in the aggregate, and that raises the possibility that firms have quasi rents to their earning from these types of fees which presumably are competed away in competition for consumers. If that's wasteful, there may be a role for policy, but it's really difficult to say exactly what that is because it likely depends on in an important way on exactly what the mechanism is that's leading consumers to pay these fees.

I thought that the paper did a great job of pointing out that there are different possible explanations for what's going on. One is simply that consumers learn the information through disclosure and then forget the information later in the relationship with the card issuer or maybe they didn't learn the information in disclosure at all upfront.

If that's what's going on, then there may be a role for improved disclosure or for repeated disclosure. On the other hand, it may be that consumers are completely aware of these fees but that they're simply unable to use that information because of procrastination or some other issue that's interfering with their ability to make wise financial decisions, so ideally we want to be able to distinguish between those two alternatives. If, for example, as I said consumers simply forget about the fees, then

there may be a role to play for repeated disclosure.

I was interested to hear John just mention that during their panel, the late fee changed from \$30 to \$35. Now I assume that that type of change in the terms of the contract precipitated a disclosure to the customers. I know that my late fee for my American Express card has recently changed, and it did trigger a disclosure to me. I've never paid a late fee to American Express, I just wanted to make that clear.

But it would be interesting to look in their data to see whether at this time that that disclosure was made to consumers whether consumer behavior changed afterwards. I'm not sure if the panel was long enough for them to be able to look at that.

On the other hand, if the issue is simply that consumers are procrastinating, then obviously providing the information isn't necessarily going to help them improve their decision-making, but there may be other mechanisms. Just other things I'm aware of in the credit card industry that are becoming more prevalent are things like automatic reminders where you can sign up for an account setting to generate an automatic email to remind you to pay your bill. I'm not sure if your issuer has that as an option, but I think it would be interesting to look to see whether that's the type of mechanism that would be useful for correcting these types of problems.

That does raise an issue that actually came up this morning,

and I think it was Jonathan Klick's presentation when he talked a little bit about the issue of paternalism and how if you have paternalism in certain areas, it can potentially lead to worse decisions in other areas, and I think that potentially applies in this setting where if you improve -- if you offer something like a reminder service with respect to one credit card, does that potentially create a dependence that would have an impact on payment for other credit cards.

And I think one thing that would be interesting to study in this research would be to look at whether payment of a fee, a late fee for one card does impact the likelihood of paying a late fee for other cards. John talked a little bit about the robustness of checks they had done across different types of fees, but I think it would be very useful to look at that -- to look at those sorts of robustness tracks across different cards, and obviously that's going to be very difficult to do, to assemble that type of data. It may be necessary to have subpoena power to collect that kind of data, but I think that that would be a very valuable robust instruction as well. I thought it was a very fascinating paper.

Thank you.

(Applause.)

MR. EICHORN: There's a lot of concern about consumer debt these days. Americans' savings rate for 2005 was negative for

the first time since the Great Depression, and it was negative in 2006 too. There's a healthy debate about the significance of this statistic and about the sources of wealth that the savings rate does not take into account, but many think credit cards invite consumers not to save. Some argue that incentives to use credit cards - such as reward programs - lead people to take on more debt. Howard Beales examines that hypothesis in his paper, *Rationality, Revolving, and Reward: An Analysis of Revolving Behavior on New Credit Cards*, which he coauthored with Lacey L. Plache.

Dr. Beales teaches in the School of Business at the George Washington University. He is of course a member of the FTC family - he served as the Director of the FTC Bureau of Consumer Protection from 2001 to 2004. One of the highlights of his time here has got to be the Do Not Call registry, which has been an incredible success. Howard also reexamined and redeveloped the FTC's approach to privacy to focus on the consequences of the use and misuse of consumer information. He received his Ph.D. in economics from the University of Chicago.

MR. BEALES: Thanks, Mark. It's nice to be back at the FTC and nice to be back amongst economists again to talk about economics as opposed to the latest consumer protection cases.

What I want to talk about today is the study of revolving behavior on new credit cards and looking at the differences

between rewards cards that pay you some bonus every time you use the card, versus other cards. The bonus may be cash. It may be airline miles or anything like that. But the rewards card feature is something that's been criticized in the literature, more in the law review literature than in the economics literature, as something that takes advantage of behavioral biases.

So what we want to test is whether behavior in the payment of rewards cards is consistent with the behavioral story or with the rational choice story. The behavioral economics story we think says that rewards cards should increase the probability of revolving, of carrying a balance from month to month. It's because it rewards current purchases. The pain of paying is still farther in the future. There's a bigger reward for current purchases and that ought to lead to more spending and more revolving.

Second we think the cumulative cost neglect notion of many behaviorlists argues that the probability of revolving behaviors should increase over time. I may pay off the card right at the beginning, but over time I should accumulate a balance as I get seduced into debt, and third, the argument has been made that cards with no annual fee increase the likelihood of revolving, and again the argument is that there's no current pain from paying. I can postpone that a little bit into the future. I

will discount the future too heavily and the result is that I'll end up more likely to be revolving if there's no annual fee on my card.

Rational choice has very different implications. Rational choice says that consumers should be less likely to revolve a reward card. If I carry a balance on my reward card I can't churn as much through the account, and that's going to reduce the amount I can earn on rewards so I should try to payoff my balance. If I do incur a balance because consumers do borrow on credit cards and it's a perfectly rational thing to do, I should payoff that balance over time so the probability that I'm carrying a balance should decline over time, and finally rational choice says consumers should be, if anything, less likely to revolve on a card with no annual fee because typically there's a trade-off in the card pricing between the annual fee and the annual percentage rate.

I would rather carry a balance on a card with a higher fee and a lower annual percentage rate, so by itself, the annual fee -- I should be less likely to revolve if there's no annual fee.

We test this in the VISA payment system panel study that's commissioned by VISA USA. This starts out as a nationally representative sample, and to participate in the panel you have to be at least 18. Household income has to be at least \$10,000, and you have to at least one payment card. Consumers are

surveyed quarterly, and the data that we use runs from 1994 to 2003.

We have card data for each payment card that the consumer has. We know whether it's got a rewards feature or not and what kind of a rewards feature although we haven't explored that. We know the annual percentage rate on the card. We know the annual fee or the category of the annual fee on that card. There's also a demographic data about the respondent and their household, and one of the interesting features of the panel is they complete a purchase diary that records how they made each purchase, which card they have used to pay for each purchase over the course of a month. We make minimal use of that data.

Our sample is consumers who acquired a new card in any given quarter. We control for whether they were carrying a balance on any of their other cards when they got this card, and in order to do that we have to have data on this same consumer for at least one of the two preceding quarters. We consider a consumer to be a revolver before they got a new card, if there was a balance on any card in either one of the previous two quarters of data for that consumer.

We end up with almost 5,000 reward cards and about 12,500 cards in total that are new cards in the sample period. Roughly a quarter of each sample we have data that goes out two years on that particular card, on behavior. We got 16,000 rewards cards

observations and about 45,000 observations on all cards.

The first thing we asked is whether getting a new reward card can change behavior, and I want to look at the cross tabulations here briefly of people who get a new rewards card. 57 percent of the people that got a new rewards card were revolvers to begin with, and the question is: Do they revolve on their new rewards card too or not? Does the new card change behavior? 43 percent of them on the other hand were not revolvers. They didn't have a balance on any card in the two quarters before the -- before they have got this new card, and again we want to look at what happened to them.

This is the prior non-revolvers who get a new rewards card, okay? Overwhelmingly they stay non-revolvers. 92 percent of the people who were not revolvers before they got this card are not revolvers in the first quarter after they acquired the card. The people who do revolve, and there's a few of them, that behavior tends to ebb over time.

The very similar picture among the prior revolvers. The people who were revolvers before are more likely to be revolvers than the non-revolvers. 58 percent of them revolve in the first quarter, but again revolving behavior declines over time. You're less likely to carry a balance the longest -- the longer it's been. Two years later it's fallen to about 50 percent that are actually revolving.

What we did then was to estimate logistic regression models to try to control for demographic variables and look at the probability that you've got a balance on your card in any given quarter. Now this is on your new rewards card that you just acquired at the beginning of our sample.

One of the most important variables is your prior revolving status, and as we saw in the graphics, people tend to stay what they were. If you were revolving before you got this card you're still revolving on this card. If you weren't revolving that tends to persist as well.

The longer it's been since you got the card, the quarters since acquisition, the less likely you are to run a balance, okay, so over time people are paying off the balance. If they incur one, the probability of carrying any balance declines over time.

People are less likely to carry a balance on a rewards card than on another kind of card, contrary to the behavioralist story. The higher the interest rate, the less likely they are to carry a balance. That makes sense from a rational choice perspective certainly, and the bigger the annual fee, the more likely you are to carry a balance on the card.

We only had categorical data on the annual fees. We could see an annual fees less than \$20 or more than \$20. The omitted annual fee is zero, so what the data are telling us is the lowest

probability of carrying a balance is the card with no annual fee.

Just to give you a flavor for the magnitude, this is the calculated probability of revolving after you get the card. It's at the sample means or the mobile values of the discrete variables, and it was for somebody who was a revolver before they got the new card. The light blue bar is any other card, is sort of the all cards effect, so the darker blue bars are the rewards cards.

You are consistently less likely to run a balance. For both kinds of cards, the probability of having a balance declines over time, falls by about 10 percentage points over the two-year period that our sample covers.

So if we look at sort of the maybe implications here of behavioral economics versus rational choice that we set out to test, behavioral economics says more revolving on rewards cards but the data says less. Behavioral economics says more revolving behavior over time, the data says less, and that's consistent with rational choice. The behavioral story says more revolving with no annual fee on the card, again rational choice says less and that's what the data says as well in this sample.

We looked a little at some demographic variables and I want to just comment on them a fairly briefly and not spend a great deal of time on them. We think these are basically proxies for credit demands. Households with higher incomes are less likely

to carry a balance. The more a household spends, the more its total spending reporting in that performance diary, the less likely it is to revolve on the new card.

Bigger households are more likely to carry a balance because the kids are expensive. Homeowners who have alternative credit sources are less likely to carry a balance. Older households are less likely to carry a balance.

We tried some variables with quarter to quarter changes in demographics and they didn't work all that well. We looked at people who bought their first house in the current quarter. We looked at households that added a member in the current quarter or that decreased by a member in the current quarter, and the results are a little mixed between the rewards card sample and the all card sample, but we may try to figure out more of what's going on with these.

We also looked at a set of employment variables, and these are kind of interesting although probably more because of what they say about employment. People who are part time employed or retired are less likely to carry a balance on a credit card, on a new credit card than people who are full time employed, which is the omitted category here.

What that suggests is people are jointly choosing what they want their income to be, and that's going to influence their credit demand. Unemployment or employment status is endogenous,

not something that happens to them. We get a very similar pattern when we look for employment status of another adult. Full time employed other adults, they're more likely to be carrying a balance. Part time employed, retired, those people are less likely to revolve.

We did several sensitivity checks to try to check on the basic results and make sure that they were robust. We let the effect of the time sense acquisition be different for rewards cards and other cards. There's no statistically significant difference. The difference is positive for the interaction term for rewards cards but it's not statistically significant.

We let your prior status, whether you were revolver or a non-revolver, have a different effect for rewards cards and non-rewards cards. Again the term for rewards cards in prior status is positive but not statistically significant, no change in the other key results. Rather than making this being a linear relationship that each additional quarter reduces the likelihood of running a balance, we used a dummy variable for each quarter that we have.

The variable for the first quarter is positive and significant. You're more likely to carry a balance in that very first quarter. The second quarter is negative but not significant, essentially zero. All the subsequent quarters are negative and significant. Could be that this is learning but

it's pretty quick learning. You have figured it out. You figured it out in the first quarter and it didn't persist.

The overall pattern is negative. Linear regression of the coefficients is significant. R squared is about 86 percent, so the linear story is reasonable.

We also tried a reduce form. There's obviously a simultaneous choice going on about what kind of a new card do I want and am I going to pay the balance or not. In this model we included only your prior revolving status, the time since you got the card and the card features themselves. None of the demographic variables are included. The essential results are unchanged. You're less likely to revolve on a rewards card. You're less likely to revolve the longer you have had it, you're less likely to revolve if there is no annual fee.

The final thing we've looked at is to look at balance categories. What we've been looking at before is the probability that you have a balance at all. What we're looking at in these models is different categories of how big is your balance. The bottom category is no balance, all right, and that's essentially what we were looking at before is the zero versus the ante balance.

This is an ordered logistic regression model that lets the balance fall into any one of the different categories that we have data for on this new card, okay. The effects are basically

the same. Prior revolving status matters a great deal. The longer you've had the card, the lower your balance category.

The rewards cards, people tend to run smaller balances than they do on other cards, and again the lowest likelihood of carrying or you have the smallest balance on cards with no annual fees consistent with the rational choice of expectations.

What we find from the data is consumers are less likely to revolve on a rewards card than on other cards. The longer they have other cards the less likely they are to revolve and consumers are less likely to revolve on a card with no annual fee. It's consistent with the rational choice story. It's very different from what some have argued as the behavioralist expectation of what we should see when consumers get a new rewards card so thank you very much.

(Applause.)

Mr. EICHORN: Ron Borzekowski will be commenting on the paper. Dr. Borzekowski is an economist in the Division of Research and Statistics at the Federal Reserve. His research examines historical and recent developments in the payments industry, including the rapid rise of debit card use in the US; the adoption and impact of new technologies; and the strategic interactions among financial institutions. He received a Masters in Public Policy from the Kennedy School of Government at Harvard and a PhD in economics from Stanford University.

MR. BORZEKOWSKI: Thank you very much. Thank you to Joe and the organizers for inviting me here today. When I got to see the paper in particular, the data set that the authors used, I have to admit massive jealousy took over. This is the second time I've come across the VISA payment panel study and it's quite an impressive data set and if only they would let all of us use it.

One caveat before I get into what's going to be a very short discussion and focus only on a small portion of the numerous findings in this paper is everything I say is my opinion, not that of the Board of Governor's.

I also want to foreshadow that was said about two slides, because I'm out of jokes I will do audience participation at this late hour in afternoon. How many people in this room have a rewards card? Looking around, I'm guessing 90 something percent, something close to that especially if we discount anybody in the under 25 set. It's probably a 95 percent of everybody above that, so keep that in mind for a minute.

Very very quickly, the data in the VISA payment study panel is fantastic. The observation in this data set is going to be people that get new cards. That's going to become important. We're going to look at either the presence or level of a balance and we're going to relate that to whether it's a reward card. We're going to control for whether the person was revolving

before, and the finding that the author has come up is the rewards people -- people with rewards cards have lower balances and they decline over time, less likely to have a balance and the balances are lower and they decline over time.

And the conclusion is going to be the behavioral descriptions of credit card use, which should produce a positive sign, must be wrong or at least not consistent or not found in this data. It might be too strong to say must be wrong.

Why is this important? It's not only important because we're all here at a conference on behavioral economics and we want to test this theory, but in this particular market, and this came up in a series of talks this afternoon, competition in credit card markets and the debit card markets are heavily shaped by rewards. For those people that don't follow these debates, a large part of the debate about public policy and credit cards has to do with interchange, the amount of money that goes from a merchant to an issuing bank. Some of that is being used to bribe you to use that particular card, so a large part of this sort of competition behavior is being shaped by these particular features of the market.

So let's think about the interpretation for this paper. The basic argument is that under any of the behavioral phenomena described, and they list five at the beginning of the paper, hyperbolic discounting, procrastination, rewards should increase

revolving. Here's the thought exercise I want to do, and I'm going to modify these bullet points slightly having seen the presentation, something that wasn't in the paper.

If I planning identical consumers, and I randomly give them reward and non-reward cards, I fully agree that if all of a sudden the behavioral story is true, transactions on the rewards cards should be higher. The same person that's being rewarded to use this card and not this card will conduct more transactions on the rewards cards. There's no doubt about that.

The balance is should the person not be able to pay on average should not be higher, and I think that's for only certain people, and I think the test is a little strict here because it's only looking at the balances, not of the transaction volume.

If it's not true, if the behavioral stories are not true, there should be no difference. Now, the caveat that just came up was, okay, if you are near the balance, if you want to churn as many transactions as possible through your card, you would never want to be running a balance, but forgetting people that churn so much up against the \$5,000 and \$6,000 limit, I think it's going to be much closer to zero, so we're testing positive against zero, and then which made me wonder a little bit: What's the negative sign in this particular -- that the authors find.

In the interest of time I'm going to skip this, but there's an interesting -- I'll just point out to people there's an

interesting -- I'll do it for a second.

Prior revolving in this paper is measured on any card, were you revolving on any card before. The current balance is whether you're running one on the new cards, and the authors have reasons for doing that but all of a sudden it starts confounding some interpretation, and I think we need to think hard about that because there's other evidence, for example, Mark Reisman's in the GIE that people tend to use a preferred card. They might have many in their wallet, but they tend to use one at a time.

And you have to worry about when you do it this way people switching cards, running balances on one transacting on another. Those kind of dynamics all of a sudden enter the equation, and I think that needs to be addressed.

The other thing is the authors are pushing hard. By demanding that the rewards -- to see what rewards cards due to human behavior, requiring that it results in a balance is very strict because there's lots of people who may be using their card a lot more, maybe running the risk of a balance or something like that, but you don't actually see a balance so far. You just see a lot more transacting on that card.

So the negative side, the heading on this slide gives it away. What worries me about the negative sign is selection. It's not random who gets a card and who doesn't, and there are two aspects of selection of this paper. The first is by virtue

of looking at new cards these are sort of different people than the average person.

This isn't important to really understand the results of the paper but it's important in thinking about the dynamics of who gets a new card. If you look at the SCF, 58 percent of people revolve, and in this sample, it's 69 percent, and among people with no non rewards cards it's 77 percent, and this is probably because people that revolve are the ones shopping for the new rate are trying to get the new card or need to expand their bonus, but all of a sudden there's something about these people, and I would just like the paper to discuss that a little bit more because they have this amazing data set to actually look at these things.

The more important point, this is probably where I'll have to finish, folks that get rewards cards just ain't like other folk. That's all you. The 90 percent of you that raised your hand, you ain't like other folk. We're a selected group in here.

In a recent paper by Andrew Ching at the University of Toronto, and Fumiko Hayashi, who is at the St. Louis fed, Kansas fed, excuse me, have a rewards paper. It's a mimeo, so this is not meant to be an indictment of missing a cite or something like that. They actually look at who has rewards and who doesn't, and it turns out on observable characteristics, demographics matter a lot. Some of those are controlled for in this paper but for

example education is not, and it's a very big predictor about whether you'll have a rewards card.

The same paper makes a point of saying that conditioning on the unobservable matters a lot. They have an instrumenting approach or the econometrics I think to handle -- they argue handles the selection effect, but whether you believe that or not, it clearly indicated that these people are different in unobservable ways than people that don't get rewards cards.

The naive versus sophisticated from the point of view of thinking about whether this is going to test the behavioral hypothesis, who's more likely to get a rewards card? And I don't know which way this goes, so for example if I think I'm going to get a credit card just for I might need one in the future but I don't plan to have any transactions whatsoever, I don't need a rewards card.

If I'm the kind of person that thinks that I'm going to run a lot of charges and then pay off my bill at the end of the month, I maybe more likely to get one but the paper needs to really think through those and argue to me that we're not sort of self selecting the answer.

And so, for example, even if you look at non-revolvers, they had no debt before they got this card, all of a sudden they start running debt on this particular card, it's -- for rewards card it's like 14 percent and for the others it's 20, so it tells me

that the people that are getting rewards cards are the ones ex ante, the ones that are planning not to run anything, not to run debt on their card, and that might be explaining the negative number.

What still could be true is they expected not to run a balance so on average they don't run balances, but they run slightly more balances than they expected to. That would be consistent with these results, so I think the authors have to handle this somehow.

Here's the good news. Let's ignore this. Actually let's ignore that point for now, look at this one. The richness of this data means you might be able to get at this because you have the diary, so you have the transaction volumes so, for example, there are two people that both run a thousand dollar balance. If one generates \$5,000 and then pays off \$4,000 versus someone who runs up a thousand dollars and only pays the de minimis minimum, the rewards are very different for those people, and since you have the pre histories, you can condition on who might for example find the rewards the most valuable.

And if you do that, then you know who's going to get the rewards card, and if you do that you can sort of correct the two samples and see if the result holds up.

So I may have seemed critical. I don't want to sound too critical. They're fantastic results in here. The demographics

are interesting. The behavioral stuff that can be explained is interesting. Until the selection issue is handled I'll just be a little -- I'll have no horse in the race on behavioral versus rational theories from this.

Thank you very much, and my apologies for the extra minute and a half.

(Applause.)

MR. EICHORN: We have a few minutes for questions.

MR. MIRAVETE: My name is Eugenio Miravete, University of Texas Austin. I'll comment on the two papers, and then I'll elaborate a little bit more on your paper.

Both papers are using lack dependent variables, and you could argue -- this is an econometrics point, so you could argue that there is endogeneity bias there and I wonder if you can simply attack the problem. If I'm never -- I'm not that state of a user, but I think the State actually includes this bond correction for pre-determined variables, so that's the case of the pre-revolving that has to be controlled for.

And in your case is this negative feedback, accumulated negative feedback, and I think that's actually critical to convince that these estimates are not biased.

And the other thing on your paper so let's show that they're being this for too long, so you can think of a different approach where you have a history. You are deciding, you're solving that

the problem for the next 50 years, and you decide how much you're going to spend and whether you're going to pay the late fee or not or you have some distribution of expenses or something like that.

My point is: How can I distinguish your interpretation of naive becoming sophisticated for something like we have an average consumption level and then we receive shocks or expenses, needs. That happens with some probability, and this happened at intervals in time, and then it looks like I am forgetting.

This is just a question but it's interesting. There are lots of things going on organizational, forgetting and learning and so it's actually a very interesting point that you make.

MR. DRISCOLL: Maybe I can say something about both of those. First on the econometrics points, you're right there is an endogenous variable bias, and we sort of are addressing that in two ways. One, we think of the magnitude is of the order of one over the number of observations and since that's relatively long here, the bias isn't kind of large enough to affect our results or to overturn our results.

But we've looked into sort of doing Arellano and Bond, but we're currently re-estimating this using a method of stimulating moments techniques which isn't subject to this critique, and those are complicated to do, and so far things look promising.

Second on the sort of history or financial need issue, so in

our regressions we do have time dummies, so we're eliminating the possibility of needs that come up regularly, the summer vacation or something like that, and moreover in the paper in a little bit we go over something I didn't have time to talk about, but we sort of try to look at how high the degree of negative correlation would have to be for financial need to render the same kinds of results that we see, and we find that the size of that is just really almost implausibly large, that you would have to have an auto-correlation of financial needs of minus .75 or higher for the late fees and minus .5 or higher for the cash advance fees.

And we don't think that seems to match other evidence that people have brought on income processes or other changes. We agree it's a possibility but we think it's relatively unlikely, and the last point I should make is we actually don't know whether it's even given our results -- we don't know whether it's forgetting or backsliding or inattention. We don't have separate models of these so all of these interpretation are at least possible.

MR. SYDNOR: My name is Justin Sydnor, I'm from Case Western Reserve University. I have a question/comment for Howard. I was a little curious on the idea that the rewards cards should necessarily sort of involve this present bias problem, so I guess you alluded to the idea that the rewards would be something that

you wanted to get right away but my experience with reward cards, is normally they have some sort of threshold, so a dollars spending today may not payoff a reward for quite some time, whereas you're going to start running a balance on it starting the end of the month.

So it would seem like some of the timing might go the other way, but within your -- you mentioned possibly having some information on the rewards structure. If you knew people that were close to a threshold like that, you may actually be able to observe a gaming of the system, a sort of present bias coming in, my dollar today gets me over the reward hurdle, and I would be willing to do that.

So I would just be curious to know if you have that capability or if you have anything more you might want to say on sort of the present bias part of the rewards cards?

MR. LETZLER: Rob Letzler, UC Berkeley. What I'm curious about on this paper is to some extent whether the possibility of getting a reward gives me sort of a positive clear reference point, that I'm getting my 1 percent back on my Discover Card but if I miss and stop revolving I'm paying 16 percent, and boy, do I not want to get burned for losing -- sort of lose all of my rewards by revolving.

And so it sort of -- I have this additional motivation not to get burned and not to go from feeling like I have made a good

choice to making a poor one.

MR. BEALE: I guess in many respects it illustrates some of the difficulties in trying to rely on behavioral economics and predictions that it makes because the prediction that we're citing is definitely out there in the literature and in the law review literature in particular, but you can make a difference of arguments as to what would actually be the case. I mean, as to what you might expect, based again on sort of behavioral principles, but a different view of what are the right and relevant behavioral principles.

It makes it a little hard to manipulate for policy purposes or to test. I can see that -- I can see the argument that, gee, maybe I really want to make sure I don't run a balance because I want to keep all these games I've got. I don't know whether we've got enough detail about the reward structure to look for thresholds. We may only know like whether it's miles or cash, but that would certainly be an interesting possibility to test for if we can.

MR. EICHORN: Time for one more question? Hearing no questions, I want to thank the panel for four excellent presentations, and thanks a lot.

(Applause.)