

The Dynamics of Overdraft Fees and Incidence *

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Abstract

In consumer banking, transactions that would reduce checking account balances below zero may be allowed with overdraft fees or denied with insufficient funds (NSF) fees. Overdraft/NSF fees comprise a majority of all checking account fees. They disproportionately fall on a small share of consumers, who tend to be younger and report lower incomes. Consumers overwhelmingly report overdrafts as mistakes, though a minority prefer they be allowed. For ATM and point-of-sale debit card transactions (in which balances are checked instantly), NSF fees are prohibited, and overdraft fees are allowed only if consumers have opted in.

We study the dynamics of overdraft/NSF fees in confidential supervisory data from several large banks representing over 20 million US checking accounts, observing every transaction over an 18-month period for a random sample of these accounts. Fixed-effects panel regressions recover within-person variation in overdraft/NSF fees as a function of account tenure and other time-varying characteristics. Our estimates imply that, for accounts opted into overdraft coverage, overdraft/NSF fees increase by about 20% over the first year of account ownership. We find no such effect for accounts opted out. We use only months in which a consumer was eligible for overdraft, so our results cannot be attributed to gaining eligibility for overdraft.

We also present novel results on the relationship between within-person variation in overdraft/NSF activity and overdraft limit, linked and unlinked deposit and credit account balances, measures of account activity, and average daily balances. We find evidence of persistence in monthly overdraft/NSF fees even after controlling for account activity. Results are qualitatively similar using the probability of incurring fees rather than the level of fees. Findings are robust to top-coding of outliers and to splitting the sample by overdraft/NSF intensity. We discuss possible explanations, including a limited attention model in which consumer attention to overdraft/NSF is focused by opening a new account and declines thereafter.

1. INTRODUCTION

Users of checking accounts may attempt to spend or withdraw funds exceeding their available funds. If the financial institution chooses to authorize the transaction, an overdraft occurs. An overdraft may or may not incur a fee, depending on the financial institution's policies.¹ If a fee is charged, this fee is usually fixed in amount regardless of the size of the transaction or the amount by which the consumer's balance went negative.²

Overdraft programs on checking accounts have evolved from a manual courtesy program to an automated feature offered to most account holders. 40.5% of all banks and 76.9% of large banks surveyed by the Federal Deposit Insurance Corporation (FDIC 2008 Study) offered an automated overdraft program, with most beginning it after 2001. The updated FDIC survey of Rhine and Robbins (2012) shows prevalence increasing in the size of the institution with automated overdraft programs in about 32% of the smallest banks, 54% of the midsize banks, and 70% of the largest banks. In addition, all the large banks covered in the CFPB 2013 Study offered an automated overdraft program.

Corresponding with the growth of automated overdraft programs, the share of consumer checking account fees attributable to overdraft has increased. Among the sample banks responding to the FDIC 2008 Study with a full five years of fee income trends (representing 794 banks or two-thirds of the sample), the aggregate ratio of overdraft/NSF-related fee income to net operating revenue increased monotonically each year from 2002 (5.51%) to 2006 (6.23%).³ In the 18-month period covered by data in our study,⁴ overdraft and related fees⁵ accounted for as much as 60% of all checking account fees at some sample banks, with NSF fees accounting for an additional 10-15%. Not surprisingly, overdraft has attracted

¹For example, some banks do not charge overdraft fees for small transactions (typically under \$5) or if the account holder's balance goes into the negative by a small amount (again, typically \$5). Such policies are known as "de minimis" policies.

²The financial institution may also reject the transaction. In this case, if the transaction was initiated by check or automated clearing house (ACH), the financial institution usually charges a fixed non-sufficient funds (NSF) fee, while no such fee is usually charged when declining automated teller machine (ATM) or debit-card transactions.

³The study estimated that the share of overdraft fees in deposit service charges was 74% in 2006, but provides no time series on this statistic.

⁴We use the term "study banks" to refer to the banks included in the CFPB 2013 Study and "sample banks" to refer to the banks included in our study. In this version, the sample banks are a subset of the study banks.

⁵Recently some banks have started to charge extended or sustained overdraft fees if the account holder does not make a deposit to bring the account back to a positive balance within a specified period of time. Such fees are generally small, but growing. They are included in our overdraft and NSF fee measure.

considerable attention from regulators and consumer advocacy groups. Thanks to this effort, the process by which financial institutions make overdraft coverage decisions is starting to be understood, and so is the impact that various policies of financial institutions have on the incidence of overdraft. What is less well understood is how overdraft is being used by consumers. It is quite well established that a relatively small portion of consumers account for a bulk of overdraft activity, but the debate continues as to whether overdraft benefits these consumers by providing much-needed liquidity or harms them by taking advantage of behavioral biases.

In this paper we aim to contribute empirical findings to this debate by studying the dynamics of overdraft fees and incidence using unique confidential supervisory information available to the CFPB that reports transaction- and account-level data for a number of large banks over an 18-month period.⁶ Specifically, we consider consumers who have access to overdraft and incur overdraft fees at some point during the 18-month period.⁷ We then consider how a consumer’s overdraft activity changes with account tenure around an individual-specific mean, i.e., using a fixed-effects specification. We measure overdraft activity by combined monthly overdraft and NSF fees incurred and by an indicator for positive overdraft/NSF activity in a given month.

We find that, for accounts opted into overdraft coverage,⁸ there is a substantial increase in the amount of fees that an account holder pays over the account’s first year. By the end of the first year, monthly fees increase by over \$5.88 for opted-in accounts, a 20% increase in fees compared to the average fees paid by opted-in accounts paying some fees over our sample period. By the end of the second year there is an additional \$1.20 increase in monthly fees. We see no such increase in monthly fees for opted-out accounts⁹; indeed fees are actually

⁶Because the data used in this analysis are confidential supervisory information, this paper only presents results that are aggregated and do not identify specific institutions. Additionally, the data used contain no direct consumer identifiers. Anonymized codes were used to identify consumer accounts and transactions.

⁷All the study banks report a consumer’s overdraft limit, which determines the extent to which a consumer’s account balance can go negative before the bank stops covering transactions that would draw the account further negative. This limit is often set to zero for recently opened accounts as banks wish to establish some account history and some history of direct deposits before extending the courtesy of overdraft coverage. To focus on accounts that have the possibility of overdrafting, we limit our attention to accounts that have a positive overdraft limit.

⁸Opting in means giving permission to the institution to charge fees on ATM and debit card transactions that result in an overdraft. See Section 2 for a more detailed description of the regulatory environment.

⁹We use the term “opted-out” to indicate accounts that are not opted into overdraft coverage. While the original A-9 model form issued by the Federal Reserve Board implemented the choice of overdraft coverage

decreasing with tenure for such accounts. In terms of the probability of incurring fees (which we refer to as “incidence”), we estimate that it increased by 5 percentage points over the first year for opted-in accounts (an 18.7% increase). Incidence rises for opted-out accounts mildly in the first year by 1 percentage point. While our interpretation of these results is yet unproven, we believe they may indicate that opted-in consumers pay declining attention to overdraft after the attention-grabbing event of account opening and thereby become more likely to accidentally overdraft with tenure.

Our non-tenure results also provide interesting insights into overdrafting behavior. We find that for the opted-in group, overdraft limits are strongly negatively correlated with fees and incidence, possibly indicating banks’ ability to identify high credit risk accounts. Interestingly, the correlation is positive for opted out accounts, meaning that credit risk may be less important a factor for this lower overdraft intensity group. Linked account balances are negatively correlated with overdraft fees and incidence for both opted-in and opted-out accounts, indicating that linking these accounts is an effective way to avoid overdrawing one’s account. The number of debit card transactions is negatively correlated with both the amount and incidence of fees, which could be due to higher debit card usage causing consumers to be more attentive to their account or reverse causality from higher fees preventing further use of debit cards. As expected, monthly deposits are positively and average daily balances are negatively related to overdraft intensity, with the first result accounting for transaction volume or a related income effect and the latter accounting for the availability of funds.

Section 2 reviews some of the regulatory history of overdraft over the past decade and discusses related literature. Section 3 describes our data and method while Section 4 presents our detailed results. Section 5 discusses our findings, and Section 6 concludes.

2. REGULATORY HISTORY AND RELATED LITERATURE

The most important development in overdraft regulation to date was a consumer “opt-in” requirement that took effect in mid-2010. The Federal Reserve Board prohibited financial institutions from charging consumers fees for paying overdrafts on ATM and one-time debit-card transactions unless a consumer consented to overdraft coverage for those types of

as an opt in (with the default option being not opted in), many banks have changed this to a forced choice form and asked consumers to elect to opt in or opt out.

transactions. This regulation, along with a model opt-in notice, was issued under Regulation E, which implements the Electronic Fund Transfer Act.¹⁰

Beyond actual regulation, several regulatory authorities have indicated that overdraft is on their radar screen. The FDIC 2008 Study was initiated in 2006 in response to the rapid growth in the use of automated overdraft programs. The FDIC's purpose was to provide empirical data on overdraft programs, their features, their management practices, the fees imposed on consumers, and consumer usage patterns.¹¹ The study surveyed the pre-Regulation E landscape and found that some but not all banks allowed customers to affirmatively opt out of their overdraft programs. Most banks with automated overdraft program (81%) covered point-of-sale and debit transactions, and most of these (89%) informed customers of OD/NSF fees only after these transactions were completed. The FDIC's analysis of transaction-level data found that overdrafting was concentrated among a relatively small fraction of bank account holders (around 30% of account holders experienced an overdraft in a given year) and that the lower the income group of a customer's census tract, the higher the customer's likelihood of incurring overdraft/NSF charges and of experiencing recurrent overdrafts.

Following the FDIC 2008 Study the CFPB 2013 Study was released in 2013. This study relied principally on aggregate statistics received from the participating study banks, as well as responses to a Request For Information and other industry sources. It concluded that the Board's opt-in amendments to Regulation E have made a material difference in the experience of some consumers. First, most account holders at CFPB study banks did not opt into overdraft coverage on ATM or point-of-sale debit card transactions. As of the end of 2011, the percentage of accounts opting in among study banks that offered this option were 16.1% for all accounts and 22.3% for accounts that were opened during 2011. Second, while heavy overdrafters demonstrated a higher propensity to opt in than infrequent users of overdraft, most appeared not to have done so when first given the chance in 2010. Third, heavy users of overdraft who had not opted in as of the end of 2010 experienced a 63% reduction in their overdraft and NSF fees, on average, between the first half of 2010 and the second half of the same year.

¹⁰For a more detailed overview of the regulatory history, see CFPB 2013 Study.

¹¹The study population was the 1,171 FDIC-supervised institutions that either were scheduled for on-site examinations from May through December 2007 or had at least \$5 billion in assets. The survey was administered to a stratified random sample of 462 institutions from the study population. The 39 banks from which transaction data were received were a non-random subset of the 462 banks surveyed.

In addition to receiving attention from regulators, overdraft has received increased attention from consumer groups emphasizing the possible harm to consumers. Borné and Smith (2013) from the Center for Responsible Lending (CRL) argue that “many financial institutions use abusive overdraft programs to unfairly drain their customers’ checking accounts, putting consumers on a treadmill of high-cost credit.” Frank and Smith (2011), also of the CRL, assert that some banks misinformed consumers about the Regulation E choice and that most consumers who opted in did so for mistaken reasons. These findings are based on an April 2011 survey of 916 consumers, of whom 33% reported being opted in. 60% of opted-in consumers said that an important reason for their choice was to avoid a fee for declined debit card transactions and 64% said an important reason was to avoid bouncing paper checks. Of course, opting in confers neither benefit.

There is also a small, nascent academic literature dealing with the market for overdrafts. Some of this literature gives a legal analysis of overdraft and its regulation, with a special focus on the 2010 opt-in regulation.¹² There are a handful of studies providing empirical analysis of overdraft. Levitin (2010) summarizes the results of an overdraft-focused survey of credit unions, with data up to 2009. Melzer and Morgan (2015) use bank financial data and variations in state payday lending laws to show that access to payday credit is associated with a larger mean size of returned item transactions at banks, an increase in overdraft fee rates, and a decrease in offers of free checking. They attribute these results to adverse selection: consumers who need to borrow small amounts choose payday, leaving banks to supply larger, more risky overdraft credit and thus to raise the flat fee. Stango and Zinman (2009) analyze administrative bank account and credit card data of 917 consumers over a two-year panel from Lightspeed Research. Although the volunteer panelists were “likely to be relatively financially sophisticated,” the study finds that 60% of these consumers’ costs could have been avoided by repaying out of checking account balances, borrowing on a credit card instead of overdrafting, and reallocating spending and debt between accounts they already hold. Stango and Zinman (2014) again use Lightspeed Research panelists, this time randomized into various surveys on financial products. Surveys are classified as overdraft-focused, overdraft-mentioning, or not overdraft-related. They find that taking an

¹²See, for example, Martin (2008), Martin (2009), Martin (2010), Zywicki (2012), or Willis (2013).

overdraft-related survey reduces the probability of overdrafting in the same month, with multiple surveys over two years having a cumulative effect.

In the theoretical literature, the “shrouded attributes” model of Gabaix and Laibson (2006) can be applied to overdraft fees. In fact, the authors consider bank fees as part of their motivation. In their model, sophisticated consumers consider fees and practices when choosing a bank and may exert effort to reduce their probability of incurring fees. Naive consumers do neither unless the bank informs them through marketing. The authors show that a competitive equilibrium may exist in which all banks shroud their fees and increase them such that naive consumers subsidize low-cost or free accounts for the sophisticates. Armstrong and Vickers (2012) apply the shrouded attributes model to overdraft fees, examining the case for regulation. In their model, sophisticates (but not naifs) consider overdraft fees when choosing a bank and may exert effort to reduce the probability of overdrafting. They argue in the context of the UK bank market that sophisticated consumers gain at the expense of naive ones.

Finally, Samolyk et al. (2014) use the same data source used in our paper to study checking-account activity, account costs, and account closure among households in low- and moderate-income neighborhoods. The paper focuses on identifying the effect of various observables on overall checking account cost and the probability of account closure in census tracts of different income levels using a cross-sectional specification. While one of their control variables is tenure,¹³ they do not focus on it, do not identify its effect in a panel-data fixed-effects framework, and do not estimate separate effects for accounts based on their opt-in status. They find that, controlling for a wide range of observables, checking account fees are highest for consumers aged 25 through 44. The oldest consumers (65+) pay the lowest fees. Other estimated effects on fees are broadly consistent between Samolyk et al. and our paper, such as average daily balance and monthly deposits, though due to our methodological differences (cross-sectional versus within-person variation), these are not directly comparable.

3. DATA AND METHOD

The data for this paper come from a unique dataset of confidential supervisory information covering several large banks that accounted for over 20 million US checking accounts at the

¹³In most of their specifications, fees are found to be increasing until about two years of tenure, after which they decline.

end of 2010. The data contain every transaction that a fraction of the banks' account holders undertook over an 18-month period spanning January 2011 through June 2012.¹⁴ Transaction-level data include transaction date, transaction time (if available), posting date, posting order¹⁵, transaction amount, and type¹⁶; ledger balance at the end of the previous day's processing; and a flag indicating whether a transaction is overdraft or NSF and whether a fee was charged.

In addition to providing transaction-level information, the study banks also provided monthly summaries for 30 months spanning January 2010 through June 2012. For each month they provided monthly total deposits (volume), monthly debit card transactions (count), monthly other debit transactions (count), monthly overdraft/NSF fees (volume) and balances in linked and unlinked deposit and credit accounts at the end of month.¹⁷ Moreover, the banks provided monthly information on the opt-in status of the accounts and on the amount of overdraft coverage available to the account within the bank's discretionary overdraft program. In terms of account characteristics, the banks provided customer year of birth, a monthly indicator of whether the account is a singly or jointly held, and zip code information. Finally, we know an account's opening and closing date, the reason for closing the account, and the bank-specific account type. It is possible to match the account-level information to the transaction-level information via an anonymized code. We perform this matching to supplement the bank-provided monthly data with a calculation of each account's average daily balance in each month.

¹⁴We exclude January 2011 data for one of our banks due to data quality issues.

¹⁵A transaction can be initiated on a given date, known as the transaction date, but clear on a later date, known as the posting date. A good example of this is a signature debit transaction. Posting order is a number indicating the order in which the transaction was posted among all items posted to the account on the posting date.

¹⁶Transaction type is a bank-specific categorization of transactions into categories such as "ATM withdrawal" (a debit), "ACH credit" (a credit), or "Monthly maintenance fee" (a fee). Some sample banks have fewer categories (as few as 70), while some have more categories (as many as 423).

¹⁷Specifically we have data on linked savings accounts, linked other deposit accounts, linked dedicated overdraft line of credit accounts, linked other credit accounts, unlinked consumer deposit accounts, and unlinked consumer credit accounts. We consolidate linked savings accounts and linked other deposit accounts into a single variable called linked deposit accounts. It should be noted that the vast majority of linked deposit account balances come from linked savings accounts. Similarly, we consolidate linked dedicated overdraft line of credit and linked other credit accounts into a single variable called linked credit accounts, though the split here between the two subcomponents is more even. Notice that the credit balance variables refer to credit available and not credit used.

Fewer than 0.5% of observations are missing account ownership. Where account ownership is missing, we assume it is singly held. About 30% of observations are missing unlinked consumer credit balances, which we assume to be zero.

Table 1 describes the construction of our analysis sample. We identify three groups of customers: those opted in for overdraft coverage for all months when they are in the sample, those opted out for all months in the sample, and the relatively small group of customers who have changed their opt-in status during the 18 months.¹⁸ We see that in our original sample we have around 153,000 opted-in accounts and 929,000 opted-out accounts. Since we are less interested in what happens to customers with a long account tenure, we restrict our sample to those observations that have 10 years of tenure or less. We also exclude observations with 3 months or less of tenure, since these accounts often do not have access to overdraft yet due to their short tenure. These restrictions reduce our sample size by 26-27%. Next, again to ensure that we are dealing with consumers who have the possibility to overdraft their accounts, we restrict our sample to account-months that have a positive overdraft limit which eliminates a further 7-8% of our sample. To focus on account holders who are affected by overdraft, we restrict our attention to accounts that incur some fees during our 18-month period of observation. For opted-in accounts, 53% of our eligible accounts incurred some fees over the sample period, while the same number is 29% for the opted-out accounts reflecting the lower overdraft intensity of such accounts. Finally, of the observations satisfying all the above inclusion criteria, all but about 0.5% have a corresponding average daily balance.

We use two model specifications and the 18 months of data covered by the transaction file.¹⁹ In the first specification, which we refer to as “fee regressions”, we use a weighted²⁰ fixed-effects panel-data specification and regress monthly overdraft/NSF fees²¹ on a continuous piecewise-linear function of account tenure, joint-account status, overdraft limit, linked and unlinked deposit and credit account balances, debit-card and other debit transactions, monthly total deposits, and average daily balances. Overdraft limits, balances, and deposits

¹⁸Since these accounts make up less than 4% of all accounts in our sample, we do not report regression results for this group. In unreported results we see that their characteristics and behavior are closer to those of opted-in accounts than of opted-out accounts.

¹⁹We limit our analysis to the period covered by the transaction file because average daily balance, an important regressor, is calculated from this file.

²⁰We use probability weights which are simply the inverse of the sampling rate at each bank.

²¹This is a monthly summary variable reported by the banks in the monthly summary file. In future versions of the paper we will distinguish between overdraft and NSF fees using the transaction-level data.

are transformed using an inverse hyperbolic sine.²² Average daily balances, an important control variable, are Winsorized at 99% to limit the effect of outliers on our results.

In our second specification, we use a weighted linear probability model with fixed effects, which we refer to as “incidence regressions.” Our dependent variable is an indicator for incurring any overdraft/NSF fees during the month. Regressors are the same as in the fee regressions. Again, we split results by opt-in status: opted-in and opted-out accounts.

In fixed-effects regressions the effect of tenure and time trend are not separately identified without additional restrictions. Since we have reason to believe that there may be a time trend in our dependent variables, our identifying assumption is that there are no tenure effects for the group of accounts with over 5 years of tenure. We believe this is reasonable since after this amount of time with a bank, an account holder most likely becomes habituated to their usage pattern and one expects no further change in their overdraft/NSF use with tenure. Given this identifying assumption, we identify tenure effects for lower tenure accounts using a continuous piece-wise linear function of tenure and any effects of calendar time using calendar month indicators. The latter gives a more flexible specification than a time trend as it allows for seasonal changes in overdraft/NSF use together with a secular change with time.

4. RESULTS

4.1. Summary Statistics. Tables 2 and 3 show summary statistics for our baseline sample: accounts with tenure greater than 3 months and less than 10 years with a positive overdraft limit that incurred some overdraft/NSF fees over the sample period and that have a corresponding average daily balance. We see that opted-in accounts incurred an average of \$29.24 in overdraft/NSF fees in a month, while the number is significantly lower at \$10.25 for opted-out accounts.²³ Of course, in most months account holders do not incur fees, so the median fees are \$0 for both groups. Average tenure is somewhat under 4 years for both groups. 32% of opted-in accounts are jointly held while the same number is 28% for opted-out accounts. Opted-in and opted-out accounts differ substantially in their account activity.

²²Unlike the log transformation, the IHS transformation allows us to include observations with zero or negative balances since it is well-defined over the whole real line. For positive balances, which characterizes most observations in our data, the IHS is very close to a log transformation.

²³Opted-out accounts cannot be charged overdraft fees on ATM and one-time debit transactions, but they can incur NSF fees and overdraft fees on recurring debit transactions, checks, and ACH.

Opted-in accounts have more than \$800 more in average deposits than opted-out accounts which may explain the substantial difference in their average overdraft limit. Despite their higher deposits, opted-in accounts have about \$170 lower average daily balances (about \$50 lower at the median). Opted-in accounts also have 30% more debit card use on average.

As for the balance variables, we see that linked deposit balances are quite common, more so for opted-out accounts (18.6% for opted-in versus 27.4% for opted out). Linked credit balances are much less common for both groups. Unlinked deposit and credit accounts are quite rare for opted-in accounts but occur with some frequency for opted-out accounts, especially unlinked deposit accounts. Conditional on having an account, average linked deposit balances are the lowest. Average balances are similar for the opted-in and opted-out group, though unlinked credit balances are notably higher for the opted out. Median balances are always much lower than the mean, indicating a very skewed distribution of balances. It is worth noting the very small median balances in linked deposit accounts: the median linked deposit account balance of \$29 for the opted-out group does not much exceed the typical sweep fee of \$10-\$15.²⁴

4.2. Fee regressions.

4.2.1. *Baseline results.* Table 4 reports the results for our baseline fee regression. We focus first on opted-in accounts. According to the point estimate for the opted-in group, fees increase by 74 cents per month during an account's first year. This is a substantial (2.5%) increase considering that in the average month fee-paying opted-in consumers spend \$29.24 on overdraft/NSF fees. This effect is also very significant statistically. After the first year, fees for opted-in accounts change only slightly. An increase in the second year is followed by decreases in the third and fourth years and a renewed increase in the fifth year. None of these changes is significantly different from zero and the largest (10.2 cents per month in the second year) corresponds to an 0.3% change relative to the mean. Figure 1 plots the predicted path of fees setting the initial value at four month's of tenure to \$0. We see that there is a marked increase in fees by \$5.88 or 20% during the first year followed by more minor changes afterwards.

²⁴A sweep fee is a fee charged by banks to transfer funds from linked accounts in case the account is overdrawn. We don't count such fees in our overdraft and NSF fee measure.

The overdraft limit effect is significant both statistically and economically. A 1% increase in the overdraft limit for an opted-in consumer is associated with a 1.6 cent decrease in monthly overdraft/NSF fees. It may be that times of lower credit risk for a consumer are both times when banks increase overdraft limits and when consumers incur lower overdraft fees. Also, additional overdraft liquidity might help a consumer avoid bounced checks and an increasing spiral of NSF fees.

In general, linked deposit and credit balances are associated with lower overdraft/NSF fees. A 1% increase in linked deposit balances is associated with a 2.2 cent decrease in overdraft/NSF fees for an opted-in consumer. If this relationship is causal, the causality could run either way; on the one hand, an increased linked deposit account balance could be leading to fewer instances of having to overdraft; on the other hand, lower overdraft/NSF fees could free up funds to be transferred to a linked deposit account. Linked credit balances are statistically significant with a 1% increase in linked credit balances associated with a 2.0 cent decrease in overdraft/NSF fees for opted-in consumers. The mechanism here is presumably the same as with linked deposit balances. Turning to unlinked balances, we find that their effect is insignificant, both economically and statistically.

Monthly debit card transactions have a statistically and economically significant impact on overdraft/NSF fees. Each extra debit card transaction by an opted-in consumer sees overdraft/NSF fees fall by 9 cents. Other debit types have an opposite and much larger impact, adding \$1.56 in fees per transaction. The sign change between debit card and other debits may be partly due to NSF fees, which are not assessed on debit card transactions. A related explanation is the use of repeated ACH debits by some merchants, including some payday lenders (Silver-Greenberg (2013)). If a merchant responds to a declined ACH transaction by repeating it until it is paid, the result will be a large number of other debits and substantial NSF fees. In future versions of this paper we may be able to investigate this issue further when we disentangle overdraft and NSF fees using the transaction data.

A 1% increase in monthly deposits sees fees increase by 5 cents for an opted-in consumer. Of course depositing funds does not cause overdrafts; the relationship may come through the correlation of deposits with spending volume (as separate from number of debits, which we control for). Another explanation is that increased overdraft/NSF fees motivate consumers to make additional deposits. Finally, as expected, average daily balance is significant and

very strong determinant of overdraft/NSF fees — a 1% increase in average daily balance decreases fees by almost 12 cents and this effect has a t-statistic of 93.

Recall that we have monthly indicator variables in our regressions. The estimated coefficients on these monthly indicators are plotted in Figure 2, with January of 2011 being our excluded category. Two things are notable about these coefficients. First, there does seem to be an upward trend over our 18-month horizon, with fees increasing by as much as \$3 in some month compared to the beginning of the period. Second, there is a notable dip in the months of February and March. Such dip is present in other small-dollar products and is usually attributed to many households receiving tax refunds around this time. The dip is notably more pronounced in 2012 than in 2011.

We turn now to the opted-out group. Customers opted out of overdraft coverage show a very different relationship between fees and tenure. Fees decrease by 19 cents per month over the first year. This effect is statistically significant, smaller than the opted-in tenure effect for the same period, and opposite in sign. As with the opted-in group, tenure effects are small in years after the first. The largest is 4.3 cents per month in the second year. However, these small effects are somewhat statistically significant due to the larger sample size of opted-out consumers. Overall, fees are more stable over account tenure for opted-out consumers than for opted-in. Figure 1 plots the predicted path of fees for this group, too.

Recall that our analysis begins at the fourth month of account ownership, a restriction we imposed to ensure that consumers are eligible for overdraft coverage (beyond the straightforward assumption of having a positive overdraft limit). One key question is why these early months of overdraft coverage eligibility see higher fees for opted-in consumers but a small reduction for those opted out. At least two explanations are possible. First, coverage has different implications for opted-out consumers. Specifically, an opted-in consumer gaining overdraft coverage has a new opportunity to incur fees on overdrafting debit card and ATM transactions, in return for having them paid. These fees are not incurred by opted-out consumers, who continue to have these transactions declined as before. Both types of consumers may start to incur overdraft fees on ACH, check, and other transactions not covered by the Regulation E opt-in rule. However, many of these non-covered transactions were already eligible for an NSF fee of equal size. Overall, the implication is that, unlike those opted in, opted-out consumers have little more opportunity to incur overdraft/NSF fees after gaining

overdraft coverage than before. A second possible explanation is provided by basic sample selection. We divide our data into opted-out and opted-in groups, and these two groups of consumers may be very different. For instance, if we interpret our results as a sign of growing inattention to overdraft over time, it could be that consumers who opt in are also those consumers who are more likely to be prone to such inattention problems.

Apart from tenure, overdraft limit shows the starkest difference in coefficients between the opted-in and opted-out groups. A 1% increase in this limit is associated with 1.6 cents less in monthly overdraft/NSF fees for opted-in customers but 1.3 cents more for those opted out. Both effects are statistically significant. This presents something of a puzzle. Clearly, our explanations above for the negative effect are not plausible here. There is at least one intuitive argument on the side of a positive effect as well. If cash-strapped consumers continue spending until they start having transactions declined or returned, the result will be more overdrafts in months with a higher limit. The bank does not inform the consumer of the limit; rather, the consumer discovers it by repeatedly drawing on the account until the bank refuses to extend additional credit. Neither this explanation nor our earlier ones (higher limits for low-risk consumers, beneficial effects of liquidity) explains why our results differ fundamentally between the opted-in and opted-out groups. Further research would be needed to resolve this divergence, including a more systematic understanding of how bank overdraft limit policies are determined.

Other coefficients are often similar in magnitude (proportional to the lower average fee of this group) and higher in statistical significance (due to the larger sample size). Two coefficients diverge from this pattern, the one on unlinked deposit balances (where the coefficient is more than three times as large as for the opted-in group) and the one on monthly debit card transactions (where the coefficient is twice as large as for the opted-in group). Recall from Table 3 that opted-out consumers are much more likely to have unlinked deposit balances, which may explain why they would find this a more effective tool in avoiding overdraft/NSF fees. As for the effect of debit card transactions, it is not immediately clear why it is larger for the opted-out group.

Finally, Figure 2 plots the estimated coefficients on the monthly indicators for the opted-out group, too. The time patterns and the seasonal effects are similar to the opted-in group with the level of the coefficients being naturally lower.

4.2.2. *Robustness checks.* One concern common to income and wealth data is that our deposit and balance variables have extreme outliers that could be affecting our estimates. To address this concern we top-code all our dollar variables (the overdraft limit, the linked and unlinked balances, and the monthly deposits) at the 99th percentile. (Recall that average daily balances are already Winsorized.) We see from Table 5 that this has no appreciable effect on any coefficient estimate. An additional robustness check is to classify sample accounts into groups by the mean value of the dependent variable and run the regressions separately on each group. Tables 6 and 7 show regression results for accounts with respectively below- and above-median values of monthly overdraft/NSF fees. As expected, coefficients are generally smaller in magnitude for the bottom half and larger for the top half. Some effects show notable differences. For instance, the first-year increase in fees for the opted-in group and the reduction for the opted-out group is present primarily for the top half. The effect for the bottom half is small and not significant. For the opted-out group, the overdraft limit effect is much larger for the top half (1.9 cents per 1% increase in limit) than for the bottom (less than a tenth of a cent). Another difference is in the effects of unlinked balances. Although sometimes not statistically significant, these effects are always positive for the bottom half and always negative for the top half. Finally, another reversal is in the effect of additional debit card transactions (1 cent in additional fees for the bottom half against -22 cents for the top half for the opted-in group).

It should not surprise us to find different effects when subsetting the sample by the level of fees incurred. For one, many of our explanatory variables have intuition to explain either a positive or a negative effect. Some of these arguments are discussed above for the baseline specification. Furthermore, splitting OD/NSF fees at the median creates two very different halves. Mean fees for the lower half of opted-in consumers are about \$4 per month; for the upper half, they are \$56 or almost two fees per month. It is thus reasonable to think that different relationships might determine fees for the rarely overdrafting bottom half and the heavy users in the top half. For the purposes of this paper, it suffices to note that the large first-year tenure effect for opted-in consumers is driven almost entirely by the top half of overdrafters.²⁵

²⁵Also note the much higher explanatory power of our empirical model for accounts in the top half as captured by the R-squared.

4.2.3. *Fee persistence.* Table 8 presents results when we include lagged fees as regressors. This specification allows us to examine whether fees incurred in one month lead to higher fees the next month holding all other measures of account activity and relevant balances constant. The answer is yes, they do, with the effect being statistically very significant for both groups. The estimates imply that, holding all else constant, \$1 in fees in one month leads to a 9 cent increase in fees the next month for the opted-in group and a 14 cent increase in fees the next month for the opted-out group. Notice that this effect is present after controlling for average daily balances, so the explanation is not simply that it takes some time for account holders to dig themselves out of the hole created by overdraft/NSF activity. It could be, though, that the additional overdraft/NSF fees are incurred at the beginning of the month with account balances brought back to higher levels later in the month.²⁶ Additionally, it is possible that this result is accounted for by persistence in financial distress (e.g., unemployment) which is not fully captured by our control variables of monthly deposits and average daily balances. The result could also be due to habituation to overdrafting with account holders accepting overdraft as the norm and exerting less effort to avoid them in subsequent months.

4.3. Incidence regressions.

4.3.1. *Baseline results.* Next we turn to our incidence regressions. Recall that our incidence variable takes a value of 0 or 1 depending on whether any overdraft or NSF fees were incurred. Also note that we are using a linear probability model. As such, our results are simply based on a non-linear transformation of our previous dependent variable where the new dependent variable can now be thought of as a probability. Not surprisingly, many of our results, reported in Table 9, are similar to our fee regressions in proportional terms. There are some notable differences, however. The tenure pattern for the opted-in group is similar to before: the rise in the first year is 18.7% for the probability and 20.1% for the fees. Surprisingly, the initial decline evidenced for the opted-out group in the fee regressions is not present in the incidence regressions. There is thus presumably a decline with tenure in the number of fees that an opted-out account holder incurs conditional on incurring a fee. Figure 3 plots the predicted path of the probability of incurring an overdraft or NSF fee for the two groups. The results regarding overdraft limit, linked and unlinked account balances, monthly

²⁶Such time patterns are possible to study further using the transaction-level data.

account activity measures, and average daily balances are broadly in agreement with the fee regressions. Figure 4 plots the coefficients on the month indicators, the findings are in line with those for the fees. Notice that the explanatory power of the incidence regressions is smaller than that of the fee regressions, which is to be expected in a limited dependent variable setting.

4.3.2. *Robustness checks.* We perform the same robustness checks as we did for the fee regressions. Topcoding has essentially no impact. Tables 10 and 11 report results by overdraft intensity and they tell the same story as before: our results are more pronounced for accounts with fees above the median. Consistent throughout is the fact that incidence is slightly increasing with tenure for the opted-out group, unlike with fees.

4.3.3. *Incidence persistence.* Interestingly, persistence in incidence is much less pronounced than in fees. The coefficient of persistence was 0.09 and 0.14 for fees and is only 0.01 and 0.02 for incidence for the opted-in and opted-out groups, respectively. While the coefficients are still estimated to be statistically significant, they are economically negligible. Understanding this divergence requires further study.

5. DISCUSSION

We document important empirical relationships between overdraft and NSF fees and account tenure, overdraft limits, linked and unlinked account balances, measures of monthly account activity, and average daily balances. Our primary interest is in the effect of tenure. We find that overdraft and NSF fees tend to increase rapidly for opted-in accounts during the first year of account ownership, especially for accounts that are heavy overdrafters. For most of this first year (starting when the account is first permitted to overdraft), fees increase at a rate of over \$1.46 per month for heavy overdrafting opted-in accounts, representing an over 20% increase in fees during the first year. Focusing on incidence tells a similar story. This pattern cannot be fully explained by changes in the overall level of account usage, represented by the number of debits and the amount of deposits. Nor is it fully explained by changes in balances held in the account or in other accounts at the bank, or by changes in the overdraft limit. The increase in fees can be due to either an increase in deliberate overdrafting and check bouncing or to inattentive or forgetful consumer behavior leading

to increased accidental overdrafts/NSFs. Attentive and well informed-consumers time their spending carefully to coincide with income and balance their accounts.

We consider first an increase in deliberate overdrafts and bounced checks in the vein of a full-information neoclassical model. Consumers may be in good financial health when opening a new bank account. At the least, most new account holders likely have enough funds to satisfy the minimum balance requirement. They may also be more likely to be receiving regular income, since some large banks require regular direct deposit to waive their monthly account maintenance fee. Over time some customers may see their financial situation deteriorate, creating demand for credit even at the high interest rates implied by overdraft/NSF fee²⁷ In summary, account holders are mostly liquid at account opening but some become illiquid as time goes on. Of course, this explanation could be supported by our results only to the extent that the deterioration of financial situation is not captured by our average daily balance or monthly deposits control variables. Such unobserved deterioration could occur for married account holders with spousal income being deposited into other checking accounts or for account holders with multiple checking accounts. It could also be due to financial distress not captured by our monthly deposit or average daily balance controls. We do not have the data to rule out such a neoclassical explanation.

Another possible explanation is declining attention paid to overdraft, with attention declining most rapidly in the first year after account opening. Overdraft coverage is unusual in that it is often an accidental purchase.²⁸ The less one thinks about overdrafting, the more likely one may be to overdraft. Recall the use in Stango and Zinman (2014) of overdraft-mentioning surveys as a shock to consumer attention and the corresponding reduction in overdraft activity. Account opening is likely to represent a similar shock, especially after mid-2010 as the Regulation E opt-in process encourages consumers to think specifically about overdraft coverage. As time passes, consumers may think less about the possibility of overdrafting and overdraft more. In other words, the salience of overdraft might be declining with account tenure. Note that limited attention can also be justified on plausibly rational grounds. At account opening, a consumer has certain prior beliefs on the amount

²⁷Relatively small transaction costs could rationalize using overdraft as opposed to alternative, cheaper sources of credit.

²⁸In a Pew Center on the States (2012) survey, 90% of respondents who had overdrafted in the past year reported that the overdraft was “by mistake.”

of (costly) care required to avoid excessive overdrafts. If consumers are unsure of the level of care needed, they may start out vigilant and relax as overdrafts do not occur. Eventually care may decline to the point that overdrafts *do* occur, leading to the pattern observed in the data.²⁹

A related but distinct explanation is that of increased forgetfulness. Account holders may be paying the same amount of attention to overdraft, but the available information may be deteriorating as time passes since account opening. Recall the findings of Frank and Smith (2011) that account holders possibly even forget factual knowledge like their Regulation E opt-in status or what it means for the account.

6. CONCLUSION

Over the past decade, overdraft fees have been a growing share of checking account fees reaching very high proportions in the past few years. Given the important role that checking accounts play in consumers' financial lives, understanding overdraft has thus become a research topic of growing significance. In this paper we study the determinants of overdraft fees and incidence using a unique dataset of confidential supervisory information covering several large banks that contains every transaction that a fraction of the banks' account holders undertook over an 18 month period. We use a fixed-effect panel data method to recover within-person variation in overdraft activity as a function of account tenure and other time-varying observables.

Our results indicate that there is a notable increase in overdraft fees and incidence over an account's first year for account holders opted into overdraft coverage. Specifically, overdraft and NSF fees increase by 20.1% over the eight months following the first four months after account opening. Moreover, for opted-in accounts, the overdraft and NSF fee are strongly and inversely related to the consumer's overdraft limit, the maximum amount by which the consumer's account balance is permitted to go negative. Such fees are also negatively related to the balances in linked deposit and credit accounts. Average daily balances are strongly negatively while deposits are positively related to these fees. Qualitatively similar results are present when we consider the probability of incurring any overdraft or NSF fee. There is no pronounced tenure effect for account holders who are opted out of overdraft coverage

²⁹When applied to organizations, this theory is known as the "normalization of deviance" and has been used to explain a gradual erosion of best practices in hospital care.

(who, of course, incur fewer and less frequent overdrafts). The derived results are robust to removing the effect of outliers by top-coding; and to differentiating results by overdraft intensity. We also present novel results showing that there is persistence in overdraft and NSF fees even after controlling for account activity.

Our results paint a rich picture of overdraft behavior. First, to the extent that consumers are not anticipating the deterioration of overdraft performance with account tenure, our results may be viewed as evidence of opted-in account holders' growing inattention to or increased forgetfulness of overdraft. Second, our overdraft limit results possibly indicate that banks are successful at determining when an opted-in account holder consumer presents higher credit risk. Third, linking deposit or credit accounts is an effective way of avoiding overdrafts. Finally, our results on the effect of monthly deposits possibly indicate that overdrafts are not necessarily a result of absolutely low account inflows but rather of low inflows relative to needs or poor account management.

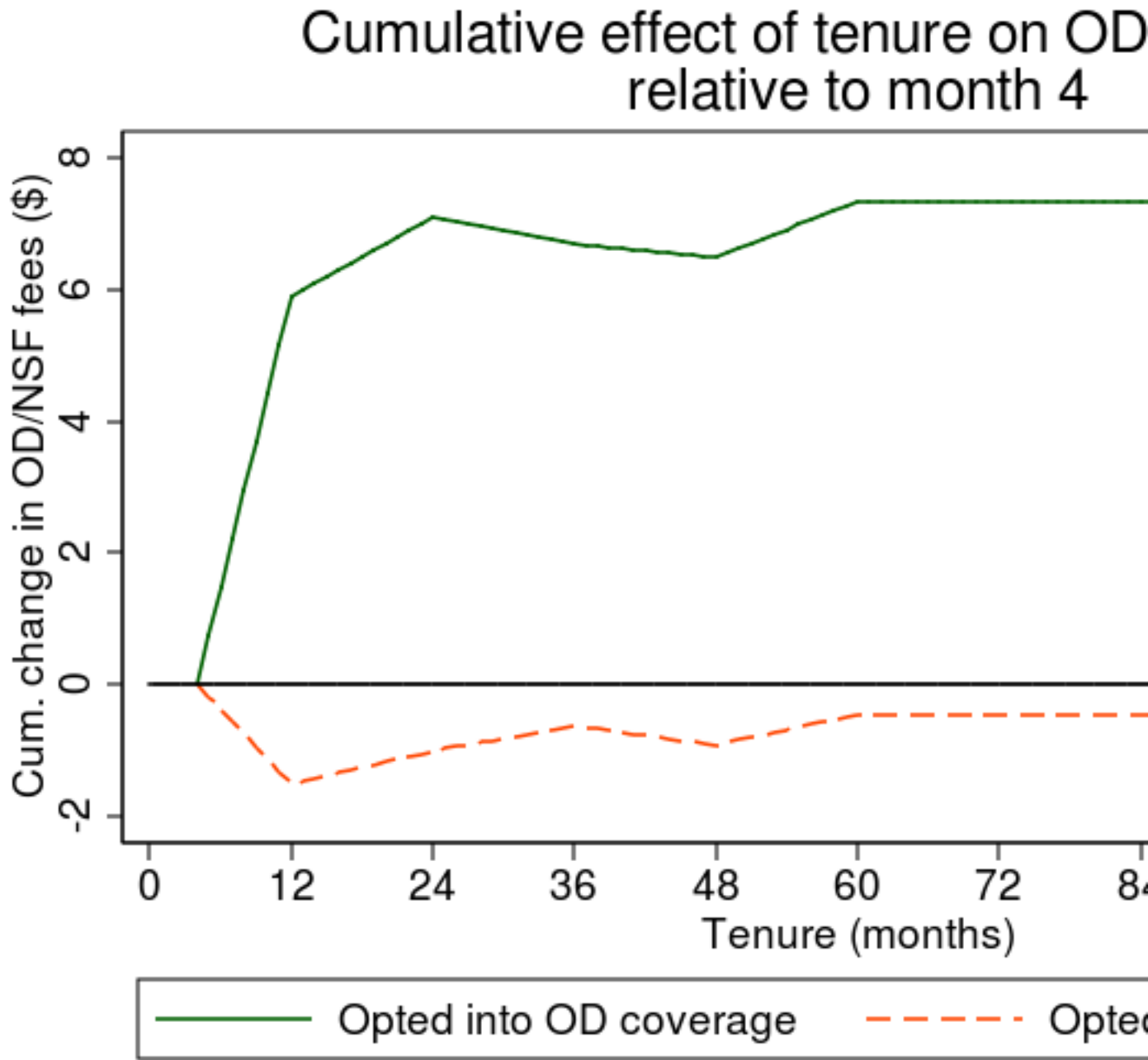
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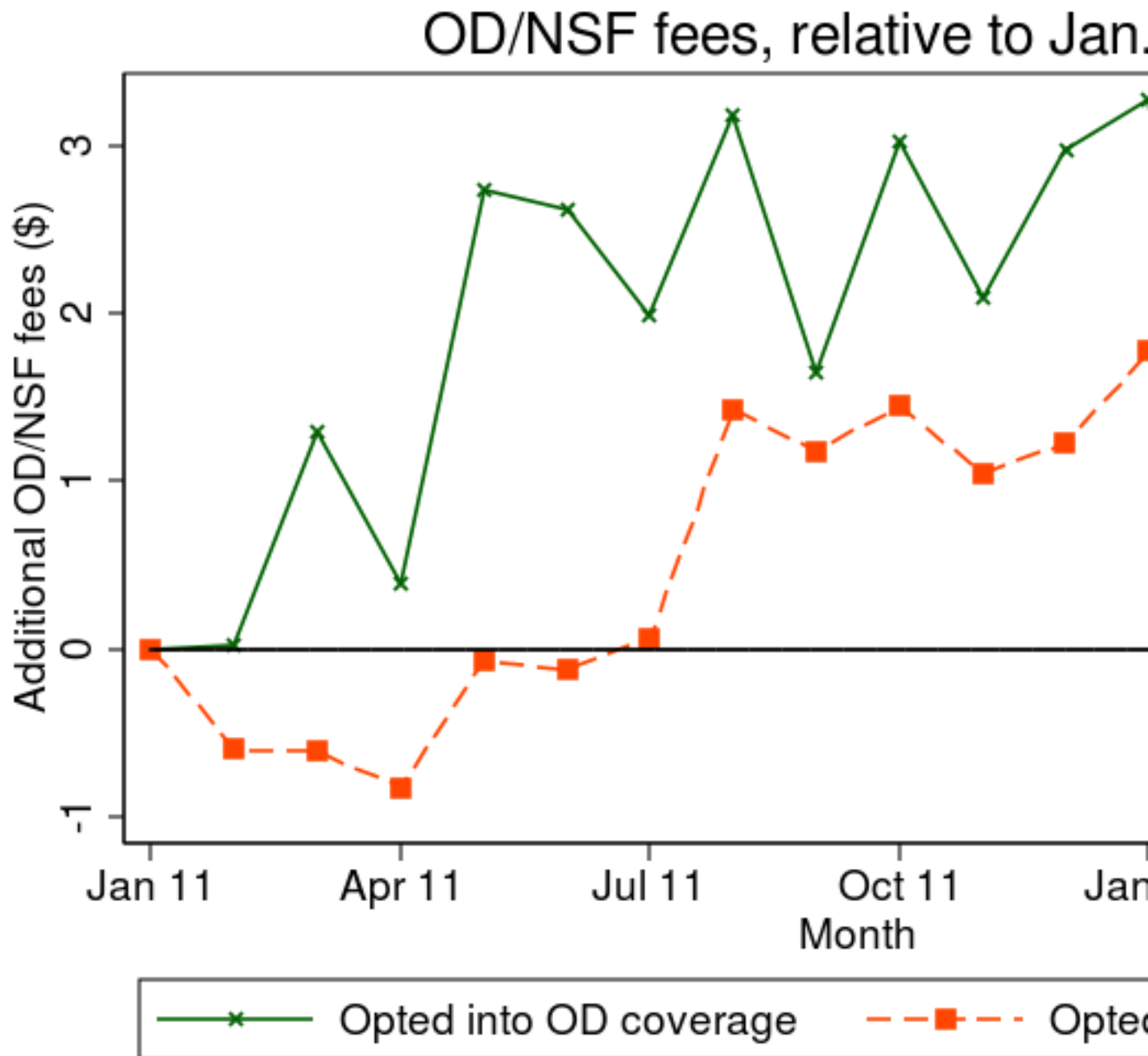
7. APPENDIX

FIGURE 1.



Changes are zero after 60 months of tenure by construction

FIGURE 2.



Estimated from accounts with 61-120 months of tenure

FIGURE 3.

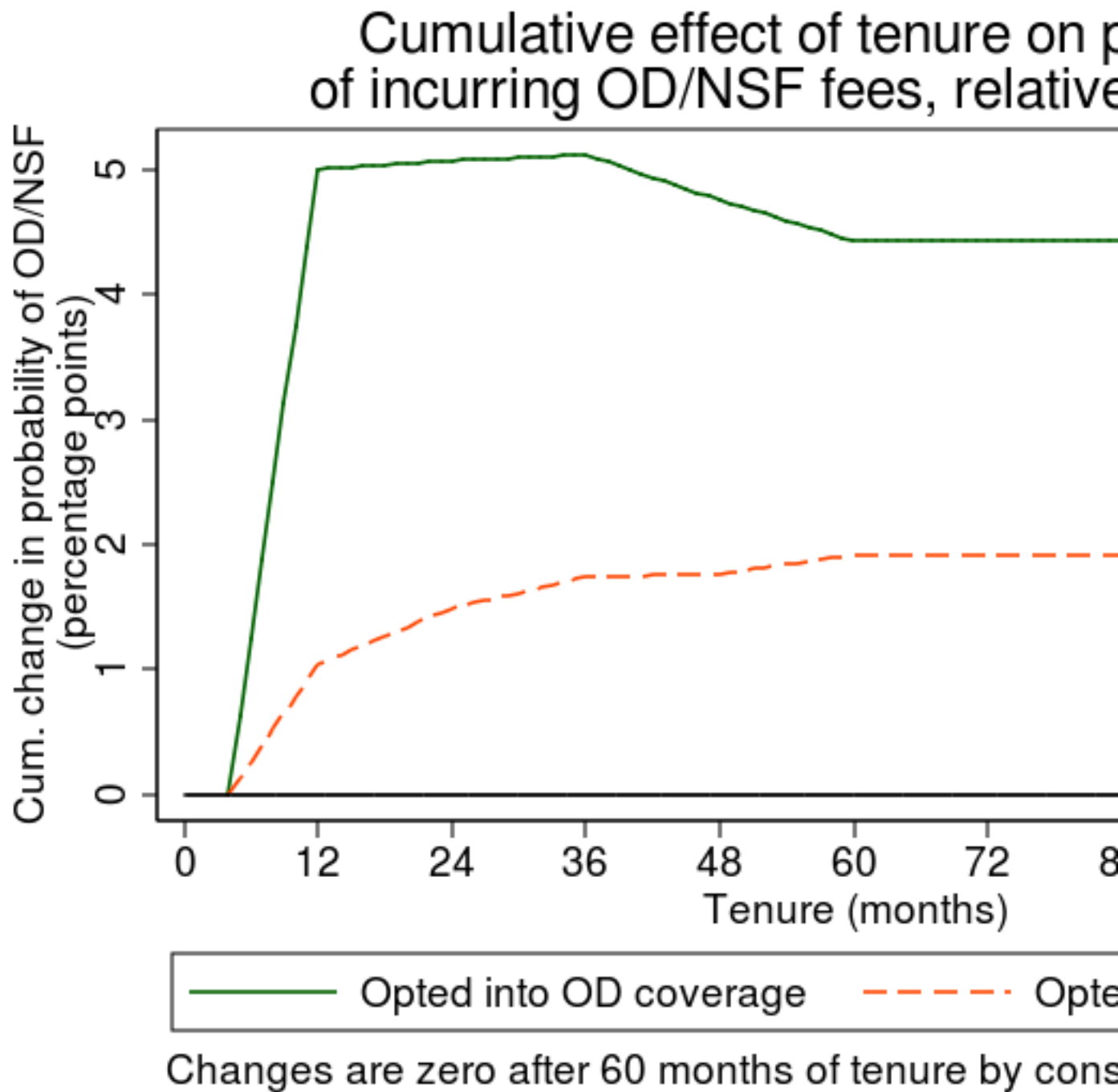
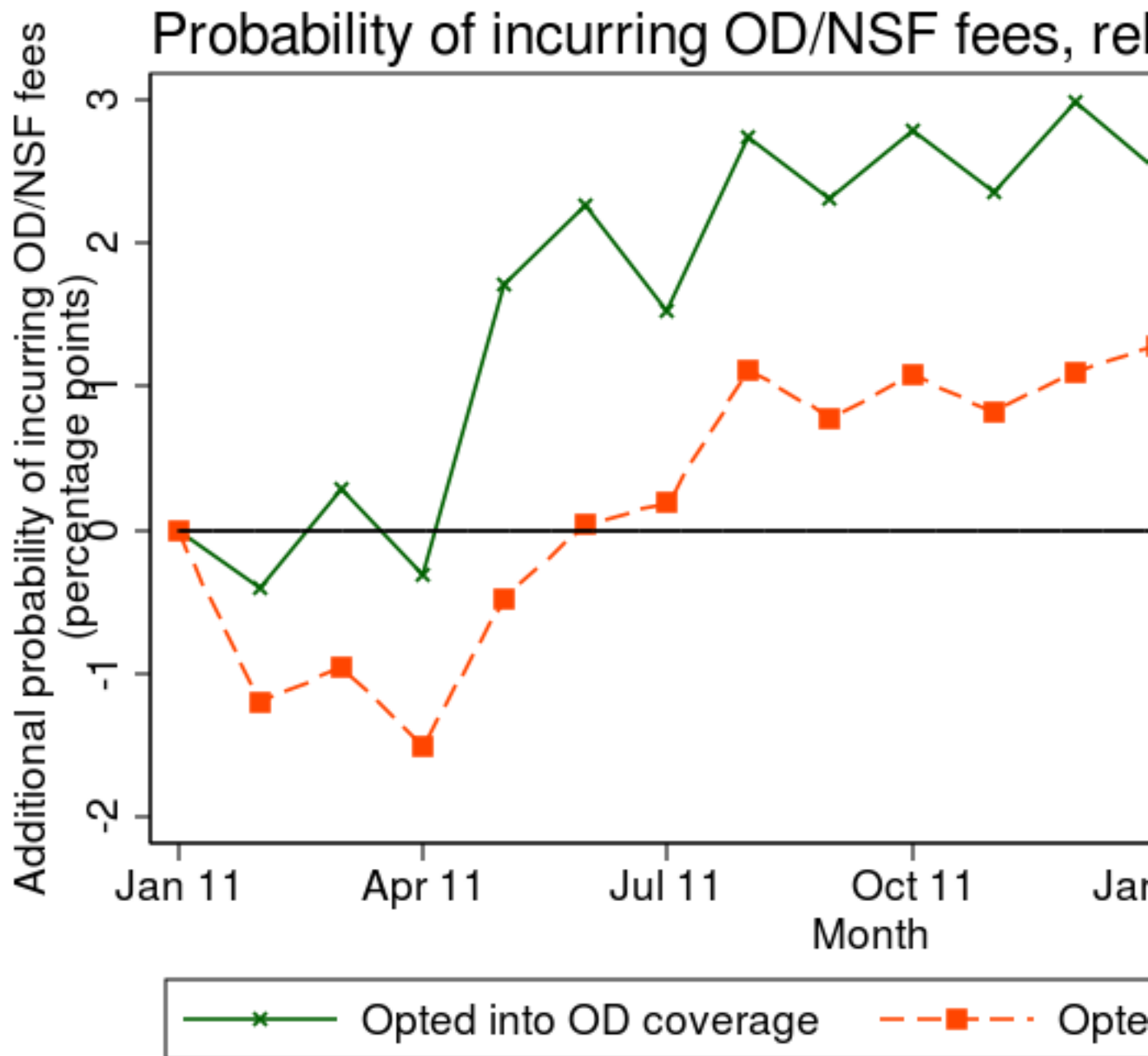


FIGURE 4.



Estimated from accounts with 61-120 months of tenure

TABLE 1. Sample construction

	Observations	Accounts
	Opted-in	
Complete sample	2,052,364	152,930
AND tenure greater than 3 months and less than 10 years	1,425,110	111,681
AND with a positive overdraft limit	1,299,958	102,550
AND incurred some OD/NSF fees over the sample period	693,391	54,752
AND has corresponding average daily balance	690,459	54,523
	Opted-out	
Complete sample	13,202,595	928,988
AND tenure greater than 3 months and less than 10 years	9,126,246	688,487
AND with a positive overdraft limit	8,413,227	640,430
AND incurred some OD/NSF fees over the sample period	2,527,610	183,065
AND has corresponding average daily balance	2,500,787	181,934
	Opt-status changers	
Complete sample	251,357	18,248
AND tenure greater than 3 months and less than 10 years	191,459	15,437
AND with a positive overdraft limit	149,712	13,392
AND incurred some OD/NSF fees over the sample period	96,191	8,541
AND has corresponding average daily balance	95,636	8,533

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

TABLE 2. Summary statistics, non-balance variables

	Mean	Median	St. Dev.
Opted-in accounts			
Monthly NSF/OD fees	29.24	0.00	76.48
Tenure (months)	44.99	38.00	30.62
Joint account indicator	0.32	0.00	0.47
Overdraft limit	874.80	749.00	739.11
Monthly debit-card transactions	30.81	24.00	28.30
Monthly other debits	10.42	8.00	9.52
Monthly total deposits	3,567.59	2,373.42	8,520.78
Average daily balance	879.49	366.59	2,509.67
Opted-out accounts			
Monthly NSF/OD fees	10.25	0.00	35.88
Tenure (months)	45.73	39.00	29.82
Joint account indicator	0.28	0.00	0.45
Overdraft limit	597.58	500.00	873.87
Monthly debit-card transactions	23.66	15.00	26.32
Monthly other debits	11.59	8.00	11.11
Monthly total deposits	2,745.36	1,551.00	21,282.40
Average daily balance	1,046.92	314.08	3,401.08

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 20 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period.

TABLE 3. Summary statistics, balance variables

	Share positive	Mean if positive	Median if positive	St. Dev. if positive
Opted-in accounts				
Linked deposit balance	18.60%	1,566.38	58.49	12,682.74
Linked credit balance	6.07%	1,716.91	298.00	5,755.81
Unlinked deposit balance	5.56%	4,911.97	291.13	40,263.19
Unlinked credit balance	8.56%	4,894.36	970.33	13,608.85
Opted-out accounts				
Linked deposit balance	27.40%	1,319.85	29.14	12,172.04
Linked credit balance	3.82%	3,044.65	441.59	60,885.63
Unlinked deposit balance	29.90%	4,700.97	246.33	51,658.26
Unlinked credit balance	16.80%	7,232.95	1,303.45	22,081.12

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 20 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period.

TABLE 4. Fee regression: baseline specification

	Opted-in		Opted-out	
Tenure 4-12 months	0.735***	(0.101)	-0.190***	(0.0325)
Tenure 13-24 months	0.102	(0.0670)	0.0427*	(0.0193)
Tenure 25-36 months	-0.0341	(0.0668)	0.0318	(0.0184)
Tenure 37-48 months	-0.0176	(0.0746)	-0.0250	(0.0188)
Tenure 49-60 months	0.0719	(0.0837)	0.0392	(0.0214)
Overdraft limit (IHS)	-1.577***	(0.209)	1.267***	(0.0582)
Linked deposit balance (IHS)	-2.246***	(0.0781)	-1.472***	(0.0299)
Linked credit balance (IHS)	-1.991***	(0.117)	-1.023***	(0.0394)
Unlinked deposit balance (IHS)	-0.103	(0.0794)	-0.340***	(0.0243)
Unlinked credit balance (IHS)	0.0537	(0.0899)	-0.0583***	(0.0144)
Monthly debit-card transactions	-0.0925***	(0.0112)	-0.213***	(0.00384)
Monthly other debits	1.556***	(0.0389)	0.878***	(0.0176)
Monthly total deposits (IHS)	5.001***	(0.0800)	1.755***	(0.0199)
Average daily balance (IHS)	-11.50***	(0.124)	-4.667***	(0.0354)
Number of observations	690,459		2,500,787	
Number of accounts	54,523		181,934	
Mean dependent variable	29.24		10.25	
R-squared	0.6099		0.4536	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 5. Fee regression robustness check: topcoding balance variables

	Opted-in		Opted-out	
Tenure 4-12 months	0.735***	(0.101)	-0.192***	(0.0325)
Tenure 13-24 months	0.102	(0.0670)	0.0426*	(0.0193)
Tenure 25-36 months	-0.0342	(0.0668)	0.0318	(0.0184)
Tenure 37-48 months	-0.0175	(0.0746)	-0.0251	(0.0188)
Tenure 49-60 months	0.0725	(0.0837)	0.0392	(0.0214)
Overdraft limit (IHS)	-1.579***	(0.209)	1.274***	(0.0586)
Linked deposit balance (IHS)	-2.254***	(0.0783)	-1.478***	(0.0300)
Linked credit balance (IHS)	-1.994***	(0.117)	-1.029***	(0.0396)
Unlinked deposit balance (IHS)	-0.104	(0.0795)	-0.340***	(0.0243)
Unlinked credit balance (IHS)	0.0544	(0.0899)	-0.0585***	(0.0145)
Monthly debit-card transactions	-0.0927***	(0.0112)	-0.213***	(0.00384)
Monthly other debits	1.558***	(0.0389)	0.879***	(0.0176)
Monthly total deposits (IHS)	5.012***	(0.0801)	1.758***	(0.0200)
Average daily balance (IHS)	-11.50***	(0.124)	-4.667***	(0.0354)
Number of observations	690,459		2,500,787	
Number of accounts	54,523		181,934	
Mean dependent variable	29.24		10.25	
R-squared	0.6099		0.4536	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 6. Fee regression robustness check: bottom half by OD intensity

	Opted-in		Opted-out	
Tenure 4-12 months	0.0344	(0.0345)	0.0145	(0.0121)
Tenure 13-24 months	-0.00646	(0.0213)	0.00394	(0.00673)
Tenure 25-36 months	-0.0391	(0.0229)	-0.00258	(0.00645)
Tenure 37-48 months	-0.0260	(0.0237)	-0.00413	(0.00683)
Tenure 49-60 months	-0.0170	(0.0250)	-0.00872	(0.00760)
Overdraft limit (IHS)	-1.587***	(0.0781)	0.0703**	(0.0229)
Linked deposit balance (IHS)	-0.686***	(0.0325)	-0.481***	(0.0109)
Linked credit balance (IHS)	-0.728***	(0.0458)	-0.442***	(0.0169)
Unlinked deposit balance (IHS)	0.0578*	(0.0286)	0.0202*	(0.00880)
Unlinked credit balance (IHS)	0.111**	(0.0341)	0.0151*	(0.00693)
Monthly debit-card transactions	0.00978**	(0.00311)	-0.0244***	(0.00102)
Monthly other debits	0.281***	(0.0114)	0.132***	(0.00413)
Monthly total deposits (IHS)	1.134***	(0.0261)	0.380***	(0.00619)
Average daily balance (IHS)	-2.866***	(0.0593)	-1.251***	(0.0150)
Number of observations	344,960		1,246,891	
Number of accounts	24,644		84,203	
Mean dependent variable	3.88		1.97	
R-squared	0.1191		0.0880	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7. Fee regression robustness check: top half by OD intensity

	Opted-in		Opted-out	
Tenure 4-12 months	1.472***	(0.191)	-0.366***	(0.0599)
Tenure 13-24 months	0.302*	(0.134)	0.0638	(0.0374)
Tenure 25-36 months	0.0390	(0.138)	0.0365	(0.0346)
Tenure 37-48 months	0.00230	(0.155)	-0.0584	(0.0355)
Tenure 49-60 months	0.178	(0.174)	0.0548	(0.0401)
Overdraft limit (IHS)	-3.696***	(0.369)	1.869***	(0.109)
Linked deposit balance (IHS)	-4.433***	(0.161)	-2.347***	(0.0530)
Linked credit balance (IHS)	-4.539***	(0.299)	-1.939***	(0.0942)
Unlinked deposit balance (IHS)	-0.237	(0.159)	-0.613***	(0.0455)
Unlinked credit balance (IHS)	-0.153	(0.197)	-0.151***	(0.0326)
Monthly debit-card transactions	-0.218***	(0.0192)	-0.352***	(0.00631)
Monthly other debits	2.225***	(0.0667)	1.336***	(0.0266)
Monthly total deposits (IHS)	9.055***	(0.175)	3.039***	(0.0390)
Average daily balance (IHS)	-13.30***	(0.145)	-5.892***	(0.0449)
Number of observations	345,499		1,253,896	
Number of accounts	29,879		97,731	
Mean dependent variable	56.44		18.16	
R-squared	0.5864		0.4584	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 8. Fee persistence: with lagged dependent variable

	Opted-in		Opted-out	
Tenure 4-12 months	0.617***	(0.0983)	-0.314***	(0.0306)
Tenure 13-24 months	0.105	(0.0642)	0.0286	(0.0175)
Tenure 25-36 months	-0.0211	(0.0650)	0.0189	(0.0165)
Tenure 37-48 months	-0.0519	(0.0723)	-0.0265	(0.0169)
Tenure 49-60 months	0.0770	(0.0803)	0.0343	(0.0192)
Overdraft limit (IHS)	-1.597***	(0.203)	1.471***	(0.0563)
Linked deposit balance (IHS)	-2.185***	(0.0773)	-1.352***	(0.0279)
Linked credit balance (IHS)	-1.940***	(0.116)	-0.963***	(0.0369)
Unlinked deposit balance (IHS)	-0.0793	(0.0748)	-0.282***	(0.0223)
Unlinked credit balance (IHS)	0.0630	(0.0851)	-0.0513***	(0.0134)
Monthly debit-card transactions	-0.0788***	(0.0111)	-0.207***	(0.00354)
Monthly other debits	1.567***	(0.0396)	0.859***	(0.0168)
Monthly total deposits (IHS)	4.621***	(0.0774)	1.668***	(0.0190)
Average daily balance (IHS)	-11.09***	(0.119)	-4.319***	(0.0316)
Lagged monthly NSF/OD fees	0.0871***	(0.00409)	0.139***	(0.00378)
Number of observations	660,916		2,459,838	
Number of accounts	53,936		181,237	
Mean dependent variable	29.44		10.32	
R-squared	0.6196		0.4659	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 9. Incidence regression: baseline specification

	Opted-in		Opted-out	
Tenure 4-12 months	0.00625***	(0.000662)	0.00130***	(0.000330)
Tenure 13-24 months	0.0000588	(0.000417)	0.000373*	(0.000184)
Tenure 25-36 months	0.0000382	(0.000429)	0.000209	(0.000174)
Tenure 37-48 months	-0.000302	(0.000447)	0.0000225	(0.000184)
Tenure 49-60 months	-0.000272	(0.000507)	0.000123	(0.000206)
Overdraft limit (IHS)	-0.0493***	(0.00118)	0.00478***	(0.000559)
Linked deposit balance (IHS)	-0.0219***	(0.000504)	-0.0190***	(0.000246)
Linked credit balance (IHS)	-0.0203***	(0.000711)	-0.0153***	(0.000367)
Unlinked deposit balance (IHS)	0.00234***	(0.000478)	-0.00293***	(0.000212)
Unlinked credit balance (IHS)	0.000354	(0.000632)	-0.000488**	(0.000163)
Monthly debit-card transactions	-0.00128***	(0.0000497)	-0.00192***	(0.0000244)
Monthly other debits	0.00642***	(0.000148)	0.00600***	(0.0000867)
Monthly total deposits (IHS)	0.0336***	(0.000446)	0.0198***	(0.000154)
Average daily balance (IHS)	-0.0448***	(0.000377)	-0.0380***	(0.000183)
Number of observations	690,459		2,500,787	
Number of accounts	54,523		181,934	
Mean dependent variable	0.2672		0.1470	
R-squared	0.4351		0.3333	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 10. Incidence regression robustness check: bottom half by OD intensity

	Opted-in		Opted-out	
Tenure 4-12 months	0.00167*	(0.000687)	0.00107***	(0.000308)
Tenure 13-24 months	-0.000212	(0.000399)	-0.0000558	(0.000161)
Tenure 25-36 months	-0.000662	(0.000402)	-0.000190	(0.000150)
Tenure 37-48 months	-0.000314	(0.000419)	-0.000132	(0.000158)
Tenure 49-60 months	-0.000323	(0.000456)	-0.000234	(0.000179)
Overdraft limit (IHS)	-0.0322***	(0.00134)	-0.000521	(0.000534)
Linked deposit balance (IHS)	-0.0122***	(0.000494)	-0.0108***	(0.000232)
Linked credit balance (IHS)	-0.0124***	(0.000671)	-0.00967***	(0.000340)
Unlinked deposit balance (IHS)	0.00193***	(0.000476)	0.000589**	(0.000193)
Unlinked credit balance (IHS)	0.00170**	(0.000576)	0.000239	(0.000155)
Monthly debit-card transactions	-0.0000649	(0.0000514)	-0.000642***	(0.0000233)
Monthly other debits	0.00435***	(0.000159)	0.00301***	(0.0000918)
Monthly total deposits (IHS)	0.0240***	(0.000442)	0.00964***	(0.000135)
Average daily balance (IHS)	-0.0543***	(0.000754)	-0.0286***	(0.000294)
Number of observations	344,960		1,246,891	
Number of accounts	24,644		84,203	
Mean dependent variable	0.0853		0.0505	
R-squared	0.1467		0.0946	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 11. Incidence regression robustness check: top half by OD intensity

	Opted-in		Opted-out	
Tenure 4-12 months	0.0105***	(0.00112)	0.00195***	(0.000563)
Tenure 13-24 months	0.000938	(0.000751)	0.000771*	(0.000332)
Tenure 25-36 months	0.00145	(0.000795)	0.000571	(0.000307)
Tenure 37-48 months	-0.0000675	(0.000832)	0.000222	(0.000324)
Tenure 49-60 months	0.000282	(0.000954)	0.000453	(0.000362)
Overdraft limit (IHS)	-0.0664***	(0.00189)	0.00812***	(0.000971)
Linked deposit balance (IHS)	-0.0344***	(0.000881)	-0.0260***	(0.000401)
Linked credit balance (IHS)	-0.0350***	(0.00146)	-0.0242***	(0.000742)
Unlinked deposit balance (IHS)	0.00241**	(0.000854)	-0.00579***	(0.000366)
Unlinked credit balance (IHS)	-0.00113	(0.00126)	-0.00160***	(0.000326)
Monthly debit-card transactions	-0.00223***	(0.0000776)	-0.00284***	(0.0000372)
Monthly other debits	0.00755***	(0.000227)	0.00772***	(0.000111)
Monthly total deposits (IHS)	0.0522***	(0.000874)	0.0303***	(0.000278)
Average daily balance (IHS)	-0.0419***	(0.000429)	-0.0418***	(0.000220)
Number of observations	345,499		1,253,896	
Number of accounts	29,879		97,731	
Mean dependent variable	0.4622		0.2391	
R-squared	0.3726		0.3370	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 12. Incidence persistence: with lagged dependent variable

	Opted-in		Opted-out	
Tenure 4-12 months	0.00597***	(0.000692)	0.000845*	(0.000334)
Tenure 13-24 months	0.000150	(0.000433)	0.000351	(0.000185)
Tenure 25-36 months	0.000208	(0.000445)	0.000228	(0.000174)
Tenure 37-48 months	-0.000550	(0.000467)	0.00000511	(0.000183)
Tenure 49-60 months	-0.000150	(0.000527)	0.000170	(0.000206)
Overdraft limit (IHS)	-0.0469***	(0.00119)	0.00638***	(0.000559)
Linked deposit balance (IHS)	-0.0220***	(0.000518)	-0.0188***	(0.000246)
Linked credit balance (IHS)	-0.0204***	(0.000728)	-0.0151***	(0.000367)
Unlinked deposit balance (IHS)	0.00210***	(0.000480)	-0.00283***	(0.000210)
Unlinked credit balance (IHS)	0.000391	(0.000640)	-0.000470**	(0.000162)
Monthly debit-card transactions	-0.00130***	(0.0000508)	-0.00192***	(0.0000245)
Monthly other debits	0.00654***	(0.000153)	0.00596***	(0.0000867)
Monthly total deposits (IHS)	0.0332***	(0.000455)	0.0195***	(0.000154)
Average daily balance (IHS)	-0.0443***	(0.000387)	-0.0372***	(0.000186)
Lagged overdraft/NSF incidence	0.00612***	(0.00175)	0.0239***	(0.000979)
Number of observations	660,916		2,459,838	
Number of accounts	53,936		181,237	
Mean dependent variable	0.2680		0.1475	
R-squared	0.4384		0.3349	

Standard errors in parentheses

Standard errors are cluster-robust.

Source: Sample banks' microdata, Jan, 2011 through June, 2012.

Sample: Accounts with tenure greater than 3 months but less than 10 years with a positive overdraft limit that incurred some OD/NSF fees over the sample period and had valid average daily balance.

Suppressed regressors: Constant, Joint account indicator, Joint account indicator missing flag,

Unlinked credit missing flag, Month indicators.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$