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Working Papers

Research Department

WORKING PAPER NO. 98-25

CHECKING ACCOUNTS AND BANK MONITORING

Loretta J. Mester
Federal Reserve Bank of Philadelphia
and
The Wharton School, University of Pennsylvania

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Checking Accounts and Bank Monitoring

Abstract

Do checking accounts help banks monitor borrowers? If they do, the rationale both for allowing regulated providers of liquidity to also make risky loans to commercial borrowers and for the government's providing deposit insurance becomes clearer. Using a unique set of data that includes monthly and annual information on small-business borrowers at an anonymous Canadian bank, we provide evidence that a bank has exclusive access to a continuous stream of borrower data that helps it to monitor the borrower, namely, the firm's checking account balances at the bank.

To our knowledge, this paper is the first direct empirical test of the usefulness of checking account information in monitoring commercial borrowers. We directly examine the mechanism through which a bank is able to gain an information advantage over other types of lenders and find evidence that checking account information is indeed relatively transparent for monitoring borrowers' collateral and that such monitoring is useful in detecting problems with loans. As such, our data provide "smoking gun" evidence that banks are special.

Checking Accounts and Bank Monitoring

1. Introduction

Do checking accounts help banks monitor borrowers? If they do, the rationale both for allowing regulated providers of liquidity to also make risky loans to commercial borrowers and for the government's providing deposit insurance becomes clearer.

Some of the information in a checking account is clearly of use to a lender. For example, a borrower's canceled checks and banking statements allow a lender to verify the usual information accompanying a loan application; these are particularly useful in the absence of an independent auditor's report. However, a bank does not have a monopoly over this kind of evidence—the borrower can provide it to any lender.

On the other hand, a bank can have exclusive access to a continuous stream of borrower data on the most timely basis possible, provided the borrower uses the bank as its exclusive depository. This timely access is useful in monitoring an existing loan to detect and control moral hazard problems associated with a rising probability of bankruptcy.

To our knowledge, this paper is the first direct empirical test of the usefulness of checking account information in monitoring commercial borrowers. We analyze a unique set of data that includes monthly and annual information on small-business borrowers at a Canadian bank that wishes to remain anonymous. Previous empirical research has documented the value of lending relationships to firms by examining loan rates (e.g., Petersen and Rajan, 1994; Berger and Udell, 1995; and Berlin and Mester, 1998). Other studies have documented a positive abnormal stock-price reaction to announcements of new or continuing bank loan agreements or loan commitments (e.g., Lummer and McConnell, 1989; Billet, Flannery, and Garfinkel, 1995; and Preece and Mullineaux, 1996). Berlin and Mester (forthcoming) present empirical evidence for an explicit link between banks' liability structure and their distinctive lending behavior. Yet none of these previous papers directly examines the mechanism through which a bank is able to gain an information

advantage over other types of lenders. And this is the focus of our paper.

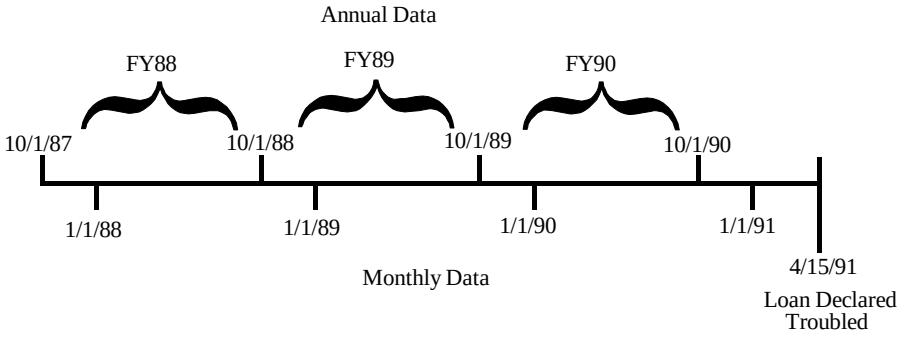
Black (1975) and Fama (1985) have argued that the "specialness" of banks rests on the notion that checking account information permits banks to monitor their loan customers. Nakamura (1993a,b) further argued that, for the United States, circumstantial evidence suggests that such information is particularly useful in lending to small borrowers, as their checking account information is relatively more transparent and complete. In this paper, we explore detailed micro data that show checking account information is indeed relatively transparent for monitoring borrowers' collateral and that such monitoring is useful in detecting problems with loans. As such, our data provide "smoking gun" evidence that banks are special.

2. The Data Set

The data contain information on 100 small-business borrowers who are customers of the Canadian bank. A small business is defined as one with authorized credit between C$500,000 and C$10,000,000 and whose shareholders are managers of the firm. The average loan size in our sample is about C$1,500,000. The selected firms have been active for at least three years; public utilities, management firms, and financial companies are excluded. Fifty of these loans were declared troubled by the bank and the rest were healthy loans over the period studied. Most troubled loans were declared so between 1990 and 1992 (only three loans were classified as troubled before 1990); healthy loans were last reviewed by the bank at some date in 1991 or 1992. Each troubled loan was matched to a healthy loan in terms of the industry in which it operates and the amount of its annual sales. Six industrial sectors are represented in the data (see Table 1).

For each loan, we have both annual and monthly data. For a troubled loan, the annual data pertain to the firm's three fiscal years prior to the loan's being declared troubled, and the monthly data pertain to the three calendar years prior to the firm's being declared troubled. For the matched healthy loan, we have comparable information, with the reference date being the last time the firm's credit file was reviewed by the bank. For example, consider a firm whose loan was declared troubled in April 1991 and whose fiscal year runs from October to September. Our annual data on this firm would cover the firm's fiscal years FY1988,

FY1989, and FY1990, and the monthly data would run from January 1988 through December 1990.[1]



The first three columns in the top panel of Table 2A show the average loan sizes for all the loans and for the healthy and troubled loan subsamples over the entire three-year period covered by the data and over each year individually. The annual data contain information typically found on a firm's financial statement, e.g., balance-sheet data, such as the book value of accounts receivable and inventories; income-statement data; some items from the statement of changes in financial position; and information in the firm's credit file. One of these variables, the business sales of the firm, is reported in Table 2B. We also have some information from the outside auditor's report on the firm, e.g., whether there were any qualifications in the auditor's report and the date of the audit. These data would be available to any lender the firm approached for a loan.

The credit file contains information about the firm's sales, the level of authorized credit the firm has

[1]Because the reference dates for a matched troubled loan and healthy loan differ, the data on two matched loans could potentially cover substantially different time periods, with significantly different macroeconomic conditions. But this does not seem to pose a large problem here, since the difference in reference dates was under two years in all but four cases, and the maximum difference was three and a half years for one loan pair.

gotten from the bank for an operating loan, additional credit for seasonal loans, and other temporary loans. In addition, there is information on whether the loan has covenants. A crucial datum in each annual credit review is the credit rating assigned to the loan by the bank's credit department upon completion of the review. This credit rating is arranged on a scale of one through eight, with one being the best, and six through eight being different degrees of "trouble." Table 3 shows the evolution of the borrowers' credit ratings over time. At the dates when the loans were matched (i.e., at $t!3$), there are 19 loans rated superior or standard in the group of loans that do not become classified as troubled loans, while 31 have substandard credit ratings. At the final rating period ($t!1$), there are 23 loans rated superior or standard. By contrast, although 18 of the troubled loans are rated superior or standard in the initial period, only one is so rated two reviews later. These credit ratings are effective on the date when the credit department signs off on the credit review. This sign-off date is typically later than the planned credit review date, as the loan officer doing the review may ask the borrower for additional information. In addition, the interval between planned credit reviews is not always one year, but may be shorter or longer.

Table 4 shows the outcomes for the troubled loans. For the vast majority (72 percent) of these loans, the borrowing firms ended up going into bankruptcy or were privately liquidated. Of the other loans, nine remained troubled, four were repaid, and one was upgraded.

The monthly data contain information on the value that the bank assigns to the firm's accounts receivable and inventories. These are important ingredients in determining how much the bank is willing to lend to a commercial borrower. To restrict the use of the operating loan to purely operational ends and to ensure that the borrower has adequate collateral for the loan, the bank verifies on a monthly basis that the estimated value of the firm's operating assets exceeds the amount borrowed. The data also include the end-of-month balance in the firm's bank account, as well as the minimum, maximum, and average balance over the month.

An important variable included in our data set is whether the firm has an *exclusive* banking

arrangement with the bank. This variable allows us to segment the loans into "exclusive" and "nonexclusive" categories, providing a metric against which we can measure certain effects. If a borrower has a nonexclusive relationship with our bank, it is not clear whose customer the borrower really is. In some cases, the borrower will have a primary customer relationship with the bank we are studying, in which case the borrower's operating balance is likely to remain quite informative. In other cases, the borrower's primary relationship will be with another bank, and the bank we are studying is dependent on the other bank for information on the borrower's creditworthiness. Thus, if checking account information is valuable, we would expect it to be more valuable for exclusive loans, since the bank's account balance data on the firm would reflect its entire checking account activity.

In our data, of the 50 troubled loans, 33 of the borrowers have an exclusive relationship with the bank; of the 50 healthy loans, 26 have an exclusive relationship. And there appears to be a definite correlation between the completeness of our data and whether the bank serves as the firm's exclusive bank. Of the 59 firms with exclusive relationships, we have complete data on 19, i.e., 32 percent, while of the 41 firms with nonexclusive relationships, we have complete data on only four, i.e., less than 10 percent. The bottom panels of Tables 2A and 2B show the average loan amounts and average annual business sales, respectively, over time for exclusive and nonexclusive loans, and for these categories separated into healthy and troubled loan subcategories. As might be expected, firms that are larger, as measured by sales, tend to deal with more than one bank and so do not have an exclusive relationship with the bank under study.

3. Information Available from the Loan Operating Balance

A bank loan officer has access to fine-grained information about a borrower's activities through its operating account, as he or she can observe checks on an item-by-item basis and compare them to the borrower's pro forma business plan. The continuing operation of a business demands that the business be able to meet its financial requirements, which means that the business must have enough cash to pay its employees, suppliers, and others. The cash flows of the business are recorded in its bank account. The bank

account information is likely to be one of the timeliest sources of information available to the bank and will not be as readily available to other lenders. Can we empirically observe the value of this information? We approach this question on two levels. First, we try to determine what information is contained in the operating account balance; that is, we ask to what extent the operating account reflects particular types of assets or liabilities of the borrower, such as accounts receivable and inventories. Second, we try to determine the extent to which the operating account supplies information that *enhances* the ability of the lender to estimate the likelihood of a loan's becoming a problem.

Before continuing, it may be worthwhile mentioning that in the Canadian bank being studied, an operating loan is supplied as a negative-balance checking account. In the U.S., by contrast, the operating loan and the checking account are separated, with the checking account balance, at least in principle, required to be positive. Thus, the operating loan balance plus the checking account balance in the U.S. would be equal to the operating loan balance in this Canadian bank. The U.S. system provides somewhat more information than this Canadian bank's system, and it is possible that drawdowns of the operating loan may represent signals the bank can interpret. Thus, if anything, the results found using our Canadian data should indicate the lower bound on the information available in U.S.-style banking systems.

One of the chief functions of operating loans is the financing of inventories and accounts receivable. These items serve as collateral for the loan, and their values fluctuate with the business activity and prospects of the borrower. Thus, fluctuations in the value of accounts receivable and inventories should give the bank information on the future performance of the loan. To the extent that changes in the firm's bank account reflect changes in accounts receivable and inventories, they too should provide valuable information to the bank.

And there is good reason to believe there is some relationship between bank account balances, accounts receivable, and inventories. A firm borrows money to make goods—the amount borrowed shows up as a positive amount in its loan account. Before the goods are sold, they show up in inventory. Thus, there is

a positive relationship between inventories and loan balance. Once the goods in inventory are sold (but before the firm is paid), inventories fall and accounts receivable rise. Once the firm is paid—accounts receivable are usually paid within 90 days—its accounts receivable fall and the firm deposits its money into its checking account, so that its loan balance falls. Thus, there is a positive relationship between accounts receivable and loan balance.

Firm borrows	6	Firm makes goods	6	Firm sells inventories, but receives payment later	6	Firm is paid for goods
Loan account increases		Inventories increase		Inventories decrease Accounts receivable increase		Accounts receivable decrease Loan account decreases

3.1 The correlation between the monthly data on collateral and the annual book-value data

The monthly data on accounts receivable and inventories in our data set are the bank's *valuation* of these items. That is, they include subjective discounts (haircuts) from book value (note, we do not have monthly information on these book values). These haircuts provide a comfort level for the lender; they also reflect the liquidity and quality of accounts receivable and inventories. For example, as accounts receivable remain uncollected, their quality may deteriorate, and the state to which the inventory is processed reflects its liquidity—works-in-progress inventory is the least valuable, since it is the most difficult to convert to other uses and, therefore, to sell to other producers. In general, the bank would rather fund accounts receivable than inventories; in other words, the bank would rather fund goods for which the firm has buyers than goods that may sit in inventory for a long time.

Table 5 shows the proportion of the haircut reflected in the bank valuations of accounts receivable and inventories for end-of-fiscal-year data. For these dates, we have both the book value of the accounts

receivable and inventories from the annual audits, as well as the bank's valuations; the table shows the bank's valuations as a proportion of the audit value. In general, accounts receivable are valued at two-thirds to three-quarters of book value, while inventories are valued at between one-quarter and two-fifths of book value. Credit rating does not seem to have much effect on the size of haircut, although borrowers with a credit rating in the "troubled" range may have their accounts receivable haircut more than those of other borrowers. This presumably reflects the aging of some proportion of the accounts receivable.

For firms that deal exclusively with the bank, we would expect to find a higher positive correlation between the book values and bank's valuations than for firms without exclusive relationships with the bank, since the bank might be relying on one of the firm's other banks to monitor it. In other words, the bank might be free riding and setting its valuations less frequently than would be implied by changes in the book values of accounts receivable and inventories. Table 6A reports the regressions of the bank's valuation of accounts receivable on the (annual) book value for the entire sample and then by four categories: exclusive-healthy, exclusive-troubled, nonexclusive-healthy, and nonexclusive-troubled. As can be seen, we find a significantly positive correlation between the book value of accounts receivable and the bank's valuation for exclusive firms: the adjusted R^2 is 0.83 for exclusive-healthy firms and 0.89 for exclusive-troubled firms, and the coefficient on the book value is about 0.6 to 0.7 in both cases, close to the size of the average haircut. The coefficients are similar for the nonexclusive loans, but the R^2 is lower in the case of nonexclusive-healthy loans—largely because of one loan in that group.[2] It should be noted that very few observations are available for nonexclusive loans. The nonexclusive loans examined in the table are by and large those for which the bank is the primary relationship, since for these loans, the bank has information on the firms' accounts receivable.

Table 6B reports similar data for inventories. The coefficients on book value average around 0.2 to

[2]These regressions omit observations where the bank's valuation is zero, as almost all of the zeros were cases where the bank was not valuing the accounts receivable, as opposed to valuing them at zero.

0.3, reflecting the substantial haircuts taken for these assets. Here the only relatively close relationship, as measured by R^2, is for the exclusive-troubled loans. Once again, the tighter relationship found for exclusive loans suggests there is much more useful information available for these loans than for nonexclusive loans.

Table 6C shows comparable information for bank balances and total operating loan balances shown in the annual audit report. Differences between the two are due to float and to cases where borrowers have an operating loan balance with another bank. We have omitted observations in which bank balances are negative (where the borrower temporarily has a deposit with the bank rather than a loan), since these negative loan balances are reflected not in negative operating loan balances in the audit report but as bank deposits.

3.2 The relationship between loan balances and the bank's valuation of collateral

The fact that we have the bank's valuation of the accounts receivable and inventories rather than their book values leads to different hypotheses about the relationship between changes in these items and changes in account balances for our four loan categories: troubled and healthy loans to exclusive and nonexclusive firms.

For healthy loans to exclusive firms, the comovements of operating loan balances and valuation of accounts receivable and inventories should be relatively transparent because the valuations for healthy firms should be relatively stable. A healthy firm should not have inventories piling up and should be receiving payments from customers on a timely basis. On the other hand, for troubled loans, the relationship between valuations and loan balances will be more affected by control issues. As inventories pile up and accounts receivable age (as is typical in firms having troubled times), the bank may increase its haircut on the collateral. As the bank's relative valuation of collateral falls, the firm's credit limit (which is related to the bank's valuation of collateral) would also fall, and the limit might become binding. This might disrupt any relationship between the valuations and actual account balances, to the extent that the bank could not

perfectly control the firm.[3] Also, the correlation between accounts receivable, inventories, and balances could be disrupted if, as an alternative to increasing the haircut as a loan deteriorates, the banks asks for other guarantees to back the loan.

How close the relationship is between the firm's checking account balance, accounts receivable, and inventories will determine the usefulness of the borrower's checking account information for monitoring the borrower. Note that if the firm has multiple banking relationships rather than an exclusive relationship with the bank, it may use the proceeds of its sales to pay down another bank's loan.[4] The connection between checking account information and accounts receivable and inventories may be less tight for nonexclusive firms.

Thus, for our first test, we estimate an equation relating checking account balances to the bank's valuations of the firm's accounts receivable and inventories and determine whether the relationship is tighter for firms that have an exclusive relationship with the bank than for firms that do not. We also estimate the equation for the exclusive and nonexclusive subsamples divided into their healthy and troubled loan subgroups to control for any loan performance effect. We estimate the following equation for the six groups: exclusive, nonexclusive, exclusive-healthy, nonexclusive-healthy, exclusive-troubled, nonexclusive-healthy:

$$) \text{End of Month Balance}_{i,t}/\text{Annual Sales}_i \; ' \; "_{0i} \% \; "_1) \text{Accounts Receivable Valuation}_{i,t}/\text{Annual Sales}_i \% \; "_2) \text{InventoriesValuation}_{i,t}/\text{Annual Sales}_i \% \; ,_{i,t}$$

where i indexes the firm and t indexes time.

Note, we normalize by the firm's annual sales to control for heteroscedasticity, and we allow for a firm-

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[3]If, however, the bank's control of the firm were strong, we would expect a tight correlation between accounts receivable, inventories, and balances, since a bank's tightly controlling the firm would force credit limits down as its valuations of collateral were reduced.

[4]Consistent with this, we find that checking account balances were more volatile for nonexclusive firms than for exclusive firms, although the difference was not statistically significant.

specific fixed effect.[5] (These fixed effects are significant (at the 10% or better level) only for the exclusive, exclusive-healthy, and exclusive-troubled subgroups.)

As shown in Table 7, we find that the relationship is tighter, i.e., there is a higher adjusted R^2, for firms with exclusive relationships than for those that do not deal exclusively with the bank, and this is true even when we control for loan performance. This suggests there is more information to be gleaned from the account balances for firms that deal exclusively with the bank than for those that have other banking relationships.[6] The difference in R^2 is driven by the valuation of inventories: for exclusive firms, this valuation is significantly positively related to changes in checking account balances, while for nonexclusive firms, it is insignificantly negatively related.

Comparing the R^2 of this relationship for troubled versus healthy loans, holding exclusivity constant, we see that the relationship is tighter for the healthy loans. This may reflect the fact that when loans become troubled, the bank may lower its valuations and the loan limits may become binding on the firm.[7] This would disrupt the normal relationship between checking account balances and bank valuations of accounts receivable and inventories.

Roughly 20 percent of the monthly observations of the bank's valuation of inventories appear to be at an upper limit. These are cases where there are more than two observations of the same valuation and that valuation is greater than others for that borrower. If we rerun our regressions for exclusive-troubled loans, dropping loans for which there are multiple observations of the same positive valuation (whether or not the observation is the maximum for the borrower), the adjusted R^2 for the remaining loans increases to 0.34 (up

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[5]We use the earliest annual sales figure available for each firm. For troubled loans, this is sales in the fiscal year three years prior to the loans' being declared troubled, and for healthy loans, this is sales in the fiscal year three years prior to the last credit file review.

[6]Not only would the bank have less data on nonexclusive firms, but the value of any information it had might be lower, since the firm would be less under the bank's control.

[7]It also suggests that the bank's control is not perfect.

from 0.22 when the full sample of exclusive-troubled loans is used). This 0.34 is almost the same as the adjusted R^2 for the regression using the subsample of exclusive-healthy loans.

These results suggest that changes in inventories and accounts receivable explain roughly one- third of changes in the operating balance. Thus, simply having a continuous record of the borrower's operating balance in an exclusive client relationship provides the lender with a substantial amount of information. Of course, the loan officer has access to even better information, as the loan officer can examine individual checks and deposits.

4. Using Monthly Valuations to Detect Loan Problems

The monthly data allow the lender to detect when the loan amount exceeds the bank's valuation of collateral, which should provide a clear signal about the health of the loan. Another signal is whether the borrower is consistently borrowing an amount close to or exceeding the credit line authorized at the beginning of the credit year. These two criteria differ sharply on what kinds of lenders can use them. The first type of signal is available only to bank lenders. Monthly monitoring and valuation of accounts receivable and inventories are likely to be very difficult for a nonbank lender who does not have access to the checking account data we have documented as providing useful information. On the other hand, presumably any lender will know the extent to which the borrower is using or even exceeding the authorized credit line. Thus, we are specifically interested in what additional information is provided by the bank's valuations of collateral.

4.1 The relationship between monthly checking account information and signs of firm trouble

Our next tests examine whether there is a relationship between the monthly checking account information and these signs of firm trouble. To the extent that there is a relationship, the monthly data would be providing information to the bank regarding the health of the loan. Our measures for signs of trouble are: *exceed*, which is the difference between the firm's collateral (as measured by the bank's valuation of the firm's accounts receivable and inventories and other guarantees posted by the firm) and the amount the firm has borrowed, as a percent of the firm's authorized credit line; and *utilization*, which is the firm's borrowing

as a percent of its authorized credit line. Troubled firms are likely to have lower, and possibly negative, values of *exceed* and higher values of *utilization*, since they are likely to have borrowed more, had the bank lower its valuations of accounts receivable and inventory, and had the bank also lower the firm's credit line.

Both *exceed* and *utilization* are computed from the monthly data on the firm, and thus, they are likely to be better trouble signs for exclusive borrowers, since the bank has more accurate monthly data on these borrowers. As expected, we found a lower mean value of *exceed* and a higher mean value of *utilization* for exclusive-troubled firms than for exclusive-healthy firms.

When *exceed* turns negative, the bank is at risk, in that the borrower's ability to relatively quickly pay off the loan has become stretched. This is a warning signal to the loan officer and to the bank. How useful is this signal? We define a variable, *violations*, which equals the number of months for which *exceed* is negative over the three years prior to our reference date (either the date when a loan was declared troubled or the date of a healthy loan's last credit review). We also define *violations_i*, i=1,2,3, which is the number of months *exceed* is negative in the i^{th} year before the reference date. Similarly, we define *nonviolations*, and *nonviolations_i*, i=1,2,3, which is the number of months for which *exceed* is positive.[8]

We are interested in two nested types of outcomes: downgrades of a loan's credit rating and, among these, downgrades to "troubled." The declaration that a borrower is troubled is tantamount to failure of the loan; in almost all cases, the ultimate outcome is bankruptcy (see Table 4).

We ran OLS regressions and logit regressions of whether a loan was eventually declared troubled on *violations*, *nonviolations*, and *utilization*. The OLS results are shown in Table 8.[9] First note that the coefficients have the expected signs: the coefficients on *violations* and *utilization* are significantly positive

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[8]Months for which our data are incomplete do not count as negative or positive *exceed* and, therefore, do not increase either *violations* or *nonviolations*. To the extent that data are missing and to the extent that the firm is just borrowing an amount equal to the bank's valuation of its collateral, the sum of *violations* and *nonviolations* will differ from 36.

[9]The logit results are qualitatively the same and are available upon request from the authors.

and that on *nonviolations* is significantly negative. Taking all loans, including those on which we have no information on violations or nonviolations, we find that the additional information on violations and nonviolations adds 13 percent to the ability to separate troubled loans from untroubled loans. (The adjusted R^2 increases from 0.11 to 0.24 when *violations* and *nonviolations* are included in the OLS regression equation.) Note that this information is useful for both exclusive clients and nonexclusive clients—apparently, the nonexclusive clients about which the bank collects this type of information are clients with whom the bank has a strong relationship. On the other hand, the results are little changed if we exclude those borrowers for which the bank lacks information about violations.

How quickly is this information used? Two pieces of evidence suggest that the information is used relatively soon after it is available, as one would expect. Most of the information that determines whether a loan is declared troubled is in violations in the most recent fiscal year before a declaration of trouble, as shown in Table 9. Here we use our disaggregated measures of violations, *violations_1*, *violations_2*, and *violations_3*, which give separate counts of the number of violations according to how far in advance they took place before the loan was declared troubled (or before the final fiscal year for nontroubled borrowers). The first column of Table 9 shows the regression results for the sample of loans excluding those for which no information is available on violations during the third year prior to declaration. The third column excludes loans where there is no information on violations in any of the three years. In both cases, the bulk of the information is derived from the latest year: there is little difference in the adjusted R^2 when only the number of violations in the year prior to declaration is included in the regression compared to when violations in each of the three years prior are included.

Now consider downgrades of loans at the second review date, that is, at least a year prior to when the loan was declared troubled.[10] Here we would expect that the most important information would be violations

[10]Since the results for downgrades at the final review date are virtually identical to the results for declarations of "trouble," we omit them here for brevity; they are available upon request from the authors.

that occurred in the second year prior to the declaration that the loan is troubled. Table 10 shows that is indeed the case. Almost all the information provided by violations in explaining downgrades in the second year is contained in violations that occurred in the year prior to the downgrade. The adjusted R^2 increases from 0.12 to 0.19 when the second-year violations are included. Here the information content of the second-year violations is somewhat lower when all other information is excluded, but the information remains significant both econometrically and economically.

4.2 How the lender reacts to signs of trouble gleaned from checking account information

The final three tables discuss what the lender does over time as loans become increasingly troubled or, conversely, improve. First, we examine the timing of the credit reviews the bank performs—both the date on which a credit review was completed, relative to the date the review was planned to be completed, and changes in the frequency of planned reviews. We also examine whether the bank asks the firm for other guarantees to back a loan as its quality deteriorates over time.

We expect that for loans that remain healthy, the completion of the credit review should be closer to the planned completion date than for loans that deteriorate in quality, since for healthy loans, the reviewer is less likely to find troublesome information that takes longer to evaluate. Similarly, we expect that as a loan's quality deteriorates, a bank would want to examine the loan more frequently. At the beginning of our data (year 3), nontroubled loans were chosen to be approximately as creditworthy as the troubled loans. Over time, the nontroubled loans, on average, improve in apparent quality, while the troubled loans, by definition, deteriorate. Table 11 shows that among nontroubled loans, delays in loan reviews decrease compared to planned dates. This suggests that for loans that improve in quality, loan officers are able to sign off on them closer to the review date, while for troubled loans, a delay remains. For example, in the third year prior to our reference date, 90 percent of healthy loans have a delayed review while in the first year prior, only 69 percent do. Moreover the length of delay is cut by three-fourths—from about 120 days to 38 days, on average. In contrast, for loans that remain troubled, there is little lessening in the number of delayed reviews or average

length of delay.

The lower part of Table 11 shows that over time, as the troubled loans worsen, the time planned between credit reviews shortens on average, while for loans that improve in health, the time between reviews increases. For example, for troubled loans, on average, the time between planned reviews decreases by about 48 days over the three years, whereas for healthy loans, on average, planned reviews become less frequent by about 18 days. Similarly, the number of troubled loans with fewer than 340 days between planned reviews increases from 10 to 19 over the three years, while the number of healthy loans with more than 390 days between planned reviews increases from 5 to 14.[11]

Table 12 replicates Table 11, but rather than sort the loans by whether they eventually are declared troubled or not, we sort them on the number of *violations* they eventually have—in particular, we divide the loans into two groups, those with *violations* less than or equal to the median level of *violations* over the sample of loans and those with *violations* greater than the median level. (The median level is 2.5 *violations*.) This is information that the bank can discern from the firms' checking accounts. In general, we see results similar to those shown in Table 11, albeit a bit weaker. First, loans with greater numbers of *violations* do have their credit reviews delayed relative to loans that have fewer *violations*: for example, in the third year prior to our reference date, 90 percent of loans with fewer *violations* have a delayed review while in the first year prior, only 69 percent do; the length of delay declines from 118 days, on average, to 48 days. For loans with a greater number of *violations*, there is little decline in the number of delayed reviews and a much smaller decline in the average length of delay, compared to loans with fewer *violations*. The bottom panel shows that all loans have an increase in the frequency of their planned reviews over the three years, but loans with a greater number of *violations* have a larger decline in the number of days between planned reviews than

[11]The modal number of days between planned reviews is about 365, a year. The 340- and 390- day cutoffs were chosen to represent periods significantly less and significantly more than a year.

do loans with a lower number of *violations* (approximately 17 days vs. 10 days).[12,13]

Overall, we see that borrowers whose borrowing needs exceed the bank's valuations of accounts receivable and inventories have their credit ratings downgraded at the next credit review. We have also shown that, together with downgrading of credit, scrutiny appears to become stronger, with the credit review itself dragging on and the time between reviews sometimes becoming shorter.

Finally, Table 13, shows that the bank does sometimes react to signs that a loan is becoming troubled by requiring the borrower to post other guarantees. But this occurs for fewer than one-third of troubled loans, suggesting that this is not the bank's major line of defense. As shown in the table, among firms whose loans remained healthy, 28 percent were required to post other guarantees in at least one month during the third year prior to our reference date, and this percentage remains relatively steady over time. Similarly, for those firms with healthy loans that have to post other guarantees, the average dollar amount of these guarantees remains fairly steady at between C$600,000 and C$700,000 per month. The median value of these guarantees for healthy loans does fall over time, as does the average number of months for which the firm is required to post these guarantees: from over 8 months in the first year of our data to under 6 months in the year prior to the last credit review.

In contrast, among firms whose loans were declared troubled, the percentage of firms required to post other guarantees increases over time, from 16 percent to 30 percent, and the average amount of other guarantees required triples, from about C$400,000 to C$1,200,000 per month. Rather than declining through

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[12]The right side of the bottom panel of Table 12 indicates there is little change over the three years in the number of high-violation loans whose planned reviews are significantly more than a year apart and there is little change in those whose planned reviews are less than a year apart. However, over the three years, the number of low-violation loans whose reviews are significantly more than a year apart increases. This increase is about the same as the increase in the number of low-violation loans whose reviews are significantly less than a year apart.

[13]Similar results are obtained if instead of dividing the loans into two groups, we divide them into three groups: *violations* = 0; 1 # *violations* # 10; and *violations* $ 10.

time, as was the case for healthy loans, the average length of time that a bank requires other guarantees for troubled loans remains fairly steady, at 9 to 10 months per year. Still, it does not appear that requiring other guarantees is a major tool used by this bank in reaction to signs of trouble, since the bank is requiring such guarantees for fewer than one-third of the troubled loans in our sample by the year before the loan is declared troubled.[14]

5. Conclusion

Are banks special? This paper has described the efforts of one Canadian bank to use information in checking accounts to scrutinize the activities of small business borrowers. It is clear from the evidence that the bank does use instances where borrowings exceed its own valuation of a firm's accounts receivable and inventories as a signal of deterioration in credit. Moreover, movements in checking account balances are closely related to movements in its valuation of accounts receivable and inventories, suggesting strongly that the checking account provides a relatively transparent window on these aspects of a firm's activity. We believe that these results taken together provide strong detailed evidence that banks' handling of the transactions of businesses enables them to be special lenders to firms.

[14]Similar results hold for when the loans are classified by the number of violations they eventually had, as in Table 12.

Table 1. Distribution of Loans by Industry

	% of sample† (100 loans)	% of exclusive loans†† (59 loans)	% of nonexclusive loans††† (41 loans)
Manufacturing	42.0%	44.1%	39.0%
Wholesale Trade	20.0%	25.4%	12.2%
Services	20.0%	15.3%	26.8%
Retail Trade	10.0%	8.5%	12.2%
Construction	6.0%	5.1%	7.3%
Primary (Mining, Agriculture, Fishing, Forestry)	2.0%	1.7%	2.4%

†These percentages also represent the percentages for healthy loans and for troubled loans, since the pairs were matched on industry category.

††Exclusive loans are loans made to firms that have an exclusive banking relationship with the bank. Column does not sum to 100% due to rounding.

†††Nonexclusive loans are loans made to firms that have relationships with other banks. Column does not sum to 100% due to rounding.

Table 2A. Average Loan Size†

	All Loans	Healthy Loans	Troubled Loans
All three years	1496.3 (2485.8)	1269.9 (2828.8)	1741.1 (2024.3)
Three years prior to reference date	1250.8 (2216.9)	1126.4 (2546.4)	1400.8 (1730.1)
Two years prior to reference date	1500.9 (2388.7)	1231.5 (2608.3)	1783.7 (2099.8)
One year prior to reference date	1679.4 (2745.7)	1426.2 (3229.3)	1938.5 (2113.2)

	Exclusive Loans	Nonexclusive Loans	Exclusive, Healthy Loans	Nonexclusive, Healthy Loans	Exclusive, Troubled Loans	Nonexclusive, Troubled Loans
All three years	1365.8 (1994.6)	1745.3 (3207.9)	883.4 (1612.5)	1849.9 (3945.6)	1802.5 (2197.5)	1584.9 (1491.1)
Three years prior to reference date	1088.5 (1682.3)	1593.0 (3028.2)	797.3 (1494.6)	1705.7 (3674.8)	1396.6 (1813.2)	1412.2 (1495.1)
Two years prior to reference date	1364.9 (2096.2)	1762.3 (2853.8)	836.7 (1686.6)	1843.7 (3516.8)	1839.7 (2307.0)	1646.6 (1472.2)
One year prior to reference date	1592.1 (2095.8)	1832.9 (3613.7)	1014.2 (1635.3)	1953.8 (4462.9)	2056.4 (2302.1)	1642.8 (1508.6)

†Average over months and firms of loan size in thousands of Canadian dollars and standard deviation of loan size in parentheses. For healthy loans, the reference date is the last time the firm's credit file was reviewed by the bank. For troubled loans, the reference date is the date when the loan was declared troubled.

Table 2B. Average Business Sales†

	All Loans	Healthy Loans	Troubled Loans
All three years	16,898.0 (36,811.3)	12,805.2 (16,445.5)	20,990.8 (49,327.0)
Three years prior to reference date	15,885.3 (38,614.2)	10,846.5 (10,730.7)	20,924.0 (53,075.3)
Two years prior to reference date	18,112.0 (42,480.3)	14,028.5 (23,284.1)	22,195.4 (55,087.6)
One year prior to reference date	16,696.9 (30,472.3)	13,540.6 (16,838.4)	19,853.1 (39,423.0)

	Exclusive Loans	Nonexclusive Loans	Exclusive, Healthy Loans	Nonexclusive, Healthy Loans	Exclusive, Troubled Loans	Nonexclusive, Troubled Loans
All three years	10,108.8 (9,379.2)	26,667.9 (55,321.0)	10,742.0 (10,363.2)	15,040.4 (21,199.6)	9,609.8 (8,657.9)	43,083.4 (80,721.0)
Three years prior to reference date	9,746.7 (10,041.9)	24,718.8 (58,012.0)	10,405.2 (10,261.7)	11,324.6 (11,227.0)	9,227.9 (9,847.3)	43,628.2 (85,719.7)
Two years prior to reference date	9,934.8 (9,423.1)	29,879.1 (63,609.2)	10,855.6 (10,762.8)	17,465.9 (31,376.1)	9,209.3 (8,156.5)	47,403.6 (88,698.4)
One year prior to reference date	10,644.8 (10,094.0)	25,406.0 (44,645.7)	10,965.2 (9,621.5)	16,330.6 (21,842.3)	10,392.3 (10,456.4)	38,218.2 (62,167.3)

†Average over firms of annual business sales in thousands of Canadian dollars and standard deviation of business sales in parentheses. For healthy loans, the reference date is the last time the firm's credit file was reviewed by the bank. For troubled loans, the reference date is the date when the loan was declared troubled.

Table 3. Number of Loans with a Given Credit Rating Over Time

Credit Ratings for Loans Not Declared Troubled within Sample

			Reservations		
	Superior	Standard	Mild	Average	Strong
Time	1	2	3	4	5
No. of Loans at t ! 3	4	15	23	0	8
No. of Loans at t ! 2	3	17	23	0	7
No. of Loans at t ! 1	4	19	18	0	9

Credit Ratings for Loans Declared Troubled at Time t

			Reservations			Troubled		
	Superior	Standard	Mild	Average	Strong	Standard	Severe	Very Severe
Time	1	2	3	4	5	6	7	8
No. of Loans at t ! 3	3	15	28	0	4	0	0	0
No. of Loans at t ! 2	1	2	14	1	31	0	0	0
No. of Loans at t ! 1	0	1	2	1	6	29	5	6

Table 4. Outcomes of the Troubled Loans

	Number of loans	Percent of Loans
Bankruptcy of the firm	10	20%
Private liquidation of the firm	26	52%
Loan remained troubled	9	18%
Loan repaid	4	8%
Loan upgraded to healthy	1	2%

Table 5. Haircuts for Bank's Valuations of Accounts Receivable and Inventories Compared to Book-Value Accounts Receivable and Inventories

		Accounts Receivable			Inventories		
Credit Rating		**No. of Observations**	**Mean**	**Median**	**No. of Observations**	**Mean**	**Median**
1	Best	7	0.68	0.68	2	0.60	0.60
2	8	30	0.72	0.76	22	0.36	0.29
3	|	50	0.72	0.76	41	0.38	0.40
4	|	2	0.46	0.46	1	0.18	0.18
5	|	38	0.71	0.73	31	0.40	0.35
6	|	17	0.61	0.66	17	0.36	0.31
7	9	2	0.74	0.74	2	0.29	0.29
8	Worst	2	0.76	0.76	2	0.26	0.26

Table 6A. Regression Results of Bank's Valuation of Accounts Receivable on Book Value of Accounts Receivable

	All Loans	Exclusive, Healthy Loans	Nonexclusive, Healthy Loans	Exclusive, Troubled Loans	Nonexclusive, Troubled Loans
Intercept	266.8 (247.6)	131.0***** (77.0)	1679.3 (1960.8)	152.4***** (81.7)	284.0 (280.6)
Book Value of Accounts Receivable	0.724***** (0.102)	0.699***** (0.049)	0.755 (0.592)	0.617***** (0.032)	0.665***** (0.092)
Adjusted R^2	0.30	0.83	0.04	0.89	0.81
No. of Observations	115	42	15	45	13

Table 6B. Regression Results of Bank's Valuation of Inventories on Book Value of Inventories

	All Loans	Exclusive, Healthy Loans	Nonexclusive, Healthy Loans	Exclusive, Troubled Loans	Nonexclusive, Troubled Loans
Intercept	392.8***** (98.6)	257.1***** (122.1)	2012.0***** (616.6)	62.5 (54.8)	488.1* (249.9)
Book Value of Inventories	0.205***** (0.036)	0.219***** (0.050)	!0.307 (0.312)	0.275***** (0.017)	0.172 (0.107)
Adjusted R^2	0.21	0.31	!0.002	0.85	0.12
No. of Observations	115	42	15	45	13

Table 6C. Regression Results of Bank Account Balance on Bank Operating Loans

	All Loans	Exclusive, Healthy Loans	Nonexclusive, Healthy Loans	Exclusive, Troubled Loans	Nonexclusive, Troubled Loans
Intercept	!187.3 (222.4)	440.9***** (207.7)	!2426.4***** (864.1)	174.2 (149.6)	410.0 (383.0)
Bank Operating Loan	1.08***** (0.085)	0.519***** (0.111)	2.49* (0.28)	0.849***** (0.048)	0.555***** (0.183)
Adjusted R^2	0.60	0.34	0.85	0.88	0.43
No. of Observations	113	41	15	45	12

Standard errors in parentheses.
*Significantly different from zero at the 5% level.

Table 7. Regression Results of Monthly Bank Account Balances on Bank's Valuation of Accounts Receivable and Inventories†

$$\text{End of Month Balance}_{i,t}/\text{Annual Sales}_i = \alpha_{0i} + \alpha_1 \text{Accounts Receivable Valuation}_{i,t}/\text{Annual Sales}_i + \alpha_2 \text{InventoriesValuation}_{i,t}/\text{Annual Sales}_i + \varepsilon_{i,t}$$

where i indexes the firm and t indexes time.

	Exclusive Loans	Nonexclusive Loans	Exclusive, Healthy Loans	Nonexclusive, Healthy Loans	Exclusive, Troubled Loans	Nonexclusive, Troubled Loans
α Accounts Receivable Valuation/Annual Sales	0.474* (0.0270)	0.501* (0.075)	0.532* (0.036)	0.670* (0.111)	0.423* (0.040)	0.414* (0.102)
α Inventories Valuation/Annual Sales	0.223* (0.053)	0.141* (0.049)	0.614* (0.101)	0.116* (0.057)	0.079 (0.064)	0.479* (0.157)
Can H_0: Firm Fixed Effects = 0 be rejected at 10% level?	Yes	No	No	No	Yes	No
Adjusted R^2	0.26	0.11	0.35	0.14	0.22	0.18
Observations	1099	385	533	221	566	164

†Here, a positive bank account balance corresponds to a firm's borrowings exceeding its deposits; a negative bank account balance corresponds to a firm's deposits exceeding its borrowings. Thus, positive bank account balances indicate the firm is borrowing, on net.
Standard errors in parentheses.
*Significantly different from zero at the 5% level.

Table 8. Regression Results of Troubled Loans on Signs of Trouble in All Three Years Prior: Evidence that Warning Signs of Trouble Forecast "Troubled" Loans

	All Loans	Exclusive Clients	Nonexclusive Clients	All Loans Except Those With No Information On Violations or Nonviolations		
Intercept	0.330* (0.134)	0.366 (0.231)	0.397* (0.160)	0.151 (0.195)	0.388* (0.174)	0.278* (0.0684)
Violations	0.0158** (0.007)	0.0137 (0.0094)	0.0239 (0.0147)	0.017** (0.0083)	0.0215** (0.00798)	0.0285** (0.0065)
Nonviolations	!0.010* (0.0046)	!0.0078 (0.0074)	-0.0128* (0.0062)	!0.0071 (0.0060)	!0.00745 (0.0059)	
Credit Utilization	0.236** (0.080)	0.389* (0.143)	0.164* (0.098)	0.353** (0.123)		
Exclusive Client Dummy	Yes	No	No	Yes	Yes	No
No. of Observations	86	56	30	78	81	81
Adjusted R^2	0.24	0.24	0.21	0.26	0.19	0.19
Adj. R^2 w/o credit utilization	0.17	0.14	0.16	0.19		
Adj. R^2 w/o violations or nonviolations	0.11	0.15	0.07	0.15		

Standard errors in parentheses.
*Significantly different from zero at the 5% level.

Table 9. Regression Results of Troubled Loans on Signs of Trouble in Each of Three Prior Years: Evidence that Almost All the Useful Information Is in Recent Warning Signs of Trouble

	All Loans Except Those With No Information On Violations or Nonviolations in 3rd Year		All Loans Except Those With No Information On Violations or Nonviolations
Intercept	0.0753 (0.0990)	0.198* (0.0749)	0.0819 (0.0843)
Violations, 1 year prior to declaration of "troubled"	0.0831* (0.0196)	0.0879* (0.0183)	0.0852* (0.0149)
Violations, 2 years prior to declaration of "troubled"	!0.0217 (0.0207)	!0.0218 (0.0210)	!0.0216 (0.0192)
Violations, 3 years prior to declaration of "troubled"	0.0201 (0.0215)	0.0199 (0.0218)	0.0163 (0.0197)
Credit Utilization	0.2273** (0.1257)		0.238* (0.113)
No. of Observations	60	61	78
Adjusted R^2	0.34	0.32	0.39
Adj. R^2 for violations, including 1 year prior only	0.32	0.33	0.37
Adj. R^2 w/o violations	0.10		0.11

Standard errors in parentheses.
*Significantly different from zero at the 5% level.

Table 10. Regression Results of Credit Downgrades in the 2nd Year Before Classification on Signs of Trouble in Each of the Three Prior Years: Evidence that Warning Signs of Trouble Are Used Immediately

	All Loans Except Those With No Information On Violations or Nonviolations in 3rd Year	All Loans Except Those With No Information On Violations or Nonviolations in 2nd Year
Intercept	0.1109* (0.0751)	0.2564* (0.0665)
Violations, 1 year prior to classification	0.0375* (0.0184)	
Violations, 2 years prior to classification	0.051* (0.021)	0.0386* (0.0167)
Violations, 3 years prior to classification	!0.0293 (0.0219)	
No. of Observations	61	75
Adjusted R^2	0.19	0.06
Adj. R^2 w/o violations 1 year prior to declaration of "troubled"	0.15	
Adj. R^2 w/o violations in 2nd year prior to declaration of "troubled"	0.12	

Standard errors in parentheses.
*Significantly different from zero at the 5% level.
**Significantly different from zero at the 10% level.

Table 11. Evidence of More Intensive Monitoring as Loans Deteriorate

Delayed Completion of Review

	% of Delayed Reviews			Average Number of Days Delayed			Median Number of Days Delayed		
	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior
Healthy Loans	90%	84%	69%	119.6	89.0	37.8	118.0	99.0	24.0
Troubled Loans	84%	85%	79%	123.2	121.6	115.0	111.0	117.0	92.0

Times Between Planned Reviews

	Average Number of Days Between Planned Reviews		Average Change in Number of Days Between Planned Reviews	Number of Loans Whose Days Between Planned Reviews Are:			
				> 390	**< 340**	**> 390**	**< 340**
	3rd year prior to 2nd year prior	2nd year prior to year prior	Between 3rd year prior to 2nd year prior and 2nd year prior to year prior	3rd year prior to 2nd year prior		2nd year prior to year prior	
Healthy Loans	365.0	383.3	Number of days between planned reviews increases, on average, by 18.37 days	5	7	14	6
Troubled Loans	365.8	318.1	Number of days between planned reviews decreases, on average, by 47.96 days	10	10	9	19

Table 12. Evidence of More Intensive Monitoring in Response to Violations Based on the Monthly Bank Account Information†

Delayed Completion of Review

	% of Delayed Reviews			Average Number of Days Delayed			Median Number of Days Delayed		
	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior
Loans with # Median No. of Violations	90%	80%	69%	118.1	98.9	48.1	118.0	99.0	51.0
Loans with > Median No. of Violations	85%	90%	79%	124.7	111.5	104.5	111.0	105.0	83.0

Times Between Planned Reviews

	Average Number of Days Between Planned Reviews		Average Change in Number of Days Between Planned Reviews	Number of Loans Whose Days Between Planned Reviews Are:			
				> 390	**< 340**	**>390**	**< 340**
	3rd year prior to 2nd year prior	2nd year prior to year prior	Between 3rd year prior to 2nd year prior and 2nd year prior to year prior	3rd year prior to 2nd year prior		2nd year prior to year prior	
Loans with # Median No. of Violations	367.1	354.6	Number of days between planned reviews decreases, on average, by 9.94 days	5	6	10	12
Loans with > Median No. of Violations	363.6	347.7	Number of days between planned reviews decreases, on average, by 16.98 days	10	11	13	13

†The median number of violations is 2.5.

Table 13. Evidence on Whether the Bank Requires Other Guarantees as Loans Deteriorate

Other Guarantees Required by the Bank

	% of Loans Required to Post Other Guarantees†			Average Dollar Amount of Other Guarantees for Loans Requiring Other Guarantees‡ (As a percent of average loan size)			Median Dollar Amount of Other Guarantees for Loans Requiring Other Guarantees			Average Number of Months Other Guarantees Are Required		
	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior	3rd year prior	2nd year prior	year prior
Healthy Loans	28%	22%	26%	664.7 (60.1%)	620.6 (60.3%)	623.0 (65.1%)	557.6	646.3	280.9	8.4	11.0	5.5
Troubled Loans	16%	30%	30%	401.5 (32.2%)	835.8 (52.0%)	1213.3 (34.2%)	281.5	397.1	403.0	9.9	10.0	8.7

†This is the percentage of firms in each category that were required to post other guarantees in at least one month of the year.

‡Dollar amount in thousands of Canadian dollars. The ratio in parentheses is the average value of other guarantees in the year divided by the average loan size in the year. We excluded one firm in the healthy loan category because it was a depositor rather than a borrower over most of the period.

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