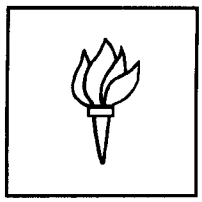

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Contagious Bank Runs: Evidence From the 1929-1933 Period

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CONTAGIOUS BANK RUNS:

EVIDENCE FROM THE 1929-1933 PERIOD

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Abstract

This paper analyzes the behavior of deposit flows in failed banks and (a control) sample of non-failed banks over the 1929-1933 period. Evidence of significant contagion effects were found for the 1930-1932 period. No apparent contagion effects existed in 1929 or 1933. It was also found that the pace of contagion accelerated between 1929 and 1932, indicative of a learning effect among depositors. Interestingly, even in the period of contagion there were a significant number of informed depositors who could distinguish among good and bad banks. This is despite the fact that this period preceded the establishment of the FDIC and the SEC and their associated information production requirements for banks. Finally, our results suggest that in the pre-1933 period there was a significant amount of depositor discipline on bad banks.

I. Introduction

In recent years there has been a great deal of interest in the causes and consequences of bank runs and the role of deposit insurance in deterring the incentives to run. Diamond and Dybvig (1983), Waldo (1985) and Postlewaite and Vives (1987) develop a "bubble" explanation of bank runs, whereby contagious runs develop from the "anticipation" that such runs might occur. In contrast, Gorton (1985), Chari and Jaganathan (1988) and Park (1991) emphasize an informational role in bank runs: with uninformed depositors initiating runs against solvent banks when "noisy" indicators of bank solvency are observed.

However, little empirical evidence, at the level of individual banks, has been presented to establish an informational role to bank runs. Indeed, the empirical work to date has been largely concerned with analyzing the time series behavior of aggregate deposits and other financial and money variables. For example, it is well documented that the deposit base and money stock declined sharply over the 1930-1933 period, while currency held by the public increased (see Friedman and Schwartz, 1963, Gorton (1988), Calomiris and Gorton (1991) and Donaldson (1992) for time series tests of bank panics using aggregate data). However, the aggregate data cannot reveal the extent to which the deposit base contraction was a consequence of contagious withdrawals across banks, or relatedly, reveal the degree to which deposit withdrawals were informed.

One possible rationale for an aggregate empirical approach is

that the theoretical models tend to ignore individual bank differences and contagion effects, and therefore model a run on a representative bank as equivalent to a run on the system as a whole (see Diamond and Dybvig (1983), for example). Yet, as Kaufman (1993) has argued, the social costs of a run on an individual bank may be much less than a run on many banks -- a so-called panic -- in which depositors are unable (or unwilling) to distinguish between good (i.e., non-failing) and bad banks. Therefore, the role of contagion becomes particularly relevant for evaluating the economic losses and costs of bank runs.

In a non-contagious bank run, informed depositors may simply withdraw funds from a bank perceived to be bad and redeposit them with (an often local) bank perceived to be good. The social costs of such a reshuffling of deposit funds may be quite small -- with little erosion to the deposit or lending base, either locally, regionally or nationally.[1] By contrast in a panic, uninformed depositors may withdraw indiscriminantly from both good and bad banks, perhaps on the basis of "noisy" signals such as local or macro-economic indicators, or the local or national failure rate of banks.[2] In this case, there may be a flight to quality by both informed and uninformed depositors, away from deposits and banks generally, towards other assets such as currency and Treasury securities.[3] Thus, good banks may be forced into fire-sales of assets and lending contractions, and potential failure as well. As a result, panics can lead to both regional and national contractions in the deposit/lending base of banks.

In reviewing the historical record, Kaufman (1993) and others have identified the 1929-1933 period as one in which panic conditions prevailed. The objective of this paper is to examine informed and uninformed depositor behavior at the individual bank level over the 1929-1933 period, so as to determine the "anatomy" of a bank panic. First, we are interested in trying to identify when and if -- during the 1929-1933 period-- depositors switched from engaging in runs on individual bad banks, to contagious behavior engaging in significant deposit withdrawals from good banks as well. Selective or individual bank runs may start with informed depositors withdrawing funds and re-depositing them (in part) with good banks. In a panic, informed and uninformed depositors withdraw their deposits per se.

A second objective of the study is to examine the importance of informed versus uninformed deposit withdrawals during panic conditions. This evidence will shed some light on the bubble versus information models of bank runs, and thereby on the appropriate bank regulatory response. For example, Diamond and Dybvig (1983, p. 404) state that "Government deposit insurance can improve on the best allocations that private markets provide", since it prevents the significant economic damage resulting from a run on the banking system. In contrast, if an informational role exists in bank runs, then greater bank-specific solvency information might deter contagious runs from developing, and thereby forgo (literally or partially) the need for deposit insurance. The empirical results of the paper should therefore be of interest to the current policy

debate over restructuring deposit insurance, depositor discipline and the introduction of market-value accounting to improve the timeliness and accuracy of the production of solvency information to bank claim-holders (see, for example, White (1990)).

In Section II we discuss our approach towards examining the run behavior of depositors over the 1929-1933 period. In Section III we present the data and in Section IV the empirical results. In Section V a regression analysis of bank deposit flows is pursued. Finally, Section VI is a summary and conclusion.

II. Methodology

Our approach is to examine the dynamics of deposit withdrawals in failing (bad) banks and a matched control sample of non-failing (good) banks in the three years leading up to the year of a bank failure. For example, suppose we examine the deposit withdrawal rates of banks that failed in 1929 over the three years prior to failure --1926, 1927 and 1928-- including the failure year (1929) itself. We then compare these deposit withdrawal rates with a matched pair sample of good banks, of similar size and location as the failing banks, that survived beyond 1929.

In a world in which a bank run is not a panic, we should expect to observe depositors -- especially informed depositors-- withdrawing deposits from bad banks and re-depositing them with good banks. That is, deposit withdrawals at bad banks may be offset by deposit accruals at good banks in the same locality. By contrast, in a world in which bank runs develop into contagious

panics we should expect to see increased withdrawal rates at both bad and good banks in the same locality. In our example, ex ante good banks that did not fail in 1929 would also be subject to significant deposit withdrawals as well.

We repeat this type of relative withdrawal analysis for each year 1929-1933. An analysis of variance (ANOVA) is used to analyze the impact of year of failure, years prior to failure and control versus failed banks on the deposit flow rates. Over the period 1929-1932 we are interested to see if there was some kind of "cumulative effect" in that relatively less-informed depositors increased their withdrawal rates at both bad and good banks over the period. We are also interested to see how deposit withdrawals behaved in 1933, the year in which deposit insurance was announced and other Federal support operations were put into effect such as the "bank holiday" and the creation of the Federal Reconstruction Corporation that took preferred equity stakes in some of the most poorly capitalized banks. That is, did such federal actions deter runs -- especially in good banks-- as the theoretical literature suggests it should have?

In analyzing deposit withdrawal rates our methodology bears some similarities to the more contemporary studies of bank failure and contagion by Sinkey (1975), Kurtz and Sinkey (1973) and Swary (1986), that looked at deposit flow (run) behavior at major banks prior to the failures of USNB of San Diego, Franklin National Bank and Continental Illinois.

In Section III, that follows, we describe the definitions and

data sources for our failed and matched (good) bank samples.

III. Data

A list of failed national banks was drawn from the 1936 Annual Report of the Comptroller of the Currency. The 1936 Annual Report was chosen since it was the first such annual report that listed the deposits of failed national banks at the time of final liquidation. The resulting list consisted of 214 national banks whose liquidations were finalized in 1936. Of these 214 national banks, those banks that had been closed during the period 1929-1933 were selected as the study's sample of failed banks. Due to the small number reported in the 1936 report, the sample of national banks that were closed in 1929 was augmented by additional 1929 closed banks whose liquidations were completed in 1937 and 1938 and listed in the annual Comptroller of the Currency reports of those years. The resulting sample totaled 163 failed national banks. Sample sizes by year of closure are listed in Table I (Year 0 column).

Annual deposit data on good and bad banks were obtained from various volumes of Rand McNally's Bankers Directory. This directory provides asset and liability data on all national and state banks (by state) on a semi-annual basis. Control (good) banks were selected from the directory to match each failed national bank in the sample using two criteria. First, control banks were required to have remained in operation for at least two years after the last full year of operation of the failed bank. Second, control banks

were drawn from the same town as the failed bank, if available, otherwise, a nearby town was selected. This process was simplified by the state maps contained in the directory. In some cases, more than one bank met both criteria. In this case all such banks were included as controls for the particular failed bank in order to capture as much of the potential substitution of deposits from bad banks to control (good) banks as possible. A total of 229 control banks resulted.

Control banks were selected without regard to size or other attributes. However, they were selected from towns or cities of approximately the same size as those of the failing banks. In the resulting sample, mean deposit levels were approximately equal for the 1929 sample of control and failed banks, with mean deposit levels of $934,057 and $998,898, respectively. Not surprisingly, over the period 1930-1933, control banks tended to increase, and failed banks decrease, in mean deposit size.

Additional data were collected to investigate the relationship between bank deposit flows and both bank-specific and regional factors. Bank-specific balance sheet data, including bank assets: cash, securities, loans and other assets, and owners' equity (capital and surplus) were collected from Rand McNally's Bankers Directory. Regional data collected included the number of bank failures per state, taken from the Federal Reserve Bulletin (September, 1937, pp. 866-910) and the number of business failures per state from the Statistical Abstract of the United States (various years). In addition, state-level personal income data were

obtained from the U.S. Department of Commerce's Regional Economic Information System (1993).

IV. Deposit Flows at Failed Versus Control Sample Banks

Table I shows the mean deposit withdrawal (flow) rates for the failed banks and the control banks in our sample, for the 3 years prior to failure (plus the year of failure) and for each year 1929-1933. In addition, it shows the withdrawal (flow) rate for the control banks for the year after which the bad banks failed. The final column shows the national deposit "withdrawal" rate. Note that a positive number in this table implies a positive growth of deposits (or net deposit accruals) while a negative number implies net deposit withdrawals (runs).

Insert Table I about here

IV.1 Evidence of Deposit Substitution: 1929

First looking at the final column for national deposit withdrawal rates, it can be seen that only in 1932 (-15.2%) and 1933 (-8.7%) were there large nation-wide contractions in the deposit base. In 1929 the national deposit base still appeared to have been growing (+5.1%).[4] This suggests that in 1929 depositors were still distinguishing between bad (fail) and good (control) banks. Specifically, the evidence from the matched bank sample appears to support the contention that depositors distinguished between good and bad banks in 1929. For example, in each of the

three years prior to failure (1926, 1927, 1928), plus the year of failure itself (1929), failed banks experienced growing net withdrawals. By comparison matched local good banks --with one exception (year 2)-- received net fund accruals or inflows on average. Even in the year of failure itself (1929), failed banks had mean net outflows of 18.5%, while good banks had mean net inflows of 5.4%, a difference that is statistically significant at the 1% level. This evidence argues against a pervasive contagion effect either regionally or nationally in 1929 --despite the stock market crash. That is, there is no evidence linking the 1929 stock market crash with the onset of a contagious bank panic.

IV.2 Evidence Consistent With Contagion Effects: 1930-32

By contrast, the period 1930-1932 appears to be consistent with the presence of significant contagion effects, whereby deposit withdrawals at control good (solvent) banks appeared to be linked to deposit withdrawals at bad (failing) banks, matched in the same community. The question of whether the observed co-movement in deposits was a consequence of local economic conditions, or indicative of a "spill-over" effect from failing banks to control banks is pursued in Section V, in the context of a regression analysis.

As shown in table I column 4 (year 0), the deposit withdrawal rates in failed banks increased from 18.5% in 1929 to 38.5% in 1930, 33.2% in 1931 and 37.8% in 1932 in the year of failure. Table II shows the year-to-year increases in withdrawal rates and their

significance. Thus, for example, the year of failure mean withdrawal rate for failed banks increased from 18.5% in 1929 to 38.5% in 1930 or by (-)20%. The increase was statistically significant at the 5% level.

Insert Table II about here.

Our interest specifically is in the effect of these pre-failure deposit withdrawals on deposit withdrawals at good banks, i.e., in contagion effects. From Table I we can analyze the contagion effects of failed banks on the matched pair sample of non-failed (good) banks over the 1930-1932 period. In each of the failure years (year 0), good banks suffered net deposit withdrawals of respectively 10.1% (1930), 4.7% (1931) and 19.3% (1932). Consistent with a contagion effect, these banks also suffered increased deposit withdrawals in the years leading up to failure as well, i.e., as the 1930-1932 period evolved. In particular, comparing 1932 with 1931, the rate of deposit withdrawals was greater for good banks in each of the 3 years prior to the failure of their matched bad banks than in the preceding year, that is, 1.2% vs. 7.9% (-3 years to failure of bad matched banks), -2.8% vs. 2.3% (-2 years), -13.6% vs. 4.3% (-1 year) and -19.3% vs. -4.7% (0 or failure year). In the latter two cases the differences are statistically significant at the 1% and 5% levels respectively (see Table II). The results are consistent with an acceleration of contagion effects at good banks over the 1930-1932 period.

The distribution of deposit flows for 1929, as well as for 1930, 1931 and 1932 are summarized in Charts 1-4. As can be seen, the distribution of deposit flows are relatively well separated for failed and control banks in 1929. As the period 1930-32 evolves, the deposit flow rate of the good banks gets increasingly skewed to the left of the 0% withdrawal rate in a similar fashion to bad banks (i.e., an increasing number of matched good banks facing enhanced rates of deposit withdrawal), so that by 1932, all but a few good banks are facing net deposit withdrawals.

IV.3 Evidence on an Informational Role in Deposit Withdrawals

The deposit withdrawal data from the 1930-1932 period, while supporting the presence of contagion effects, also indicate that significant differences in withdrawal rates existed between control banks and failing banks. A "pure" contagion effect --whereby depositors are completely uninformed and are unable to distinguish between good and bad banks-- implies that deposit withdrawals over this period would occur indiscriminantly (randomly) against control and failing banks. In contrast, if there are informed depositors at failing banks who withdraw before failure (and potentially re-deposit at local good banks), then withdrawal rates at failing banks should exceed withdrawal rates at good control banks.

The results in Table I indicate that in the year of failure (year 0) the mean withdrawal rate at failing banks exceeded that at control banks by 28.4% (38.5% versus 10.1%) in 1930, by 28.5% (33.2% versus 4.7%) in 1931, and by 18.5% (37.8% versus 19.3%) in

1932. These differences are significant at the 1% level in 1930 and 1931 and at the 5% level in 1932 (as shown in Table I). Further, in the year prior to failure (year -1), the mean withdrawal rate at failing banks exceeded that at control banks by 15.8% (11.5% versus a positive flow of 4.3%) in 1931, and by 23.5% (34.8% versus 11.3%) in 1933, both significant at the 1% level. These results suggest that, even in this relatively noisy information period, "informed" depositors existed, who disciplined bad banks by withdrawing their deposits faster against "failing" banks prior to their actual demise, compared to those banks that were good. In particular, the relatively low level of information production by banks and their owners (pre-FDIC, pre-SEC) compared to today did not detract from greater depositor discipline being imposed on bad banks through informed depositor withdrawals.[5]

Insert Table III about here.

The results presented in Table I also suggest that "informed" withdrawals equaled or exceeded those of "uninformed" withdrawals in magnitude over the 1930-1932 period when significant contagion occurred. For example, in 1932 the "uninformed" or contagious withdrawal rate against (good) control banks was 19.3% versus an "informed" withdrawal rate of 18.5% (where informed depositors are defined as the failing bank withdrawal rate less the control good bank withdrawal rate).[6] In 1930 and 1931 the corresponding estimates were 10.1% and 4.7% "uninformed" versus 28.4% and 28.5%

"informed", respectively.

IV.4 Recovery Period: 1933

Finally, we also analyze 1933, the year of major federal intervention --such as the March 1933 bank holiday and forced closures, and the announcement of deposit insurance. Chart 5 plots the distribution of deposit flows for 1933. While it is difficult to disentangle the deposit insurance (and other legislative) announcement effects from the bank holiday effect, the impact on withdrawal rates in 1933 (year 0) is quite dramatic.

Specifically, those banks that failed in 1933 suffered a withdrawal rate of "only" 6.8% compared to 34.8% (for one year prior to failure, i.e., a withdrawal rate of 34.8% in 1932 for those banks actually failing in 1933), while the good bank control group actually had positive deposit flows of 12.9% in the year of bad bank failure (year 0), compared to 11.3% withdrawals in the year prior to the bad bank's actual failure. These differences in withdrawal rates between year 0 and year -1 are statistically significant at the 1% level, both for the failed and (good) control banks. That is, the rate of deposit withdrawals for both bad and good banks fell significantly in 1933 with the switch in sign from net withdrawals to net additional deposit flows for the good (control) banks, consistent with the ending of contagion effects. In 1933 depositors appeared once again to distinguish between failing versus good banks as in 1929.

V Regression Analysis of Bank Deposit Flows

The deposit flow analysis presented in the previous section found evidence consistent with contagion effects during the 1930-1932 period. Under the contagion hypothesis, deposit outflows at failing banks would have created uncertainty over the solvency of nearby good (control) banks, leading to deposit outflows (runs) at those banks, as well.

However, these apparent contagion effects may simply reflect declining local and national economic conditions, that would have put downward pressure on all banks' deposits in any particular locale. In particular, the observed deposit outflows at control banks would also be consistent with a local "flight to safety" hypothesis, whereby risk-averse depositors withdraw funds from all local banks to protect their wealth levels. As has been documented by Friedman and Schwartz (1963), the recessionary 1930s were characterized by both declining national income and a declining money supply. Therefore, an empirical question of particular interest is the extent to which deposit outflows at control and failing banks were a consequence of changing local economic conditions and declining bank capital (solvency ratios), rather than contagion effects per se.

To pursue this question, the deposit flow data presented in Table I, and discussed in the previous section (Section IV) is analyzed in the context of a regression equation that controls for the influence of regional economic conditions and bank-specific solvency measures on deposit flows of good and bad banks. Several

measures of local economic conditions were included in the analysis, namely measures of local personal income, the failure rate of local commercial enterprises and the local bank failure rate, all measured as state-level aggregates.[7] Included among the bank solvency measures were the book capital-to-assets ratio and the cash-to-deposit ratio, derived from published bank balance sheet data.

Table III presents the results from the regression of control-bank and failing-bank deposit flows on regional economic, bank-specific and other explanatory variables. The analysis is segmented into two distinct periods: (i) the 1930-1932 period[8] of heightened recession and (ii) the transitional year 1933, marked by the national bank holiday and passage of federal deposit insurance legislation. In Table III the results for each period, 1930-1932 and 1933, are listed along with the bank sample size (N), the R^2 and the regression intercept (Const). Standard errors are listed parenthetically where appropriate. In addition, the regression results are presented separately for the control bank sample and the failed bank sample.

Consistent with the informational effects discussed in the preceding section, the regression results presented in Table III indicate that bank-specific factors, namely a bank's book capital ratio (BCAP) and the cash-to-deposit (CDEP) ratio had a significant effect on deposit flows during the 1930-1932 period.[9] The bank capital ratio (BCAP) had a positive impact on deposit flows, particularly for the (good) control sample banks, where it is

significant at the 5% level. The cash-to-deposits ratio (CDEP) had a positive impact on deposit flows of control banks, but a negative impact on failing-bank deposit flows, perhaps indicative that the failing banks (rationally) increased liquidity in anticipation of greater deposit outflows.

Regional economic variables also appeared to have had a significant impact on deposit flows during the 1930-1932 period. Interestingly, the annual change in non-farm personal income (DNFPI), measured at the state level, had a strong positive impact on deposit flows at both control and failing banks.[10] Specifically, Table III indicates that a 10 percent decline in non-farm personal income resulted in respectively an 8.0 percent and 9.52 percent decline in deposits at control and failing banks. Also, both the (state-level) bank failure rate (BFAIL) and the annual change in the bank fail rate over the year (DBFAIL) had a negative impact on deposit flows at control and failing banks.[11] Therefore, regions with a high failure rate, or those that realized a large increase in their bank failure rate, had larger deposit outflows.

To test for a potential contagion effect from failing banks to control banks, an additional variable was included in the regression for control banks. This was the deposit-flow rate observed for the failing bank matched to that particular control bank. As constructed, this variable captures the potential "spill-over" effect from a "run" on a failing bank to deposit withdrawals in the same year at control banks from the same locale. Adding this variable to the analysis yields a test of whether a significant

contagion effect exists, after controlling for the influence of regional economic and firm-specific effects.

The failing-bank deposit flow variable is listed as DDEP_FB in Table III, where its coefficient is positive and significant at the 5 percent level. This is consistent with a positive "spill-over" effect existing in the 1930-1932 period, even after accounting for the other factors. As such, these results support the evidence presented earlier in Table I -- where increased deposit outflows occurred at both failing and matched control banks over the 1930-1932 period.

The results for the 1933 subsample are in sharp contrast with those discussed above for the 1930-1932 period. First, the explanatory power (R^2) of the deposit flow regressions increased approximately four-fold for the 1933 period (compared to the 1930-1932 period). Second, bank-specific factors (namely the book capital (BCAP) and cash-to-deposit (CDEP) factors) predominated as significant explanatory variables of deposit withdrawals in 1933. In particular, regional factors such as state personal income were not significant in explaining the cross-sectional variation in deposit flows in 1933. Perhaps of greater significance for the contagion hypothesis, the failing bank deposit flow variable (DDEP_FB) was significant for the control sample of banks, but in this case with a <u>negative</u> sign. This negative sign is consistent with the transition seen in Table I from the contagious withdrawals of the 1930-1932 period to deposit substitution in 1933 (i.e., control banks located near failing banks realized greater deposit

inflows). Therefore, the results for 1933 are consistent with a return to more normal (pre-1930) conditions, as indicated by the increased importance of bank-specific factors in determining deposit flows, and deposit substitution replacing contagious withdrawals.

In summary, the regression results indicate that local economic conditions had a significant impact on deposit flows at control and failing banks. In particular, declining personal income was strongly correlated with deposit outflows. Other (state-level) regional variables, such as the (state-level) bank failure rate and increase in the bank failure rate, also negatively impacted deposit flows -- indicating that depositors may have used regional economic information as a proxy for bank-specific information concerning the solvency of their particular bank. Of greater direct evidence regarding contagion effects, we find that even after controlling for these regional effects (as well as bank-specific variables), there still appeared to be a significant "spill-over" effect from failing banks to the matched control banks in our sample. Therefore, in general the results provide evidence in support of the hypothesis that significant depositor contagion existed during the 1930-1932 period. In contrast, this effect disappears in 1933.

VI Impact on Correspondent Banks and New York City Banks

The results discussed in Sections IV and V above are consistent with the presence of a bank failure contagion during the 1930-1932 period -- at least at the local level. The aggregate

statistics presented in Table I also indicate that a contraction occurred in the national deposit base, consistent with a national contagion and panic. In this section we investigate the impact of local or regional contagion on the national banking system.

Table IV about here

Table III lists deposit flows for the two primary correspondent banks for each of the banks in the failed bank sample. Table III also gives deposit flows for a sample of New York City banks, including the major money center banks in New York at the time. The deposit flows of correspondent banks allow us to examine the extent and nature of how (and whether) regional contagion became national in scope. With the New York City banks we can focus on the impact of the banking panic on the nation's financial center. Our sample is also split between state and national banks to focus on the large New York City national banks.

The results in table III indicate positive deposit growth over the 1927-1929 period for both correspondent and New York City banks. Moreover, net deposit withdrawals for correspondent banks did not start to occur until 1931 and 1932. That is, major New York correspondents appear to have been buffeted from regional contagion during 1930. By contrast, New York City state banks suffered net deposit withdrawals over the 1930-1932 period, similar in magnitude to the contagion effects discussed previously for control banks. Finally, while the major New York City national banks showed the

smallest withdrawal rates of all banks examined, these rates are still consistent with (even) the largest banks being affected by a contagion effect emanating from failing non-New York banks.[12]

VII. Summary and Conclusions

During the contractionary period from 1930-1933 the national deposit base and monetary base declined sharply, while concurrently currency held by the public increased, a pattern consistent with a flight-to-currency by depositors over this period. However, past studies of this period have not established the extent to which the declining deposit base simply reflected the period's large number of bank failures, or the extent to which there was an informational component to deposit withdrawals. This paper has sought to answer these questions through an analysis of individual bank data on deposit flows in failed banks and a control sample of non-failed banks over the 1929-1933 period. Of particular interest is: (i) the extent to which deposit withdrawals occurred against both bad (failed) and good (non-failed) banks, consistent with the occurrence of contagious bank runs, and (ii) the extent to which deposit withdrawals had an informational component.

Our analysis of deposit flows suggest that in both 1929 and 1933, depositors actually distinguished between good and bad banks, so that deposit withdrawals against bad banks appeared to be re-deposited locally in good banks. Therefore, a run on a bad bank did not necessarily result in a contagious run on other banks in the same locality. By comparison, the years 1930-1932 exhibited

depositor behavior consistent with a regional (and national) panic, with non-failing (good) control banks exhibiting substantial deposit withdrawals in the same year of the matched failed bank's demise as well as in the three years immediately preceding the matched bad bank's failure in 1932.

However, consistent with studies of Gorton (1985) and others the study finds support for the existence of informed depositors in the observed withdrawal dynamics, even during the years 1930-1932 when significant contagion occurred and required information production by banks was relatively low compared to today. Specifically, withdrawals against failing banks significantly exceeded withdrawals against control banks during the period. Since control banks were drawn from the same locale as failing banks, this result indicates that some depositors were more informed than others about individual bank solvency -- even during this relatively "noisy" information period.

These results are further supported by a regression analysis of the impact of regional economic and bank-specific variables on deposit flows. During the 1930-1932 period changes in regional personal incomes, regional bank failure rates, and bank-specific variables were found to be significant explanatory factors of deposit withdrawals. Nevertheless, after controlling for these regional and bank-specific effects, the analysis also found a significant "spill-over" effect from failing-bank to control-bank deposit flows in 1930-1932. Finally, in 1933 this effect appeared to reverse, resulting in significant evidence of a return to normal

(or non-contagious) conditions.

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End Notes

(1) Kaufman (1987, p. 30) identifies the following social costs that can arise from a bank's failure: (1) the loss of banking services caused by the liquidation of banking facilities in a community, (2) the interruption of banking services to a community while a bank is reorganized and (3) the "domino" effect that one bank failure can have on other banks. Kaufman argues that the first two costs have been small historically, and that the third cost has been eliminated since the implementation of federal deposit insurance in 1934.

(2) Following Kaufman (1987), we define contagion as the spill-over effect that a bank failure can have on the failure of other banks, both regionally and nationally, and therefore the potential destabilizing impact of bank failures on the entire financial system.

(3) A flight to Treasury securities would effect banks locally, but ultimately these funds may be re-deposited within the banking system by the seller of the securities, who may have a wider range of banks available for redepositing. The "flight to currency" may act as well to depress interest rates on federal government securities relative to private securities. In contrast, a flight to currency would represent a drain of funds from the entire banking system, which in turn could impact the stability of the system.

(4) However, the fact that the deposit base was still expanding in 1929 reflected in part actions taken by the Federal Reserve after the October 1929 stock market crash. In particular, the Federal Reserve loaned freely through its discount window and purchased about $160 million of government securities (Friedman and Schwartz, 1963, p. 339). Effective Federal Reserve action post-1929 was hampered in part by member disagreements over appropriate policy (e.g., see Friedman and Schwartz, 1963, p. 407-419).

(5) Interestingly a paper by Smirlock and Kaufold (1987) found that discipline was imposed on stockholders of banks most exposed to LDC debt problems in 1982 -- even though regulators did not require banks to produce detailed figures on their exposures at that time. This is consistent with depositors expending resources to collect their own information in lieu of official production of such information.

(6) That is, we are defining "uninformed" withdrawals as equal to the net withdrawals from good banks. This approach to estimate "informed" and "uninformed" withdrawals assumes that informed withdrawals at bad banks were not redeposited at the matched good banks. This assumption appears to be consistent with the empirical results. In Table I withdrawal rates at control good banks in the year of failure (year 0) of their matched bad bank are comparable in magnitude to withdrawal rates at other control good banks whose matched bad banks did not fail that year.

(7) As detailed in Section III, the personal income data was obtained from the Regional Economic Information System of the U.S. Department of Commerce, the business failure rates from the Statistical Abstract of the United States and the aggregate bank failure data from the Federal Reserve Bulletin (1937). These three data sources exhaust most of the state-level economic data available for the period.

(8) The state-level personal income data, obtained from the U.S. Department of Commerce's Regional Economic Information System (1993), is not available prior to 1929. Because of the important observed influences of changes in personal income on deposit flows, the regression analysis is limited to the 1930-1932 and 1933 periods. Fortunately, this includes the time period of critical relevance to the study.

(9) The bank-specific variables, BCAP and CDEP are beginning-of-period values and therefore represent information available to depositors prior to the observed deposit flows. As well, the regression analysis may understate the potential informational effect, to the extent that the included variables do not capture private information leaked from bank insiders to depositors.

(10) The personal income data obtained from the Regional Economic Information System data of the U.S. Department of Commerce included a number of sub-categories, such as "wages and salaries" and

"dividend, interest, and rent". In all 31 various income variables are given, of which the "non-farm personal income" variable proved to be significant in the present analysis.

(11) The state-level commercial failure rate variable was not significant and therefore not listed in Table III, for sake of brevity of presentation. In addition, as would be expected, region-specific effects were also found to be significant. In particular, deposit flows were overall higher in Great Lake (GLAK) states and lower for failing banks in Rocky Mountain (RKMT) states during the 1930-1932.

(12) Of the 44 New York City national banks 1 was closed and liquidated, 4 underwent voluntary liquidation, 22 were acquired by other banks and 17 survived the entire period. Of the 32 New York City state banks 5 were closed, 4 voluntarily liquidated, 17 merged, 12 survived the period, and 4 were lost to follow-up.

TABLE I: MEAN DEPOSIT FLOW RATES (%)

Year of Failure	Sample	YEAR RELATIVE TO FAILURE YEAR -3	-2	-1	0	0†	1	Aggregate National Rate
	Fail	-2.8	-9.5	-5.5	-18.5	-46.0		
		(9.1)	(6.6)	(6.2)	(5.8)	(5.8)		
1929		(11)	(21)	(24)	(27)	(27)		
	Control	1.9	-6.4	15.8**	5.4**		-3.4	5.1
		(5.6)	(5.7)	(5.5)	(5.3)		(6.3)	
		(29)	(28)	(30)	(32)		(32)	
	Fail	-0.5	10.5	1.4	-38.5	-52.4		
		(6.0)	(6.0)	(6.0)	(6.2)	(5.3)		
1930		(25)	(25)	(25)	(24)	(24)		
	Control	11.1	7.2	3.7	-10.1**		-4.8	-0.6
		(4.3)	(4.7)	(4.6)	(4.6)		(5.6)	
		(48)	(41)	(42)	(43)		(40)	
	Fail	2.6	-2.0	-11.5	-33.2	-46.9		
		(3.9)	(3.8)	(3.8)	(3.9)	(3.3)		
1931		(61)	(63)	(64)	(59)	(59)		
	Control	7.9	2.3	4.3**	-4.7**		-12.4	-2.7
		(3.2)	(3.2)	(3.1)	(3.1)		(3.9)	
		(88)	(91)	(93)	(92)		(83)	
	Fail	-0.2	-7.7	-16.7	-37.8	-51.8		
		(5.2)	(5.4)	(5.7)	(5.9)	(4.4)		
1932		(34)	(31)	(28)	(26)	(26)		
	Control	1.2	-2.8	-13.6	-19.3*		9.9	-15.2
		(5.1)	(5.0)	(5.0)	(5.0)		(5.9)	
		(35)	(36)	(36)	(37)		(36)	
	Fail	-0.1	-13.1	-34.8	-6.8	-7.2		
		(5.3)	(5.7)	(5.7)	(5.8)	(2.3)		
1933		(32)	(28)	(28)	(27)	(27)		
	Control	-6.0	-15.8	-11.3**	12.9*		28.6	-8.7
		(6.0)	(6.0)	(6.0)	(6.0)		(7.1)	
		(25)	(25)	(25)	(25)		(25)	

*(**) indicates that control mean significantly differs from the failed bank mean at $p \leq 0.05$ ($p \leq 0.01$). Standard errors are listed in parentheses under each listed mean, with sample size parenthetically listed under the standard errors. All results were generated by Proc GLM of SAS.

† These rates are annualized to account for the day and month of failure within the failure year.

Source of deposit and aggregate national data: Rand McNally's Bankers Directory.

TABLE II: MEAN DEPOSIT FLOW RATES (%)

YEAR-TO-YEAR MEAN FLOW DIFFERENCES

Year of Failure	Sample	YEARS TO FAILURE -3	-2	-1	0	0†	1	Aggregate National Rate
	Fail	2.3	20.0*	6.9	-20.0*	-6.4		
1930-1929	Control	9.2	13.6	-12.1	-15.5*		-1.4	-5.7
	Fail	3.1	-12.5	-12.9	6.3	5.5		
1931-1930	Control	-3.2	-4.9	0.6	5.4		-7.6	-2.1
	Fail	-2.8	-5.7	-5.2	-5.6	-4.9		
1932-1931	Control	-6.7	-5.1	-17.9**	-14.6*		22.3*	-12.5
	Fail	0.1	-5.4	-18.1*	31.0**	44.6**		
1933-1932	Control	-7.2	-13.0	2.3	32.2**		18.7	6.5

*(**) indicates that the year-to-year differences are significant at $p \leq 0.05$ ($p \leq 0.01$). All results were generated by Proc GLM of SAS.
† These rates are annualized to account for the day and month of failure within the failure year.
Source of deposit data: Rand McNally's Bankers Directory.

TABLE III: Deposit Flow Regression Results
Dependent Variable: Deposit Flow

Recessionary Period: 1930-1932

	Control Banks		Failed Banks	
Term	Value	SE	Value	SE
N	594		326	
R-Square	0.122	-	0.240	-
Constant	-.149	0.05 ***	-.002	0.04
	Bank-Specific Factors			
BCAP	0.478	0.20 **	0.144	0.18
CDEP	0.761	0.11 ***	-.207	0.09 **
	Regional Economic and Contagion Factors			
DNFPI	0.800	0.26 ***	0.952	0.22 ***
BFAIL	-.459	0.30	-1.15	0.27 ***
DBFAIL	-.442	0.27 *	-0.40	0.22 *
DDEP_FB	0.162	0.07 **	-	-
	Regional Dummies			
GLAK	0.060	0.03 *	0.092	0.03 ***
RKMT	0.087	0.06	-.086	0.05 *

Recovery Period: 1933

	Control Banks		Failed Banks	
Term	Value	SE	Value	SE
N	65		23	-
R-Square	0.488	-	0.194	
Constant	-.204	0.15	-.271	0.20
	Bank-Specific Factors			
BCAP	3.04	0.49 ***	0.756	0.76
CDEP	0.552	0.26 **	-.865	0.54
	Regional Economic and Contagion Factors			
DDEP_FB	-1.44	0.54 ***	-	-
	Regional Dummies			
GLAK	-.183	0.10 *	0.009	0.09

* 10-percent significance level
** 5-percent significance level
*** 1-percent significance level

TABLE IV: MEAN DEPOSIT FLOW RATES (%)

Of Correspondent and New York City Banks

	1927	1928	1929	1930	1931	1932	1933
Correspondent Banks							
Mean	5.4%	8.1%	2.4%	2.3%	-12.1%	-5.1%	14.0%
S.E.	1.4%	2.4%	2.3%	2.3%	1.7%	1.7%	3.6%
N	83	78	64	55	50	47	41
New York City State Banks							
Mean	14.8%	112.1%	2.3%	-13.1%	-15.2%	-6.4%	2.3%
S.E.	23.8%	75.2%	5.1%	11.2%	9.0%	6.4%	5.9%
N	6	6	6	6	10	10	8
New York City National Banks							
Mean	-0.4%	15.6%	308.0%	-0.3%	6.8%	-1.4%	9.9%
S.E.	3.3%	16.1%	297.0%	7.4%	28.1%	3.3%	8.0%
N	8	9	10	11	16	16	10
Aggregate New York City Banks							
Mean	6.1%	54.2%	193.4%	-4.8%	-1.6%	-3.3%	6.5%
S.E.	10.1%	32.5%	185.8%	6.2%	17.6%	3.2%	5.1%
N	14	15	16	17	26	26	18

Table III: Of the 83 correspondent banks, 47 survived, 19 were merged, and 13 closed over the 1927-1932 period. 10 had unknown end points. Also, 14 of the correspondents were from the northeast, 25 from the southeast, 30 from the midwest and 14 from the west region of the country. 85.5% of the correspondent banks were national banks, and therefore summary statistics are only given in the aggregate. Finally, 7 of the correspondent banks from the northeast overlap with the New York City bank sample. S.E. is the standard error of the mean and N is the sample size. Source of deposit data: Rand McNally's Bankers Directory.

Chart 1: DISTRIBUTION OF DEPOSIT FLOWS - 1929 YEAR OF FAILURE

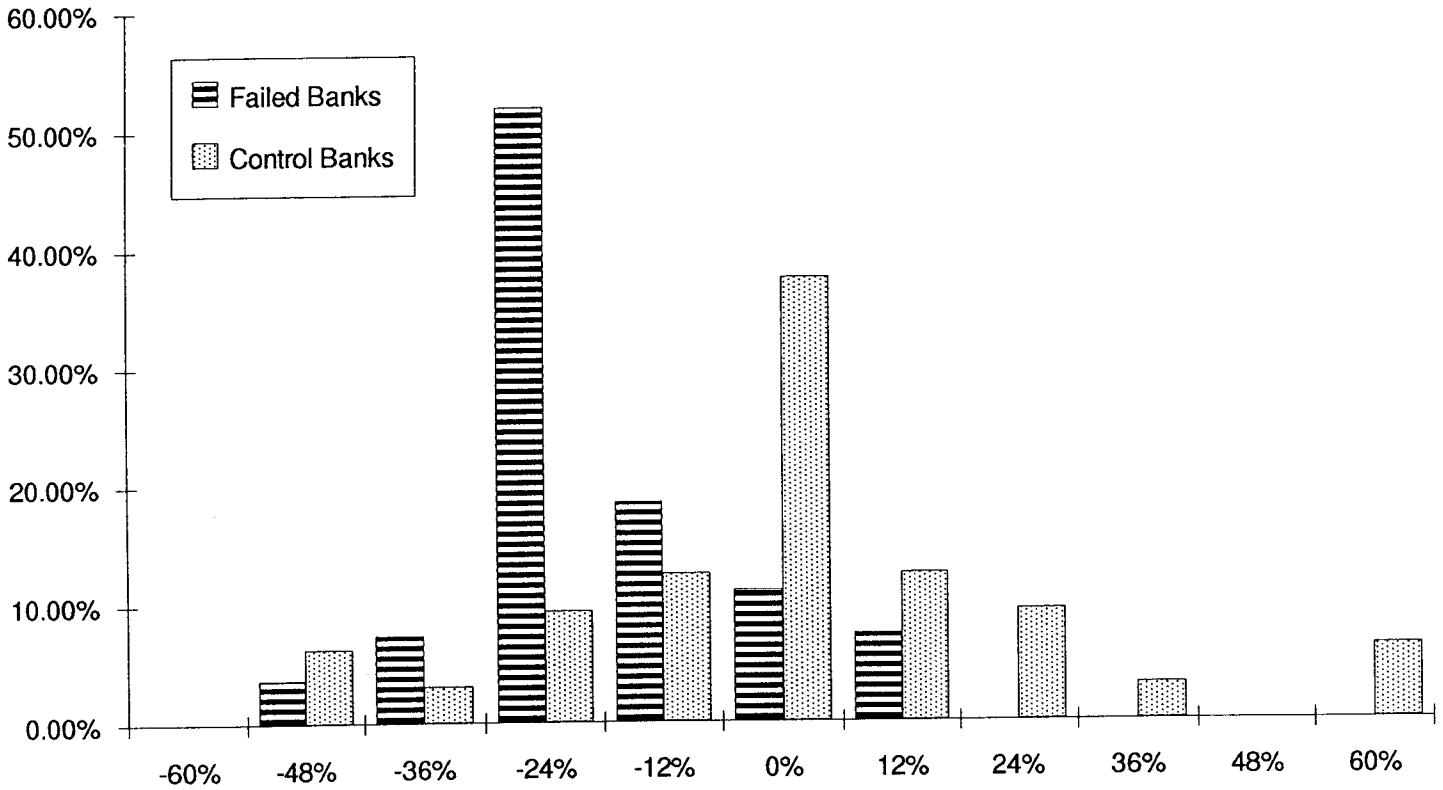

Chart 2: DISTRIBUTION OF DEPOSIT FLOWS - 1930 YEAR OF FAILURE

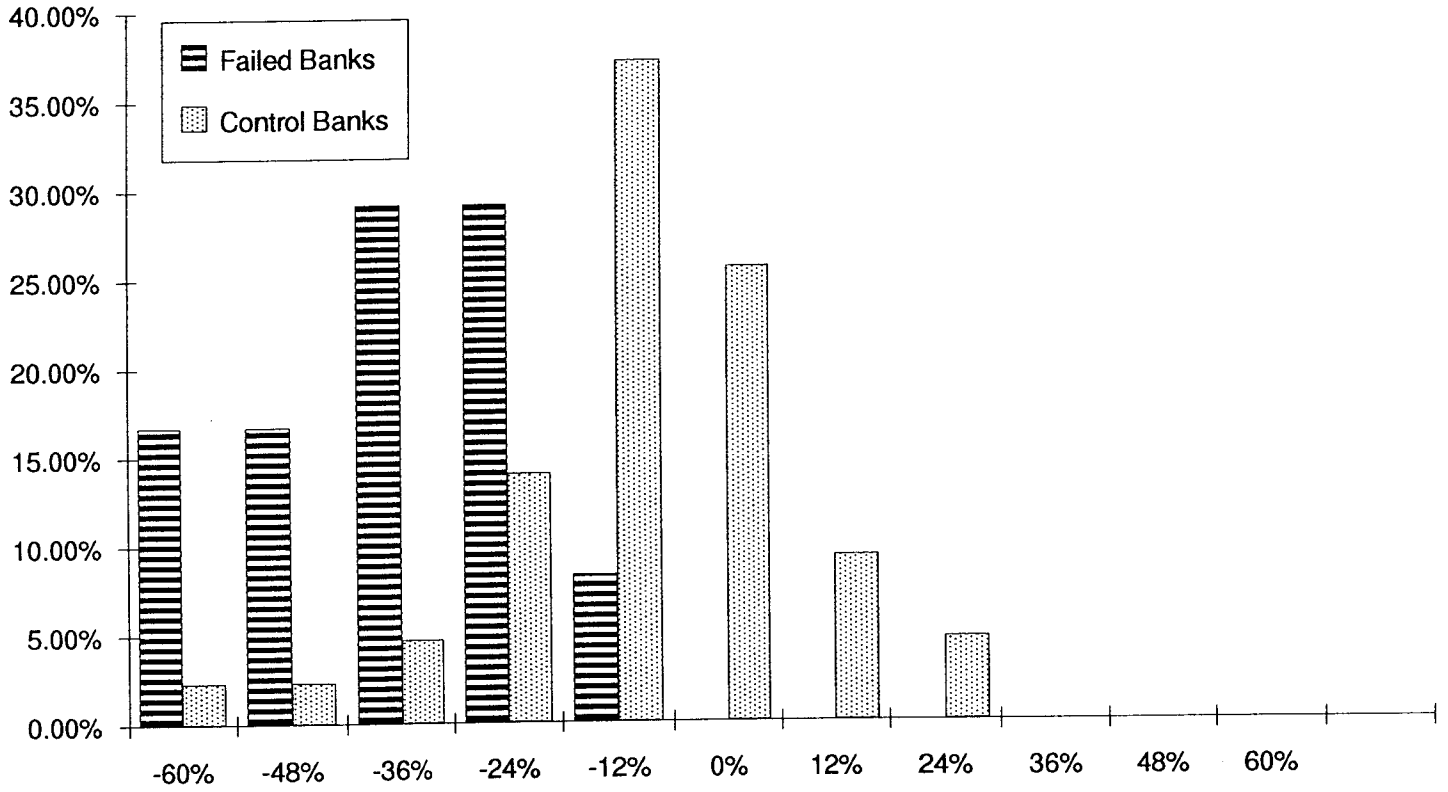

Chart 3: DISTRIBUTION OF DEPOSIT FLOWS - 1931 YEAR OF FAILURE

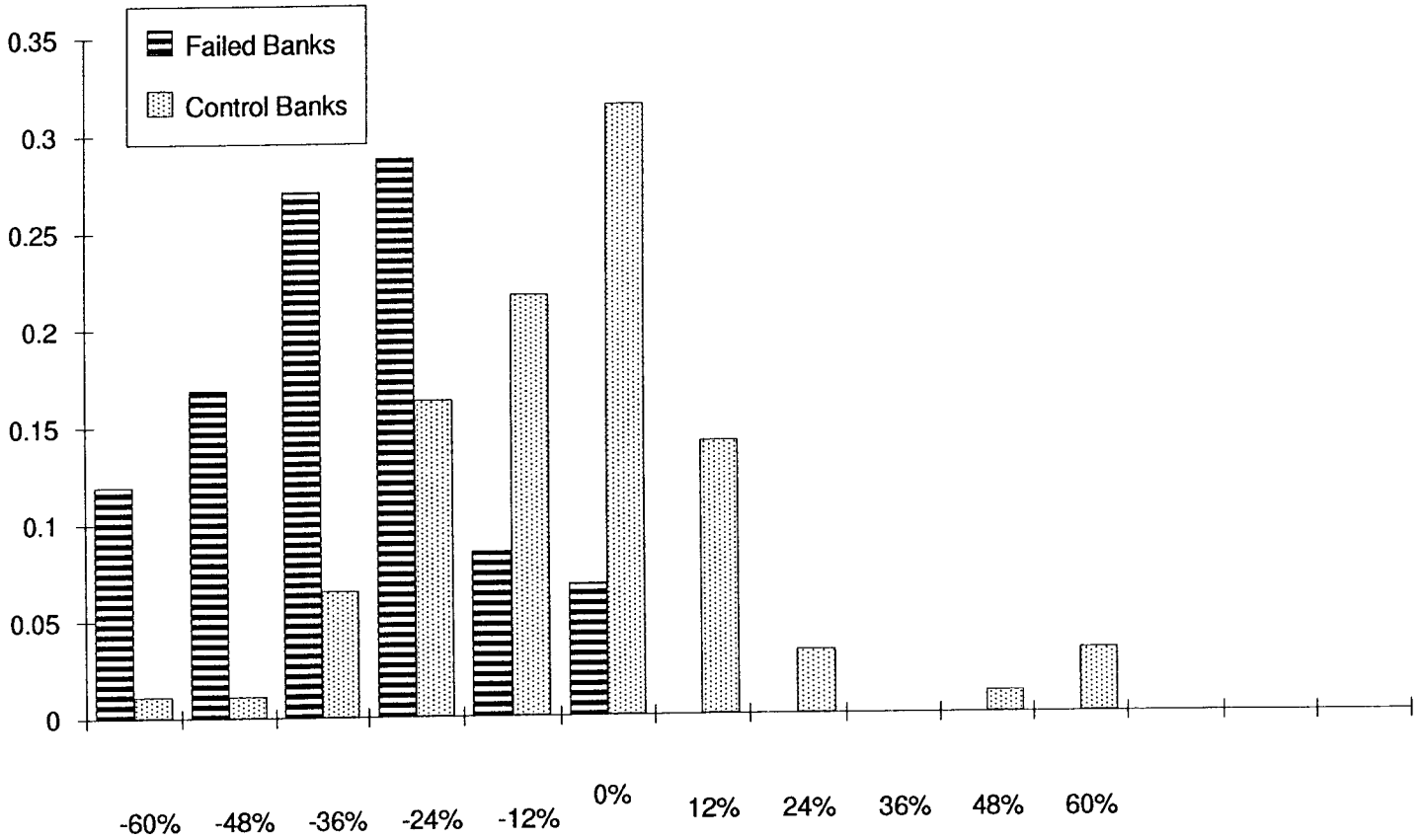

Chart 4: DISTRIBUTION OF DEPOSIT FLOWS - 1932 BANK FAILURES

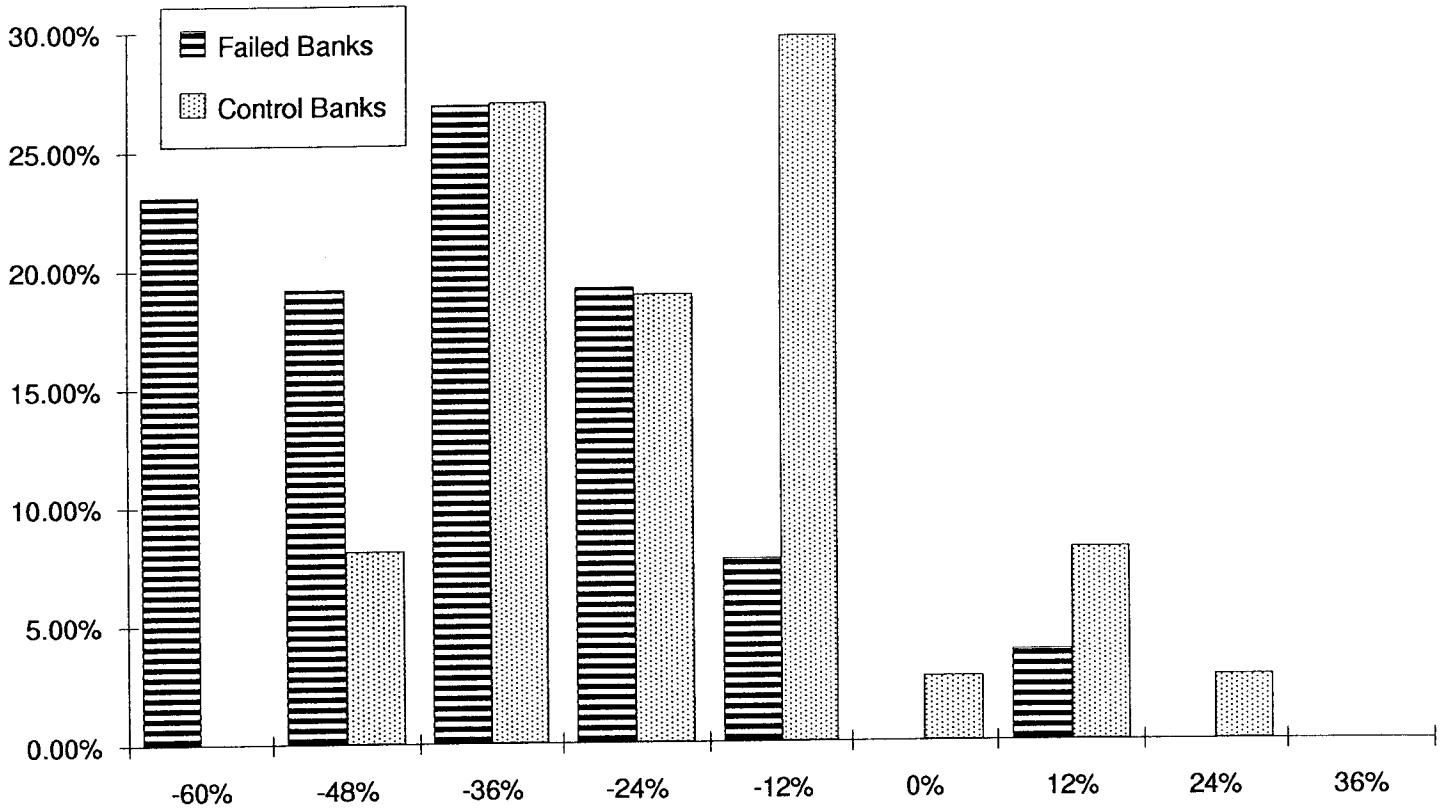

Chart 5: DISTRIBUTION OF DEPOSIT FLOWS - 1933 BANK FAILURES