



# The demise of community banks? Local economic shocks are not to blame

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## Abstract

The number of US community banks is falling rapidly. Is this reduction being driven in part by banks' desire to geographically diversify to reduce their vulnerability to local economic shocks? A comparison of the performance of banks in counties that suffered economic shocks in the 1990s with similar banks in counties that did not suffer economic shocks shows that banks withstand local economic shocks quite well. This result suggests that the geographic concentration risk that community banks must bear to focus on relationship lending is small and is not an important factor contributing to the decline of community banks.

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## 1. Motivation

The US banking industry is becoming increasingly polarized, with large, complex banks on the one end, and small community banks on the other end (Berger et al., 1995). DeYoung et al. (2004) theorize that with the elimination of branching restrictions and continued technological advances, banks are gradually migrating to one of these two types of banking models. Large banks specialize in transactions-based lending in which they base loan decisions on hard information such as credit scores.

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They offer homogenized products and services to achieve low unit costs. Community banks specialize in relationship lending in which they base loan decisions on soft information such as a borrower's character or reputation in the community. Community banks offer personalized products and services and have high unit costs.

The relative importance of community banks in the future financial services industry depends critically on the cost advantage that large banks hold over their smaller competitors. The wider this cost gap, the more likely that bank customers will be attracted to the large-bank products. Recent trends suggest that community banks have lost significant ground to their larger counterparts over the past several years. Let us define for the moment community banks as those with less than \$400 million in assets in 1990 dollars. At year-end 1990, community banks accounted for 23% of all banking assets; that same figure at year-end 2002 was just 11%.<sup>1</sup>

In addition to the cost disadvantage, another factor that could potentially diminish the role of community banks in the future financial system is their vulnerability to local economic shocks. Community banks tend to have geographically concentrated operations to facilitate the collection of soft information about their customers that comes from personal interaction. This concentration, however, exposes them to risks from local economic downturns. If this risk is significant, many banks will feel pressure to geographically diversify their operations, providing incentives at the margin for community banks to switch to the large-bank model. As banks expand geographically, the collection of soft information becomes more costly because the average distance between lenders and borrowers grows. In addition, a bank that geographically diversifies simultaneously grows larger, and in the process it begins to lose its comparative advantage in collecting soft information because loan officers have a difficult time passing soft information through managerial hierarchies, and the costs of monitoring loan officers grow so that the discretion of the loan officers must be limited (Stein, 2002; Berger and Udell, 2002).<sup>2</sup>

The concern over the waning influence of community banks is not simply a nostalgic longing for the "good old days" such as the concern expressed over the disappearance of the small farm. Community banks are significant providers of credit to small businesses because of their comparative advantage in collecting and processing soft information. A good deal of empirical evidence suggests that small-business lending diminishes as organizations grow larger (Berger et al., 1995, 1998, 2001; Keeton, 1995; Strahan and Weston, 1998). Hence, community banks play an important role in providing relationship loans to relatively risky entrepreneurs with few alternative funding sources.

This article contributes to the literature by assessing geographically concentrated community banks' vulnerability to local economic shocks and, hence, their incentives to diversify geographically. Geographical concentration is a relative term. A

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<sup>1</sup> Information based on call report data from the Federal Financial Institutions Examination Council. Other size cutoffs for community banks yield the same conclusion.

<sup>2</sup> Also see Berger, Miller, Petersen, Rajan and Stein, "Does function follow organizational form? Evidence from the lending practices of large and small banks", NBER working paper # 8752, for empirical evidence supporting this argument.

bank may be characterized as geographically concentrated if it operates primarily within a region of the nation, a state, a cluster of counties, or a single county. I define geographically concentrated banks as those with all deposits derived from offices in a single county. The preferred measure – the locations of a bank’s loan customers – is not available, so deposits serve as a proxy. A county is a convenient boundary for geographic concentration because most US banks – 61% as of June 2001 – operate within a single county, county boundaries are well defined, and economic data are readily available at this level of aggregation. County boundaries also are useful because many people, especially those in rural areas, identify themselves in part based on their county of residence. A bank operating entirely in a given county has a natural tie to and knowledge of the local community. Banks with operations across counties are likely to engage in less relationship lending than single-county banks.

I employ three different techniques to assess the vulnerability of banks to local economic shocks. First, I regress various bank performance measures on state and local unemployment rates. The results indicate that such risk is insignificant. I then compare the performance of community banks exposed to economic shocks with a control group of state-aggregate peer banks. The results indicate that the “shock” banks perform slightly worse than their peers. Finally, a matched-pairs technique matches each “shock” bank with a similar “no-shock” bank that did not reside in a county that suffered an economic shock. For each pair of shock and match banks, I compare the deterioration in key performance ratios following the economic shock and find that much of the vulnerability to local shocks disappears.

The weight of the evidence indicates that community banks are not systematically vulnerable to local economic shocks. This finding bodes well for the survival of community banks and for the small businesses that rely on soft information for access to credit. Although community banks may still be at a disadvantage relative to their larger counterparts due to scale inefficiencies and broader sources of market risk, they are unlikely to abandon their focus on relationship lending due to exposure to local economic shocks.

## **2. How important is local market risk?**

Portfolio theory suggests that geographically concentrated banks are riskier than more geographically diversified banks because of heightened credit risk. Credit risk includes idiosyncratic risk and market (systematic) risk. Idiosyncratic credit risk is the potential for default by specific borrowers, driven by firm-specific events unrelated to business cycle conditions. Banks can diversify away idiosyncratic risk by increasing the number of loan customers whose default probabilities are not perfectly correlated with existing loans. Market risk is the increased default risk associated with a local, regional, national or international economic downturn. Laderman et al. (1991) find that community banks tend to lend to firms and individuals nearby. In addition, informal discussions with bank examiners in the Federal Reserve System and with community bankers suggest that 75–90% of the loan customers at typical single-county community banks reside within the county. Performance

at geographically concentrated banks, therefore, may deteriorate significantly when the local economy suffers a recession or a negative economic shock. I call this risk *local market risk*. Although geographically concentrated banks cannot insulate themselves fully from broader sources of market risk such as a regional downturn, they can diversify away local market risk by operating across several counties. Hughes et al. (2001) find evidence that greater geographical diversity is associated with larger scale economies, suggesting that larger banks are potentially less risky and more profitable than community banks.

Alternatively, banks with geographically concentrated operations may not be particularly vulnerable to local market risk. Meyer and Yeager (2001) find that the correlation between bank performance and local economic data is both statistically and economically insignificant. A few researchers argue that the vulnerability of banks to regional economic markets has declined over the last few decades, either because banks or regional economies have become more diversified. Gunther and Robinson (1999) find that banks faced less risk from regional economic fluctuations in 1996 than in 1985 in part because of industry diversification at the state level.<sup>3</sup> Petersen and Rajan (2002) find that community banks increased their lending to more distant borrowers over the last few decades. In particular, the distance between small firms and lenders grew from an average of 51 miles in the 1970s to 161 miles in the 1990s. The authors attribute most of the gain to improvements in gathering and analyzing information. Banks have reduced the importance of person-to-person contact by relying increasingly on financial statements and credit reports to evaluate potential borrowers. Credit markets have also become more efficient. Banks can engage more easily in financial diversification through loan participations or collateralized mortgage obligations, which offset some of their credit risk. Because of the decreased costs of diversification without geographic expansion, banks may have reduced or eliminated the risk exposures that previous intrastate branching restrictions imposed. The vulnerability of community banks to local economic conditions, then, is an empirical issue.

Relaxation of intrastate and interstate branching restrictions in the 1980s and 1990s has given management at single-county banks the opportunity to geographically diversify. Does such diversification significantly improve the bank's risk–return tradeoff? Craig and Cabral dos Santos (1997) examine the risk effects of bank acquisitions and conclude that they improve profitability and reduce risk. The risk reduction, however, is not strong enough to be a major force driving acquisitions. Benston et al. (1995) find evidence consistent with the risk-reduction motive for acquisitions, but inconsistent with the deposit subsidy enhancement motive. Their study, however, applies to larger publicly traded banks. Finally, Emmons et al. (2004) simulate community bank mergers and find that geographic diversification does not significantly improve the risk–return tradeoff at community banks. The implication is that bank performance is weakly correlated with local economic shocks.

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<sup>3</sup> Neely and Wheelock (1997), however, find that bank earnings are still sensitive to state economic activity.

### 3. Regression analysis

The coefficients obtained from regressing bank performance measures on county and state economic data should shed some light on the relative importance of local and regional market risk. Large and statistically significant coefficients on the county data may indicate high levels of local market risk.

Consistent with Meyer and Yeager (2001), regression analysis shows that local market risk is low at geographically concentrated community banks.<sup>4</sup> To illustrate, I run some simple fixed-effects regressions, regressing quarterly bank performance measures on quarterly seasonally adjusted county and state unemployment rates. Bank performance measures include return on assets (ROA), nonperforming loans (90 days or more past due plus nonoccurring) to total loans, and net chargeoffs (chargeoffs less recoveries) to total loans. The bank sample includes only geographically concentrated US banks – those banks with all their deposits derived from offices in a single county – because those banks are the most likely to be affected by changing local economic conditions.<sup>5</sup> The data span 1990 through 2001; reliable county unemployment data are unavailable before 1990. The regression equation is the following:

$$BP_{it} = \alpha_i + \sum_{j=0}^4 (\beta_{1j} \cdot CEcon_{i,t-j} + \beta_{2j} \cdot SEcon_{i,t-j}) + e_{it}, \quad (1)$$

where  $BP_{it}$  represents bank  $i$ 's performance at time  $t$ , and the  $\alpha_i$  coefficient is the bank-specific intercept term. The variables  $CEcon_{it}$  and  $SEcon_{it}$  and their four lags represent, respectively, county and state economic data relevant to bank  $i$  at time  $t - j$ . Economic data are matched with the county and state of each bank's headquarters. Regression results appear in Table 1.

The regression results suggest that local market risk is economically insignificant. A 1% point increase in the contemporaneous county unemployment rate increases ROA by one basis point. The sum of the contemporaneous county coefficient and its four lags is zero.<sup>6</sup> Similarly, nonperforming loans rise by a sum of two basis points, and net chargeoffs by one basis point, in response to a 1% point increase in the county unemployment rate. The standardized coefficients represent the effect that a one standard-deviation change in the unemployment rate has on the bank performance measure, relative to a one standard deviation change in the bank performance measure. The coefficients on county unemployment rates remain low even after this adjustment.

Several problems arise when using regression analysis to identify local market risk. First, regression analysis relies heavily on the quality of local economic data,

<sup>4</sup> See Meyer and Yeager for a thorough econometric analysis, including two-stage least squares, tobit regressions and a variety of robustness checks.

<sup>5</sup> The bank sample does not have an explicit size restriction, but imposing a size restriction of, say, \$300 million does not affect the results because most banks in the sample are small community banks.

<sup>6</sup> Regressions with eight-quarter lags yield similar results.

Table 1  
OLS regressions with quarterly observations

Independent variable	Return on assets			Nonperforming loans			Net chargeoffs		
	Coefficient	<i>t</i> -value	Standardized coefficient	Coefficient	<i>t</i> -value	Standardized coefficient	Coefficient	<i>t</i> -value	Standardized coefficient
County unemployment rate	0.012*	1.73	0.005	0.017***	5.78	0.018	-0.016***	-3.67	-0.012
One-quarter lag	-0.006	-1.02	-0.003	0.002	0.66	0.002	0.022***	5.81	0.016
Two-quarter lag	0.031***	4.92	0.014	0.010***	3.92	0.011	-0.018***	-4.74	-0.013
Three-quarter lag	-0.063***	-10.18	-0.028	-0.022***	-8.31	-0.023	0.055***	14.46	0.040
Four-quarter lag	0.029***	4.30	0.013	0.017***	5.89	0.018	-0.034***	-8.18	-0.025
Sum of county coefficients	0.002	0.32	0.001	0.024***	7.21	0.026	0.009**	1.92	0.007
State unemployment rate	-0.152***	-5.86	-0.043	0.334***	30.70	0.223	0.135***	8.46	0.062
One-quarter lag	0.203***	4.67	0.057	-0.112***	-6.19	-0.075	-0.092***	-3.44	-0.042
Two-quarter lag	-0.105***	-2.37	-0.030	-0.002	-0.13	-0.002	-0.002	-0.06	-0.001
Three-quarter lag	-0.185***	-4.26	-0.052	0.130***	7.17	0.086	0.125***	4.71	0.057
Four-quarter lag	0.191***	7.32	0.053	-0.138***	-12.67	-0.090	-0.142***	-8.88	-0.064
Sum of state coefficients	-0.049***	4.63	-0.014	0.211***	48.14	0.142	0.025***	3.83	0.012
<i>R</i> -squared	0.001			0.031			0.002		
Number of observations	291,861			291,095			291,072		

This table reports the coefficients from a fixed-effects ordinary-least-squares regression, regressing bank performance measures on contemporaneous and lagged state and county unemployment rates. The county coefficients are small and often have the unexpected signs, suggesting that the correlation between bank performance and county economic conditions is weak.

\*, \*\*, \*\*\* Significant at the ten, five and one percent level, respectively.

which tend to be highly volatile because of measurement error. Noisy data bias downward the county economic coefficients, potentially understating the importance of local market risk.<sup>7</sup> Second, multicollinearity is a serious concern when using quarterly observations because economic data tend to be persistent so that contemporaneous and lagged values are highly correlated. To reduce the collinearity, I regressed annual bank performance ratios on annual county and state economic data and one-year lags (results not shown). The main conclusion holds; local market risk remains unimportant. Besides the collinearity between the labor data and their lags, state and county labor data are also correlated, regardless of the frequency of the data used in the regression. Indeed, the Bureau of Labor Statistics (BLS) estimates county labor data explicitly from state labor data.<sup>8</sup> Regression analysis, therefore, cannot cleanly separate local and regional market risk. Finally, because the time period between 1990 and 2001 was one in which most counties and most banks performed extremely well, ordinary least squares regressions on the full bank sample disproportionately account for the strong banks and local economies at the expense of the weak banks and economies. Such a weighting scheme may dampen the county unemployment rate coefficients. In short, regression analysis cannot focus intensely on the subset of banks that we are most interested in analyzing.

#### 4. Economic shocks and “shock” banks

One way to focus exclusively on banks exposed to large adverse economic shocks is to identify counties that suffered economic shocks and then study only the banks with significant operations in those counties. I define local economic shocks two different ways, using an absolute-change rule and a total-cost rule. The absolute-change rule requires a 4% point or greater increase in the seasonally adjusted county unemployment rate between the rate in a given quarter and the average rate over the following year. Suppose, for example, that the seasonally adjusted unemployment rate in the fourth quarter of 1991 was 6%. The average unemployment rate during 1992 had to be at least 10% to qualify as a shock.<sup>9</sup> The within-county standard deviation of unemployment rates in the 1990s was 1.93%; therefore, a 4% point increase in the unemployment rate is approximately a two-standard-deviation event.

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<sup>7</sup> The relationship between bank performance and county unemployment rates may be nonlinear, but including squared values of the county unemployment rates in the regression does not improve the model's fit.

<sup>8</sup> “Local area unemployment statistics estimation methodology”, Bureau of Labor Statistics, 2001, <http://stats.bls.gov/lau/laumthd.htm>.

<sup>9</sup> A change in employment is a potential alternative to a change in unemployment rates, but an unemployment-based shock definition is more stringent than an employment-based definition because unemployment rates account for the effects of labor force participation and mobility. If a local economy suffers an economic shock and many residents relocate to other areas or otherwise drop out of the labor force, the percentage decline in the county employment would exceed the rise in the unemployment rate because the number unemployed declines with the drop in the labor force.

Although the absolute-change rule is simple, a 4% point increase is somewhat arbitrary and has no connection to a natural rate of unemployment. An increase in the unemployment rate from, say, 2% to 6% is treated the same as an increase in the unemployment rate rising from 6% to 10%. One could argue, however, that the second scenario would be more difficult for a bank to deal with because the county is farther away from full employment.

The total-cost (TC) rule is based on an assumed natural rate of unemployment of 6%. Using the total-cost rule, a shock is one in which TC exceeds six (not connected to the natural rate), and

$$TC = TC_1 + TC_2, \quad (2)$$

where  $TC_1 = \max[\min[U_{t+1}, 6] - U_t, 0]$ ,  $TC_2 = (\max[U_{t+1}, 6] - 6)^{1.5} - (\max[U_t, 6] - 6)^{1.5}$ ,  $U_t$  = current quarter's unemployment rate,  $U_{t+1}$  = average unemployment rate over the next four quarters.

Given this definition, the first cost component,  $TC_1$ , rises linearly as the unemployment rate rises to 6%, the implicit natural rate of unemployment. If  $U_t$  is four and  $U_{t+1}$  is nine,  $TC_1$  is two ( $6 - 4$ ). Because of the assumption that the hardships of unemployment on a bank increase as unemployment rises above the natural rate, the second cost component,  $TC_2$ , increases exponentially with a rise in the unemployment rate above 6%. A rise in the rate from 4% to 9% results in a value for  $TC_2$  of 5.2 ( $(9 - 6)^{1.5}$ ), for a total cost of 7.2 ( $2 + 5.2$ ). This change, then, qualifies as an economic shock because TC exceeds six. Finally, because the first component of  $TC_2$  calculates the cost of unemployment assuming that the initial unemployment rate was 6%, the second component of  $TC_2$  subtracts the amount by which the initial unemployment rate exceeds 6%. If, for example, the unemployment rate rises from 8% to 11%,  $TC_1$  is zero, but  $TC_2$  is  $(11 - 6)^{1.5} - (8 - 6)^{1.5}$ , or 8.35. This increase also qualifies as a shock. Because both the absolute-change rule and the total-cost rule are somewhat arbitrary, I report the results using both definitions.<sup>10</sup>

Despite the arbitrary definitions of economic shocks, some independent evidence exists that the shock rules are isolating counties that have suffered serious setbacks. The Federal Worker Adjustment and Retraining Notification Act (WARN) became effective in 1989 and requires employers to provide at least 60 days notice of covered plant closings or mass layoffs to affected workers and local governments. Georgia's Department of Labor maintains a web site with a complete series of WARN data that lists the affected county and the date of the layoffs.<sup>11</sup> Georgia counties defined in this study as "shock" counties appear on the WARN list more frequently and with

<sup>10</sup> The total-cost definition of a shock has the shortcoming that small changes in the unemployment rate qualify for a shock if they are far enough above the natural rate of unemployment. A change in the unemployment rate from 12% to 13.5%, for example, qualifies as a shock. As a robustness check, I tested a 50% change rule, in which the current unemployment rate had to exceed 6% initially and then increase by an average of at least 50% over the subsequent four quarters. Results were similar to the absolute-change and total-cost rules. I also experimented with different natural rates of unemployment of 5% and 7% under the total-cost rule. Again, the results were not sensitive to the choice of a natural rate.

<sup>11</sup> See <http://www.dol.state.ga.us/eshtml/warn.htm>. Historical data for a sample of other states were not readily available.

more substantial layoffs than Georgia “no-shock” counties. The evidence is suggestive that the absolute-change and total-cost shock definitions are picking up meaningful slowdowns in local economic activity.

The counties identified suffered economic shocks sometime between the fourth quarter of 1990 and the fourth quarter of 1998. This time period allows for observations of bank performance four quarters before and three years after the economic shock to give a reasonable time period to compare pre- and post-shock performance.<sup>12</sup> If a county suffered from two or more economic shocks in the 1990s, usually in consecutive quarters, I use the time period of the first shock.

The next step is to identify “shock banks” with geographically concentrated operations in the counties that suffered economic shocks. Using Summary of Deposits data from the Federal Deposit Insurance Corporation (FDIC), I select only those banks that derived all of their deposits from branches in a single county. These banks are the ones most likely to be vulnerable to local economic shocks. I exclude banks that had merger activity any time between 4 quarters before and 12 quarters after the quarter of the economic shock because financial ratios are likely to be distorted by a merger. Finally, each bank had to exist over that same 17-quarter time period to adequately measure the bank’s performance before and after the shock.

The selection criteria produced 239 banks using the absolute-change rule and 571 banks using the total-cost rule. Summary statistics are reported in Table 2. Under the absolute-change rule, the average bank size four quarters before the economic shock is \$44.6 million. The average county labor force in the quarter of the shock is 8580. The average current unemployment rate as of the date of the shock is 7.4%, and the future unemployment rate is 12.1%, meaning that the typical shock county has an unemployment-rate increase of 4.7% points. For the 571 shock banks under the total-cost rule, the average asset size is \$51.3 million, the average county labor force is 16,798, and the unemployment rate increases from an average of 8.4–11.4%.

## 5. Sensitivity of shock banks relative to state peer banks

After defining an economic shock and identifying the bank sample, I assess the vulnerability of geographically concentrated banks to local economic shocks by comparing pre- and post-shock bank performance relative to state-aggregated peer banks.<sup>13</sup> I examine three bank ratios to assess a bank’s response to local

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<sup>12</sup> If the shock occurred in the fourth quarter of 1990, only three quarters of observations before the shock are available.

<sup>13</sup> A potential criticism of this analysis is survivorship bias. Local economic shocks may lead geographically concentrated banks to fail or merge, which eliminates them from the sample. Fortunately, banking data allow one to investigate the importance of this bias. If local economic shocks contributed significantly to the decline of community banks through either failures or mergers, the survival rate for the shock banks should be significantly lower than that for the match banks. I computed the survival rates of shock banks and a set of comparable banks not located in counties with economic shocks, three years after the quarter of the shock. The average survival rate of shock banks (about 85%) is essentially the same as the average survival rate of the comparable banks. I conclude, therefore, that survivorship bias is unimportant and that local economic shocks do not induce a wave of mergers or failures.

Table 2

Summary statistics of banks in counties that suffered economic shocks

Shock banks	Average	First quartile	Median	Third quartile
<i>Absolute-change rule</i>				
Bank assets (\$000s)	44,646	21,855	35,882	56,695
County labor force	8580	3896	5561	9036
Future county unemployment rate (%)	12.1	10.0	11.7	13.6
Current county unemployment rate (%)	7.4	5.3	6.9	8.9
Absolute change (%)	4.7	4.2	4.5	5.0
Number of banks:	239			
Number in MSA:	7			
<i>Total-cost rule</i>				
Bank Assets (\$000s)	51,307	24,877	41,652	65,313
County Labor Force	16,798	4986	8687	15,502
Future unemployment rate	11.4	10.0	10.9	11.9
Current unemployment rate	8.4	6.5	8.0	9.4
Total cost	7.7	6.4	7.0	8.5
Number of banks:	571			
Number in MSA:	58			

This table provides summary statistics for the shock banks under both the absolute-change and total-cost rules. Under the absolute-change rule, the average shock bank has about \$45 million in assets. The average unemployment rate rises from 7.4% to 12.1%, an increase of 4.7% points. More shock banks qualify under the total-cost rule than under the absolute-change rule. Under the total-cost rule, the average bank has \$51 million in assets. The average unemployment rate rises from 8.4% to 11.4%.

economic shocks. Two ratios that bank examiners routinely use to evaluate loan quality are nonperforming loans to total loans, and net chargeoffs to total loans. I also include return on assets (ROA) as a performance measure. Earnings may capture broader risk effects of local shocks such as liquidity risk that asset quality ratios ignore.

In addition to these performance ratios, three additional ratios attempt to measure bank management reactions to the local shocks. These ratios are the book value of equity to assets, loans to assets, and securities to assets. Even if an economic shock reduces a bank's capital directly, management can respond over time by replenishing the capital out of earnings or by raising additional funds. If management does replenish or even increase capital after a shock, that suggests that bank management takes the threat from a weak local economy seriously. Similarly, bank management may respond to a local shock by contracting its loan portfolio if it perceives local credit risk rising. In this instance, the loan-to-asset ratio should fall while the securities-to-assets ratio rises.

To control for broader market risk factors such as regional and national market risk, I compare changes in the six key bank performance ratios relative to peer bank ratios. The peer ratios for a sample bank in a given county are asset-weighted averages of ratios from banks with less than \$250 million in assets with headquarters in the same state as the sample bank, excluding banks with deposits in the same counties as the shock banks. Ninety-nine percent of the sample banks under both shock

rules have less than \$250 million in assets; therefore, the peer banks are selected to be similar in size so that the peer ratios are not influenced by financial data from larger banks. Subtracting the peer banks' ratios from the sample banks' ratios in a given quarter controls for location and business cycle factors.<sup>14</sup>

To illustrate visually the impact of an economic shock on bank performance, I plot in Fig. 1 the average values of four of the performance ratios relative to peer banks under each economic shock rule.<sup>15</sup> The figure plots time periods  $-4$  through  $+12$  where time period 0 is the quarter of the shock. The vertical axes represent the average percentage-point difference between the sample bank ratios and peer bank ratios. Clearly, loan quality and earnings deteriorate following the economic shock under both shock definitions. Both nonperforming loans and net chargeoffs rise while ROA declines after the shock. Equity, however, appears little changed.

An alternative way to assess the impact of the economic shock on bank performance is to compute the differences between the post- and pre-shock bank ratios. Specifically, for each performance measure, I compute the average difference between the sample bank and peer bank for time periods 5–12 (years two and three) following the economic shock, and subtract from that value the average difference between the sample bank and peer bank for the four quarters prior to the shock (time periods  $-4$  through  $-1$ ).<sup>16</sup> The results are listed in Table 3.

On average, banks react negatively to the local economic shocks. Under the absolute-change rule, nonperforming loans rise 33 basis points, net chargeoffs rise 22 basis points, and ROA (annualized) falls 15 basis points relative to peer banks. Under the total-cost rule, nonperforming loans rise 25 basis points, net chargeoffs increase 25 basis points and ROA declines 12 basis points. Each of these ratios is significantly different from zero, usually at the 1% level, under both shock rules.

The remaining three ratios show little reaction by management to the shocks. Under the absolute-change rule, equity to assets declines by 14 basis points, loans to assets fall by 32 basis points, and securities to assets increase by 7 basis points. The same numbers for the total-cost rule are  $-12$ ,  $-6$ , and 33 basis points, respectively. Only one of those six values is statistically significant at the 10% level. Bank managers, therefore, seem to react passively to the local economic shocks.

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<sup>14</sup> For example, one bank (Bank A) in Duval County, Texas suffered an economic shock in the first quarter of 1991 as defined by the absolute-change rule. Its nonperforming loan to total loan ratio in the first quarter of 1990 was 0.16%; the same ratio in the first quarter of 1992 was 7.05%. In contrast, the nonperforming loan ratio at peer Texas banks was 4.44% in the first quarter of 1990 and 2.87% in the first quarter of 1992. The change in nonperforming loans between the first quarters of 1990 and 1992 at Bank A relative to peer banks was  $(7.05 - 2.87) - (0.16 - 4.44)$ , or 8.46% points.

<sup>15</sup> The charts of loans to assets and securities to assets are omitted for expositional ease and because the lines are essentially flat.

<sup>16</sup> I experimented with several timing conventions, including post-shock horizons of two and four years. The timing convention chosen and reported here reflects the greatest sensitivity of bank ratios to local shocks. For many counties, the large jump in the future unemployment rate came towards the end of the one-year period in which the unemployment rates were averaged. Excluding the first four post-shock quarters, therefore, increases the sensitivity of the bank to the shock.

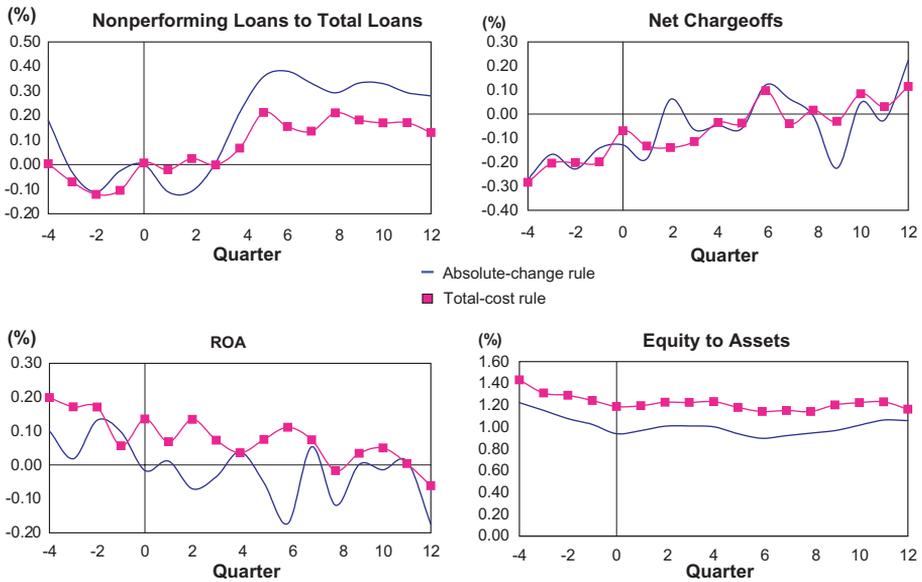


Fig. 1. Average bank performance ratios by quarter around the economic shock. This figure plots for each of four bank performance ratios, the average percentage point difference by quarter between the shock-bank ratios and peer-bank ratios under both the absolute-change and total-cost rules. The horizontal axes represent the quarter around the shock where quarter 0 is the quarter of the economic shock. The charts suggest that local economic shocks have some effect on nonperforming loans, net chargeoffs and ROA. Equity, however, is affected less.

To interpret the relative vulnerability of geographically concentrated banks to local economic shocks, we need a measure of economic significance. Just how big are the differences in performance ratios before and after the economic shocks? The average decline in annualized ROA following the absolute-change rule economic shock is 15 basis points. Is this a large decrease?

Bank examination ratings guide the assessments of large changes in bank performance ratios. CAMELS is an acronym that stands for Capital adequacy, Asset quality, Management, Earnings, Liquidity and Sensitivity (to market risk). Each time a bank is examined, regulators assign a composite rating and an individual rating to each of the CAMELS components. CAMELS ratings range from 1 (the safest banks) to 5 (the riskiest banks). Banks with composite ratings of 1 and 2 are considered to exhibit “strong” and “satisfactory” performances, respectively. Banks that fall below a 2 rating may prompt supervisory action, which could include a board resolution, a memorandum of understanding, a written agreement, or a cease and desist order. Hence, regulators consider a drop from a 2 rating to a 3 rating to be a significant change.

Median differences in bank performance ratios between 2- and 3-rated banks serve as benchmarks for evaluating economic significance. To be consistent with the sample, I constructed the benchmarks using examination ratings and performance ratios

Table 3  
Performance of shock banks relative to peer banks

Post-shock less pre-shock value of	Average	P-value	Economic significance benchmark	Percent of economic significance benchmark
<i>Absolute-change rule</i>				
Nonperforming loans to total loans (%)	0.33***	0.016	1.26	26.6
Net chargeoffs (%)	0.22**	0.025	0.34	64.6
ROA (%)	-0.15***	0.010	-0.49	30.1
Equity to total assets (%)	-0.14	0.210	-1.14	12.0
Loans to assets (%)	-0.32	0.502	5.67	5.6
Securities to assets (%)	0.07*	0.069	-7.23	1.0
<i>Total-cost rule</i>				
Nonperforming loans to total loans (%)	0.25***	0.002	1.26	20.1
Net chargeoffs (%)	0.25***	0.000	0.34	75.2
ROA (%)	-0.12***	0.004	-0.49	23.9
Equity to total assets (%)	-0.12	0.101	-1.14	10.4
Loans to assets (%)	-0.06	0.862	5.67	1.0
Securities to assets (%)	0.33	0.319	-7.23	4.6

This table lists the average differences between pre-shock and post-shock performance ratios relative to state-aggregated peer groups. For example, the nonperforming loan to total loan ratio increased by an average of 33 basis points at the shock banks relative to state-aggregated peer banks under the absolute-change rule. The timing convention differences the average of the four quarters before the shock from the average of quarters 5–12 after the shock. The economic significance benchmark is the median difference between CAMELS 2-rated banks and 3-rated banks. The “percent of economic significance benchmark” is computed by dividing the change in the given bank ratio by the economic significance benchmark. The results suggest that shock banks do deteriorate relative to peer banks, but the deterioration is economically small. \*, \*\*, \*\*\* Significant at the ten, five and one percent level, respectively.

of all US banks with less than \$250 million in assets between 1990 and 2001. I used only bank performance ratios during the quarter of the bank examination instead of using all performance ratios for 2- and 3-rated banks to avoid endogeneity issues that might arise if supervisors required 3-rated banks to improve performance. Inclusion of post-examination ratios would potentially decrease the differences between 2- and 3-rated banks. The economic significance benchmarks for each bank ratio are listed in the third numeric column of Table 3.

Relative to the economic significance benchmarks, the average changes in key bank ratios are small following the economic shock. As the last column of Table 3 illustrates, the only ratio showing evidence of significant deterioration is net chargeoffs, which increase by 64.6% of the benchmark under the absolute-change rule, and by 75.2% of the benchmark under the total-cost rule. Nonperforming loans increase by only 26% of the benchmark under the absolute-change rule, and ROA by just 12%. Importantly, none of the three management-reaction ratios changes by an economically significant amount. Under the absolute-change rule, equity to assets decreases by 12% of the benchmark, loans to assets by 5.6%, and securities to assets by just 1.0%. Similar ratios result from the total-cost rule. Reactions by bank management seem to suggest “business as usual” following the local economic shocks.

## **6. Matched-pairs analysis**

In this section, I use matched-pairs analysis to examine the effect of county economic shocks on bank performance. In particular, I match each of the shock banks with a similar “no-shock bank” located in a county in the same state that did not suffer a local economic shock. I compare the deterioration of the shock banks with the match (no-shock) banks using a variety of parametric and nonparametric tests.

Unlike the peer group comparisons in the preceding section, the control group in matched-pairs analysis contains idiosyncratic risk. In contrast, peer group comparisons diversify away idiosyncratic risk. Take, for example, two geographically concentrated community banks – Banks A and B – located in the same state. Both banks deteriorate for idiosyncratic reasons. In addition, the county in which Bank A is located suffers an economic shock, which has no separate effect on its performance. When comparing Bank A to the state-averaged peer group, it appears that the local economic shock caused Bank A to deteriorate relative to peer banks because the idiosyncratic risk of Bank B is diversified away when it is averaged into the peer group. Matched-pairs analysis, however, compares the performance of Bank A directly to Bank B.

Matched-pairs analysis also allows for uneven influences of broader levels of market risk. Assume that a state-level economic slowdown affects Bank A more than the average peer bank. Bank A also suffers from a local economic shock, which has no separate influence on the bank’s performance. In a peer-group comparison, it appears that Bank A deteriorates because of the local economic shock instead of the state-level shock. With matched pairs, however, it is just as likely that Bank B also suffers more than the average peer bank from the state-level slowdown, so that the local economic shock suffered by Bank A is not deemed important. Matched pairs reintroduces the variance into the control group that peer comparisons remove.

To isolate local market risk by controlling for idiosyncratic risk and broader levels of market risk, I pair each of the banks that experience an economic shock with a similar bank from the same state that did not suffer an economic shock. To qualify as a match bank under the absolute-change rule, each bank had to derive all its deposits from branches in a single county that had an absolute increase in the unemployment rate of 1% point or less for the 4 quarters before and the 12 quarters after the shock date of the sample bank. Under the total-cost rule, each match bank had to derive all its deposits from branches in a single county that had a total cost calculation of less than two for each of the quarters around the shock quarter. These requirements eliminate the possibility that a match bank suffered a local economic shock just before or after the quarter in which the matched sample bank suffered the shock. In addition, each match bank had to have: (1) the same rural/MSA status as the shock bank, and if both banks were in MSAs, the match bank had to be from a different MSA to ensure that the effects of the local shock did not spill over into the no-shock bank; (2) a composite CAMELS rating within one of the shock bank to proxy for initial levels of idiosyncratic risk; and (3) no merger activity around the shock date to ensure that the ratios were not distorted by mergers. I then calculate the percentage difference between the labor forces of the shock and no-shock counties as

well as the percentage difference in the banks' total assets. Given the potential pool of match banks, I choose the one with the smallest sum of the percentage differences in county labor forces and bank assets.

Not all of the shock banks have suitable matches. Table 4 presents summary statistics of the shock and match banks. Under the absolute-change rule, 183 of 239 shock banks have matches, while under the total-cost rule, 497 of 571 shock banks have matches. On average, the match banks are slightly larger than the shock banks as measured by total assets, and they are located in slightly more populated counties. County unemployment rates at the match banks, however, fall on average, from 6.0% to 5.8% under the absolute-change rule, and from 5.8% to 5.7% under the total-cost rule. In contrast, county unemployment rates at the shock banks surge by an average of 4.7% points under the absolute-change rule and by 3% points under the total-cost rule.

Table 5 presents a series of parametric and nonparametric tests comparing shock banks with match banks. To calculate the difference in means (reported in the top half of the table), I first compute the average value of the given performance ratio – say, nonperforming loans – at shock banks 5–12 quarters after the shock and then subtract from that value the average nonperforming loan ratio one to four quarters before the shock. I do the same for the match banks and then compute the average difference in the shock-bank changes less the match-bank changes.<sup>17</sup> Higher differences in means suggest that shock banks react adversely to the local shocks.

With a few exceptions, the difference-in-means results suggest that local economic shocks have small and unsystematic effects on community bank performance. Although nonperforming loans at shock banks increase a statistically significant 36 basis points more than at match banks under the absolute-change rule, none of the other bank ratios is statistically or economically significant. In contrast to the peer-bank comparisons, shock banks increase capital ratios by 26 basis points relative to match banks, but the difference is statistically insignificant. Shock banks also curtail lending and increase securities, but again by statistically and economically insignificant amounts.

Shock banks show more deterioration relative to match banks under the total-cost rule, but the deterioration is usually economically small. Specifically, differences in means of nonperforming loans and net chargeoffs are 20 basis points and 26 basis points, respectively, and these differences are equal to 15.6% and 76.8% of the economic significance benchmarks. In addition, equity increases by 23 basis points more at shock banks relative to match banks, a statistically significant but economically small amount. Similar to the absolute-change rule, banks curtail lending and increase securities following the local shocks, but the changes are statistically and economically insignificant.

In addition to the parametric tests, nonparametric sign tests examine how many banks in shock counties respond more adversely than their match banks to the local

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<sup>17</sup> These differences in means use the same timing convention as the earlier tests that compared shock banks to peer banks. For robustness, I experimented with numerous different timing conventions, but this convention resulted in the largest difference between shock banks and match banks.

Table 4  
Summary statistics of shock banks and match banks

Summary statistics	Shock banks		Match banks	
	Average	Median	Average	Median
<i>Absolute-change rule</i>				
Bank assets (\$000s)	44,590	35,384	46,793	37,791
County labor force	8210	5549	11,896	8227
Future unemployment rate	12.2	11.8	5.8	5.2
Current unemployment rate	7.5	7.1	6.0	5.7
Absolute change	4.7	4.5	0.1	0.0
Number of banks	183		183	
Number in MSA	6		6	
<i>Total-cost rule</i>				
Bank Assets (\$000s)	50,503	41,451	53,439	40,627
County labor force	17,265	8479	22,447	10,335
Future unemployment rate	11.4	10.9	5.7	5.6
Current unemployment rate	8.4	8.0	5.8	5.6
Total cost	7.7	7.1	0.3	0.0
Number of banks	497		497	
Number in MSA	57		57	

This table lists summary statistics of the shock banks and match banks under the absolute-change and total-cost rules. Match banks are similar to shock banks except for their exposure to local shocks. While counties of the shock banks have an average increase in the unemployment rate of 4.7% points under the absolute-change rule and 3.0% points under the total-cost rule, unemployment rates in match-bank counties actually fall by 0.2% and 0.1% points, respectively.

economic shocks. The differences in the changes in ratios between shock banks and match banks should be positive more than half the time for nonperforming loans, net chargeoffs, equity to assets, and securities to assets, and negative more than half the time for ROA and loans to assets.<sup>18</sup> Sign tests on each of the six performance measures subtract half the sample size from the number of times that each matched-pair ratio has the expected sign so that the mean of the sign test should be positive if the local economic shocks impair bank performance. For example, under the absolute-change rule, more than half of the 183 differences between shock-bank changes in ROA and match-bank changes in ROA should be negative if the local economic shocks cause earnings deterioration. A mean value for the sign test of  $-1.5$ , then, suggests that only  $90 (= 183/2 - 1.5)$  of the 183 shock banks had earnings deterioration relative to match banks. The results are listed in the bottom half of Table 5.

The sign tests give somewhat mixed results. Under the absolute-change rule, only two of the six bank ratios – equity to assets and securities to assets – have the

<sup>18</sup> Although the sign for equity could be positive or negative depending on management's response to the shock, I model it as positive because the matched-pair results suggest that management increases capital ratios by small amounts following the local shocks.

Table 5  
Performance of shock banks relative to match banks

Shock banks versus match banks	Absolute-change rule			Total-cost rule		
	Difference in means	Pr >  t	Percent of economic significance benchmark	Difference in means	Pr >  t	Percent of economic significance benchmark
Nonperforming loans	0.36**	0.037	28.5	0.20*	0.074	15.6
Net chargeoffs	0.01	0.910	2.7	0.26***	0.002	76.8
ROA	-0.06	0.310	13.8	-0.07	0.205	16.7
Equity to assets	0.26	0.133	-22.5	0.23**	0.0308	-20.2
Loans to assets	-0.61	0.429	10.7	-0.31	0.5021	5.5
Securities to assets	0.77	0.350	10.7	0.36	0.455	5.0
Sign tests HO : $X_S > X_M$	Mean	Pr >  z		Mean	Pr >  z	
Nonperforming loans	-5.5	0.208		16.5*	0.069	
Net chargeoffs	-3.5	0.302		19.5**	0.040	
ROA	-1.5	0.412		19.5**	0.040	
Equity to assets	8.5	0.104		10.5	0.173	
Loans to assets	-4.5	0.253		0.5	0.482	
Securities to assets	2.5	0.356		14.5*	0.097	

This table lists results of various parametric and nonparametric tests comparing shock-bank performance ratios with match-bank ratios. Differences in means capture the average shock banks' reactions to local shocks relative to match banks. The sign tests calculate the number of times that the shock banks deteriorate relative to their match banks. Positive means of the sign tests reflect relative deterioration at the shock banks. The results suggest that local economic shocks negatively affect some banks sometimes, but the deterioration is economically small.

\*, \*\*, \*\*\* Significant at the ten, five and one percent level, respectively.

expected sign more than half the time, and none of the sign tests are statistically significant from zero. Under the total-cost rule, all the ratios have the expected signs, and four of the ratios are statistically significant at the 10% level or better. The means, however, are small relative to the sample size. For example, although nonperforming loans decline more at shock banks than at match banks 16.5 more times than half the sample size, that still suggests that many shock banks (232 of 497) showed improving nonperforming loans relative to match banks following the economic shocks. In sum, shock banks seem to react adversely to local economic shocks only slightly more than half the time.

## 7. Conclusion

Local economic shocks do not lead to systematic deterioration of community bank performance. Local shocks do appear to effect adversely some banks sometimes, but they seem to have little or no effect on bank performance the majority of the time. These results are robust to different timing specifications and different definitions of economic shocks.

These findings add to the evidence that small community banks will remain viable in the future financial services industry, preserving their unique relationship-lending focus. Because these banks are unlikely to reap significant risk-reduction benefits from operating across county lines, many may be content to operate as single-county institutions. Of course, scale and scope economies will continue to reduce the number of US community banks; however, research by Berger and DeYoung (2001) suggests that there is a limit to these efficiency gains as well. They find that no one type of organizational structure has a sufficient efficiency advantage to drive others out of existence. This result is especially true for small banks that specialize in relationship lending because larger organizations seem to have difficulty effectively managing such banks from a distance. Given the limited scale economies and the small degree of local market risk, relationship banking still has a future.

Why might geographically concentrated community banks be insulated from local economic shocks? Anecdotal evidence suggests that the increasing economic integration of county economies is important in reducing local market risk. Community bankers that I questioned at an Arkansas Bankers Association meeting in April 2002 responded that the ability of workers to quickly find new jobs, even if commuting times increased greatly, diminished the impact on bank performance. If workers in a given county are laid off when a plant closes, family members of those unemployed often find jobs in neighboring counties. In addition, new firms are quick to move into buildings vacated by former employers and hire many of the old workers. The Arkansas bankers also commented that consumers tend to protect their cars and houses from default even as they default on other loans. Credit card banks and other nonbank financial institutions hold an increasingly large share of those “other loans”. Finally, Jackson (2002) found in banker interviews of some of the banks involved in this study that increased commuting patterns of loan customers and bankers’ flexibility in repayment terms eased some banks through plant closings.

One note of caution is that the sample period covers the 1990s, a period of robust economic growth. Banks may have performed as well as they did following local shocks because economic activity outside of the county remained strong. If the broader regional economy is in a deep recession, however, local economic shocks may compound the market risk that banks already face. The robust economy of the 1990s is a benefit for this study, however, because it allows one to isolate local economic shocks that are independent from broader market risk. Much research has already documented the link between bank performance and regional economic shocks (FDIC, 1997; Zimmerman, 1996). These results suggest that local market risk by itself is small.

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