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This paper presents evidence that banking deregulation led to decreases in entrepreneurship in some U.S. regions, and to increases in others. This is contrary to recent research that found an unambiguous positive relationship.

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1. Introduction

Recent research presents persuasive evidence that banking deregulation in the United States has led to increased rates of entrepreneurship. Specifically, Black and Strahan (2002) use a panel of U.S. states and find that entrepreneurship in the states "increases following deregulation of banking restrictions, and that deregulation reduced the negative effect of concentration" on the entry of entrepreneurs. This result allays concerns that deregulation would lead to the loss of small banks and less "relationship banking," making it more difficult for small and medium-sized borrowers to obtain funds. While seeming to resolve competing views on the effects of banking deregulation on entrepreneurs, this finding also identifies a channel through which banking deregulation can lead to the increased growth rates first found by Jayaratne and Strahan (1996).[1]

In this paper, I reexamine this finding and use the Black-Strahan model to demonstrate that when the effects of deregulation are allowed to differ across regions, entrepreneurship is negatively associated with deregulation in some regions, and positively associated in others. This suggests a more ambiguous relationship between the real economy and the market structure of the banking sector than has been found previously in the literature.

2. The Black-Strahan Model

Black and Strahan's most-general reduced-form estimation of the state-level rate of entrepreneurship – the log of the number of new incorporations per thousand of population –

[1] See also Strahan (2003).

includes a relatively long list of independent variables. These are: the deposit Herfindahl index averaged over a state's MSAs; current and lagged per capita personal income growth (six lags); the fraction of assets held by small banks; bank productivity as measured by the log of business loans per FTE employee; the shares of banks with capital/asset ratios less than 2%, between 2 and 4%, between 4 and 6%, and between 6 and 8%; and the share of the population with college degrees.[2] The model also includes state effects that are fixed over time and time effects that are fixed across states.

There are three variables to measure the effects of banking deregulation on entrepreneurship. The first two are dummies that equal one in the years after a state has eliminated restrictions on branching and interstate banking. For both dummies, the years before deregulation are indicated by a zero and the year in which the deregulation came into effect is ignored. The third deregulation variable interacts the branching dummy with the state's deposit Herfindahl index. The dataset covers 1976-1994 and includes all states but South Dakota and Delaware, which are not included because their measures of bank structure are skewed due to their having large numbers of credit card banks. The District of Columbia is excluded from the estimation because of missing observations of the concentration variable for all years in the sample.

My estimation differs from that of Black and Strahan in that I use Feasible Generalized Least Squares (FGLS) to correct for fairly general heteroskedasticity and autocorrelation. Specifically, when error terms are suspected to be non-spherical, as they are in other cross-region studies of entrepreneurship, the panel data can be exploited to correct for group-specific

[2] See Black and Strahan (2002) for detailed descriptions of the data sources and summary statistics.

heteroskedasticity and autocorrelation (Georgellis and Wall, 2000 and 2002).[3] Black and Strahan used Ordinary Least Squares (OLS), which is not useful for correcting for these types of errors. My first step is to provide a benchmark by reproducing the results in Black and Strahan using FGLS, which, when spherical errors are assumed, yields the same coefficients but slightly different standard errors as OLS.

The benchmark results are summarized in the first column of Table 1, which includes the estimated coefficients for the main variables only. The results indicate that entrepreneurship was positively related with the removal of restrictions on interstate branching, although the effect occurs only through its interaction with the concentration variable. Also, the removal of restrictions on interstate banking was associated with a 6.1 percent increase in the rate of entrepreneurship $[100\times(e^{0.059}-1)=6.1]$. Other, less-central, results are the negative relationship between industry concentration and entrepreneurship, and the negative relationship between the preponderance of small banks and entrepreneurship.

The second column of results in Table 1 demonstrates that the results from the benchmark model change a great deal after relaxing the restrictions that errors are homoskedastic and have no autocorrelation. The estimation allows for the most-general error structure that can be considered within the data constraints – state-specific heteroskedasticity along with state-specific autocorrelation.[4] Using these results, one cannot conclude that the removal of branching

[3] Beck and Katz (1995) and Beck (2001) argue that it is preferable to use the Panel-Corrected Standard Errors (PCSE) method, although Greene (2000) disputes this. In the present situation, PCSE and FGLS produce substantially similar results, except that the former is less likely to find that banking deregulation had a statistically significant effect. In any event, results from either estimation procedure are consistent with my present contentions.

[4] If the dataset had at least as many years as states, it would be possible to allow the heteroskedasticity to be correlated across states. Beck and Katz (1995) suggest that there should be at twice as many years as states.

restrictions increases the rate of entrepreneurship. On the other hand, one can conclude that when interstate banking is allowed, the rate of entrepreneurship rises, but only by 2.4 percent. And, finally, there is no evidence of a relationship between banking industry concentration and the rate of entrepreneurship.

3. Regional Policy Effects

As in any estimation using data that are pooled serially and cross-sectionally, homogeneity restrictions need to be placed on nearly all of the coefficients to be estimated. In the estimation above, the coefficients on all of the independent variables – including the policy variables – are assumed to be the same for all states and years. The only heterogeneity in the model is that the intercept can differ across states and over time. Nonetheless, with such a large dataset there are more than enough observations to allow for more heterogeneity than this. Because the policy variables are of the most present interest, the most interesting thing would be to relax the homogeneity restrictions on their coefficients. In fact, it would be possible to estimate separate policy effects for all 48 states in the sample if every state changed its policy within the sample period and if there were sufficient pre- and post-deregulation observations. However, because this is beyond the current dataset, some cross-state restrictions still need to be placed on the policy coefficients.

For convenience, I simply assign the states to the eight regions determined by the Bureau of Economic Analysis, and assume that the effects of deregulation are the same for all states within a region. Because some regions might have too few observations despite the pooling, this assignment of states into regions is not necessarily optimal. Nevertheless, it is sufficient to

demonstrate that the differences across regions are large, statistically significant, and lead to very different conclusions about the effects of banking regulation on entrepreneurship.

The first column in Table 2 presents the estimated policy effects at the regional level without correcting for heteroskedasticity or autocorrelation (analogous to the benchmark estimates). It is clear that by removing the restrictions that the effects of deregulation are the same across regions, one finds evidence that deregulation can lead to large increases or large decreases in the level of entrepreneurship.[5] Six of the estimated coefficients on the branching dummies are statistically significant: four negatives and two positives. The largest positive effect is for the Southwest (51.1 percent) and the largest negative effect is for the Mideast (22.5 percent). Also, of the four statistically significant coefficients on the interstate banking dummies, three are positive and one is negative. The largest positive effect is for the Mideast (17.2 percent), and the largest negative effect is for the Southwest (13 percent). Finally, of the five statistically significant coefficients on the interaction variables, four are positive and one is negative.

These results should not be taken too seriously, though, because they assume spherical error terms. The results in the second column in Table 2 are corrected for state-specific heteroskedasticity and autocorrelation (analogous to the last column in Table 1). These results provide evidence that branching deregulation increased the rate of entrepreneurship only for the Great Lakes region (16.4 percent). None of the coefficients for the other regions are close to being statistically significant. For interstate banking deregulation, the results suggest that it led to increased entrepreneurship in three regions only, with the largest increase occurring in the

[5] As is clear from the log likelihoods for the two models, the null that the restriction that the policy coefficients are the same across regions is easily rejected.

Mideast (12.5 percent). For two of the other regions – the Southwest and Rocky Mountains – the coefficients are actually negative and relatively large, but not statistically significant at the 10 percent level.[6]

It is the coefficients on the interaction between the branching dummy and the Herfindahl index where the results differ the most from the benchmark model. For most regions, the estimated coefficient is statistically no different from zero. The exceptions are the Rocky Mountain region, where it is positive, and the Great Lakes region, where it is negative. These results stand in stark contrast to the positive coefficient provided by the benchmark model.

As mentioned above, the BEA's assignment of states to regions is not necessarily optimal. One obvious problem is the assignment of Alaska and Hawaii to the Far West, even though these states lie thousands of miles from other states in the region. For this reason, it is common for regional analyses to exclude these two states. Doing this with the present dataset does fatal damage to the claim of an unambiguous positive relationship between banking deregulation and entrepreneurship.

For branching deregulation independent of concentration, the only statistically significant effect is the negative one for the Mideast (11.5 percent), although the positive effect for the Great Lakes (15.1 percent) is just outside the 90 percent confidence interval. The estimated effects of branching deregulation on entrepreneurship are statistically significant for four regions. For two regions the effect was negative and for two regions it was positive. The largest negative effect is for the Southwest (10 percent) and the largest positive effect is for the Mideast (10.1 percent).

[6] A likelihood ratio test comparing these estimates to those in Table 1 easily rejects the null that the restriction that the policy coefficients are the same across regions.

Similarly, for three regions the coefficient on the interaction variable is positive and statistically significant, while for two regions it was negative and significant.

The fact that there are large negative and large positive effects of deregulation means that the rather small effects reported in Table 1 were roughly the average of the various regional effects. By assuming that the regional effects were the same, Black and Strahan's original estimation was masking diverse underlying effects. Thus, the relatively small positive effects they report are really what happened on average, but are by no means "the" effects of banking deregulation on entrepreneurship, as they suggest. Instead, "the" effects of deregulation appear to depend on where it occurred.

4. Conclusions

When restrictions on the error terms and the regional policy effects are relaxed, the Black-Strahan model provides little support for the hypothesis that banking deregulation has a consistent effect on entrepreneurship. Because these restrictions have no economic or statistical basis, the least-restrictive model (as summarized by the last column of Table 2) is the preferred one. The largest estimated effects of branching deregulation – independent of concentration – were the 11.5 percent reduction in the rate of entrepreneurship in the Mideast and the 15.1 percent increase in the rate of entrepreneurship for the Great Lakes. The largest estimated effects of interstate banking deregulation on entrepreneurship were the 10 percent decrease in the Southwest and the 10.1 percent increase in the Mideast.

The more pressing question is whether there are potential problems with the Black-Strahan model itself that should lead one to question the validity of the results that it generates. Most notably, the model is predicated on the exogeneity of the decision to deregulate a state's

banking system. Kroszner and Strahan (1999), however, estimate the economic and political determinants of branch deregulation, some of which appear as independent variables in the benchmark model. Clearly, if some factors are simultaneously determining deregulation and the rate of entrepreneurship, the simple benchmark will necessarily have problems.

Further evidence of a problem with the exogeneity assumption is the likely sensitivity of the results to which years and states are included in the sample. This is because there are at least two, related patterns in the timing of states' decisions to deregulate. First, much of the deregulation of branching took place during the 1980s, when the banking sector was in dire trouble in many states and the country as a whole was recovering slowly from a period of slow economic growth (Freeman, 2002). Second, the timing of banking deregulation exhibits a clear regional pattern, with states in New England and the South tending to have deregulated earlier than those in the middle of the country (Wheelock, 2003). This might be a reflection of the correlation between income growth and the decision to deregulate, but it also suggests the possibility of spatial dependence or spatial autocorrelation.

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Table 1
FGLS results with common policy dummies

	Homoskedastic, No Autocorrelation		State-Specific Heteroskedasticity and Autocorrelation	
	48 states		48 states	
Branching Dummy	-0.039	(0.034)	-0.027	(0.028)
Interstate Banking Dummy	0.059	(0.019)*	0.024	(0.014)*
Herfindahl Index	-0.722	(0.200)*	-0.075	(0.165)
Herfindahl × Branching Dummy	0.345	(0.162)*	0.237	(0.152)
Fraction of Assets in Small Banks	-0.597	(0.133)*	-0.653	(0.126)*
Share of Banks with K/A < 2%	-0.901	(0.230)*	-0.294	(0.173)*
Share with K/A between 2 and 4 %	0.633	(0.084)*	0.103	(0.066)
Share with K/A between 4 and 6 %	0.136	(0.050)*	0.048	(0.037)
Share with K/A between 6 and 8 %	0.058	(0.050)	0.007	(0.035)
Log likelihood	653.20		1029.79	
Observations	823		823	
Estimated coefficients	84		84	

A * indicates significance at the 10% level. Both models also include state and year fixed effects, personal income, six lags of logged personal income, education variable, and bank-productivity measure. The results for these control variables are suppressed for space consideration.

Table 2
FGLS results with regional policy dummies

	Homoskedastic, No Autocorrelation	State-Specific Heteroskedasticity and Autocorrelation	State-Specific Heteroskedasticity and Autocorrelation
	48 States	48 States	46 Contiguous States
Branching Dummies			
New England	-0.182 (0.094)*	-0.024 (0.070)	-0.076 (0.069)
Mideast	-0.203 (0.111)*	-0.070 (0.065)	-0.109 (0.064)*
Great Lakes	0.078 (0.094)	0.152 (0.089)*	0.141 (0.088)
Plains	0.038 (0.136)	0.014 (0.077)	0.029 (0.078)
Southeast	-0.093 (0.054)*	0.008 (0.047)	-0.010 (0.049)
Southwest	0.413 (0.120)*	0.107 (0.151)	0.119 (0.153)
Rocky Mountain	-0.201 (0.091)*	-0.071 (0.103)	-0.107 (0.102)
Far West	0.179 (0.108)*	0.067 (0.111)	-0.101 (0.116)
Interstate Banking Dummies			
New England	0.031 (0.037)	-0.013 (0.034)	-0.012 (0.033)
Mideast	0.159 (0.035)*	0.118 (0.025)*	0.096 (0.025)*
Great Lakes	0.116 (0.043)*	0.065 (0.027)*	0.049 (0.027)*
Plains	0.041 (0.032)	0.005 (0.024)	-0.011 (0.024)
Southeast	0.092 (0.028)*	0.045 (0.022)*	0.034 (0.022)
Southwest	-0.122 (0.057)*	-0.062 (0.050)	-0.095 (0.050)*
Rocky Mountain	0.033 (0.039)	-0.048 (0.035)	-0.062 (0.035)*
Far West	-0.044 (0.034)	-0.031 (0.037)	-0.018 (0.038)
Herfindahl × Branch Dummies			
New England	0.864 (0.407)*	0.326 (0.295)	0.510 (0.296)*
Mideast	1.391 (0.639)*	0.518 (0.383)	0.703 (0.381)*
Great Lakes	-0.353 (0.492)	-0.885 (0.488)*	-0.808 (0.485)*
Plains	-0.573 (0.851)	-0.180 (0.576)	-0.296 (0.598)
Southeast	0.446 (0.260)*	0.144 (0.270)	0.246 (0.279)
Southwest	-1.405 (0.555)*	-0.180 (0.656)	-0.151 (0.661)
Rocky Mountain	1.570 (0.438)*	1.078 (0.511)*	1.201 (0.505)*
Far West	-0.134 (0.386)	-0.022 (0.404)	0.707 (0.444)*
Log likelihood	693.25	1031.27	1009.64
Observations	823	823	788
Estimated coefficients	105	105	105

* indicates significance at the 10% level. Models also include state and year fixed effects, bank-size variables, Herfindahl index, personal income, six lags of logged personal income, education variable, and bank-productivity measure. The results for these control variables are suppressed for space consideration.