AN EXAMINATION OF THE IMPACT OF GOVERNMENTAL DISASTER RELIEF INCENTIVES ON BUSINESS LOCATION AND EMPLOYMENT DECISIONS*

Robert T. Greenbaum and *Tricia L. Petras,* The Ohio State University
Andy Hultquist, University of North Dakota

INTRODUCTION

EVEN BEFORE RECORD-SETTING NATURAL disasters this decade such as Hurricanes Katrina, Rita, and Ivan, the United States was breaking records in terms of insured property losses due to disasters in the 1990s. Whether or not this increase is due to changes in weather patterns, the pattern of increasing economic costs due to disasters is unlikely to abate. Migration patterns in the United States are such that much of the population growth is occurring in costal locations. Furthermore, increased demand for these popular locations creates additional effects such as increasing property values and potentially changing the geographic distribution of economic activity. Thus, in both population and economic terms, the United States has likely become more vulnerable to disasters over time (Changnon and Changnon, 1999; Van der Vink, et al. 1998).

Much research has gone into quantifying the costs of disasters, speculating on changes in their frequency and impacts, and on the costs and benefits of public versus private insurance. However, despite the fact that the federal government spends billions of dollars in federal disaster relief payments, subsidized loans, and tax incentives to help rebuild disaster areas, the effectiveness of these incentives to businesses is unclear (Gravelle, 2005). Because of this ambiguity, it becomes difficult to measure the resilience of local economies to such disasters. Thus, evaluation of the innate ability of an economy to recover from a shock is confounded by government relief incentives.

Providing a better measure of the effectiveness of the disaster relief payments and tax incentives provides policy makers with two important benefits. First, it helps the development of better measures of resilience *net* of post-disaster relief efforts. By better understanding the characteristics of communities that lead to greater dynamic economic resilience, this paper helps aid pre-disaster planning. Second, by helping to evaluate the impact of various relief efforts, the paper informs policy with regard to the design of future post-disaster rebuilding incentives.

To examine the impact of federal government relief assistance on local economies, this paper examines the role that Small Business Administration (SBA) disaster lending has on economic recovery. Data on disaster declarations and assistance from 1989 through 1999 come from the Department of Homeland Security's (DHS) Federal Emergency Management Agency (FEMA) and disaster lending data come from the United States Small Business Administration (SBA). Data on business establishments, employment, and payroll come from the Census Bureau's County Business Patterns. The research makes use of the heterogeneity of government responses to similar disasters. Some of this heterogeneity is due to the political nature of federal relief (e.g., Garrett and Sobel, 2002). Other variation comes from differences in local government incentives in response to similar disasters across states.

The next section presents a brief review of the literature on government recovery incentives, including a discussion of the FEMA and SBA programs. That is followed by a description of the data, the regression model, and results. Using regression analysis, county level employment is regressed on measures of the generosity of government incentives and controls for the severity of the incident, county size, and socioeconomic conditions. If the incentives are successful, it is expected that more generous government incentives will lead to faster business recovery from disasters. The paper finds that, controlling for the size of the disaster, increased SBA lending has a small, positive effect on countywide employment. However, the impact of the lending is mediated by the socioeconomic conditions in the county prior to the disaster.

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REBUILDING COMMUNITIES

Federal tax incentives to help rebuild disaster-ravaged areas are not typical, but, given their popularity for helping to rebuild declining industrial areas and depressed neighborhoods, it is not surprising that business tax incentives were offered to attempt to help Gulf Coast residents recover from Hurricane Katrina. This paper does not directly examine the impact of such tax incentives. However, the literature on the ability of disaster relief incentives to increase the resilience of affected areas is scant, and it is worthwhile to examine some lessons from the experience of programs such as state enterprise zones (EZ) and federal Empowerment Zones (Stoker and Rich, 2006).

EZs target business tax incentives to specific distressed areas. While some of the early research on their effectiveness was positive, more recent assessments have been much more pessimistic (e.g., Greenbaum and Engberg, 2004; Peters and Fisher, 2002). Disaster relief incentives are similar to EZs in the sense that they attempt to help a specific geographic area recover from external events. In both cases, market failures lead to both equity and efficiency justifications for intervention. Unlike the case of persistently distressed areas, areas recovering from a disaster must "re-attract" businesses that may have fewer location-specific fixed costs that previously made it more costly to leave. The disaster-induced loss of physical infrastructure coupled with private insurance payouts lead to greater business mobility. Beyond physical direct costs, there are indirect costs related to the stigma of the event and the perception of increased potential future vulnerability, such as higher insurance rates, wage premiums to attract reluctant employees, or difficulty in attracting customers. There are also several reasons to expect that the disaster relief incentives may be more successful than EZ incentives. First, EZ incentives are extended to locations that have proven not to be resilient, thus making success more challenging. Further, the sheer pervasiveness of EZ incentives makes them less effective in any given location (Greenbaum and Bondonio, 2004).

Further, the pace of recovery is likely to be related to economic and socioeconomic conditions in the area prior to the disaster. Indeed, poor areas are likely less resilient. As Fothergill and Peek (2004) find in their review of related literature, socioeconomic status is related not only to how people perceive of and prepare for disasters, but it also affects how people respond to disasters. While greater financial resources certainly provide a source of self-insurance that aids in recovery, higher income people also have been found to have more success in navigating the disaster relief process and have greater access to relief resources.

Background on SBA/FEMA Assistance

In the wake of a major disaster, government agencies provide assistance for disaster relief. Disaster assistance is provided by a number of local, state, and federal agencies, but the primary sources of disaster assistance come from FEMA and the SBA. While most federal disaster assistance goes directly to individuals, some assistance does go to businesses and state and local governments.

Once the president has made a disaster or emergency declaration, FEMA steps in to provide assistance for housing and nonhousing needs to individuals and businesses in the affected areas. Direct assistance provided by FEMA is intended to assist with uninsured losses. This assistance is intended to cover critical expenses rather than to restore property to pre-disaster conditions. Housing assistance consists of money or direct assistance for temporary housing and the repair and replacement of homes not covered by insurance. Nonhousing assistance consists of money for necessary expenses and serious needs caused by the disaster such as medical and funeral costs, household items, and cleanup items. Additional services such as crisis counseling and unemployment assistance are also available through FEMA. Further, FEMA provides public assistance in the form of grants to nonprofit organizations and state and local governments to help with disaster recovery.

SBA's aim is to aid economic resiliency. They do so by providing stricken areas with capital infusions that provide much-needed economic stimulus, which is intended to create and retain jobs, support businesses, and help to stabilize the tax base of the local community. Once a major disaster has been declared by the president, SBA provides disaster assistance, primarily in the form of direct below-market loans (not grants) to individuals (both homeowners and renters) and businesses to assist with uninsured real and personal property losses through the Physical Disaster Loan Program. These loans can be used to restore property to pre-disaster conditions or to protect the property against future similar disasters. SBA's

disaster assistance programs may also be triggered by a disaster declaration from a state governor or the Secretary of Agriculture or Commerce, or by the SBA itself. SBA also provides below-market loans to businesses who have suffered economic injury due to the disaster to assist with necessary financial obligations it would have otherwise been able to meet through its Economic Injury Disaster Loan Program. Economic Injury Disaster Loans represent only about 20 percent of SBA disaster assistance.

Next, we describe the data used to help evaluate the effectiveness of this lending.

DATA

The data used in this paper are compiled from a combination of four sources. Information on disaster declarations are drawn from a database provided by FEMA detailing 726 agency Major Disaster, Emergency Management, and Fire Management Assistance declarations for the 50 states and District of Columbia over the period 1989-1999. Information on declaration date, disaster type, and total value of FEMA assistance were provided for each incident. These data were combined with information from the Federal Register to assign individual counties to each FEMA incident declaration. These data were combined with data provided by the SBA on lending under their Disaster Loan Program for the period 1989-1999. Each entry in this data set, representing information on each of the Disaster Loan Program's individual loans disbursed during this period, included the date of disbursal, amount of the loan, location of the recipient (state, county, city, and ZIP code), industrial classification of the establishment receiving the loan (using SIC or NAICS classification systems, as appropriate), and whether the loan was directed at a business or an individual. Measures of industrial activity were drawn from U.S. County Business Patterns data for 1988-2000, including total number of establishments, total annual employment, and total annual wages by county. Demographic controls were assigned to each county using 1990 U.S. Census data (reflecting the value of these characteristics as of 1989), including population, median household income, percent nonwhite, unemployment rate, poverty rate, and median house value. The data set resulting from this combination produces a panel of 34,511 county-year observations and contains usable annual information on disaster assistance, economic activity, and socioeconomic controls for approximately 3,135 counties over the 1989-1999 period.

Examining Table 1, detailing overall SBA and FEMA assistance from 1989-1999, a number of patterns are apparent. SBA Disaster Loans are directed, on average, at a greater number of counties compared to FEMA assistance, with loans distributed over an average of approximately 1,300 counties per year compared to an annual average of roughly 740 that receive FEMA assistance. Unfortunately, total FEMA spending for each disaster could not be accurately apportioned to the individual counties, as neither the original FEMA data nor information appearing in the Federal Register indicated how much of a disaster's total assistance was received by each affected county.

Inspecting the information contained in Table 1 on SBA Disaster Loans by loan type, additional trends become apparent. While SBA programs granted approximately 433,000 disaster loans over the 1989-1999 period (an average of roughly 39,300 loans per year), these loans were not evenly distributed among businesses and individuals. While business loans accounted for 23.9 percent of all loans by number over this period, these loans represented about 45.1 percent of all loan value, with the average business loan, $55,742, valued at over twice the typical disaster loan to individuals, $21,325. All figures are in current dollars.

SBA disaster lending from 1989-1999 also varied somewhat by geographic location. Considering the geographic dispersion of SBA lending displayed in Figure 1, the lowest areas of SBA lending activity by loan value appear roughly concentrated in the Rocky Mountain and southwestern states, as well as in the New England area. Comparatively greater amounts of SBA loans are directed at the eastern seaboard, Gulf Coast, Pacific states, and the upper Midwest. In many ways, with the exception of the sparsely populated upper Midwest, this map looks similar to a map of the 1990 distribution of the U.S. population. One obvious reason for the similarity is that loans are made to people and business owners, and thus there will be more lending where the population is larger. However, another explanation is that, over time, the population has been moving to more vulnerable locations, particularly on the coasts of Washington, California, Texas, North Carolina, Maryland, and Florida, which are particularly vulnerable to earthquakes

Table 1
FEMA and SBA Assistance, 1989-1999

	FEMA	SBA							
Year	*No. of Counties Assisted*	*No. of Counties Assisted*	*No. of Loans*	*No. of Loans, Businesses*	*No. of Loans, Individuals*	*Mean Loan Value, Businesses*	*Mean Loan Value, Individuals*	*Mean Loan Value*	*Total Assistance ($ millions)*
1989	299	1,206	12,507	2,641	9,866	46,952	16,521	22,947	287
1990	559	1,485	28,651	8,206	20,445	61,784	21,668	33,123	949
1991	506	1,008	10,714	2,703	8,011	58,824	18,599	28,747	308
1992	290	1,328	40,744	13,951	26,793	51,394	24,148	33,379	1,360
1993	1,458	1,565	39,933	10,846	29,087	57,440	18,703	29,299	1,170
1994	636	1,593	131,661	27,091	104,570	61,644	25,246	32,660	4,300
1995	515	1,115	33,823	9,077	24,746	46,822	16,811	24,865	841
1996	1,089	1,314	35,525	8,292	27,233	48,360	14,798	22,632	804
1997	673	1,394	38,620	8,837	29,783	50,130	17,896	25,272	976
1998	1,104	1,317	31,520	6,389	25,131	46,330	17,787	23,572	743
1999	995	1,180	29,001	5,479	23,522	74,284	26,181	36,206	1,050
Total	8,124	14,505	432,699	103,512	329,187	55,742	21,325	29,582	12,800

and hurricanes (Changnon and Changnon, 1999; Van der Vink et al., 1998).

Based upon the demographic statistics presented in Table 2, it is apparent that counties that received assistance are very similar to those that did not. This is useful from an evaluation perspective, as the "treatment" of a disaster can be considered somewhat random. The two exceptions are population (the same incident in a sparsely populated area is less likely to affect as many people as in a more densely populated area and is thus less likely to be declared a federal disaster) and median house value (again, house values are correlated with population).

The next section of the paper presents a method to assess the effectiveness of the SBA lending in terms of its ability to increase county-level employment subsequent to disasters.

METHODS

The basic model regresses the natural log of county employment on a set of controls for the size of the county, the severity of the disaster, socioeconomic conditions in the county, a time trend, and state fixed effects. In addition to controlling for unique characteristics at the state level that we do not measure, state fixed effects are important to control for the value of any state disaster relief.[1] To examine how SBA lending affects county employment, we include a measure of the value of all SBA lending in the county in the previous year. The model, estimated using Ordinary Least Squares with robust standard errors[2] and state fixed effects, is represented as follows:

$$\textbf{(1)}\quad \text{Ln } Employment_{i,t} = \beta_0 + \beta_1 \text{Ln } Establishments_{i,t} + \beta_2\, FEMA/SBA_{i,t} + \beta_3 \text{Ln } Number\ of\ SBA\ loans_{i,t-1} + \beta_4 \text{Ln } Value\ of\ SBA\ loans_{i,t-1} + \beta_5 \text{Ln } Value\ of\ FEMA\ Assistance_{i,t-1} + \beta_6 X_{i,1989} + \beta_7\, Time\ Trend + \varepsilon_{i,t},$$

where Ln *Establishments* is a measure of the total number of business establishments in county *i* in year *t*. *FEMA/SBA* is an indicator variable that equals one if a county receives any FEMA disaster assistance or SBA lending in the current year. This variable helps account for the presence of any disasters in the county in the current year, and it also helps to control for the fact that counties that

Figure 1: **Value of SBA Disaster Loans by County, 1989-1999**

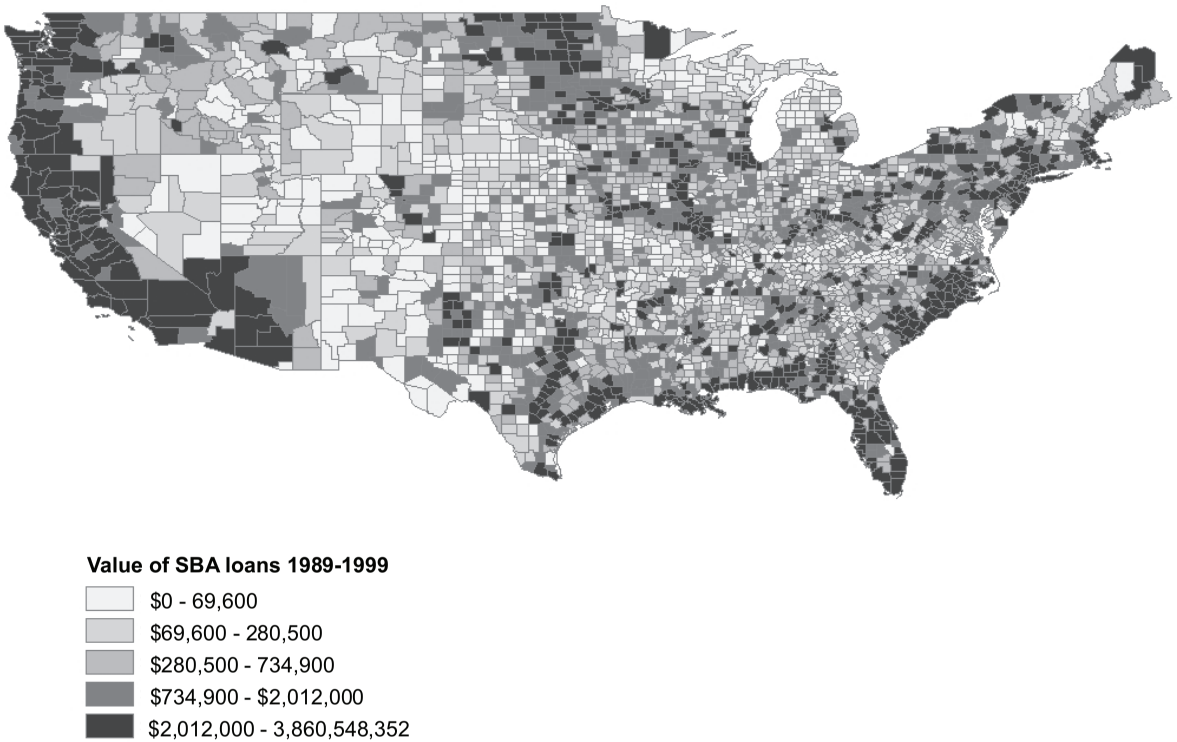

Table 2
Descriptive Statistics for Counties by Type of Disaster Assistance Received, 1989-1999

	Receive FEMA Assistance	*Receive SBA Loans*	*Receive No Assistance*	*All Counties (1990 Census Data)*
Population	107,870 (384,098)	147,306 (392,291)	47,560 (164,356)	79,318 (264,046)
Median Household Income	$24,166 (6,824)	$25,751 (7,310)	$23,217 (6,066)	$23,973 (6,601)
Percent Nonwhite	13.0% (15.3)	14.4% (15.4)	12.2% (16.1)	12.8% (15.8)
Unemployment Rate	6.7% (3.0)	6.5% (2.8)	6.7% (3.3)	6.7% (3.1)
Poverty Rate	16.7% (8.1)	15.6% (7.6)	17.1% (8.0)	16.7% (7.9)
Median House Value	$56,984 (37,198)	$63,928 (41,994)	$49,626 (27,705)	$54,109 (33,563)
Number of Counties	8,124	14,505	26,635	3,135

receive assistance tend to have larger populations with more businesses. Ln *Number of SBA loans* is the natural log of the count of the total number of both business and personal loans that the SBA extended in the county in the previous year, and this helps to control for the size of the disaster. Ln *Value of SBA loans* is the natural log of the total value of both business and individual disaster SBA loans in the previous year, and this is the main treatment variable of interest. Ln *Value of FEMA Assistance* is the natural log of the total FEMA disaster expenditures for the disaster area in which the county is located. As noted above, because the FEMA grants could not be allocated to individual counties, this should not be interpreted as the amount of FEMA expenditures in the county but should rather be interpreted as a measure of the relative size of the particular disaster. It is thus used as another control for the size of the disaster. *X* represents a vector of socioeconomic controls from the 1990 Census measuring the natural log of the county's population, the unemployment rate, the natural log of the median housing value, and the faction of the population that was "nonwhite" in 1989. Finally, we include a time trend to account for the growth in employment over time.[3]

Model 1 is initially estimated with the constraints that β_2 through $\beta_5 = 0$ in order to assess the impact of local characteristics on local economic activity, and then the constraint is relaxed to assess the impact of federal disaster loans.

As noted previously, prior research indicates that lower-income families have more difficulty recovering from disasters. Thus, to examine this beyond the inclusion of the socioeconomic measures in equation (1), we split the counties into three groups based upon their level of poverty in 1989. "Low Poverty" counties are the counties in the first quartile of the poverty distribution (poverty rates greater than 11.1 percent), "Medium Poverty" counties are counties in the middle 50 percent of the poverty distribution, and "High Poverty" counties represent the top quartile (poverty rates greater than 20.4 percent). We then reestimated equation (1) on each of the three subsamples of counties based upon their poverty status.

Finally, because we are unable to accurately measure FEMA grant expenditures at the county level, we also model the FEMA expenditures in a nonparametric manner. We break the counties into three categories: counties in any given year with no FEMA expenditures and counties below and above the median value of FEMA expenditures for the counties that did receive assistance ($20.12 million). For each of these categories, we estimate equation (2),

(2) $\text{Ln } Employment_{i,t} = \gamma_0 + \gamma_1 \text{Ln } Establishments_{i,t}$
$+ \gamma_2 FEMA/SBA_{i,t}$
$+ \gamma_3 \text{Ln } Number\ of\ SBA\ loans_{i,t-1}$
$+ \gamma_4 \text{Ln } Value\ of\ SBA\ loans_{i,t-1} + \gamma_5 X_{i,1989}$
$+ \gamma_6 Time\ Trend + \varepsilon_{i,t}$,

which includes all of the same covariates as equation (1) other than FEMA expenditures in the previous year.

RESULTS

The results for the estimation of equations (1) and (2) are reported in Tables 3 and 4. The first

Table 3
OLS Regression with State Fixed Effects and Robust Standard Errors
All Counties and by Poverty Status, 1989-1999

Dependent variable: Ln Employment

	Pooled Limited	*Pooled Full*	*Low Poverty*	*Medium Poverty*	*High Poverty*
Ln Establishments	0.980	0.984	0.978	0.957	1.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FEMA/SBA Indicator	—	-0.030	-0.038	-0.028	-0.017
		(0.000)	(0.000)	(0.000)	(0.003)
Ln # SBA Loans Last Year	—	-0.026	-0.019	-0.028	-0.008
		(0.000)	(0.000)	(0.000)	(0.081)
Ln value SBA Loans Last Year	—	0.003	0.002	0.004	-0.001
		(0.000)	(0.126)	(0.000)	(0.639)
Ln value FEMA Assist. Last Year	—	0.002	0.001	0.001	0.001
		(0.000)	(0.019)	(0.000)	(0.003)
Ln Population	0.209	0.218	0.221	0.237	0.203
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Poverty Rate	-0.581	-0.584	0.871	-0.451	-0.641
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment rate	-0.158	-0.180	-2.046	-0.191	0.181
	(0.139)	(0.087)	(0.000)	(0.238)	(0.217)
Ln Median Housing Value	-0.078	-0.073	-0.149	-0.005	0.064
	(0.000)	(0.000)	(0.000)	(0.700)	(0.001)
Percent Nonwhite	0.451	0.454	0.533	0.373	0.542
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time Trend	0.010	0.010	0.010	0.010	0.011
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-17.957	-19.759	-17.824	-20.604	-23.070
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	34409	34405	8606	17200	8599
Adj R^2	0.9759	0.9763	0.9762	0.9761	0.9683

Notes: P-values are in parentheses.

Table 4
OLS Regression with State Fixed Effects and Robust Standard Errors By Level of FEMA Assistance in the Previous Year, 1989-1999

Dependent variable: Ln Employment

	No FEMA	*Low FEMA*	*High FEMA*
Ln Establishments	0.979	1.050	0.999
	(0.000)	(0.000)	(0.000)
FEMA/SBA Indicator	-0.033	-0.029	-0.031
	(0.000)	(0.002)	(0.003)
Ln # SBA Loans Last Year	-0.039	-0.021	-0.015
	(0.000)	(0.000)	(0.001)
Ln value SBA Loans Last Year	0.005	0.004	0.004
	(0.000)	(0.029)	(0.042)
Ln Population	0.229	0.142	0.177
	(0.000)	(0.000)	(0.000)
Poverty Rate	-0.657	-0.096	-0.463
	(0.000)	(0.498)	(0.001)
Unemployment Rate	-0.182	-0.809	0.342
	(0.122)	(0.005)	(0.295)
Ln Median Housing Value	-0.074	-0.094	-0.049
	(0.000)	(0.000)	(0.034)
Percent Nonwhite	0.471	0.359	0.484
	(0.000)	(0.000)	(0.000)
Time Trend	0.011	0.009	0.008
	(0.000)	(0.000)	(0.000)
Constant	-20.668	-15.772	-15.041
	(0.000)	(0.000)	(0.000)
N	27300	3474	3631
Adj R^2	0.9757	0.9779	0.979

Notes: P-values are in parentheses.

column ("Pooled Limited") of Table 3 reports the estimation of equation 1 with the constraints that β_2 through $\beta_5 = 0$. With 34,409 observations across all U.S. counties over 11 years, it is not surprising that all coefficients other than the coefficient on the unemployment rate are significant at the .001 level. Also not surprisingly, the level of establishments in a county explains a great deal of the variation of the level of employment in the county in that year. The coefficient on the natural log of establishments is 0.98, which can be interpreted to indicate that, all else equal, a 1 percent increase in the number of establishments would lead to a .98 percent increase in employment on average. Given this strong relationship, it is also not surprising that the adjusted R^2 of this (and all of the models) is very high, 0.976. Population, percent of the population that is nonwhite, and the time trend all also have positive estimated coefficients. The poverty rate, unemployment rate, and somewhat surprisingly, the median housing value all have negative estimated coefficients.[4]

The second column of Table 3 ("Pooled Full") reports the same regression with the inclusion of

the FEMA and SBA disaster variables. The coefficient on the value of SBA lending in the previous year is positive and significant, thus indicating that more generous SBA lending in the previous year is associated with more countywide employment, controlling for disaster size, number of establishments, and socioeconomic conditions. The coefficient, 0.003, is very small, however, and indicates that for every 1 percent increase in the value of SBA lending, employment increases by an average of .003 percent. As expected the coefficient on the indicator of whether or not the county received any FEMA or SBA assistance in the current year is negative (-0.030), suggesting that the presence of a disaster lowers employment. Similarly, the coefficient on log of the number of SBA loans in the previous year, an indicator of the severity of the disaster, is -0.026, which can be interpreted to suggest that every 1% increase in loans leads to .026 percent drop in average employment, all else equal. The coefficient on the value of the FEMA assistance in the previous year is also positive, indicating that more FEMA assistance is associated with more employment, although the point estimate should be interpreted with caution given the measurement issues described above. Inclusion of these four additional variables affects the other coefficients in the model only minimally.

The final three columns of Table 3 report the separate estimation of equation (1) based upon the three different levels of poverty. Indeed, we do find that the relationship between SBA lending and county employment does vary based on how impoverished the residents of the county are. In the lowest and highest poverty counties, the coefficient on the value of the SBA loans is no longer significant. Only in the "Medium Poverty" counties is the coefficient on SBA lending (0.004) significant.

Finally, as a robustness check to address concerns regarding the measurement of FEMA assistance, we remove this variable as a parameter in the regression and estimate equation (2) for counties with no FEMA assistance in the previous year and with below median ("low") and above median ("high") FEMA support in the previous year. These results are presented in Table 4. The results are consistent with the other specifications, and the coefficient on the value of SBA is slightly lower (0.004 versus 0.005) in the counties that that had FEMA support in the previous year, possibly indicating that SBA lending has a more beneficial effect on employment in less distressed counties.

CONCLUSIONS

It is natural to assume that disaster relief and assistance programs would affect different types of communities differently, especially when categorizing counties by level of poverty. Indeed, we do find that the resilience to disasters is partially a function of the pre-disaster socioeconomic conditions in a county.

FEMA programs seek to address the immediate needs, both housing and nonhousing related needs, of individuals. SBA looks to aid in the economic resiliency of a community through loans to individuals and businesses. Both programs seek to assist with uninsured losses due to a disaster. The wealth of a community is directly related to its uninsured losses due to a disaster and to its uninsured property profile. While SBA's loans are available to both homeowners and renters, renters are only eligible for loans covering personal property losses. As the value of personal property is likely small compared to real estate and the immediate need for personal property items, such as clothing and other household items, are likely covered by FEMA programs, it is not surprising that SBA loans have no statistically significant effect on outcome measures in high poverty communities where the proportion of renters is likely to be high. Also, this result is consistent with the literature that finds the lower-income individuals are less resilient to disasters.

On the other end of the scale, low poverty communities also show no statistically significant effect of the SBA loan programs. High-income communities are likely to be better insured communities with less reliance on insures of last resort such as FEMA and SBA. With increased wealth also comes more reliance on personal assets to persevere through tough times, which would also indicate less reliance on government programs to assist in post-disaster economic resiliency. This leaves middle income communities, the places with moderate poverty. These communities are likely to have higher homeownership rates than high poverty communities, but they may have more uninsured personal and real property losses and smaller financial cushions to rely on for economic

stability than low poverty communities. It is in these moderate poverty communities where we see a positive impact from SBA loan programs. SBA loan programs appear to have the intended effect of aiding in the economic resiliency of a community after a major disaster. The effect is only seen in communities where individuals are more likely to be eligible for SBA programs. In moderate poverty communities homeownership rates are higher but losses covered by insurance may be lower, and there may be lower ability for individuals to absorb financial hardship on their own.

Future research should explore whether these relationships persist across different types of man-made and natural disasters, and future research should also explore which industries are the most resilient to disasters and which are the most responsive to disaster relief.

Notes

[1] Estimations using county fixed effects yielded similar results.

[2] A robust cluster estimator that adjusts the coefficient standard deviations for the possible within-county correlation of observations was also estimated and resulted in higher standard errors than with this more general correction for heteroscedasticity.

[3] We also specified models that included time fixed effects, and the results did not change. Results are not reported and are available from the authors upon request.

[4] The pairwise Pearson correlation coefficient between the median housing values and the poverty rate is -.51.

References

Changnon, Stanley A. and David Changnon. Record-High Losses for Weather Disasters in the United States During the 1990s: How Excessive and Why? *Natural Hazards* 18 (October 1999): 287-300.

Fothergill, Alice and Lori A. Peek. Poverty and Disasters in the United States: A Review of Recent Sociological Findings. *Natural Hazards* 32 (May 2004): 89-110.

Garrett, Thomas A. and Russell S. Sobel. The Political Economy of FEMA Disaster Payments. St. Louis: Federal Reserve Bank of St. Louis, 2002. Working paper 2002-012B. http://research.stlouisfed.org/wp/2002/2002-012.pdf

Gravelle, Jane G. Tax Policy Options after Hurricane Katrina. Report for Congress RL33088. Congressional Research Service, Library of Congress, Washington, D.C., September 2005.

Greenbaum, Robert T. and Daniele Bondonio. Losing Focus: A Comparative Evaluation of Spatially Targeted Economic Revitalization Programs in the US and the EU. *Regional Studies* 38 (May 2004): 319-334.

Greenbaum, Robert T. and John B. Engberg. The Impact of State Enterprise Zones on Urban Manufacturing Establishments. *Journal of Policy Analysis and Management* 23 (Spring 2004): 315-339.

Peters, Alan H. and Peter S. Fisher. *State Enterprise Zone Programs: Have They Worked?* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 2002.

Stoker, Robert P. and Michael J. Rich. Lessons and Limits: Tax Incentives and Rebuilding the Gulf Coast after Katrina. Survey Series. Washington, D.C.: The Brookings Institution, August 2006.

U.S. Census Bureau. County Business Patterns. Washington, D.C., various years. http://www.census.gov/epcd/cbp/index.html

U.S. Department of Homeland Security. Federal Emergency Management Agency. Washington, D.C., various years. http://www.fema.gov

U.S. Small Business Administration. Office of Disaster Assistance. Washington, D.C., various years.

Van der Vink, Gregory, Richard M. Allen, Jeffery Chapin, Morgan Crooks, W. Fraley, Joshua Krantz, AnnMarie Lavigne, Andrew LeCuyer, Eugene K. MacColl, W. J. Morgan, Brandy Ries, Eryn Robinson, Kristina Rodriquez, Margaret Smith, and Kelly Sponberg. Why the United States Is Becoming More Vulnerable to Natural Disasters. *EOS, Transactions, American Geophysical Union* 79 (November 1998): 536–537.