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Highlights

Business Complexity and Risk Management: Evidence from Operational Risk Events in U.S. Bank Holding Companies

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- The post-crisis regulations emphasize the business complexity of banks.
- Complexity weakens banks' risk management, as evidenced by operational risk events.
- These risk management weaknesses affect both banking and nonbanking activities.
- Complexity does not significantly improve performance.
- Managerial failure caused by complexity offsets the benefits of strategic risk taking.

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Business Complexity and Risk Management: Evidence from Operational Risk Events in U.S. Bank Holding Companies

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Abstract

Recent regulatory proposals tie a financial institution's systemic importance

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to its complexity. However, little is known about how complexity affects banks' risk management. Using the 1996–1999 deregulations of U.S. banks' nonbanking activities as a natural experiment, we show that banks' business complexity increases their operational risk. This result is driven by banks that had been constrained by regulations, compared with other banks and also with nonbank financial institutions that were never subject to these regulations. We provide evidence that managerial failure underlying these events offsets benefits of strategic risk taking.

Keywords: operational risk, bank holding companies, financial deregulation, Glass-Steagall Act, business complexity

JEL Classification: G18, G20, G21, G32, L25.

1. Introduction

The recent financial crisis has catapulted the regulation of complex financial institutions to the center of policy debate.¹ The business complexity of U.S. bank holding companies (BHCs) has increased significantly since late 1990s due to their aggressive expansion into nonbanking activities. This expansion has been driven primarily by the Gramm-Leach-Bliley Act (GLBA) of 1999, which removed the restrictions on business activities imposed under the Glass-Steagall Act (GSA) of 1933, including securities underwriting and trading. Using the passage of GLBA as a natural experiment, we find that banks' increased complexity due to expansion into nonbanking activities has caused a deterioration of banks' operational risk management. This effect is driven by BHCs that were particularly constrained by pre-GLBA regulations, i.e., those BHCs that dealt in bank-ineligible securities through their heavily regulated Section 20 investment banking subsidiaries.

The term *complexity* can be related to different concepts (Cetorelli and Goldberg, 2014), including business diversification, geographic diversification, and network interconnectedness.² We follow the guidelines provided by the Bank for International Settlements (BIS) and the Federal Reserve, which

¹"The failure of large, *complex*, and interconnected financial firms can disrupt the broader financial system and the overall economy, and such firms should be regulated with that fact in mind." (Ben S. Bernanke, former Chairman of the Federal Reserve System, June 16, 2010).

²See, for example, Gai, et al. (2011), Caballero and Simsek (2013), Neuhann and Saidi (2018), and Loutskina and Strahan (2011).

Other Variables

Non-Interest Income Ratio	Non-interest income divided by the sum of net interest income and interest income, BHCK4079/(BHCK4079+BHCK4074) from FR Y9C. Non-interest income (BHCK4079) includes fiduciary income, fees and charges, trading revenue, and other income from interest activities, such as brokerage, advisory services, and underwriting.
Nonbank Asset Ratio	Nonbank assets divided by total assets, BHCP4778/BHCK2170 from FR YLP. Nonbank assets (BHCP4778) refer to the assets derived from nonbank subsidiaries. Nonbank subsidiaries exclude all banks (including credit unions and industrial banks that file the commercial bank Report of Condition and Income) and their subsidiaries and Edge and Agreement corporations and their subsidiaries that are held through a bank subsidiary.
Banking M&A	The number of banking sector M&As for each BHC in the previous three years, from the Federal Reserve Board's FR Y-9C data or Call Reports. For each M&A deal, it provides information on the top holding company of the acquirer, along with the total assets of the acquiring bank target bank.
Banking M&A Target Assets Ratio	Annual target assets ratio for banking sector M&As for each BHC in a given year is the assets of all targets from M&As in the current year divided by the total assets of the high holder in the previous year. Banking M&A Assets Ratio is the average of annual target assets ratio over the last three years. Data are obtained from FR Y-9C data or Call Reports. If data are missing because the target did not report FR Y-9C or Call Report information at the time of the M&A (for example, the target is a savings and loan association), we estimate the total assets by using the change from the previous quarter in the total assets of the acquirer. To measure the size of a high holder's banking sector M&A activity, we calculate an annual target assets ratio, defined as the sum of the assets of all targets from M&As in the current year divided by the total assets of the high holder in the previous year.
BHC	An indicator variable equal to 1 if the financial institution is a BHC.
BHC Sec20	An indicator variable equal to 1 if a BHC owned a Section 20 subsidiary before the repeal of the Glass-Steagall Act. This variable is the same as the Diversified Sec20 variable.
BHC NonSec20	An indicator variable equal to 1 if a BHC did not own a Section 20 subsidiary before the repeal of the Glass-Steagall Act.
SIC61– SIC65, SIC67	Nonbank indicator variables for each financial industry, according to the SIC two-digit code: nondepository credit institutions (SIC61), securities firms (SIC62), insurance carriers (SIC63), insurance agents, brokers, and services (SIC64), real estate firms (SIC65), and other investment offices excluding SIC codes 631 and 637.
Media	Annual count of news articles for each BHC from the Factiva business news database.

Table 2: Summary Statistics of Key Bank-Level Characteristics

This table summarizes the sample statistics of key bank characteristics used in our study, measured at event origination and at the bank-year level. Panel A uses the full sample of BHCs during the 1988-2005 period (left) and reduced sample for DID models over the 1994-1996 (pre-deregulation) and 2000-2002 (post-deregulation) periods (right). Panel B compares the summary statistics for Section 20 holders (left) and non-Section 20 BHCs (right) during the 1994-1996 (pre-deregulation) period. For the first three operational risk variables (Count, Ln Total Loss, and Ln Avg Loss), the reported statistics are conditional on having at least one operational risk event in a given bank-year observation. In Panel A, our full sample consists of 968 unique BHCs, of which 262 are pre-diversified and 41 are Section 20 holders. Our reduced sample consists of 482 unique BHCs, of which 192 are pre-diversified and 29 are Section 20 holders.

Panel A: Full Sample (1988-2005) and Reduced Sample (1994-1996 and 2000-2002)

	Full Sample, 1988-2005						Reduced Sample, 1994-1996 and 2000-2002					
	Mean	Median	SD	1%	99%	Num Obs	Mean	Median	SD	1%	99%	Num Obs
Count(conditional)	2.55	1.00	3.31	1.00	17.00	288	2.15	1.00	2.88	1.00	13.00	105
Ln Total Loss(conditional)	1.44	1.96	3.69	-4.61	9.08	288	1.01	1.60	3.46	-4.61	8.18	105
Ln Avg Loss(conditional)	0.94	1.83	3.27	-4.61	6.84	288	0.63	1.26	3.09	-4.61	5.73	105
Count	0.09	0.00	0.79	0.00	2.00	7,751	0.10	0.00	0.77	0.00	2.00	2,257
Total Loss (Millions USD)	10.50	0.00	290.90	0.00	48.15	7,751	9.24	0.00	289.44	0.00	55.26	2,257
Ln TA	7.09	6.68	1.59	4.82	12.16	7,751	7.18	6.73	1.61	5.06	12.31	2,257
Market-To-Book	1.77	1.59	5.27	0.26	4.84	6,222	1.70	1.56	0.87	0.54	4.69	1,816
Cash-To-TA	0.09	0.08	0.06	0.02	0.31	7,751	0.09	0.08	0.05	0.02	0.28	2,257
Tier 1 Ratio	0.13	0.12	0.07	-0.00	0.26	7,751	0.14	0.13	0.06	0.04	0.29	2,257
ROE (%)	6.52	7.60	19.49	-20.46	16.11	7,751	7.65	7.93	4.87	-4.32	16.06	2,257
Excessive Growth	0.42	0.00	0.49	0.00	1.00	6,800	0.38	0.00	0.49	0.00	1.00	2,075
High Dividend	0.51	1.00	0.50	0.00	1.00	7,743	0.56	1.00	0.50	0.00	1.00	2,254
ROA (%)	0.60	0.64	0.51	-1.11	1.43	7,751	0.69	0.69	0.41	-0.29	1.58	2,257
SD ROA (%)	0.36	0.33	0.29	0.06	1.28	7,624	0.37	0.36	0.22	0.08	0.97	2,217
Z-Score	2.17	2.21	1.20	-1.43	4.49	7,624	2.29	2.20	1.82	-0.53	5.09	2,217
Non-Interest Income Ratio	0.22	0.19	0.14	0.04	0.73	7,751	0.22	0.19	0.18	0.04	0.74	2,257
Nonbank Asset Ratio	0.02	0.00	0.09	0.00	0.52	7,751	0.02	0.00	0.08	0.00	0.48	2,257

Panel B: Section 20 vs. Non-Section 20 BHCs during the Pre-Deregulation Period (1994-1996)

	Section 20 BHCs						Non-Section 20 BHCs					
	Mean	Median	SD	1%	99%	Num Obs	Mean	Median	SD	1%	99%	Num Obs
Count(conditional)	2.39	1.50	2.09	1.00	9.00	18	1.11	1.00	0.32	1.00	2.00	18
Ln Total Loss(conditional)	2.59	3.47	2.59	-4.61	5.73	18	0.16	0.70	2.95	-4.61	4.03	18
Ln Avg Loss(conditional)	1.99	2.47	2.33	-4.61	5.73	18	0.08	0.70	2.87	-4.61	4.03	18
Count	0.49	0.00	1.35	0.00	9.00	87	0.02	0.00	0.14	0.00	1.00	1,211
Total Loss (Millions USD)	11.08	0.00	39.59	0.00	306.75	87	0.15	0.00	2.33	0.00	0.60	1,211
Ln TA	10.63	10.80	1.30	7.49	12.73	87	6.64	6.32	1.22	5.05	9.90	1,211
Market-To-Book	1.74	1.63	0.53	0.79	3.35	87	1.59	1.50	0.65	0.60	3.62	872
Cash-To-TA	0.09	0.09	0.03	0.02	0.18	87	0.10	0.09	0.05	0.02	0.28	1,211
Tier 1 Ratio	0.12	0.12	0.02	0.06	0.18	87	0.14	0.13	0.05	0.03	0.28	1,211
ROE (%)	9.84	10.04	2.17	0.41	14.86	87	7.64	7.86	5.55	-6.15	17.18	1,211
Excessive Growth	0.43	0.00	0.50	0.00	1.00	87	0.30	0.00	0.46	0.00	1.00	1,036
High Dividend	0.83	1.00	0.38	0.00	1.00	87	0.50	1.00	0.50	0.00	1.00	1,211
ROA (%)	0.71	0.74	0.18	0.02	1.19	87	0.70	0.70	0.38	-0.33	1.60	1,211
SD ROA (%)	0.37	0.38	0.09	0.16	0.59	87	0.37	0.36	0.18	0.09	0.90	1,183
Z-Score	2.13	2.16	0.34	0.40	2.83	87	2.33	2.19	2.35	-0.52	6.08	1,183
Non-Interest Income Ratio	0.36	0.33	0.13	0.17	0.76	87	0.19	0.17	0.10	0.04	0.67	1,211
Nonbank Asset Ratio	0.06	0.03	0.08	0.00	0.31	87	0.02	0.00	0.09	0.00	0.57	1,211

Table 3: Business Complexity and Operational Risk Preliminary Evidence

This table presents the results from the models for our preliminary analysis used in Section 2.4. The dependent variables are annual operational risk event frequency (Count), annual total loss (Ln Total Loss), and annual average loss per event (Ln Avg Loss). The second and third variables are in logarithms. The key explanatory variables are proxies for business complexity: noninterest income ratio (Panel A) and nonbank asset ratio (Panel B). Each operational risk measure Model (1) contains only size as a control and Model (2) contains the full set of controls. All models use annual data for 1990-2005. t-statistics reported in parentheses are based on robust standard errors double clustered by the BHC and by year. Superscripts ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels. The coefficients of control variables are omitted due to space limitations. Complete results can be found in the Internet Appendix C, Table C.

Panel A: Measure of Complexity: Noninterest Income Ratio

	Count		Ln Total Loss		Ln Avg Loss	
	(1)	(2)	(1)	(2)	(1)	(2)
Non-Interest Income Ratio	0.351* (1.930)	0.281 (1.185)	0.520** (2.324)	0.469* (1.722)	0.469** (2.466)	0.445** (1.964)
Ln TA	0.163*** (2.887)	0.225*** (2.931)	0.309*** (4.491)	0.397*** (4.488)	0.273*** (4.794)	0.346*** (4.797)
Other Control Variables	No	Yes	No	Yes	No	Yes
Num Observations	7,751	4,735	7,751	4,735	7,751	4,735
R-squared	0.130	0.154	0.162	0.184	0.154	0.174

Panel B: Measure of Complexity: Nonbank Asset Ratio

	Count		Ln Total Loss		Ln Avg Loss	
	(1)	(2)	(1)	(2)	(1)	(2)
Nonbank Asset Ratio	1.168* (1.868)	1.511* (1.956)	1.137** (2.339)	1.336** (2.195)	0.882** (2.286)	1.032** (2.100)
Ln TA	0.165*** (3.050)	0.221*** (3.100)	0.319*** (4.757)	0.403*** (4.866)	0.283*** (5.084)	0.355*** (5.231)
Other Control Variables	No	Yes	No	Yes	No	Yes
Num Observations	7,751	4,735	7,751	4,735	7,751	4,735
R-squared	0.146	0.172	0.167	0.188	0.157	0.176

Table 4 Difference-in-Differences Analysis: Evidence from the Natural Experiment

This table presents the results from our difference-in-differences analysis for operational risk. The dependent variables are annual operational risk event frequency (Count) in Panel A, annual total loss (Ln Total Loss) in Panel B, and annual average loss per event (Ln Avg Loss) in Panel C. The second and third variables are in logarithms. All data are averaged over the 1994-1996 (prederegulation) and 2000-2002 (postderegulation) sample periods. All models include bank-level fixed effects, which subsume the effect of the state, time treatment and control group dummies. Statistics reported in parentheses are based on robust standard errors clustered at the bank holding company level. Superscripts ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels.

Panel A: Annual Operational Risk Event Frequency

	(1)	(2)	(3)	(4)	(5)	(6)
After	0.010*	-0.125**	-0.224*	0.010*	-0.135**	-0.282**
	(1.950)	(-1.984)	(-1.871)	(1.949)	(-2.322)	(-2.388)
After \hat{E} Pre-Diversified	0.243***	0.243***	0.282**			
	(2.856)	(2.882)	(2.525)			
After \hat{E} Pre-Diversified Sec20				1.527***	1.533***	1.569***
				(2.807)	(2.853)	(2.787)
After \hat{E} Pre-Diversified NonSec20				0.051**	0.050**	0.061
				(2.151)	(2.140)	(1.555)
Ln TA		0.171**	0.316**		0.184**	0.337***
		(2.143)	(2.190)		(2.490)	(2.614)
Market To-Book			0.012			-0.057
			(0.234)			(-0.875)
Cash To-TA			-0.082			-1.383
			(-0.086)			(-1.191)
Tier 1 Ratio			3.105**			2.694**
			(2.096)			(2.434)
ROE			-0.010			0.011
			(-0.775)			(0.861)
Excessive Growth			0.011			0.080
			(0.119)			(1.002)
High Dividend			-0.188			-0.141
			(-1.244)			(-1.071)
Num Observations	694	694	412	694	694	412
R-squared	0.061	0.075	0.118	0.293	0.309	0.336

Panel B: Annual Total Operational Loss

	(1)	(2)	(3)	(4)	(5)	(6)
After	0.051 (1.279)	-0.136 (-1.210)	-0.283 (-1.404)	0.051 (1.278)	-0.149 (-1.466)	-0.356** (-2.011)
After $\hat{\epsilon}$ Pre-Diversified	0.383*** (3.080)	0.383*** (3.105)	0.501*** (3.458)			
After $\hat{\epsilon}$ Pre-Diversified Sec20				1.918*** (3.436)	1.927*** (3.474)	2.102*** (4.091)
After $\hat{\epsilon}$ Pre-Diversified NonSec20				0.152 (1.559)	0.151 (1.576)	0.227* (1.831)
Ln TA		0.237* (1.776)	0.401* (1.796)		0.252** (2.139)	0.426** (2.144)
MarketTo-Book			-0.124 (-0.688)			-0.210 (-1.163)
CashTo-TA			-3.298 (-1.518)			-4.916** (-2.478)
Tier 1 Ratio			4.628 (1.506)			4.116 (1.542)
ROE			0.026 (0.734)			0.052 (1.579)
Excessive Growth			-0.153 (-0.836)			-0.068 (-0.419)
High Dividend			-0.304 (-1.490)			-0.246 (-1.215)
Num Observations	694	694	412	694	694	412
R-squared	0.074	0.085	0.145	0.211	0.223	0.294

Panel C: Annual Average Operational Loss per Event

	(1)	(2)	(3)	(4)	(5)	(6)
After	0.052 (1.315)	-0.111 (-1.048)	-0.236 (-1.250)	0.052 (1.314)	-0.121 (-1.253)	-0.298* (-1.756)
After $\hat{\epsilon}$ Pre-Diversified	0.341*** (2.914)	0.341*** (2.935)	0.452*** (3.304)			
After $\hat{\epsilon}$ Pre-Diversified Sec20				1.643*** (3.150)	1.651*** (3.172)	1.822*** (3.746)
After $\hat{\epsilon}$ Pre-Diversified NonSec20				0.146 (1.528)	0.145 (1.543)	0.217* (1.805)
Ln TA		0.206* (1.667)	0.344* (1.673)		0.219** (1.970)	0.365* (1.955)
MarketTo-Book			-0.131 (-0.738)			-0.204 (-1.156)
CashTo-TA			-3.350 (-1.581)			-4.735** (-2.430)
Tier 1 Ratio			4.133 (1.470)			3.695 (1.492)
ROE			0.031 (0.903)			0.053 (1.645)
Excessive Growth			-0.163 (-0.993)			-0.091 (-0.600)
High Dividend			-0.276 (-1.430)			-0.226 (-1.176)
Num Observations	694	694	412	694	694	412
R-squared	0.068	0.078	0.137	0.179	0.189	0.261

Table 5: Robustness Test with Nonbanks as the Control Group

This table presents the results from a robustness test for operational risk with nonbanks as the control group. The dependent variable is the annual operational risk event frequency (Count) in Panel A, annual total loss (Ln Total Loss) in Panel B, and annual average loss per event (Ln Avg Loss) in Panel C. The second and third variables are in logarithms. All data are averaged over the 1994-1996 (prederegulation) and 2000-2002 (postderegulation) sample periods. All models include bank/firm level fixed effects, which subsume the effect of the state treatment and control group dummies. t-statistics reported in parentheses are based on robust standard errors clustered at the firm level. Superscripts ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels. The coefficients of control variables are omitted due to space limitations; complete results can be found in the Internet Appendix C Table C3.

Panel A: Annual Operational Risk Event Frequency

	(1)	(2)	(3)	(4)	(5)	(6)
After	0.223*	0.185	0.298	0.223*	0.184	0.296
	(1.830)	(1.516)	(1.531)	(1.830)	(1.512)	(1.520)
After E BHC	-0.049	-0.062	-0.216			
	(-0.368)	(-0.473)	(-1.064)			
After E BHC Sec20				1.634**	1.622**	1.072*
				(2.390)	(2.396)	(1.934)
After E BHC NonSec20				-0.160	-0.174	-0.316
				(-1.293)	(-1.404)	(-1.593)
After E SIC61	-0.157	-0.157	-0.230	-0.157	-0.157	-0.230
	(-1.216)	(-1.221)	(-1.092)	(-1.216)	(-1.221)	(-1.091)
After E SIC63	-0.153	-0.155	-0.318	-0.153	-0.156	-0.317
	(-1.224)	(-1.247)	(-1.595)	(-1.224)	(-1.247)	(-1.588)
After E SIC64	-0.131	-0.143	-0.267	-0.131	-0.144	-0.271
	(-0.919)	(-1.008)	(-1.237)	(-0.918)	(-1.010)	(-1.251)
After E SIC65	-0.223*	-0.215*	-0.323*	-0.223*	-0.214*	-0.329*
	(-1.830)	(-1.765)	(-1.737)	(-1.830)	(-1.763)	(-1.770)
After E SIC67	-0.223*	-0.241**	-0.334*	-0.223*	-0.241**	-0.339*
	(-1.830)	(-1.967)	(-1.774)	(-1.830)	(-1.971)	(-1.797)
Ln TA		0.063**	0.087***		0.065**	0.092***
		(2.135)	(2.598)		(2.439)	(2.914)
Other Control Variables	No	No	Yes	No	No	Yes
Num Observations	2,576	1,680	986	2,576	1,680	986
R-squared	0.036	0.042	0.064	0.204	0.210	0.233

Panel B: Annual Total Operational Loss

	(1)	(2)	(3)	(4)	(5)	(6)
After	0.148	0.073	0.106	0.148	0.072	0.104
	(0.738)	(0.384)	(0.380)	(0.737)	(0.379)	(0.372)
After E BHC	0.111	0.086	0.037			
	(0.531)	(0.414)	(0.128)			
After E BHC Sec20				1.738***	1.715***	1.647***
				(3.286)	(3.252)	(2.767)
After E BHC NonSec20				0.004	-0.022	-0.088
				(0.018)	(-0.107)	(-0.306)
After E SIC61	-0.073	-0.075	-0.107	-0.073	-0.075	-0.107
	(-0.348)	(-0.364)	(-0.363)	(-0.348)	(-0.364)	(-0.364)
After E SIC63	0.010	0.006	-0.166	0.010	0.006	-0.165
	(0.046)	(0.025)	(-0.522)	(0.046)	(0.024)	(-0.519)
After E SIC64	0.466	0.441	0.524	0.466	0.441	0.519
	(0.916)	(0.873)	(0.796)	(0.916)	(0.873)	(0.789)
After E SIC65	-0.148	-0.132	-0.217	-0.148	-0.131	-0.225
	(-0.738)	(-0.671)	(-0.793)	(-0.737)	(-0.670)	(-0.824)
After E SIC67	-0.152	-0.185	-0.245	-0.152	-0.186	-0.251
	(-0.757)	(-0.922)	(-0.901)	(-0.757)	(-0.924)	(-0.924)
Ln TA		0.123***	0.199***		0.124***	0.205***
		(3.131)	(2.764)		(3.240)	(2.987)
Other Control Variables	No	No	Yes	No	No	Yes
Num Observations	2,576	1,680	986	2,576	1,680	986
R-squared	0.041	0.051	0.063	0.111	0.122	0.142

Panel C: Annual Average Operational Loss per Event

	(1)	(2)	(3)	(4)	(5)	(6)
After	0.104	0.035	0.049	0.104	0.035	0.047
	(0.554)	(0.200)	(0.195)	(0.554)	(0.196)	(0.188)
After E BHC	0.127	0.104	0.084			
	(0.653)	(0.539)	(0.320)			
After E BHC Sec20				1.451***	1.430***	1.462***
				(2.993)	(2.946)	(2.657)
After E BHC NonSec20				0.040	0.016	-0.023
				(0.206)	(0.086)	(-0.089)
After E SIC61	-0.040	-0.042	-0.061	-0.040	-0.042	-0.061
	(-0.205)	(-0.219)	(-0.231)	(-0.205)	(-0.219)	(-0.232)
After E SIC63	0.041	0.037	-0.108	0.041	0.036	-0.107
	(0.191)	(0.172)	(-0.371)	(0.190)	(0.172)	(-0.369)
After E SIC64	0.498	0.475	0.585	0.498	0.475	0.580
	(1.011)	(0.972)	(0.924)	(1.011)	(0.971)	(0.917)
After E SIC65	-0.104	-0.088	-0.156	-0.104	-0.088	-0.163
	(-0.554)	(-0.485)	(-0.631)	(-0.554)	(-0.484)	(-0.660)
After E SIC67	-0.108	-0.137	-0.182	-0.108	-0.138	-0.187
	(-0.574)	(-0.732)	(-0.742)	(-0.574)	(-0.734)	(-0.764)
Ln TA		0.112***	0.180***		0.113***	0.186***
		(2.966)	(2.681)		(3.025)	(2.871)
Other Control Variables	No	No	Yes	No	No	Yes
Num Observations	2,576	1,680	986	2,576	1,680	986
R-squared	0.038	0.047	0.060	0.090	0.100	0.124

Table 6: Difference-in-Differences Analysis with Banking and Nonbanking Events for Growth-Matched BHCs

This table presents the results for banking and nonbanking operational risk events separately. The dependent variables are annual operational risk event frequency (Count) in Panel A, annual total loss (Total Loss) in Panel B, and annual average loss per event (Avg Loss) in Panel C. The second and third variables are in logarithms. We use matched samples in which Section 20 subsidiary holders are matched by asset growth with other BHCs for banking events and with nonbanking for nonbanking events. For each operational risk measure, Models (1), (2), and (3) present the results for banking events and Models (4), (5), and (6) present the results for nonbanking events. Data are averaged over the 1994-1996 (prederegulation) and 2000-2002 (postderegulation) sample periods. All models include bank/firm level fixed effects, which subsume the effect of the state, time treatment and control group dummies. t -statistics reported in parentheses are based on robust standard errors at the bank holding company or firm level. Superscripts ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels. The coefficients of control variables are omitted due to space limitations; complete results can be found in the Appendix C Table C4.

Panel A: Annual Operational Risk Event Frequency

	Banking Events			Nonbanking Events		
	(1)	(2)	(3)	(4)	(5)	(6)
After	0.035*	-0.107	-0.341*	0.093**	-0.332	-0.719
	(1.692)	(-1.211)	(-1.853)	(2.052)	(-1.229)	(-1.499)
After \hat{E} BHC Sec20	0.724***	0.736***	0.871***	0.630*	0.846**	1.159*
	(3.154)	(3.221)	(2.994)	(1.996)	(2.090)	(1.815)
Ln TA		0.173*	0.256**		0.290	0.627*
		(1.700)	(2.078)		(1.454)	(1.724)
Other Control Variables	No	No	Yes	No	No	Yes
Num Observations	130	130	90	72	72	62
R-squared	0.376	0.398	0.482	0.239	0.271	0.332

Panel B: Annual Total Operational Loss

	Banking Events			Nonbanking Events		
	(1)	(2)	(3)	(4)	(5)	(6)
After	0.070	-0.176	-0.624	0.387*	-0.303	-0.855
	(0.489)	(-0.717)	(-1.524)	(1.766)	(-0.486)	(-0.860)
After \hat{E} BHC Sec20	1.894***	1.915***	2.325***	1.065*	1.416*	1.759
	(4.123)	(4.207)	(5.064)	(1.798)	(1.982)	(1.683)
Ln TA		0.299	0.401		0.472	0.979
		(1.364)	(1.291)		(1.073)	(1.366)
Other Control Variables	No	No	Yes	No	No	Yes
Num Observations	130	130	90	72	72	62
R-squared	0.402	0.413	0.527	0.274	0.297	0.348

Panel C: Annual Average Operational Loss per Event

	Banking Events			Nonbanking Events		
	(1)	(2)	(3)	(4)	(5)	(6)
After	0.075	-0.128	-0.502	0.387*	-0.159	-0.563
	(0.529)	(-0.534)	(-1.244)	(1.804)	(-0.280)	(-0.633)
After \hat{E} BHC Sec20	1.757***	1.774***	2.131***	0.888	1.165*	1.393
	(4.044)	(4.094)	(4.784)	(1.683)	(1.889)	(1.524)
Ln TA		0.246	0.327		0.373	0.763
		(1.183)	(1.126)		(0.952)	(1.222)
Other Control Variables	No	No	Yes	No	No	Yes
Num Observations	130	130	90	72	72	62
R-squared	0.387	0.395	0.503	0.273	0.291	0.335

Table 7: Difference-in-Differences Analysis: Performance Measures

This table presents our results for performance measures. The dependent variables are metrics of performance: return on assets, standard deviation of return on assets, Z-score, and market-to-book ratio. Panel A contains the results from our main regressions that use the 1994–1996 (pre-deregulation) and 2000–2002 (post-deregulation) sample periods; all data are averaged over the 1994–1996 (pre-deregulation) and 2000–2002 (post-deregulation) sample periods. Panel B presents the estimation results that use the samples from 2000–2002 vs. 2003–2005 to construct the *Before* and *After* periods; all data are averaged over the 2000–2002 and 2003–2005 sample periods. All models include bank-level fixed effects, which subsume the effect of the stand-alone treatment and control group dummies. *t*-statistics reported in parentheses are based on robust standard errors clustered at the bank holding company level. Superscripts ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels.

Panel A: Main Regressions with the 1994–1996 (Pre-Deregulation) and 2000–2002 (Post-Deregulation) Periods

	Return on Assets		Standard Deviation of Return on Assets		Z-Score		Market-to-Book Ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>After</i>	-0.050 (-1.194)	-0.048 (-1.161)	-0.005 (-0.258)	-0.003 (-0.154)	0.017 (0.158)	0.001 (0.011)	0.133 (1.169)	0.127 (1.125)
<i>After</i> × <i>Pre-Diversified</i>	0.012 (0.404)		0.020 (1.353)		-0.016 (-0.176)		0.228*** (2.700)	
<i>After</i> × <i>Pre-Diversified Sec20</i>		-0.018 (-0.324)		-0.015 (-0.488)		0.223 (1.066)		0.324* (1.747)
<i>After</i> × <i>Pre-Diversified NonSec20</i>		0.018 (0.574)		0.027* (1.761)		-0.062 (-0.666)		0.210** (2.366)
<i>Ln TA</i>	-0.027 (-0.645)	-0.027 (-0.660)	-0.022 (-1.145)	-0.022 (-1.186)	0.021 (0.270)	0.024 (0.301)	0.002 (0.017)	0.003 (0.025)
<i>Cash-To-TA</i>	-0.383 (-1.038)	-0.348 (-0.961)	-0.138 (-0.562)	-0.098 (-0.405)	-0.720 (-0.574)	-1.000 (-0.757)	0.579 (0.501)	0.466 (0.401)
<i>Tier 1 Ratio</i>	2.257*** (3.821)	2.270*** (3.830)	0.859*** (2.966)	0.874*** (3.033)	1.990* (1.950)	1.891* (1.905)	-1.756 (-1.074)	-1.796 (-1.089)
<i>Excessive Growth</i>	0.018 (0.426)	0.016 (0.373)	-0.068*** (-2.935)	-0.071*** (-3.005)	0.298** (2.393)	0.314** (2.505)	-0.006 (-0.057)	-0.000 (-0.001)
<i>High Dividend</i>	0.190*** (3.756)	0.189*** (3.667)	0.073*** (3.330)	0.071*** (3.220)	-0.051 (-0.416)	-0.036 (-0.303)	0.237* (1.944)	0.243* (1.954)
Num Observations	412	412	408	408	408	408	412	412
R-squared	0.245	0.247	0.252	0.260	0.060	0.074	0.186	0.188

Panel B: DID Estimation with the 2000–2002 and 2003–2005 Periods

	Return on Assets		Standard Deviation of Return on Assets		Z-Score		Market-to-Book Ratio	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>After</i>	-0.064 (-1.529)	-0.063 (-1.526)	-0.005 (-0.278)	-0.005 (-0.282)	-0.152 (-0.892)	-0.151 (-0.885)	0.444*** (5.190)	0.445*** (5.219)
<i>After</i> × <i>Pre-Diversified</i>	0.005 (0.170)		-0.013 (-0.995)		0.091 (0.858)		-0.186** (-2.099)	
<i>After</i> × <i>Pre-Diversified Sec20</i>		-0.006 (-0.111)		0.009 (0.279)		-0.239 (-1.186)		-0.558*** (-3.339)
<i>After</i> × <i>Pre-Diversified NonSec20</i>		0.007 (0.245)		-0.017 (-1.320)		0.152 (1.365)		-0.118 (-1.314)
<i>Ln TA</i>	0.136 (1.550)	0.136 (1.547)	0.005 (0.125)	0.005 (0.131)	0.456 (1.115)	0.452 (1.108)	-0.259 (-1.042)	-0.261 (-1.065)
<i>Cash-To-TA</i>	0.622 (0.655)	0.625 (0.656)	-0.191 (-0.478)	-0.198 (-0.491)	1.215 (0.572)	1.315 (0.617)	0.118 (0.031)	0.222 (0.058)
<i>Tier 1 Ratio</i>	5.762*** (3.658)	5.783*** (3.601)	1.804*** (2.918)	1.764*** (2.828)	7.195* (1.948)	7.797** (2.101)	-9.933*** (-3.150)	-9.258*** (-3.339)
<i>Excessive Growth</i>	-0.001 (-0.014)	-0.001 (-0.019)	-0.014 (-0.667)	-0.014 (-0.636)	0.193 (1.282)	0.186 (1.230)	-0.215** (-1.974)	-0.223** (-2.062)
<i>High Dividend</i>	0.112* (1.743)	0.110* (1.698)	0.001 (0.038)	0.004 (0.138)	0.421* (1.895)	0.376* (1.749)	0.170 (1.443)	0.118 (0.992)
Num Observations	500	500	498	498	498	498	500	500
R-squared	0.258	0.258	0.133	0.136	0.082	0.094	0.221	0.241