Bank Profitability, Solvency and Risk in the Context of Stress Tests, Payout Policy and Bank Cost Structures

Ph.D. Thesis

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Introduction

Introduction

- Bank **Risk Mitigation** is an **important component of the financial stability** equation.
  - Excessive risk appetite threatens the safety and soundness of individual institutions as well as the stability of the entire financial sector (Srivastav and Hagendorff, 2016).
  - The Global Financial Crisis (GFC) is an example of the need to improve risk-governance mechanisms.
- Despite regulatory and supervisory efforts to improve risk practices and controls, **excessive risk-taking prevails**.
- Competition, the macroeconomic environment, market pressure, bank-specific factors, and business model characteristics can exacerbate excessive risks.

Introduction

- Bank Risk-taking, through various measures and interpretations, forms the basis of this thesis.
  - Explore profitability, solvency, risk-taking, and lending quality implications in the context of the (1) US supervisory stress-testing framework, (2) dividend payout policies, and (3) business model characteristics.
  - Aim to shed light on how fairly **recent developments** in the U.S. regulatory framework, financial system, and bank business models influence bank decision-making.
  - Ample **evidence of the role of bank-specific characteristics, regulatory developments, and macro-economic conditions** in overall economic resiliency.

Chapter 1

Supervisory Stress Tests and Bank Risk-Taking

with Dr. Germán López Espinosa

1. Supervisory Stress Tests and Bank Risk-Taking

Motivation

Financial Sector's Importance for Macroeconomic Stability

Social Costs of Large Bank Risk & Failures

Research Questions

1. US Stress Tests' Impact on Risk-taking and Solvency
2. Influence of Projected Capital Positions on Risk-taking and Solvency
3. Explanatory Power of Bank Characteristics for Stress Test Outcomes
4. Low Interest Rate Environments' Impact on Risk-Taking
5. Adjustment Channels for Higher Regulatory Capital Requirements

Findings

1. Less Risk-taking among ST Banks: Primarily among ex-ante safer, risk-averse, better capitalized banks.
2. BHCs with low-risk aversion and insufficient projected capital ratios remain relatively risky.
3. Some Bank characteristics can anticipate Stress Test Outcomes.
4. Low interest rates lead well-capitalized, ST banks to take on more risk.
5. Equity and risk-weighted asset reductions primary channels in achieving higher capital ratios; Asset Reductions among banks with projected capital shortfalls.

In the midst of the Global Financial Crisis, 13 of the 25 largest US institutions failed, required government assistance, merged or changed business structure to avoid failure (Gorton, 2015).

- Controversy over bank risk portfolios and capital adequacy
- Rising concerns that significant bank failures pose systemic risks to the market which could cripple the entire economy
- Unprecedented Federal Interventions:
  - Troubled Asset Relief Program (TARP): U.S. Department of the Treasury to buy up toxic assets & bank shares
  - $245.1B. in TARP assistance
- Unmasked urgent need for regulatory improvements:
  - Basel III Capital and Liquidity Framework
  - Heightened Supervisory oversight (**Stress Tests**)

Post-Crisis Prudential Regulation in the US: Stress Tests

▸ ST Banks ▸ ST Results

- Stress-testing provides a **mechanism** through which the **performance and viability** of large and systematically important **financial institutions** and the **resilience of the financial system** can be **assessed, reinforced, and communicated**.
  - Forward-looking assessment of the **potential impact** of various hypothetical **adverse macroeconomic scenarios** on the consolidated earnings, losses, and capital of banks over a set planning horizon
    1. Quantitative assessment of the impact of potential downturns on capital and lending
    2. Qualitative assessment of risk management and payout strategies
- Aggressive regulatory response to substantial market concerns during the crisis:
  - Tie results to specific actions
  - Limit supervisory discretion and enhance the credibility of the supervisory regime

SCAP	CCAR	DFAST
2009 TARP	2011 – Capital Plan Rule	2013 – Dodd-Frank Act

Focus on the ST Designation of Banks and Published Quantitative Results (Projected Capital Ratios)

Stress Tests in the Literature

- **Implications & Proposals of Stress Test Model Design, Implementation, & Governance** (Hirtle et al., 2016; Guerrieri and Welch, 2012; Kupiec et al., 2017; Greenwood et al., 2017; Bolotnyy et al., 2014)
- **Debate on the Effectiveness, Costs, & Consequences of Stress Tests** (Hirtle et al., 2009; Schuermann, 2016; Gallardo et al., 2016; Goldstein and Sapra, 2014)
- **Financial Variable & Balance Sheet Effects of Stress Tests**
  - Market Reactions around Stress Test Announcements & Result Disclosures (Morgan et al., 2010; Glasserman and Wang, 2011; Petrella and Resti, 2013; Morgan et al., 2014; Candelon and Sy, 2015; Fernandes, 2015; Igan and Pinheiro, 2015; Gerhardt and Vander Vennet, 2016; Flannery et al., 2017; Bird et al., 2018)
  - Balance Sheet Adjustments to Artificially Increase Capital Ratios (Shahhosseini, 2014; Acharya, Pedersen, Philippon and Richardson, 2017; Lambertini and Mukherjee, 2016; Mésonnier and Monks, 2014; Eber and Minoiu, 2016; Gropp et al., 2016)
  - Lending and Credit Implications of Stress Tests (Eber and Minoiu, 2016; Gropp et al., 2016; Covas, 2018; Mésonnier and Monks, 2014; Fernandes, 2015; Lambertini and Mukherjee, 2016)
  - Risk-Taking and Solvency Implications (Largely Overlooked)

Empirical Studies: Risk-Taking and Solvency Implications of Stress Tests

- Mega-banks have not reduced risk-taking (Ignatowski and Korte, 2014)
- Banks remain quite risky despite strict prudential capital requirements. (Acharya et al., 2014)
- Bank risk is statistically lower for ST Banks (reduced credit supply to relatively risky borrowers). Most of the risk reductions are for safer banks (Acharya et al., 2018)
- Stress test disclosures have a negative effect on systematic and/or systemic risk via reduced Market volatility of adequately capitalized banks (Neretina et al., 2015)

Theoretical Background: Risk-Taking and Capital Regulation

- Capital Adequacy Regulation reduces risk-taking incentives (Furlong and Keeley, 1989; Berger and Bouwman, 2013)
- Capital Adequacy Regulation exhibits effects opposite to those intended by regulators (Kahane, 1977; Koehn and Santomero, 1980; Kim and Santomero, 1988; Rochet, 1992; Shrieves and Dahl, 1992; Besanko and Kanatas, 1993; Boot and Greenbaum, 1992; Blum, 1999)
- U-shaped relationship between capital and risk-taking (Calem and Rob, 1999; Park, 1996)

Hypotheses

ST effects on Solvency and Risk-Taking are conditional on ex-ante risk preferences and capital positions.

H1: Ex-ante safer & risk-averse banks are more likely to reduce future risk-taking

- ☐ Ex-ante safer, riks-averse banks prefer lower leverage and asset risk and high capital (Kim and Santomero, 1988).
- ☐ Because regulatory capital ratios are based on the amount of risk-weighted assets, safer banks would prefer to reduce the amount of risky assets than to raise equity.

H2: ST banks with higher projected capital levels more likely to reduce risk-taking

- ☐ Safer banks with sufficient capital positions, have substantially more to lose in the event of default.
- ☐ Higher capital ratios raise banks' charter values via a reduction in leverage, which may also encourage reduced risk-taking.
  - Risk-taking could increase among well-capitalized banks if charter values are not at risk.

1. Supervisory Stress Tests and Bank Risk-Taking

Data Sample

1994 - 2016 (Stress Test Horizon Emphasis: 2009–2016)

116,943 Obs. for 3,489 BHCs (26 BHCs subject to Stress Tests)

Bank Holding Company Data

Commercial Banks and Bank Holding Company Regulatory Database

- The Federal Reserve Bank of Chicago
- Quarterly Regulatory Reports (FR Y-9C)

Stress Test Data

Annual CCAR Result Disclosures

- The Federal Reserve Bank of Chicago
- Available Data on 26/33 ST-Participating BHCs

Macroeconomic & Recapitalization Data

FRED Dataset - Federal Reserve Bank of St. Louis

Monthly Reports to Congress - US Department of Treasury

Dependent Variables

ZScore_F3Y[1]	Future Solvency (Financial Soundness)
σ ROA_F3Y[1]	Future Risk-Taking

Variables of Interest

CCAR	Bank subject to CCAR
FedST	Bank subject to SCAP and CCAR
Buffer[2]	Capital Position
Pass[2]	Favorable Stress Test Result
ZScore_L3Y[1]	Past Financial Soundness
σ ROA_L3Y[1]	Past Risk-Taking

Interaction Effects

ZScore_L3Y[1] $\times$ ST[2]	σ ROA_L3Y[1] $\times$ ST[2]
ZScore_L3Y[1] $\times$ Buffer[2]	σ ROA_L3Y[1] $\times$ Buffer[2]
ZScore_L3Y[1] $\times$ Pass[2]	σ ROA_L3Y[1] $\times$ Pass[2]

Bank Controls

Size	Relative Size
ETA	Capitalization
LTA	Specialization
LLPTA	Level of Loss Provisions
NPLLTL	Credit Quality
STWSFTA	Liquidity
ROA	Profitability
MSTA	Market Risk
Recap	Recapitalization
NPLLTL_Chg	Quality Change

Macroeconomic Controls

UNRATE	UnemploymentRate
GDP_Growth	GDP Growth Rate
VIXCLS	Market Volatility

1 Alternative 5-year rolling window specification also considered.

$$ZScore\_FXY = \ln \frac{ETA_{q=X} + \mu ROA\_FXY}{\sigma ROA\_FXY}$$

1. Supervisory Stress Tests and Bank Risk-Taking

Stress Tests and Risk-Taking

1. Analyze differences in Future Risk-Taking among ST and Non-ST BHCs.
2. Analyze differences in Future Risk-taking among ST BHCs with ex-ante high risk-tolerance.

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$
\begin{aligned}
Future \quad Risk - Taking &= \alpha + \beta_1 Past \quad Risk - Taking + \beta_2 Stress \quad Test \quad Dummy + \beta_3 Past \quad Risk - Taking \\
&\times \quad Stress \quad Test \quad Dummy + \gamma Bank \quad Controls + \delta Macroeconomic \quad Controls + \eta_i + \upsilon_q + \epsilon_{iq}
\end{aligned}
$$

Data

1996 - 2016
100,945 Observations
3,349 BHCs

Variables

Risk-Taking: σ ROA_F(L)3Y & σ ROA_F(L)5Y
Stress Test Dummy: CCAR $(2011 - 2016)$ & FedST $(2009 - 2016)$

Results

1. Lower Future Risk-Taking among ST BHCs ($\beta_2 < 0$)
2. But, Higher Future Risk-Taking among ST BHCs with Ex-ante High Risk Preferences ($\beta_3 > 0$)

Stress Tests and Risk-Taking

	CCAR Exercises			SCAP and CCAR Exercises		
	All Banks	Listed	Non-listed	All Banks	Listed	Non-listed
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y
σROA_L3Y	-0.066	-0.142*	-0.058	-0.066	-0.144*	-0.058
	(-1.098)	(-1.850)	(-1.164)	(-1.094)	(-1.845)	(-1.165)
σROA_L3Y $\times$ CCAR	0.177***	0.204**	0.209***			
	(3.121)	(2.604)	(3.386)			
CCAR	-0.001**	-0.001**	-0.001			
	(-2.401)	(-2.452)	(-1.637)			
σROA_L3Y $\times$ FedST				0.090*	0.118*	0.098
				(1.822)	(1.705)	(1.249)
FedST				-0.001***	-0.002***	-0.001
				(-2.928)	(-3.083)	(-1.425)
Constant	-0.006	-0.007	-0.005	-0.006	-0.007*	-0.005
	(-1.592)	(-1.653)	(-1.636)	(-1.604)	(-1.681)	(-1.636)
R^2	0.144	0.164	0.129	0.145	0.166	0.129
Observations	100,945	31,911	69,034	100,945	31,911	69,034
Number of groups	3,349	1,055	2,716	3,349	1,055	2,716
FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Stress Tests and Risk-Taking

- Stress Tests → Reduced risk-taking,
  - In line with reduced risk in the presence of stress tests (Acharya et al., 2018; Shahhosseini, 2014); and the inverse relation between capital requirements and risk-taking (Furlong and Keeley, 1989; Berger and Bouwman, 2013).
  - Likely due to (1) more stringent supervisory & payout **restrictions** and more comprehensive **monitoring**; and (2) **Market discipline** (Result Publications reduce opaqueness)
- But, despite the overall reduction in risk-taking among ST banks, **ex-ante risk-tolerant banks** have significantly **higher future risk-taking**
  - In line with positive impact among safer banks (Acharya et al., 2018; Ignatowski and Korte, 2014); and the inverse relation between capital regulation and bank risk-taking (Flannery, 1989; Kahane, 1977; Koehn and Santomero, 1980; Kim and Santomero, 1988; Rochet, 1992; Shrieves and Dahl, 1992).
  - Likely due to **Strong ex-ante preferences**. Risk-tolerant banks favor high leverage (low capital) and high asset risk. Increased capital requirements → increase in asset risk (to reach preferred risk thresholds).

Does the Interest Rate Environment Influence Bank Risk-Taking?

Do monetary policy environments influence risk-taking?

Does this relation differ based on the stress test designation and the stress exercises' outcomes?

Dynamic panel model with Driscoll and Kraay robust standard errors

$$\begin{aligned} Future \quad Risk - Taking = \alpha + \beta_1 Past \quad Risk - Taking + \beta_2 Fedfunds(Chg) + \beta_3 ST * FedFunds(Chg) \\ + \beta_4 ST + \gamma Bank \quad Controls + \delta Macroeconomic \quad Controls + \epsilon_{iq} \end{aligned}$$

Data

Full Sample (1996 - 2016): 100,945 Obs.
ST Sample (2009 - 2016): 453 Obs.

Variables

FedFunds: US Federal Funds Rate.
FedFundsChg: Δ US Federal Funds Rate.
ST: CCAR or FedST (1) Dummy; (2) Buffer; (3) Pass.

Results

Higher Future Risk-Taking among ST BHCs in Low-interest-rate Environments ($\beta_3 < 0$)

Higher Future Risk-Taking among well-capitalized ST BHCs in Low-interest-rate Environments ($\beta_3 < 0$)

Interest Rate Implications

Risk-Taking and Interest Rates

	CCAR Exercises			SCAP and CCAR Exercises		
	CCAR	Buffer	Pass	FedST	Buffer	Pass
VARIABLES	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y
σROA_L3Y	-0.058	0.108***	0.100***	-0.058	0.058***	0.052**
	(-1.012)	(3.690)	(3.587)	(-1.013)	(2.603)	(2.314)
FedFunds	0.000**	-0.001	0.006**	0.000**	-0.001	-0.000
	(2.397)	(-1.581)	(2.257)	(2.404)	(-1.596)	(-0.107)
FedFunds × ST	-0.001**			-0.001*		
	(-1.995)			(-1.717)		
ST	-0.001**			-0.001***		
	(-2.141)			(-3.013)		
FedFunds × Buffer		-0.000			0.000	
		(-0.290)			(0.386)	
Buffer		-0.000*			-0.000*	
		(-1.867)			(-1.694)	
FedFunds × Pass			-0.007**			-0.000
			(-2.476)			(-0.136)
Pass			0.000			-0.000
			(0.578)			(-0.874)
Constant	-0.012**	-0.060***	-0.046***	-0.012**	-0.035***	-0.032***
	(-2.467)	(-7.550)	(-5.767)	(-2.478)	(-6.184)	(-5.593)
R^2	0.168	0.397	0.455	0.168	0.535	0.540
Observations	100,945	387	387	100,945	453	453
FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Interest Rate Implications

- Empirical Evidence: **Banks** are willing to **take on more risk when interest rates are low** to offset NIM reductions (Delis and Kouretas, 2011; Altunbas et al., 2012; Maddaloni and Peydró, 2011).
- Banks subject to stress tests exhibit higher future risk-taking when interest rates are low.
  - Under CCAR, **safer, well-capitalized banks** are **more likely to respond to low-interest rates by increasing risk-taking**.
  - Likely due to implicit bailout guarantees for the ST designation.
- Small changes in interest rates are associated with higher risk-taking across safer and generally better capitalized ST Banks.
  - $\beta_3 < 0$: FedFunds_Chg $\times$ Buffer & FedFunds_Chg $\times$ Pass.

▸ Result: FedFundsChg

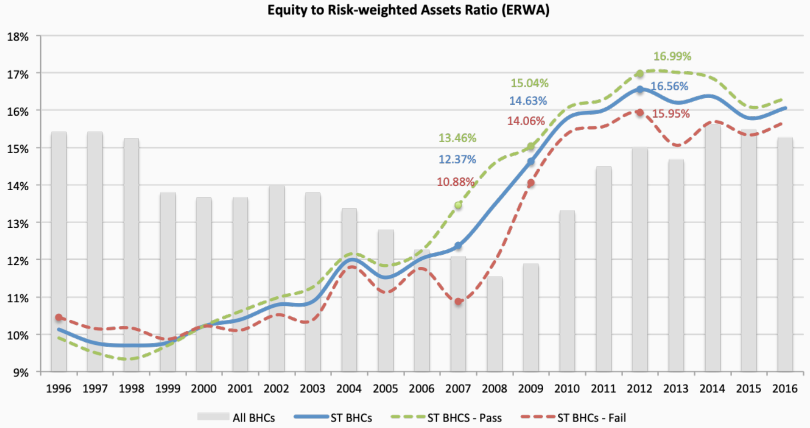
Can Stress Test Results & Capital Buffers be Predicted?

CCAR Pass Dummy		FedST Pass Dummy	
-	**Specialization** (LTA)	-	**Loan Quality** (NPLLTL)
-	**Liquidity** Exposure (STWSF_TA)	-	**Liquidity** Exposure (STWSF_TA)
-	**Market Risk** (MSTA)	-	**Recapitalization**

CCAR & FedST Projected Capital Buffer

+	**Risk-Taking**	-	**Size**
+	**Solvency**	-	**Specialization**(LTA)
+	**Leverage** (ETA)	-	**Credit Quality**(NPLLTL)
+	**Profitability** (ROA)	-	**Liquidity** (STWSF_TA)
+	**Provisions** (LLPTA)	-	**Market Risk**(MSTA)

1. Supervisory Stress Tests and Bank Risk-Taking



- ☐ Post-crisis rise in capital ratios, especially among ST BHCs
  - Primarily met through ↓**RWA** and ↑**Equity**
  - But, different adjustment channels among ST banks.

▸ Chart ▸ Chart (Failed)

1. Supervisory Stress Tests and Bank Risk-Taking

- While largely **successful** in improving the overall health of the US Financial System, Federal Reserve **Stress Tests have not fully mitigated risk-taking among ex-ante risk-tolerant banks with poor projected capital levels.**
  - The **positive effects of stress tests on bank solvency** are primarily **driven by the safest banks**, but **low-interest rate environments** have **forced** these **relatively safe banks to engage in more risk-taking** to make up for NIM reductions.
- Several bank characteristics foresee stress test outcomes.
- First empirical evaluation of how bank risk-taking and solvency evolve in the context of:
  - Stress-test designation and results
  - Monetary environment
  - Adjustment Channels to higher capital requirements
- Empirical Contribution to the literature on bank risk-taking, stress tests, capital regulation, and post-crisis reforms.

Chapter 2

The Puzzle of Dividend Payouts

with Dr. Germán López Espinosa & Dr. Andrés Mesa Toro

2. The Puzzle of Dividend Payouts

Motivation

- ☐ Strong impact of Dividends on Bank Soundness
- ☐ Moral Hazard Implications of Dividend Policy in Highly Leveraged Industry
- ☐ The role of Regulators & Creditors as important stakeholders

Research Questions

- ☐ Payout Policy Effects on future (1) Profitability, (2) Solvency, and (3) Risk-taking
- ☐ Attempt to answer whether dividend decisions are based on firm-specific expectations.
- ☐ Sample of US BHCs, CBs, & CUs (1998-2017)

Findings

- ☐ **Banks**: Risk-shifting and Increased Information Asymmetry
  –Payouts and Performance Expectations Misalignment ← Managerial Overoptimism;
  –Dividend Change Avoidance ← Market Discipline
- ☐ **Credit Unions**:
  –Payout policy more reactive to and in line with expected future performance ← Signalling

Dividends in Banks: A Historical Overview

- Banking sector among the industries with largest dividend ratios (Dickens et al., 2002; Guntay et al., 2015).
  - In 2000, **92% of US banks paid dividends** compared with only 49% of non-financial firms (Dickens et al., 2002; Forti and Schiozer, 2015).
  - In the 15 years preceding the financial crisis, banks paid dividends **4× more often** than industrial firms and **33% more frequent** than non-bank financial firms (Guntay et al., 2015).
  - During the same period, banks continuously increased dividends: **3 to 4× higher** and **35% to 50% more frequent** than industrial firms and non-bank financial firms. (Guntay et al., 2015).
- Reluctance to cut dividends (Lintner, 1956)
- **Strong market reactions** to dividend decreases and omissions (Pettit, 1972).

Dividends in Banks: Post-Crisis Scrutiny

- **Drained capital** from the banking system in a time of extreme stress (Hirtle, 2014)
  - Severe **impact** on the soundness of the **financial system** (Acharya, Le and Shin, 2017; Rosengren, 2010; Scharfstein and Stein, 2008).
- **Continued payouts despite poor performance and capital levels**
  - Largest 21 banks distributed $130B. in dividends (Acharya and Richardson, 2009) → **excessive leverage, inadequate capital ratios, and risk-shifting** (Srivastav et al., 2014; Acharya et al., 2014).
  - Accounted for > 50% of TARP funds through 2008 (Acharya and Richardson, 2009).
  - Safe(r) assets sell-off to accommodate dividend distributions → increased proportion of riskier assets (Acharya et al., 2011)

Dividends in Banks: Post-Crisis Regulatory Response

- Regulations and Supervisory Programs to **limit capital distributions** for **under-capitalized and risky banks** (Caruana, 2014).
  - Basel III's capital conservation buffer
  - Federal Reserve's Comprehensive Capital Analysis and Review (CCAR).
- Introduction of **RWA capital adequacy requirements** to mitigate risk-shifting (Acharya et al., 2011; Kanas, 2013; Onali, 2014).
  - **Forces banks to internalize excessive risk-taking**.

Dividends: Institutional Differences

Dividends in Banks

- **Shareholders entitled to dividends** regardless of deposit holdings.
- **Depositors entitled to interest** regardless of share holdings
- **Clear distinction** between shareholders and debt-holders.
  - **Debt-to-Equity Priority** in Liquidation
  - **"Moral Hazard"** Implications: Risk-Shifting to (1) avoid adverse market reactions and (2) protect managerial remuneration interests.

Dividends in Credit Unions

- **Dividends are the Interest rate paid on deposits**, but **not all deposits are entitled** to a dividend (Gómez-Biscarri et al., 2020).
- **Debt-holders are also shareholders.**
  - Each account is entitled to one share and one voting right.
- **Intertwined** interests of debt-holders and shareholders.
  - **Moral hazard implications and Adverse Signalling Incentives should be lower**

Bank Dividend Policy in the Literature

- Increased Regulatory Relevance and Oversight of Dividend Payout Policy (FRB, 2011; BCBS, 2011)
- Distinctive nature and characteristics of payout policy in Banking (Acharya et al., 2011; Floyd et al., 2015)
- Factors that influence dividend decisions (Abreu and Gulamhussen, 2013; Hirtle, 2014)
- Dividend Decisions in Periods of Crisis. (Oliveira, 2015; Hoshi and Kashyap, 2004; Forti and Schiozer, 2015)
- Managerial incentives behind dividend payout decisions.
    - **Signaling Power and Risk-Shifting**

Determinants of Dividend Policy: Signalling Hypothesis

- **Arises from Information gaps** between managers and investors (Bhattacharya, 1979; Miller and Rock, 1985)
  - In a world of asymmetric information, better-informed insiders use the **dividend policy as a signal** to convey **future prospects** to less informed outsiders such that a dividend increase (decrease) conveys managerial optimism (pessimism) about a firm's future prospects.
- Extensively analyzed (Brealey et al., 1977; Ross, 1977; Forti and Schiozer, 2015; Bessler and Nohel, 1996, 2000; Filbeck and Mullineaux, 1993; Collins et al., 1995; Boldin and Leggett, 1995; Kauko, 2012; Abreu and Gulamhussen, 2013; Huang and Ratnovski, 2011; Oliveira, 2015)
  - Positive association between **dividend changes** and **share prices**.
  - High **Sensitivity** to Dividend Changes Among **Institutional Investors** and/or in periods of **crises**.

Determinants of Dividend Policy: Risk-Shifting Hypothesis

- **Arises from Bondholder-Shareholder Conflicts**.
  - Limited Liability Protection for Shareholders lead to wealth transfers from creditors (Jensen and Meckling, 1976)
- **Particularly Strong Risk-shifting Incentives in Banking**
  - Due to government guarantees and asset opaqueness (Becht et al., 2011)
  - **Lower Risk-Shifting Incentives** and Higher Probability of Dividend Reductions **among CEOs with higher inside debt-to-equity** proportions. (Srivastav et al., 2014)
  - Higher Risk in Banks $\longrightarrow$ Larger Dividend Payouts (Onali, 2014)
  - Positive relation between payout ratios and risk of default (Kanas, 2013)

Data Sample

1994 – 2017

27,602 Top-Holder BHC Obs. (8,311 Listed); 44,883 CB Obs. (337 Listed) & 43,481 CU Obs.

Exclude Net Income < 0; Dividend-to-Income > 100%.

Bank Holding Company & Commercial Bank Data

Commercial Banks and Bank Holding Company Regulatory Database

- The Federal Reserve Bank of Chicago
- Quarterly Regulatory Reports (FR Y-9C)

Credit Union Data

Quarterly Call Reports – National Credit Unions Administration (NCUA)

Excludes TA < \$50M[1]

Macroeconomic & Recapitalization Data

FRED Dataset – Federal Reserve Bank of St. Louis

Monthly Reports to Congress – US Department of Treasury.

[1] Inconsistent Reporting Frequency: Prior to 2002Q3 only CUs with TA > \$50M reported on a quarterly basis, smaller CUs reported semiannually.

2. The Puzzle of Dividend Payouts

Dependent Variables

μ ROA_FXY[1]	Future Profitability
σ ROA_FXY[1]	Future Risk-Taking
ZScore_FXY[1]	Future Solvency

Variables of Interest

DivNI	Dividend-to-Net Income Ratio
DPS_%Chg	DPS Change
DivNI_%Chg	Payout Ratio Change
Div_Init	Dividend Initiations
μ ROA_LXY[1]	Past Profitability
σ ROA_LXY[1]	Past Risk-Taking
ZScore_LXY[1]	Past Solvency

[1] Considers 3-Year and 5-Year rolling windows

Bank Controls

Size	Relative Size
ETA	Capitalization
LTA	Specialization
LLPTA	Level of Loss Provisions
NPLLTL	Credit Quality
STWSFTA	Liquidity
ROA	Profitability
MSTA	Market Risk
Recap	Recapitalization
TCBuffer	Regulatory Capital Position
Loans_Chg	Loans Growth

Macroeconomic Controls

UNRATE	Unemployment Rate
GDP_Growth	GDP Growth Rate
VIXCLS	Market Volatility
TB3MS	Risk-Free Rate

Dividends and Profitability

Examine the relation between dividend-to-income ratios (DivNI) and profitability (μROA) among top-holder BHCs, CBs, and CUs

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future \quad Profitability_{it} = \alpha + \beta_1 Past \quad Profitability_{it-1} + \beta_2 Dividend \quad Ratio_{it-1}$$
$$+\gamma' Bank \quad Controls_{it-1} + \delta' Macroeconomic \quad Controls_{t-1} + \epsilon_{it}$$

Data

1996 - 2017
16,713 BHC Obs. (5,287 Listed)
24,461 CB Obs. (255 Listed)
31,014 CU Obs.

Variables

Profitability: μROA_F(L)3Y & μROA_F(L)5Y
DivNI Ratio: In Banks, Dividends Declared to Net Income; In CUs Dividend expenses for ordinary shares (or share certificates) to Net Income

Results

Negative relation between dividend ratios and future profitability among Banks ($\beta_2 < 0$).
Higher β_2 for Listed Banks.

Positive relation between dividend ratios and future profitability among CUs ($\beta_2 > 0$).
Higher β_2 than in BHCs.

Dividend Ratios and Future Profitability

VARIABLES	μROA_F3Y	μROA_F5Y	μROA_F3Y	μROA_F5Y
Controls	Yes	Yes	Yes	Yes
Bank Holding Companies	**Listed**		**Non-Listed**	
DivNI	-0.001**	-0.001***	-0.000**	-0.000***
	(-2.806)	(-4.441)	(-2.889)	(-3.303)
Constant	0.023**	0.017**	0.023***	0.019***
	(2.300)	(2.461)	(3.107)	(3.493)
R^2	0.389	0.333	0.354	0.290
Observations	5,287	5,287	11,426	11,426
Commercial Banks	**Listed**		**Non-Listed**	
DivNI	-0.001	-0.004***	-0.000**	-0.000***
	(-0.349)	(-4.231)	(-2.611)	(-3.017)
Constant	0.012*	0.003	0.014***	0.013***
	(2.067)	(0.793)	(4.204)	(5.018)
R^2	0.574	0.556	0.175	0.153
Observations	255	255	24,206	24,206
Credit Unions	**Regular Shares**		**Share Certificates**	
DivNI	0.003***	0.002***	0.001**	-0.000
	(9.435)	(11.207)	(2.344)	(-0.262)
Constant	0.017**	0.012**	0.032***	0.030***
	(2.659)	(2.731)	(3.240)	(4.133)
R^2	0.383	0.338	0.444	0.501
Observations	32,014	32,014	30,178	30,179

- ☐ **Higher dividends** $\leftrightarrow$ **lower future profitability** in Banks.
- ☐ Stronger in listed banks.
- ☐ Exacerbate **Information asymmetry**.
- ☐ Due to Managerial over-optimism; market discipline; risk-shifting.
- ☐ **In CUs: Dividends as a Signalling Mechanism**

Dividends and Risk-Taking

Analyze the relation between dividend ratios and risk-taking, measured as the volatility of ROA (σROA_FXY) for top-holder US BHCs, CBs, and CUs

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future \quad Risk - Taking_{it} = \alpha + \beta_1 Past \quad Risk - Taking_{it-1} + \beta_2 Dividend \quad Ratio_{it-1}$$
$$+\gamma' Bank \quad Controls_{it-1} + \delta' Macroeconomic \quad Controls_{t-1} + \epsilon_{it}$$

Data

1996 - 2017
16,545 BHC Obs. (5,214 Listed)
23,938 CB Obs. (246 Listed)
31,945 CU Obs.

Variables

Risk-Taking: σROA_F(L)3Y & σROA_F(L)5Y
DivNI Ratio: In Banks, Dividends Declared to Net Income; In CUs Dividend expenses for ordinary shares (or share certificates) to Net Income.

Results

Positive relation between dividend ratios and risk-taking across both listed BHCs, CBs, and CUs ($\beta_2 > 0$).
Weaker β_2 among non-listed BHCs.

2. The Puzzle of Dividend Payouts

Dividend Ratios and Future Risk-Taking

VARIABLES	σROA_F3Y	σROA_F5Y	σROA_F3Y	σROA_F5Y
Controls	Yes	Yes	Yes	Yes
Bank Holding Companies	**Listed**		**Non-Listed**	
DivNI	0.001***	0.001***	0.000**	0.000
	(4.472)	(3.291)	(2.171)	(0.995)
Constant	-0.016*	-0.008*	-0.014***	-0.010***
	(-2.076)	(-1.788)	(-2.970)	(-3.051)
R^2	0.270	0.269	0.198	0.150
Observations	5,214	5,214	11,331	11,332
Commercial Banks	**Listed**		**Non-Listed**	
DivNI	0.003**	0.004***	0.000	-0.000
	(2.538)	(5.905)	(1.056)	(-0.158)
Constant	-0.010***	-0.001	-0.004*	-0.000
	(-3.579)	(-0.278)	(-1.796)	(-0.247)
R^2	0.304	0.323	0.0658	0.0657
Observations	246	246	23,692	23,692
Credit Unions	**Regular Shares**		**Share Certificates**	
DivNI	0.002***	0.002***	0.003***	0.002***
	(9.110)	(13.923)	(4.517)	(3.659)
Constant	-0.003	0.004**	0.012	0.022***
	(-1.327)	(2.403)	(1.568)	(3.345)
R^2	0.355	0.314	0.608	0.569
Observations	31,944	31,945	30,093	30,095

- **Higher dividend** ratios $\leftrightarrow$ **higher future risk-taking**.
- Strong **influence of market participants**. Investors require **risk-return premiums**.
- Managers consider **upward profit potential** of risk strategies.

Dividends and Solvency

Analyze the relation between dividend ratios and solvency, measured as the Distance to Default (ZScore_FXY) for top-holder US BHCs, CBs, and CUs

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future \quad Solvency_{it} = \alpha + \beta_1 Past \quad Solvency_{it-1} + \beta_2 Dividend \quad Ratio_{it-1}$$
$$+\gamma' Bank \quad Controls_{it-1} + \delta' Macroeconomic \quad Controls_{t-1} + \epsilon_{it}$$

Data

1996 - 2017
12,716 BHC Obs. (4,275 Listed);
16,576 CB Obs. (121 Listed);
26,868 CU Obs.

Variables

Solvency: ZScore_F(L)3Y & ZScore_F(L)5Y
DivNI Ratio: In Banks, Dividends Declared to Net Income; In CUs Dividend expenses for ordinary shares (or share certificates) to Net Income.

Results

Negative relation between dividend ratios (DivNI) and future solvency (Z-Score) for BHCs, CBs, & CUs ($\beta_2 < 0$). Largest β_2 among Listed CBs and CUs.

Dividend Ratios and Future Solvency

VARIABLES	ZScore_F3Y	ZScore_F5Y	ZScore_F3Y	ZScore_F5Y
Controls	Yes	Yes	Yes	Yes
Bank Holding Companies	Listed		Non-Listed	
DivNI	-0.687***	-0.076	-0.244**	-0.046
	(-3.612)	(-0.308)	(-2.585)	(-0.519)
Constant	11.640**	7.567***	12.289***	7.940***
	(2.837)	(3.097)	(3.742)	(3.372)
R^2	0.286	0.334	0.226	0.258
Observations	4,275	3,389	8,441	6,516
Commercial Banks	Listed		Non-Listed	
DivNI	-2.183***	-2.355***	-0.097***	-0.040***
	(-4.373)	(-6.771)	(-6.612)	(-5.508)
Constant	15.151**	12.122	8.967***	8.297***
	(2.567)	(1.636)	(7.390)	(8.523)
R^2	0.359	0.577	0.0750	0.116
Observations	121	84	16,455	12,944
Credit Unions	Regular Shares		Share Certificates	
DivNI	-0.728***	-0.852***	-1.253***	-0.816***
	(-7.346)	(-9.526)	(-6.731)	(-4.039)
Constant	6.929***	1.791	-0.491	-5.576**
	(3.897)	(1.362)	(-0.187)	(-2.843)
R^2	0.475	0.465	0.613	0.625
Observations	26,868	22,241	25,228	20,753

- ☐ **Higher dividend ratios ↔ lower future solvency**
- ☐ In CUs, **managerial over-optimism** ; existence of **depositor discipline** (Gómez-Biscarri et al., 2020).
- ☐ In BHCs, **reluctance to cut** dividends; managerial **overoptimism**; **market discipline**; managerial **remuneration incentives**.

2. The Puzzle of Dividend Payouts

- The results point to **significant differences** in payout policies **across financial institutions**.
  - Distinct nature of dividends
  - Different shareholder objectives and market reactions.
  - Within banks, emphasis on stakeholder and market demands.
  - Within credit unions, emphasis on transparency.
- First study to provide a comparative analysis of payout policy within BHCs, CBs, and CUs.
- While shareholders are a vital component of the financial industry, dividends should more closely convey managerial (insider) expectations about banks' future prospects.
- Oversight and restrictions of bank payouts can mitigate risk-shifting and adverse signalling.

Chapter 3

Cost Structure and Lending Quality

with Dr. María del Carmen Aranda León & Dr. Javier Arellano Gil

3. Cost Structure and Lending Quality

Motivation

Importance of non-performing loans for the viability of the financial system.
Longest credit expansion in recent history; NPL implications to follow
Increased presence of online banks (lightweight cost structures)
Cost-Cutting: Solution for Low Profitability?

Research Questions

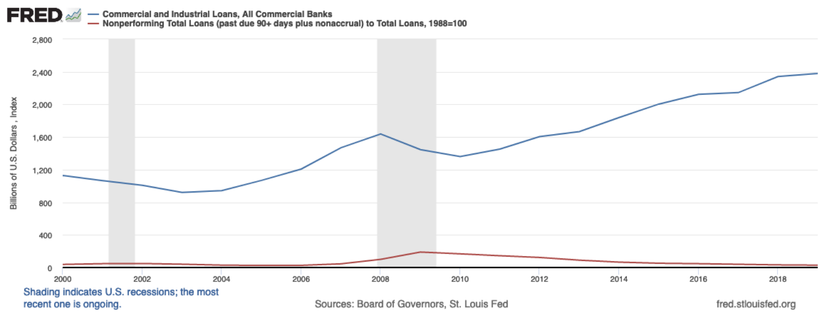
1. Do all banks have the same capability of achieving healthy growth? Identify if cost structures influence lending quality.
2. What are the reasons for low efficient banks to lack the skills needed to screen and monitor borrowers? Identify the determinants of efficiency.
3. Is it worth for banks to have a more rigid cost-structure?
4. Do lending growth timing and volume dynamics influence lending quality?

Findings

1. Credit Expansions lead to lower lending quality. The effect is weaker among banks with more fixed cost structures.
2. Several Bank Characteristics seem to determine Cost Efficiency.
3. Banks with more fixed cost structures have smaller short-run cost increases in response to the same lending growth level (Banker et al., 2014), yet reduce future NPL to a greater extent.
4.Lending growth too late or too quickly exert negative influence on lending quality.

3. Cost Structure and Lending Quality

- **Prolonged period of growth** in commercial and industrial loans leading up to the Global Financial Crisis.
  - **Loan volume doubled** to $1,509.84 Billion by 2008 from $879.85 Billion in 2004
- **Excessive risk-taking** arising from favorable macroeconomic environment and weak regulatory oversight
  - 1 in 20 loans deemed **delinquent** while **collateral** assets severely **impaired**
  - **7x NPL increase** (from 0.73% in 2006 to 5.30% in 2010)



- Scant literature on the long-term inte-rtemporal determinants of lending quality.
  - Assume lending growth affects lending quality of all banks equally.
- **Negative relation between lending volume and lending quality** (Clair, 1992; Keeton, 1999).
  - Excessive Lending → Lower Lending Quality after a three-year lag. Especially at under-capitalized banks(Clair, 1992).
  - Lax credit standards → unusually high lending volume due to (1) increased competition and (2) over-optimism arising from continued economic expansion. (Keeton, 1999).
  - Fast acceleration in lending growth could lead to a surge in loan losses, reduce profits, and cause bank failures (Keeton, 1999).
- **Existence of Congestion Costs**, which **increase with more flexible cost structures** (Banker et al., 2014)

3. Cost Structure and Lending Quality

Efficiency and Risk relationship: Four Main Hypotheses

'Bad luck'	'Skimping'	'Bad management'	'Moral Hazard'
↑ NPL - - →↓ Efficiency	↑ Efficiency - - →↑ NPL	↓ Efficiency - - →↑ NPL	↓ Capital - - →↑ NPL
External events influence the number of resources needed and expenses incurred in managing problem loans. Bad Loan Exogeneity triggers inefficiency. Lower cost efficiency is a result of extra monitoring cost of increased (through exogenous shock) number of bad borrowers.	Deliberate managerial restrictions on loan monitoring resources to improve short-run cost-efficiency. ↓ *Costs* - - →↑ *Efficiency* Trade-off between short-term efficiency and long-term lending quality.	Insufficient managerial capacities in overseeing operations. Poor cost-performing banks would probably also have poor skills in credit screening and/or monitoring, and thus, larger proportion of problem loans.	Less capitalized banks may respond to moral hazard incentives by increasing (credit) risk.
Berger and DeYoung (1997); Rossi et al. (2005)	Berger and DeYoung (1997)	Berger and DeYoung (1997); Delis et al. (2017); Fiordelisi et al. (2011); Ghosh (2015); Podpiera and Weill (2008); Williams (2004)	Berger and DeYoung (1997)

Efficiency is measured in terms of profits and costs

3. Cost Structure and Lending Quality

Increased NPL variability across banks points to differences in the quality of banks' lending growth.

Two decision channels as important components of proper credit risk management within banks:

- Momentum: Banks' ability to optimally time lending growth.
  - Measured via a spectrum of lending growth dynamics indicators (**when** and **how fast** lending grows)
  - Alleviate competitive pressures and reduce "panic" lending and "Fear of Missing Out" when credit demand becomes too saturated.
- Vision: Banks' ability to anticipate optimal opportunities and market conditions and the capability to cease on them.
  - Measured via banks' capacity (**cost structure rigidity**) to pursue optimal lending growth strategies.

A good 'vision' enables banks to pinpoint good lending growth prospects. BUT, strong and robust cost structures condition banks to take optimal advantage of convenient opportunities.

Hypotheses

H1: Lending Quality is Conditional on Banks' Cost Structure

H1a: Banks with Higher Cost Rigidity[1] will have Lower increases in NPL.

- ☐ **Soft Information Advantage** (Berger and Udell, 2002; Petersen, 2004):
  - Requires an extensive net of premises to capture the information and an extensive set of structures and processes to transmit, store, and use it. These resources are mainly fixed.
  - The collection of 'Soft' information could not be increased in the short-run by adding new discrete amounts of resources.

H1b: The reduction of NPLs upon an increase in ST Costs is higher for banks with more rigid cost structures.

- ☐ **Lower Congestion Costs**: Cost structures affect the collection and processing of hard information from additional costumers. More flexible short-run cost structures, with higher variable and lower fixed costs, suffer from congestion costs (Banker et al., 2014).
  - Due to the limited capacity of the fixed input, the congestion in the additional costs gets worse with higher increases in volume.
  - An increase in the fixed input relieves the congestion for the variable input, making it more productive.

[1] Cost rigidity is measured as employee salaries and office expenses, which are relatively fixed throughout time, as a fraction of operating expenses.

Hypotheses

H2: Banks with more sustainable and well-timed lending growth will have lower increases in NPL Ratios

H2a: Earlier lending growth will have smaller negative impact on lending quality.

- ☐ Early growth likely to be characterized by higher choices of borrower profiles and risk scores.
- ☐ Higher loan demand during Early stages of credit cycles relieves pressure to take on high risk credit lines. During the final stretches of credit expansions, fewer quality borrowers forces banks to grab for what they can.

H2b: Rapid lending growth will have larger negative impact on lending quality.

- ☐ Lax risk management practices or insufficient resources for adequate borrower screening.
- ☐ The effect could be especially strong among banks with less fixed cost structures (to be empirically tested)

3. Cost Structure and Lending Quality

Data Sample

1994 - 2017 (Emphasis on 1998-2010)

Annualized Year-End Data

Unbalanced Sample: 14,872 observations corresponding to 2,179 BHCs

Balanced Sample: 3,571 observations for 347 BHCs textcolorgray(1998 - 2010)

Bank Holding Company

Commercial Banks and Bank Holding Company Regulatory Database

- The Federal Reserve Bank of Chicago
- Quarterly Regulatory Reports (FR Y-9C)

Alternative Data

Commercial Banks (FFIEC 031/041) - The Federal Reserve Bank of Chicago

Credit Unions (Call Reports) - National Credit Unions Administration (NCUA)[1]

Bank Annual Reports - Compustat

Macroeconomic Data

Open Data Repository - World Bank

[1] Excludes CUs with assets below $50 million (inconsistent reporting frequency across our sample period)[2].

3. Cost Structure and Lending Quality

Dependent Variables

Δ NPL	Lending Quality Indicator Change in NPL-to-TL Ratio

Variables of Interest

Δ Loans	Lending Growth
Prem	Cost Structure Indicator Fixed-to-Total Costs Ratio
Banker Slope	β of $\Delta Loans = \alpha + \beta \Delta Cost$
σ Cost/Loans	Cost-to-Loans Variance
Δ Cost	Short-run Cost Changes
Distance	When Lending Grows? Distance from peak (0-1) Current Year/ (Max - Min Year)
Lend. Growth (Normalized)	How Fast Lending Grows? Current Growth/Total Growth
Log Growth Horizon	How Long Lending Grows? Log (Max - Min Years)

Interaction Effects

H1a: $\Delta Loans \times$ Prem

H1b: $\Delta Cost \times$ Prem

H2: Lend. Growth (Normalized) $\times$ Distance

Bank Controls

Size	Relative Size
Solv	Capitalization
LTA	Specialization

Macroeconomic Controls

Δ Unemp	Change in Unemployment
Δ Int	Change in Real Int. Rate
Inf	% Change in CPI

Descriptive Stats

Do Cost Structures Influence Lending Quality?

Explore Inter-temporal relations among lending quality and (1) Lending Growth; (2) Short-run cost changes; and (3) how cost structures influence the results of (1) and (2).

Panel model (Bank and Year FEs & Robust Variance Estimator SEs)

$$\Delta NPL_{it} = \sum_{j=0}^{2} \beta_{1j} \Delta Loans_{it-j} + \sum_{j=1}^{2} \beta_{2j} \Delta Loans_{it-j} \times Prem_{it-j} + \sum_{j=1}^{2} \beta_{3j} \Delta Cost_{it-j} \times Prem_{it-j} + \sum_{j=1}^{2} \beta_4 Prem_{it-j}$$
$$+\beta_{5j} Cost_{it-j} + \gamma' Bank \quad Controls_{it} + \delta' Macroeconomic \quad Controls_t + \mu_i + \lambda_t + \epsilon_{it}$$

Data

1998 - 2010
14,751 BHC Observations

Variables

Short-run Cost Changes (Δ Cost): changes in costs w.r.t. changes in lending.
Cost Structure (Prem): fixed to total costs
Interaction Effects: Δ Cost $\times$ Prem & Δ Loans $\times$ Prem

Results

Positive Relation for Lagged values of lending growth ($\beta_{1j} > 0$);

Negative relation for the interaction between lending growth and cost rigidity with future NPLs ($\beta_{2j} < 0$);

Negative relation for the interaction between short-run cost changes and cost rigidity with future NPLs ($\beta_{3j} < 0$).

Do Cost Structures Influence Lending Quality? (Panel)

VARIABLES	Δ NPL$_t$	Δ NPL$_t$	Δ NPL$_t$	Δ NPL$_t$	Δ NPL$_t$
Lending Growth$_t$	-0.057	-0.057	-0.057	-0.058	-0.058
	(-0.800)	(-0.800)	(-0.797)	(-0.808)	(-0.810)
Lending Growth$_{t-1}$	0.332***	0.332***	0.318	0.329***	0.258
	(5.162)	(5.162)	(1.212)	(5.103)	(0.974)
Lending Growth$_{t-2}$	0.360***	0.360***	0.863***	0.357***	0.910***
	(5.473)	(5.473)	(2.860)	(5.403)	(3.098)
Prem$_{t-1}$			0.801	0.821	0.755
			(1.369)	(1.489)	(1.289)
Prem$_{t-2}$			-0.804	-1.295**	-0.753
			(-1.289)	(-2.322)	(-1.212)
Lending Growth$_{t-1}$ $\times$ Prem$_{t-1}$			0.121		0.516
			(0.065)		(0.275)
Lending Growth$_{t-2}$ $\times$ Prem$_{t-2}$			-3.690*		-4.003*
			(-1.676)		(-1.855)
Δ Cost$_{t-1}$				0.002**	0.002**
				(2.336)	(2.547)
Δ Cost$_{t-2}$				0.020***	0.019***
				(3.250)	(3.075)
Δ Cost$_{t-1}$ $\times$ Prem$_{t-1}$				-0.015	-0.016
				(-0.989)	(-1.086)
Δ Cost$_{t-2}$ $\times$ Prem$_{t-2}$				-0.130**	-0.127**
				(-2.386)	(-2.285)
R^2	0.0665	0.0665	0.0672	0.0678	0.0681
Observations	14,751	14,751	14,751	14,751	14,751

3. Cost Structure and Lending Quality

Do Cost Structures Influence Lending Quality?

- Ex-ante high lending growth lead to higher non-performing loans in the future.
  - In line with Clair (1992); Keeton (1999); Ghosh (2015).
- Short-run cost increases lead to decreases in lending quality.
  - In line with **'Bad management'** hypothesis.
  - Low cost efficiency is due to lackluster managerial competence.
  - Inadequate loan underwriting and monitoring lead to high non-performing loans.
- Lower increases in NPLs among banks with higher cost-rigidity
  - Banks with **higher fixed costs are better equipped to cope with increased lending demand** due to **Soft Informational Advantages and Lower Congestion Costs**. (Banker et al., 2014).
  - Banks with **higher fixed costs** achieve higher short-term cost efficiency while maintaining changes in future NPLs to relatively low proportions.
- Robustness Analyses: 2-Step GMM Model Alt. Proxies (Linear Model)

Do Lending Growth Dynamics Influence Lending Quality?

Inter-temporal relationships among lending quality and (4) Relative Distance of Lending Growth; (5) Relative Change of Lending Growth; and the interaction of (4) and (5).

Panel model (Bank and Year FEs & Robust Variance Estimator SEs)

$$\Delta NPL_{it} = \sum_{j=0}^{2} \beta_{1j} \Delta Loans_{it-j} + \sum_{j=1}^{2} \beta_{2j} \Delta Loans_{it-j} \times Prem_{it-j} + \sum_{j=1}^{2} \beta_{3j} \Delta Cost_{it-j} \times Prem_{it-j} + \sum_{j=1}^{2} \beta_{4} Prem_{it-j} + \beta_{5j} Cost_{it-j}$$
$$+\gamma' \; Bank \quad Controls_{it} + \delta' \; Macroeconomic \quad Controls_{t} + \mu_i + \lambda_t + \epsilon_{it}$$
$$+\beta_{12} Distance_{it-1} + \beta_{13} \Delta Loans\_Normalized_{it-1} + \beta_{14} Distance_{it-1} \times \Delta Loans\_Normalized_{it-1}$$

Data

1998 - 2010
14,751 BHC Observations

Variables

Distance from peak (0-1) (Current Year/ (Max - Min Year))
Lend. Growth (Normalized): How Fast Lending Grows? (Current Growth/Total Growth)

Results

Distance is negatively related to NPLs ($\beta_{12} < 0$);

Faster Growth is positively associated with NPLs ($\beta_{13} > 0$);

Faster growth at the beginning of the growth cycle has a smaller negative effect on NPLs. ($\beta_{14} < 0$)

3. Cost Structure and Lending Quality

Do Lending Growth Dynamics Influence Lending Quality? (Panel)

Lending Growth$_{t-2}$	0.910***	1.058**	1.057**	1.103**
	(3.098)	(2.154)	(2.150)	(2.056)
Prem$_{t-1}$	0.755	-0.014	-0.052	0.061
	(1.289)	(-0.013)	(-0.049)	(0.051)
Prem$_{t-2}$	-0.753	0.777	0.780	1.421
	(-1.212)	(0.753)	(0.757)	(1.269)
Lending Growth$_{t-1}$ × Prem$_{t-1}$	0.516	2.175	2.294	1.726
	(0.275)	(0.610)	(0.644)	(0.407)
Lending Growth$_{t-2}$ × Prem$_{t-2}$	-4.003*	-6.123*	-6.079*	-6.554
	(-1.855)	(-1.667)	(-1.653)	(-1.622)
Δ Cost$_{t-1}$	0.002**	0.010***	0.010***	-0.000
	(2.547)	(3.219)	(3.167)	(-0.008)
Δ Cost$_{t-2}$	0.019***	0.034***	0.034***	0.034***
	(3.075)	(7.124)	(6.973)	(6.383)
Δ Cost$_{t-1}$ × Prem$_{t-1}$	-0.016	-0.077**	-0.075**	0.066
	(-1.086)	(-2.252)	(-2.182)	(0.471)
Δ Cost$_{t-2}$ × Prem$_{t-2}$	-0.127**	-0.274***	-0.270***	-0.255***
	(-2.285)	(-4.650)	(-4.542)	(-4.009)
Distance$_{t-1}$		-0.140*	-0.132*	-0.029
		(-1.956)	(-1.831)	(-0.320)
Lending Growth$_{t-1}$ (Normalized)				0.704***
				(2.896)
Lending Growth$_{t-1}$ (Normalized) × Distance$_{t-1}$				-0.806***
				(-3.218)
Lending Growth$_{t-1}$ × Distance$_{t-1}$			-0.333	
			(-1.089)	
R^2	0.068	0.102	0.102	0.097
Observations	14,751	7,950	7,950	6,969

3. Cost Structure and Lending Quality

Do Lending Growth Dynamics Influence Lending Quality?

- Lending Growth closer to the peak of the lending growth horizon is associated with lower Lending Quality.
- More rapid growth is associated with increases in non-performing loans.
  - Consistent with **Congestion Costs Hypothesis**: Sharp Increases in lending volume strain banks' ability to adequately process loan applications (limited resources → relaxed standards → high risk score borrowers).
- But, Rapid growth further from the cycle peak have a smaller impact on Lending Quality.
- Robustness Analyses: 2-Step GMM Model Alt. Proxies (Linear Model)

3. Cost Structure and Lending Quality

- ☐ The 'Bad Management' phenomenon that happens in the short-run seems to be the result of 'Skimping' in the long-run cost structure decisions (deliberate managerial decision to limit the costs associated with fixed assets)
- ☐ Avoiding long-term 'Skimping' by adopting a more fixed cost structure allows banks to achieve both higher short-term increases in cost efficiency and lower future NPL.
- ☐ Contribution to the literature on the determinants of lending quality.
- ☐ First study to analyze how bank operational characteristics influence the relation between lending growth and lending quality.
- ☐ First empirical evaluation of the congestion costs hypothesis.
- ☐ Importance of results for novel business models with lightweight cost-structures and the predominant low-interest rate monetary policies.

Concluding Remarks

Concluding Remarks

- Substantial regulatory and supervisory contributions in strengthening the financial system since the onset of the Global Financial Crisis.
- But, more effort is needed, especially for banks with generally weak financial conditions; overly ambitious risk-taking strategies; opaque payout policies; and inefficient cost-cutting strategies.
- ...Especially now, in a period characterized by deficient profitability, high competition, ever-increasing market pressures, and the rise of new entrants with low-cost business models. .
- Unprecedented challenges pave the road ahead. As the COVID-19 crisis develops, (EU) banks are likely to face growing non-performing loan (NPL) volumes, which can reach levels similar to those recorded in the aftermath of the sovereign debt crisis (EBA, 2021).
- Dividend Restrictions during Covid-ignited economic slowdown particularly effective as a means to ensure that banks continue to provide funds to households and firms. Especially given the 'Moral Hazard' Implications of Dividends in this highly leveraged industry.

Thank you!

1. Supervisory Stress Tests and Bank Risk-Taking

SCAP

19 Largest BHCs

TA > $100B

Baseline and Adverse Scenarios

2-year horizon

Objectives: Quantify effect on capital and extent of capital needs;

- Assess BHCs' capital sufficiency to absorb losses while continuing to operate "normally";
- Avert further distress;
- Reduce uncertainty and promote market confidence.

10/19 BHCs Shortfall: $185B

Payout Restrictions & Recap.

CCAR

19 + Largest BHCs

Quantitative Assesment: TA > $50B

+ Qualitative Layers: TA > $250B

Baseline and Adverse Scenarios

9-quarter horizon

Objectives: Provide Fed with tools and authority to determine if BHCs have sufficient capital to resume or increase payouts

- Restrictions on dividend distributions if payouts would erode capital positions.

DFAST

19 + Largest BHCs

Fed-run ST: TA > $10B

+ Company-run ST: TA > $50B

Baseline and Adverse Scenarios

9-quarter horizon

Objectives: Assess sufficient capital to absorb losses; maintain access to funding and credit intermediation; meet counter-party and creditor obligations;

- Help market participants identify downside risks and assess capital adequacy.
- Disclosures enhance transparency and promote market discipline.

1. Supervisory Stress Tests and Bank Risk-Taking

Domestic SIFIs	RSSD ID	US Owned	Initial Stress Test	Listed	Data
Ally Financial Inc.*	1562859	Yes	2009	-	Yes
American Express Company	1275216	Yes	2009	Yes	Yes
Bancwest Corporation	5005998	Yes	2016	Yes	-
BB&T Corporation	1074156	Yes	2009	Yes	Yes
BMO Financial Corp.	1245415	-	2014	Yes	-
Capital One Financial Corporation	2277860	Yes	2009	Yes	Yes
Comerica Incorporated	1199844	Yes	2014	Yes	Yes
Discover Financial Services	3846375	Yes	2014	Yes	Yes
Fifth Third Bancorp	1070345	Yes	2009	Yes	Yes
Huntington Bancshares Incorporated	1068191	Yes	2014	Yes	Yes
KeyCorp	1068025	Yes	2009	-	Yes
M&T Bank Corporation	1037003	Yes	2014	Yes	Yes
MetLife, Inc.	2945824	-	2009	Yes	Yes**
Northern Trust Corporation	1199611	Yes	2014	Yes	Yes
The PNC Financial Services Group, Inc.	1069778	Yes	2009	Yes	Yes
RBS Citizens Financial Group, Inc.	1132449	-	2014	Yes	Yes****
Regions Financial Corporation	3242838	Yes	2009	Yes	Yes
SunTrust Banks, Inc.	1131787	Yes	2009	Yes	Yes
TD Group US Holdings LLC	3606542	-	2016	Yes	-
U.S. Bancorp	1119794	Yes	2009	Yes	Yes
Zions Bancorporation	1027004	Yes	2014	Yes	Yes

Global SIFIs	RSSD ID	US Owned	Initial Stress Test	Listed	Data
Bank of America Corporation	1073757	Yes	2009	Yes	Yes
The Bank of New York Mellon Corporation	3587146	Yes	2009	Yes	Yes
BBVA Compass Bancshares, Inc.	1078529	-	2014	Yes	-
Citigroup Inc.	1951350	Yes	2009	-	Yes
Deutche Bank	1032473	-	2015	Yes	-
The Goldman Sachs Group, Inc.	2380443	Yes	2009	Yes	Yes
HSBC North America Holdings Inc.	3232316	-	2014	Yes	-
JPMorgan Chase & Co.	1039502	Yes	2009	Yes	Yes
Morgan Stanley	2162966	Yes	2009	Yes	Yes
MUFG Americas Holdings Corporation***	1378434	-	2014	Yes	-
Santander Holdings USA, Inc.	3981856	-	2014	Yes	-
State Street Corporation	1111435	Yes	2009	Yes	Yes
Wells Fargo & Co.	1120754	Yes	2009	Yes	Yes

No data on foreign-owned BHCs: BMO Financial Corp., TD Group, BBVA Compass Bankshares Inc., Deutche Bank, HSBC North America Holdings Inc., MUFG Americas Holdings Corporation, and Santander Holdings USA Inc.

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1. Supervisory Stress Tests and Bank Risk-Taking

	2009	2012	2013		2014		2015		2016	
Domestic SIFIs	SCAP	CCAR	DFAST	CCAR	DFAST	CCAR	DFAST	CCAR	DFAST	CCAR
Ally Financial Inc.*	-	-	-	-	+	+	+	+	+	+
American Express Company	+	+	+	-	+	+	+	+	+	+
Bancwest Corporation									+	+
BB&T Corporation	+	+	+	-	+	+	+	+	+	+
BMO Financial Corp.***					+	+	+	+	+	+
Capital One Financial Corporation	+	+	+	+	+	+	+	+	+	+
Comerica Incorporated					+	+	+	+	+	+
Discover Financial Services					+	+	+	+	+	+
Fifth Third Bancorp	-	+	+	+	+	+	+	+	+	+
Huntington Bancshares Incorporated					+	+	+	+	+	+
KeyCorp	-	+	+	+	+	+	+	+	+	+
M&T Bank Corporation					+	+	+	+	+	+
MetLife, Inc. **	+	-								
Northern Trust Corporation					+	+	+	+	+	+
The PNC Financial Services Group, Inc.	-	+	+	+	+	+	+	+	+	+
RBS Citizens Financial Group, Inc.					+	-	+	+	+	+
Regions Financial Corporation	-	+	+	+	+	+	+	+	+	+
SunTrust Banks, Inc.	-	-	+	+	+	+	+	+	+	+
TD Group US Holdings LLC***									+	+
U.S. Bancorp	+	+	+	+	+	+	+	+	+	+
Zions Bancorporation					-	-	+	+	+	+

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	2009	2012	2013		2014		2015		2016	
Global SIFIs	SCAP	CCAR	DFAST	CCAR	DFAST	CCAR	DFAST	CCAR	DFAST	CCAR
Bank of America Corporation	-	+	+	+	+	+	+	+	+	+
The Bank of New York Mellon Corporation	+	+	+	+	+	+	+	+	+	+
BBVA Compass Bancshares*** Inc.					+	+	+	+	+	+
Citigroup Inc.	-	-	+	+	+	-	+	+	+	+
Deutche Bank***							+	-	+	-
The Goldman Sachs Group, Inc.	+	+	+	-	+	+	+	+	+	+
HSBC NA Holdings Inc.****					+	-	+	+	+	+
JPMorgan Chase & Co.	+	+	+	-	+	+	+	+	+	+
Morgan Stanley	-	+	+	+	+	+	+	+	+	+
MUFG Americas Holdings Corporation***					+	+	+	+	+	+
Santander USA, Inc.****					+	-	+	-	+	-
State Street Corporation	+	+	+	+	+	+	+	+	+	+
Wells Fargo & Co.	-	+	+	+	+	+	+	+	+	+

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Summary Statistics

All Banks

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
CCAR	112,611	0.00	0.07	0.00	1.00
FedST	112,611	0.01	0.08	0.00	1.00
σROA_F3Y	113,083	0.00	0.00	0.00	0.04
ZScoreF3Y	79,012	4.86	1.02	0.05	7.58
σROA_L3Y	107,999	0.00	0.00	0.00	0.04
ZScore_L3Y	107,516	4.95	1.05	-0.12	14.29
Size	112,611	13.45	1.37	5.96	21.67
ETA	112,611	0.09	0.04	0.03	0.84
LTA	112,610	0.65	0.13	0.00	0.99
STWSF_TA	111,475	0.05	0.06	0.00	0.45
MS_TA	112,611	0.19	0.12	0.00	0.80
Recap'd	112,611	0.03	0.16	0.00	1.00
NPLLTL	112,595	0.01	0.02	0.00	0.11
ROA	111,270	0.00	0.00	-0.02	0.03
QLLP_TA	111,197	0.00	0.00	0.00	0.02
NPLLTL_Chg	106,740	0.29	2.51	-1.00	54.75
UNRATE	112,611	5.78	1.50	3.90	9.90
VIXCLS	112,611	20.26	7.20	11.03	58.60
GDP_Chg	112,611	0.67	0.59	-2.11	1.89

Stress Test Banks

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Buffer (CCAR)	414	2.34	1.89	-3.48	8.21
Buffer (FedST)	489	2.00	2.38	-7.29	8.21
σROA_F3Y	621	0.00	0.00	0.00	0.01
ZScoreF3Y	368	5.02	0.77	2.65	6.78
σROA_L3Y	641	0.00	0.00	0.00	0.01
ZScore_L3Y	641	4.67	1.01	2.07	11.26
Size	647	19.58	1.10	17.82	21.67
ETA	647	0.11	0.02	0.05	0.16
LTA	647	0.50	0.24	0.02	0.84
STWSF_TA	647	0.11	0.08	0.00	0.33
MS_TA	647	0.22	0.11	0.03	0.58
Recap'd	647	0.12	0.32	0.00	1.00
NPLLTL	647	0.02	0.02	0.00	0.08
ROA	646	0.00	0.00	-0.02	0.01
QLLP_TA	646	0.00	0.00	0.00	0.02
NPLLTL_Chg	630	0.09	2.17	-0.99	53.36
UNRATE	647	7.34	1.73	4.90	9.90
VIXCLS	647	19.40	6.81	12.74	45.00
GDP_Chg	647	0.46	0.50	-1.39	1.22

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Summary Statistics

Listed Banks

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
CCAR	34,510	0.01	0.12	0.00	1.00
FedST	34,510	0.02	0.13	0.00	1.00
σROA_F3Y	33,822	0.00	0.00	0.00	0.02
ZScoreF3Y	24,126	4.93	1.12	0.43	7.58
σROA_L3Y	33,526	0.00	0.00	0.00	0.04
ZScore_L3Y	33,505	5.06	1.10	0.05	11.54
Size	34,510	14.51	1.66	11.54	21.67
ETA	34,510	0.10	0.05	0.03	0.84
LTA	34,509	0.65	0.13	0.00	0.96
STWSF_TA	34,409	0.08	0.07	0.00	0.45
MS_TA	34,510	0.18	0.11	0.00	0.80
Recap'd	34,510	0.05	0.22	0.00	1.00
NPLLTL	34,497	0.01	0.02	0.00	0.11
ROA	34,310	0.00	0.00	-0.02	0.03
QLLP_TA	34,301	0.00	0.00	0.00	0.02
NPLLTL_Chg	33,230	0.18	1.89	-1.00	54.75
UNRATE	34,510	5.86	1.57	3.90	9.90
VIXCLS	34,510	20.13	7.41	11.03	58.60
GDP_Chg	34,510	0.63	0.61	-2.11	1.89

Listed Stress Test Banks

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Buffer (CCAR)	386	2.46	1.77	-0.20	8.21
Buffer (FedST)	454	2.15	2.28	-7.29	8.21
σROA_F3Y	570	0.00	0.00	0.00	0.01
ZScoreF3Y	328	5.07	0.67	2.77	6.78
σROA_L3Y	591	0.00	0.00	0.00	0.01
ZScore_L3Y	591	4.73	0.95	2.46	11.26
Size	595	19.66	1.10	17.82	21.67
ETA	595	0.11	0.02	0.05	0.16
LTA	595	0.48	0.25	0.02	0.84
STWSF_TA	595	0.11	0.08	0.00	0.33
MS_TA	595	0.23	0.11	0.03	0.58
Recap'd	595	0.11	0.32	0.00	1.00
NPLLTL	595	0.02	0.02	0.00	0.08
ROA	595	0.00	0.00	-0.02	0.01
QLLP_TA	595	0.00	0.00	0.00	0.01
NPLLTL_Chg	579	0.10	2.26	-0.99	53.36
UNRATE	595	7.28	1.74	4.90	9.90
VIXCLS	595	19.34	6.83	12.74	45.00
GDP_Chg	595	0.46	0.50	-1.39	1.22

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Stress Tests and Solvency

1. Analyze differences in Future Solvency among ST and Non-ST BHCs.
2. Analyze differences in Future Solvency among ST BHCs with ex-ante high solvency.

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future\quad Solvency = \alpha + \beta_1 Past\quad Solvency + \beta_2 Stress\quad Test\quad Dummy + \beta_3 Past\quad Solvency$$
$$*Stress\quad Test\quad Dummy + \gamma Bank\quad Controls + \delta Macroeconomic\quad Controls + \eta_i + \upsilon_q + \epsilon_{iq}$$

Data

1996 - 2016
70,263 Observations
2,455 BHCs

Variables

Solvency: ZScore_F(L)3Y & ZScore_F(L)5Y
Stress Test Dummy: CCAR (2011 – 2016) & FedST (2009 – 2016)

Results

1. Lower Future Solvency among ST BHCs ($\beta_2 < 0$)
2. Higher Future Solvency among ST BHCs with Ex-ante High Solvency ($\beta_3 > 0$)

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Stress Tests and Solvency

	CCAR Exercises			SCAP and CCAR Exercises		
	All Banks	Listed	Non-listed	All Banks	Listed	Non-listed
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ZScore_F3Y	ZScore_F3Y	ZScore_F3Y	ZScore_F3Y	ZScore_F3Y	ZScore_F3Y
ZScore_L3Y	-0.026	-0.047	-0.030	-0.026	-0.049	-0.030
	(-0.899)	(-1.295)	(-1.174)	(-0.908)	(-1.334)	(-1.161)
ZScore_L3Y × CCAR	0.298***	0.368***	0.211			
	(3.266)	(3.846)	(1.397)			
CCAR	-0.584**	-0.943***	-0.290			
	(-2.109)	(-3.436)	(-0.531)			
ZScore_L3Y × FedST				0.273***	0.346***	0.129
				(3.345)	(3.906)	(1.167)
FedST				-0.399	-0.793**	0.085
				(-1.660)	(-2.586)	(0.167)
Constant	9.722***	10.605***	9.483***	9.746***	10.671***	9.479***
	(3.987)	(3.888)	(4.301)	(3.990)	(3.893)	(4.298)
R^2	0.170	0.180	0.168	0.171	0.180	0.168
Observations	70,263	22,745	47,518	70,263	22,745	47,518
Number of groups	2,455	788	1,970	2,455	788	1,970
FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

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Do Stress-Tested Banks Exhibit Different Solvency Characteristics Ex-ante?

ST Banks are the Largest and Most Systematically Important Institutions.
Could our results simply be a reflection of size and importance?

Match and Rank 100 Non-ST BHCs with ST BHCs based on 2008Q3 distance matrices.
(Size; Capitalization; Credit Quality; Liquidity; Specialization; and Risk-Taking)

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future\quad Solvency = \alpha + \beta_1 Past\quad Solvency + \beta_2 Post2009(2005) + \beta_3 Post2009(2005) \times ST$$
$$+\beta_4 ST + \gamma Bank\quad Controls + \delta Macroeconomic\quad Controls + \eta_i + \upsilon_q + \epsilon_{iq}$$

Data

2009 - 2016; 2005-2008
ST BHCs (18 Banks)
Non-ST BHCs (100 Banks)

Variables

Post2009: Dummy = 1 for years $\geq$ 2009
Post2005: Dummy = 1 if 2005 $\leq$ year $\geq$ 2008
ST: Dummy = 1 for BHCs s.t. Sress Tests

Results

Higher Future Solvency among ST BHCs after 2009 ($\beta_3 < 0$)
No evidence of differences in solvency among ST and Similar Non-ST BHCs between 2005 and 2008!

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Do Stress-Tested Banks Exhibit Different Solvency Characteristics?

VARIABLES	Original Sample ZScore_F3Y	100 Similar Banks ZScore_F3Y	50 Similar Banks ZScore_F3Y
Post2009	0.635***	0.887***	0.973***
	(3.790)	(3.313)	(3.740)
ST × Post2009	0.671***	0.435***	0.228*
	(4.730)	(3.940)	(1.929)
ZScore_L3Y	-0.022	0.048	-0.006
	(-0.648)	(0.852)	(-0.109)
Constant	11.803***	11.397***	12.288***
	(4.312)	(3.337)	(4.044)
R^2	0.170	0.178	0.207
Observations	70,263	6,993	4,317
Number of groups	2,455	116	68
FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Robustness

VARIABLES	Original Sample ZScore_F3Y	100 Similar Banks ZScore_F3Y	50 Similar Banks ZScore_F3Y
Post2005	-0.758***	-1.184***	-1.093***
	(-6.524)	(-9.291)	(-10.689)
ST × Post2005	-0.388**	-0.013	-0.069
	(-2.324)	(-0.098)	(-0.779)
ZScore_L3Y	-0.021	0.037	0.002
	(-0.701)	(0.761)	(0.033)
Constant	6.414***	3.819**	3.895***
	(3.698)	(2.134)	(3.396)
R^2	0.226	0.318	0.324
Observations	70,263	6,993	4,317
Number of groups	2,455	116	68
FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Back

1. Supervisory Stress Tests and Bank Risk-Taking

Do Stress-Tested Banks Exhibit Different Risk-Taking Characteristics Ex-ante?

ST Banks are the Largest and Most Systematically Important Institutions.
Could our results simply be a reflection of size and importance?

Match and Rank 100 Non-ST BHCs with ST BHCs based on 2008Q3 distance matrices.
(Size; Capitalization; Credit Quality; Liquidity; Specialization; and Risk-Taking)

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future \quad Risk - Taking = \alpha + \beta_1 Past \quad Risk - Taking + \beta_2 Post2009(2005) + \beta_3 Post2009(2005) \times ST$$
$$+\beta_4 ST + \gamma Bank \quad Controls + \delta Macroeconomic \quad Controls + \eta_i + \upsilon_q + \epsilon_{iq}$$

Data

2009 - 2016; 2005-2008
ST BHCs (18 Banks)
Non-ST BHCs (100 Banks)

Variables

Post2009: Dummy = 1 for years $\geq$ 2009
Post2005: Dummy = 1 if 2005 $\leq$ year $\geq$ 2008
ST: Dummy = 1 for BHCs s.t. Sress Tests

Results

Lower Future Risk-Taking among ST BHCs after 2009 (β_3 < 0)

No evidence of differences in risk-taking among ST and Similar Non-ST BHCs between 2005 and 2008!

Do Stress-Tested Banks Exhibit Different Risk-Taking Characteristics?

VARIABLES	Original Sample σROA_F3Y	100 Similar Banks σROA_F3Y	50 Similar Banks σROA_F3Y
Post2009	-0.001***	-0.001**	-0.002***
	(-3.539)	(-2.254)	(-2.701)
ST × Post2009	-0.001***	-0.001***	-0.001***
	(-3.822)	(-4.094)	(-3.803)
σROA_L3Y	-0.047	0.069	-0.077
	(-0.849)	(0.714)	(-1.118)
Constant	-0.011***	-0.012*	-0.012**
	(-2.682)	(-1.887)	(-2.361)
R^2	0.161	0.213	0.223
Observations	100,945	8,145	5,007
Number of groups	3,349	118	69
FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Robustness

VARIABLES	Original Sample σROA_F3Y	100 Similar Banks σROA_F3Y	50 Similar Banks σROA_F3Y
Post2005	0.001***	0.002***	0.002***
	(3.077)	(7.188)	(6.886)
ST × Post2005	0.001***	0.000	0.000
	(3.248)	(0.003)	(0.090)
σROA_L3Y	-0.068	0.036	-0.084
	(-1.143)	(0.321)	(-0.983)
Constant	-0.004	-0.000	0.000
	(-1.423)	(-0.054)	(0.109)
R^2	0.175	0.317	0.322
Observations	100,945	8,145	5,007
Number of groups	3,349	118	69
FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Statistically significant differences in risk-taking among ST and Non-ST Banks after the implementation of Stress Tests (Post2009) **but not before** (Post2005).

Stress-testing has influenced risk-taking in banks which had similar characteristics and behaved alike prior to the implementation of stress-testing.

Do Stress-Tested Banks Exhibit Different Solvency Characteristics?

- ☐ **Statistically significant differences in solvency among ST and Non-ST Banks after the implementation of Stress Tests** (Post2009).
    - ST banks exhibit significantly higher solvency
    - These differences are not driven by fundamental characteristics.
    - ST and Non-ST banks **did not diverge** in terms of solvency **prior to 2009**.
- ☐ Stress-testing has influenced solvency in banks that were very similar prior to stress-testing

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1. Supervisory Stress Tests and Bank Risk-Taking

Stress Test Results and Risk-Taking

Previous Results are independent of ST Outcomes.
Do Projected Capital Levels Influence Risk-Taking?

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future \quad Risk - Taking = \alpha + \beta_1 Past \quad Risk - Taking + \beta_2 Buffer(Pass)$$
$$+\beta_3 Past \quad Risk - Taking * Buffer(Pass) + \gamma Bank \quad Controls + \delta Macroeconomic \quad Controls + \epsilon_{iq}$$

Data

2012 - 2016; 2009 - 2016
453 Observations (26 ST BHCs)
CCAR (2011 – 2016) & FedST (2009 – 2016)

Variables

Risk-Taking: σ ROA_F(L)3Y & σ ROA_F(L)5Y
Buffer: Projected Capital Ratio in excess of Regulatory Minimums
Pass: Dummy = 1 if Favorable Quantitative ST Result

Results

Higher Future Risk-Taking among ST BHCs with Ex-ante Lower ST-Projected Capital Buffers ($\beta_3 < 0$)

Higher Future Risk-Taking among ST BHCs who failed previous Stress Test Exercise ($\beta_3 < 0$)

Do Projected Capital Levels Influence Risk-Taking?

	CCAR Exercises		SCAP and CCAR Exercises	
	Buffer	Pass	Buffer	Pass
	(1)	(2)	(3)	(4)
VARIABLES	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y
σ ROA_L3Y	0.237***	0.387***	0.095***	0.196***
	(6.966)	(9.426)	(4.273)	(6.819)
σ ROA_L3Y $\times$ Buffer	-0.037***		-0.027***	
	(-6.418)		(-5.752)	
Buffer	0.000		0.000	
	(1.376)		(1.138)	
σ ROA_L3Y $\times$ Pass		-0.377***		-0.278***
		(-8.813)		(-7.276)
Pass		0.000		0.000*
		(1.447)		(1.788)
Constant	-0.032***	-0.015*	-0.022***	-0.013**
	(-3.789)	(-1.922)	(-3.914)	(-2.236)
R^2	0.444	0.538	0.564	0.588
Observations	387	387	453	453
Number of entity	26	26	26	26
FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Stress Test Results and Risk-Taking

- **Risk-taking among ST banks is conditional on the projected capital levels.**
  - Weaker under SCAP
- Ex-ante **risk-tolerant ST banks, with inadequate capital levels**, and ex-ante **risk-averse banks with sufficient capital ratios** exceeding regulatory minimums **exhibit increased levels of ROA volatility** in the future.
  - Smaller incentives to avoid default (Blum, 1999; Calem et al., 2020).
  - High costs of raising equity = ↑ Risk today ⟶ ↑Capital tomorrow (Blum, 1999).
  - Risk-shifting benefits of deposit insurance (Calem and Rob, 1999)
  - Charter value preservation among low-buffer banks (Blum, 1999; Calem and Rob, 1999)
  - Well-capitalized banks ⟶ more likely to increase risk-taking (lower default risk, higher charter values, and (likely) lower supervisory scrutiny).

1. Supervisory Stress Tests and Bank Risk-Taking

Stress Tests and Solvency

- ☐ **ST BHCs** exhibit **lower future solvency** than non-ST BHCs. ▸ Methodology ▸ Results
  - Stronger under CCAR
  - Likely due to **implicit guarantees** and **Too-Systematically-Important-To-Fail** designation.
  - Could trigger **higher moral hazard incentives** among ST banks.
- ☐ But, result is **conditional** on **ex-ante solvency**.
  - Low (high) ex-ante solvency $\longrightarrow$ lower (higher) future solvency.
  - Consistent with safest banks' contribution in restoring overall stability (Hirtle et al., 2009).

Stress Test Results and Solvency

- ☐ Future Solvency is conditional on the projected capital levels. ▸ Methodology ▸ Results
  - **Ex-ante more solvent banks with high projected capital levels** are **more prone to have higher future solvency**.
  - Positive Capital Buffers $\times$ Solvency and Future Solvency relation under CCAR

Stress Test Results and Solvency

Previous Results are independent of ST Outcomes.
Do Projected Capital Levels Influence Solvency?

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future \quad Solvency = \alpha + \beta_1 Past \quad Solvency + \beta_2 Buffer(Pass)$$
$$+\beta_3 Past \quad Solvency * Buffer(Pass) + \gamma Bank \quad Controls + \delta Macroeconomic \quad Controls + \epsilon_{iq}$$

Data

2012 - 2016; 2009 - 2016
209 Observations (19 ST BHCs)
CCAR (2011 – 2016) & FedST (2009 – 2016)

Variables

Solvency: ZScore_F(L)3Y & ZScore_F(L)5Y
Buffer: Projected Capital Ratio in excess of Regulatory Minimums
Pass: Dummy = 1 if Favorable Quantitative ST Result

Results

Higher Future Solvency among ST BHCs with Ex-ante Higher ST-Projected Capital Buffers ($\beta_3 > 0$)

Higher Future Risk-Taking among ST BHCs who passed previous Stress Test Exercise ($\beta_3 > 0$)

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Do Projected Capital Levels Influence Solvency?

	CCAR Exercises		SCAP and CCAR Exercises	
	Buffer	Pass	Buffer	Pass
	(1)	(2)	(3)	(4)
VARIABLES	ZScore_F3Y	ZScore_F3Y	ZScore_F3Y	ZScore_F3Y
ZScore_L3Y	-0.490***	0.070	-0.103	0.311***
	(-5.760)	(0.379)	(-1.492)	(2.838)
ZScore_L3Y × Buffer	0.072***		-0.005	
	(4.400)		(-0.370)	
Buffer	-0.285***		0.057	
	(-3.619)		(0.867)	
ZScore_L3Y × Pass		-0.326		-0.609***
		(-1.633)		(-4.519)
Pass		1.676*		2.935***
		(1.865)		(4.903)
Constant	60.317***	28.693*	24.596***	5.370
	(3.900)	(1.740)	(3.179)	(0.649)
R^2	0.497	0.421	0.608	0.654
Observations	144	144	209	209
Number of entity	18	18	19	19
FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

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Stress Test Results and Solvency

- ☐ Solvency among ST banks is conditional on the projected capital levels.
  - Positive relation between Capital Buffers $\times$ PSolvency and future Solvency
  - Significant under CCAR
- ☐ **Ex-ante more solvent banks with high projected capital levels** are **more prone to have higher solvency** in the future.

Can Stress Test Results and Capital Buffers be Predicted?

Analyze potential indicators of future stress test outcomes

Two-stage Heckmann Selection Model

1. Selection (Probit) Equation tests whether bank characteristics and past risk-taking predict ST results:

$$Pass^{*} = \Phi(\beta Bank\_Fundamentals + \epsilon_{iq})$$

2. Heckmann selection model (OLS observation equation) for Buffer examines the factors that influence the size of the capital buffer or shortfall while controlling for selection bias:

$$Buffer = \alpha + \beta Bank\_Fundamentals + \lambda_{iq} + \epsilon_{iq}$$

Φ follows a cumulative normal density function, $[0, \sigma^2]$; effect of unobserved factors on the likelihood of failure to meet required regulatory minimum capital ratios is captured by the residual (λ). The residual is used to construct a selection bias control factor in the second stage of the selection model.

Data

2009 - 2016
453 Observations (24 ST BHCs)

Results

Bank Fundamentals do serve as signals for ST outcomes.

Can Stress Test Results & Capital Buffers be Predicted?

	CCAR Exercises (437 Observations)			SCAP and CCAR Exercises (499 Observations)		
VARIABLES	Pass	Buffer	Mill's	Pass	Buffer	Mill's
σROA_L3Y	28.067	661.228***		-91.645	669.964***	
	(0.09)	(3.68)		(-0.42)	(5.23)	
ZScore_L3Y	1.309	0.534***		0.780	0.540***	
	(1.54)	(3.02)		(1.58)	(3.88)	
Size	-0.545	-0.277**		-0.079	-0.285***	
	(-0.99)	(-2.12)		(-0.36)	(-2.70)	
ETA	-5.326	20.370***		14.884	22.262***	
	(-0.29)	(3.05)		(1.50)	(4.21)	
LTA	-24.020**	-7.797***		-3.849	-8.281***	
	(-2.21)	(-8.22)		(-1.55)	(-11.25)	
QLLP_TA	-57.745	281.757***		21.749	242.697***	
	(-0.27)	(2.91)		(0.29)	(4.69)	
NPLL_TL	-3.242	-22.483***		-26.627**	-23.643***	
	(-0.21)	(-2.99)		(-2.56)	(-3.76)	
NPLL_Chg	-0.118	-0.068**		0.329	-0.071***	
	(-0.07)	(-2.34)		(0.39)	(-2.80)	
STWSF_TA	-23.453**	-9.106***		-7.309**	-9.053***	
	(-2.34)	(-5.18)		(-2.08)	(-6.27)	
ROA	24.652	157.233***		-8.926	135.579***	
	(0.27)	(2.67)		(-0.22)	(3.97)	
Recap'd	4.195	-0.441		-1.429***	-0.408	
	(.)	(-0.46)		(-3.10)	(-0.94)	
MS_TA	-35.308**	-4.681**		-0.098	-5.261***	
	(-2.14)	(-2.54)		(-0.02)	(-3.61)	
λ			1.542**			1.293**
			(2.05)			(2.38)

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Interest Rate Implications

Risk-Taking and Interest Rate Changes

	CCAR Exercises			SCAP and CCAR Exercises		
	CCAR	Buffer	Pass	FedST	Buffer	Pass
VARIABLES	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y	σ ROA_F3Y
σ ROA_L3Y	-0.064	0.123***	0.086***	-0.064	0.069***	0.059***
	(-1.072)	(4.157)	(3.082)	(-1.072)	(3.120)	(2.691)
FedFundsChg	-0.000*	0.000**	0.001***	-0.000*	0.000	0.001***
	(-1.686)	(2.295)	(4.012)	(-1.686)	(1.612)	(3.611)
FedFundsChg $\times$ ST	0.000			0.000**		
	(1.191)			(2.082)		
ST	-0.001**			-0.001***		
	(-2.304)			(-3.295)		
FedFundsChg $\times$ Buffer		-0.000***			-0.000***	
		(-2.779)			(-3.736)	
Buffer		-0.000**			-0.000**	
		(-2.154)			(-2.197)	
FedFundsChg $\times$ Pass			-0.001***			-0.001***
			(-3.967)			(-4.019)
Pass			-0.000***			-0.000***
			(-4.202)			(-2.912)
Constant	-0.006	-0.053***	-0.042***	-0.006*	-0.037***	-0.035***
	(-1.659)	(-6.820)	(-5.500)	(-1.671)	(-6.629)	(-6.084)
R^2	0.148	0.392	0.459	0.149	0.546	0.553
Observations	100,945	387	387	100,945	453	453
FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

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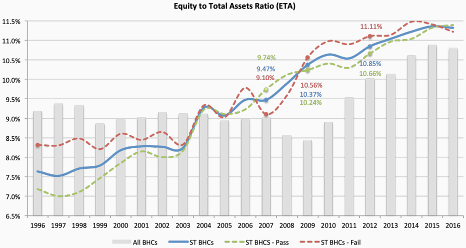
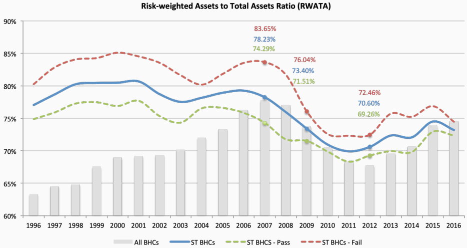
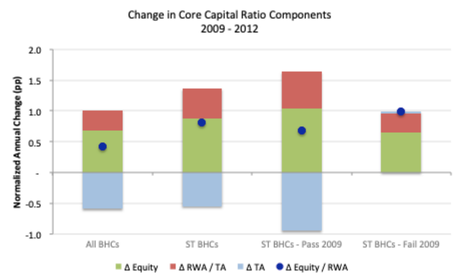
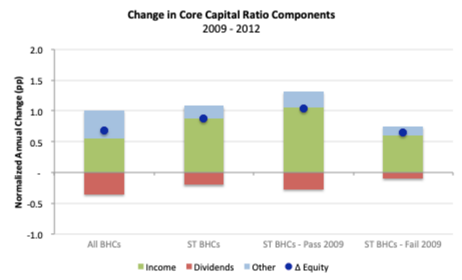
1. Supervisory Stress Tests and Bank Risk-Taking









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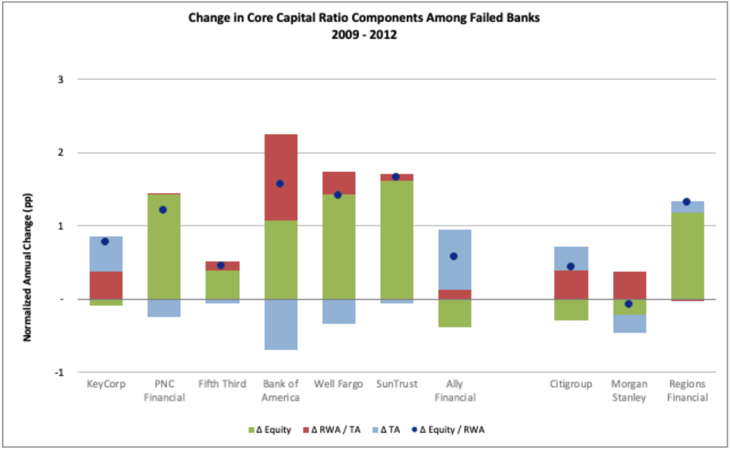
1. Supervisory Stress Tests and Bank Risk-Taking



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The Importance of Dividend Policy for Firm Value

- **"Irrelevance Theorem"** (Miller and Modigliani, 1961)
  - Modified to include varying **market imperfections** (Lease et al., 1999): tax rates, information asymmetries (Bhattacharya, 1979; Miller and Rock, 1985) and agency costs (Easterbrook, 1984); the role of the legal framework (La Porta et al., 2000); catering incentives (Baker and Wurgler, 2004); firms' life-cycle stage (DeAngelo et al., 2006)
- **Mixed empirical results** on the impact of tax clienteles, signalling effects, and life-cycle factors (Farrar et al., 1967; Brennan, 1970; Healy and Palepu, 1988; Grullon et al., 2005; DeAngelo et al., 2006; Denis and Osobov, 2008; Von Eije and Megginson, 2008; De Cesari, 2012)
  - **Information content** of dividends is more **important** than agency, catering, or behavioral determinants of dividend policy (Turner et al., 2013)
- Differences in agency problems, capital structures, and regulatory environments raise questions about the extent to which these theories apply to the financial industry (Foerster and Sapp, 2005)

Determinants of Dividend Policy: Risk-Shifting Hypothesis

- Institutional Investors Influence Payout Policy (Ben-David, 2010).
- **Bank Dividend Payouts = Risk-shifting Mechanism**. Continued high dividend payments during the financial crisis were an attempt to shift value from creditors to shareholders.
- **Negative Externalities of Bank Dividend Payouts**: one banking company's dividend payments affect the risk of default and equity values of other banking companies, who are creditors of the first bank (Acharya, Le and Shin, 2017)
- **Lower Risk-Shifting Incentives** and Higher Probability of Dividend Reductions **among CEOs with higher inside debt-to-equity** proportions. (Srivastav et al., 2014)
- **Higher dividends are associated with higher risk** in the cross-section before and during the GFS (Onali, 2014; Kanas, 2013)
  - Higher Risk in Banks $\longrightarrow$ Larger Dividend Payouts (Onali, 2014); positive relation between dividend payout ratios and risk of default (Kanas, 2013)

Determinants of Dividend Policy: Signalling Hypothesis

- **Stock price responses to dividend changes, initiations, and omissions** to gauge the informational content of dividends (Forti and Schiozer, 2015)
  - Dividend Change Announcements $\longrightarrow$ $\uparrow$Stock Returns in non-financial firms (Aharony and Swary, 1980; Asquith and Mullins Jr, 1983; Bajaj and Vijh, 1990; Kalay and Loewenstein, 1985)
  - $\downarrow$Dividends/Omissions $\longrightarrow$ $\downarrow$ Stock Prices in Banks (Bessler and Nohel, 1996, 2000)
- **Extreme Market Sensitivity to Bank Dividend Decreases during Crises**.
  - Dividends = Signaling Mechanism in banks (Filbeck and Mullineaux, 1993; Collins et al., 1995; Boldin and Leggett, 1995)
  - Dividends = Essential source of profitability & liquidity information for depositors (Kauko, 2012)
  - Signaling = significant determinant of payout rates for BHCs during GFC, but not before (Abreu and Gulamhussen, 2013)
  - Depositors sensitivity to bank liquidity due to negative effects of bank runs and fire sales.
  - Dividend Increases to Keep Depositors Calm and Prevent Bank Runs. (Kauko, 2012)
  - Institutional investors are more sensitive in periods of high information asymmetry and more prone to engage in runs. (Huang and Ratnovski, 2011; Oliveira, 2015)

Summary Statistics: BHCs

Bank-Specific and Macroeconomic Controls

	Non-Listed BHCs					Listed BHCs				
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
ROA	17370	0.01	0.01	-0.05	0.07	7933	0.01	0.01	-0.05	0.07
Recap'd	17374	0.01	0.1	0.00	1.00	7933	0.05	0.22	0.00	1.00
LLPTA	17361	0.00	0.00	0.00	0.03	7932	0.00	0.00	0.00	0.03
NPLLTL	17374	0.01	0.01	0.00	0.11	7931	0.01	0.01	0.00	0.11
Loans_Chg	16897	0.02	0.06	-0.41	1.55	7855	0.04	0.1	-0.41	1.55
Size	17374	12.99	0.89	10.1	20.12	7933	14.55	1.67	11.73	21.67
ETA	17374	0.09	0.03	0.03	0.83	7933	0.1	0.04	0.03	0.84
LTA	17374	0.64	0.13	0.00	0.99	7933	0.65	0.14	0.00	0.96
STWSFTA	17135	0.04	0.05	0.00	0.45	7910	0.08	0.07	0.00	0.45
MSTA	17374	0.19	0.12	0.00	0.79	7933	0.19	0.11	0.00	0.76
TCBuffer	13311	0.07	0.06	-0.13	1.2	5649	0.07	0.06	-0.07	1.52
Unemployment	17374	5.66	1.37	3.97	9.61	7933	5.71	1.41	3.97	9.61
VIXCLS	17374	20.67	5.58	12.39	32.69	7933	19.94	5.82	12.39	32.69
GDP_Chg	17374	2.87	1.51	-2.54	4.75	7933	2.75	1.53	-2.54	4.75
TB3MS	17374	2.86	2.05	0.03	5.82	7933	2.74	2.13	0.03	5.82

Summary Statistics: BHCs

Variables of Interest

	Non-Listed BHCs					Listed BHCs				
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
DivNI	14377	0.19	0.25	0.00	1.00	7039	0.23	0.24	0.00	1.00
DivNI_%Chg	5657	0.10	1.08	-1.00	13.24	3551	0.09	0.82	-1.00	13.24
DPS_%Chg	30	0.41	1.08	-0.62	5.08	3787	0.11	0.60	-1.00	5.08
Div_Init	19291	0.05	0.22	0.00	1.00	8311	0.05	0.21	0.00	1.00
μROA_F3Y	19286	0.25	0.21	-2.33	3.02	8311	0.21	0.26	-2.33	3.02
μROA_F5Y	19286	0.24	0.21	-2.33	3.02	8311	0.20	0.26	-2.33	3.02
μROA_L3Y	17028	0.27	0.17	-2.33	3.02	7866	0.26	0.19	-2.28	3.02
μROA_L5Y	17115	0.27	0.16	-2.33	2.87	7866	0.26	0.18	-2.28	3.02
σROA_F3Y	19089	0.11	0.16	0.00	2.67	8159	0.12	0.19	0.00	1.91
σROA_F5Y	19093	0.13	0.17	0.00	2.67	8159	0.15	0.21	0.00	1.91
σROA_L3Y	16574	0.09	0.13	0.00	2.09	7783	0.09	0.14	0.00	2.60
σROA_L5Y	16667	0.10	0.13	0.00	1.64	7785	0.10	0.14	0.00	2.60
ZScore_F3Y	14008	4.89	0.94	0.19	7.54	6022	5.00	1.09	0.49	7.43
ZScore_F5Y	10949	4.69	0.93	-0.08	6.94	4728	4.71	1.04	0.66	7.20
ZScore_L3Y	16522	4.97	0.88	0.48	12.28	7779	5.18	0.96	0.08	9.25
ZScore_L5Y	16529	4.87	0.86	0.58	12.28	7783	5.00	0.93	0.08	9.25

Summary Statistics: CBs

Bank-Specific and Macroeconomic Controls

	Non-Listed CBs					Listed CBs				
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
ROA	32450	0.01	0.01	-0.05	0.07	308	0.01	0.01	-0.05	0.04
Recap'd	39512	0.00	0.04	0.00	1.00	308	0.04	0.19	0.00	1.00
LLPTA	32449	0.00	0.00	0.00	0.03	308	0.00	0.00	0.00	0.03
NPLLTL	34970	0.00	0.01	0.00	0.11	308	0.00	0.00	0.00	0.03
Loans_Chg	37473	0.04	0.21	-0.41	1.55	305	0.04	0.05	-0.22	0.39
Size	39144	11.58	1.7	2.3	19.02	308	12.9	1.25	8.84	17.56
ETA	32467	0.14	0.11	0.03	0.84	308	0.1	0.05	0.03	0.67
LTA	39135	0.55	0.23	0.00	0.99	308	0.68	0.13	0.12	0.94
STWSFTA	39073	0.02	0.06	0.00	0.45	308	0.02	0.04	0.00	0.27
MSTA	39144	0.16	0.17	0.00	0.8	308	0.15	0.11	0.00	0.52
TCBuffer	26758	0.23	1.44	-0.06	170.47	260	0.06	0.08	0.00	1.32
Unemployment	39512	5.76	1.44	3.97	9.61	308	5.53	1.25	3.97	9.61
VIXCLS	39512	19.9	5.85	12.39	32.69	308	20.1	5.75	12.39	32.69
GDP_Chg	39512	2.89	1.55	-2.54	4.75	308	3.06	1.42	-2.54	4.75
TB3MS	39512	3.24	2.04	0.03	5.82	308	3.46	1.88	0.05	5.82

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Summary Statistics: CBs

Variables of Interest

	Non-Listed CBs					Listed CBs				
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
DivNI	27150	0.22	0.27	0.00	1.00	275	0.21	0.22	0.00	0.95
DivNI_%Chg	13177	0.03	0.83	-1.00	13.24	150	0.16	1.24	-1.00	13.24
DPS_%Chg	1	-0.15	-	-0.15	-0.15	150	0.19	0.78	-1.00	5.08
Div_Init	44546	0.02	0.14	0.00	1.00	337	0.06	0.23	0.00	1.00
μROA_F3Y	36899	0.21	0.33	-2.33	3.02	337	0.20	0.27	-1.73	1.05
μROA_F5Y	36903	0.21	0.32	-2.33	3.02	337	0.20	0.25	-1.73	0.93
μROA_L3Y	32047	0.22	0.37	-2.33	3.02	307	0.23	0.25	-2.33	1.08
μROA_L5Y	32054	0.21	0.37	-2.33	3.02	307	0.20	0.28	-2.33	1.08
σROA_F3Y	36106	0.16	0.22	0.00	3.24	326	0.14	0.23	0.00	1.41
σROA_F5Y	36111	0.17	0.23	0.00	3.24	326	0.15	0.23	0.00	1.42
σROA_L3Y	31626	0.15	0.21	0.00	3.79	304	0.13	0.21	0.01	1.74
σROA_L5Y	31631	0.18	0.22	0.00	3.79	304	0.17	0.25	0.01	1.74
ZScore_F3Y	24627	4.71	0.95	-0.62	9.12	171	4.83	1.16	0.47	7.21
ZScore_F5Y	19252	4.59	0.90	0.71	9.38	116	4.61	1.09	0.72	6.65
ZScore_L3Y	31552	4.80	0.90	0.18	9.57	304	4.91	1.02	0.89	7.21
ZScore_L5Y	31566	4.66	0.91	0.18	9.57	304	4.63	1.05	0.89	7.16

Summary Statistics: CUs

Bank-Specific and Macroeconomic Controls

	Non-Listed CUs					Listed CUs				
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
ROA	40944	0.02	0.01	-0.01	0.05	38800	0.02	0.01	-0.01	0.05
Recap'd	41736	0.00	0.01	0.00	1.00	39591	0.00	0.01	0.00	1.00
LLPTA	41736	0.01	0.00	0.00	0.03	39591	0.01	0.00	0.00	0.03
NPLLTL	41736	0.01	0.01	0.00	0.06	39591	0.01	0.01	0.00	0.06
Loans_Chg	40881	0.01	0.03	-0.07	0.16	38737	0.01	0.03	-0.07	0.16
Size	41736	12.02	0.99	10.82	18.19	39591	12.02	0.99	10.82	18.19
ETA	41736	0.11	0.03	0.05	0.24	39591	0.11	0.03	0.05	0.24
LTA	41736	0.63	0.15	0.17	0.92	39591	0.63	0.15	0.17	0.92
STWSFTA	41736	0.01	0.02	0.00	0.12	39591	0.01	0.02	0.00	0.12
MSTA	41736	0.09	0.12	0.00	0.6	39591	0.08	0.12	0.00	0.6
TCBuffer	33690	0.03	0.03	-0.07	0.42	31857	0.03	0.03	-0.07	0.42
Unemployment	41736	6.04	1.63	3.97	9.61	39591	6.05	1.62	3.97	9.61
VIXCLS	41736	20.09	6.01	12.39	32.69	39591	20.08	5.98	12.39	32.69
GDP_Chg	41736	2.39	1.62	-2.54	4.75	39591	2.4	1.61	-2.54	4.75
TB3MS	41736	2.15	2.1	0.03	5.82	39591	2.12	2.1	0.03	5.82

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Summary Statistics: CUs

Variables of Interest

	Non-Listed CUs					Listed CUs				
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
DivNI	38115	0.15	0.16	0.00	1.00	35970	0.27	0.20	0.01	1.00
DivNI_%Chg	34820	0.06	0.86	-1.00	10.05	32860	0.11	0.82	-1.00	9.29
DPS_%Chg	38830	-0.08	0.34	-0.84	2.47	36580	0.04	0.57	-0.83	4.12
Div_Init	43481	0.00	0.02	0.00	1.00	41336	0.00	0.03	0.00	1.00
μROA_F3Y	43481	0.25	0.22	-1.03	2.70	41160	0.32	0.21	-0.97	2.22
μROA_F5Y	43481	0.24	0.20	-1.03	2.70	41182	0.30	0.20	-0.97	2.22
μROA_L3Y	41089	0.30	0.22	-1.03	2.70	38800	0.36	0.20	-0.97	1.85
μROA_L5Y	41109	0.32	0.22	-1.03	2.70	38820	0.37	0.20	-0.97	1.85
σROA_F3Y	43358	0.26	0.23	0.00	2.64	41047	0.32	0.23	0.00	2.13
σROA_F5Y	43363	0.25	0.21	0.00	2.64	41072	0.32	0.22	0.00	2.13
σROA_L3Y	40887	0.31	0.25	0.00	1.91	38582	0.35	0.23	0.00	1.64
σROA_L5Y	40907	0.33	0.24	0.00	1.91	38602	0.38	0.20	0.00	1.64
ZScore_F3Y	37789	4.00	0.87	1.57	7.15	35719	3.72	0.84	1.46	7.13
ZScore_F5Y	32904	3.88	0.75	1.58	6.78	31031	3.57	0.73	1.55	9.73
ZScore_L3Y	40816	3.90	0.88	1.19	10.04	38513	3.68	0.83	1.06	11.54
ZScore_L5Y	40825	3.74	0.77	1.19	10.04	38522	3.54	0.72	1.06	11.54

Dividend Initiations and Solvency

Analyze the relation between dividend initiations and solvency for top-holder BHCs, CBs, and CUs.

Dynamic Panel Model with Driscoll and Kraay Standard Errors

$$Future\quad Solvency_{it} = \alpha + \beta_1 Past\quad Solvency_{it-1} + \beta_2 Dividend\quad Initiations_{it-1}$$
$$+\gamma' Bank\quad Controls_{it-1} + \delta' Macroeconomic\quad Controls_{t-1} + \epsilon_{it}$$

Data

1996 - 2017
13,697 BHC Obs. (4,453 Listed)
17,084 CB Obs. (123 Listed)
27,733 CU Obs.

Variables

Solvency: ZScore_F(L)3Y & ZScore_F(L)5Y
Div_Init: Dummy equal to 1 for first ever dividend distribution; 0 otherwise.

Results

Positive relation between dividend initiations and solvency for both listed and non-listed BHCs ($\beta_2 > 0$).
Larger β_2 among listed BHCs.

Dividend Initiations and Future Solvency

VARIABLES	ZScore_F3Y	ZScore_F5Y	ZScore_F3Y	ZScore_F5Y
Controls	Yes	Yes	Yes	Yes
Bank Holding Companies	**Listed**		**Non-Listed**	
Div_Init	0.533***	0.498***	0.295***	0.314***
	(4.424)	(7.958)	(4.502)	(4.845)
Constant	9.025*	5.995**	10.176***	6.740**
	(2.055)	(2.682)	(2.996)	(2.743)
R^2	0.290	0.354	0.227	0.264
Observations	4,453	3,527	9,244	7,011
Commercial Banks	**Listed**		**Non-Listed**	
Div_Init	0.183	-0.272*	0.015	0.029
	(0.691)	(-2.141)	(0.394)	(1.290)
Constant	15.324**	11.490	8.466***	7.649***
	(2.446)	(1.639)	(7.133)	(7.742)
R^2	0.283	0.421	0.0724	0.110
Observations	123	86	16,961	13,311
Credit Unions	**Regular Shares**		**Share Certificates**	
Div_Init	0.126	0.110	-0.179	-0.063
	(1.220)	(1.616)	(-1.658)	(-0.873)
Constant	6.185***	1.292	0.772	-4.191*
	(3.492)	(0.961)	(0.253)	(-1.998)
R^2	0.464	0.444	0.552	0.592
Observations	27,733	23,045	26,070	21,539

- **Higher Dividend Initiations** $\leftrightarrow$ **Higher future solvency**
- In **BHCs**, **conservative dividend changes policies**: Dividend Initiations solely in the presence of favorable solvency expectations.
- In **CUs & CBs**, **Insignificant results**: Dividend Initiations when necessary.

Dividend Changes

Supplemental Analysis on the relation between dividend changes and profitability, risk-taking, and solvency for top-holder BHCs, CBs, and CUs

Dynamic Panel Model with Driscoll and Kraay Standard Errors

Replaces Dividend Payout Ratios with Quarterly Dividend-Per-Share Percentage Changes

Dividend Changes & Profitability

1996 - 2017

3,232 Obs. for Listed BHCs
142 Obs. for Listed CBs
32,340 Obs. for CUs

Positive relation between dividend-per-share changes and future profitability for credit unions.

Non-significant results among banks

Dividend Changes & Risk-Taking

1996 - 2017

3,189 Obs. for Listed BHCs
139 Obs. for Listed CBs
32,268 Obs. for CUs

Negative relation between future ROA Volatility and dividend changes for listed BHCs.

Positive relation among non-listed BHCs, listed CBs, and Credit Unions.

Dividend Changes & Solvency

1996 - 2017

2,702 Obs. for Listed BHCs
78 Obs. for Listed CBs
27,179 Obs. for CUs

Positive relation between dividend changes and future solvency among listed BHCs.

More strongly pronounced negative relation among CUs and listed CBs.

Dividend-Per-Share Percentage Changes

DPS Changes and Future Profitability

	Listed BHCs		Listed CBs		CUs - Reg. Shares		CUs - Share Cert.	
VARIABLES	μROA_F3Y	μROA_F5Y	μROA_F3Y	μROA_F5Y	μROA_F3Y	μROA_F5Y	μROA_F3Y	μROA_F5Y
DPS_%Chg	0.000	0.000	0.000	-0.000	0.000**	0.000***	0.000***	0.000***
	(1.157)	(1.195)	(0.224)	(-0.114)	(2.635)	(3.593)	(3.056)	(3.287)
Constant	0.036***	0.024***	0.016*	0.002	0.019**	0.014**	0.031***	0.030***
	(3.380)	(3.609)	(2.109)	(0.282)	(2.772)	(2.892)	(3.562)	(4.272)
R^2	0.447	0.335	0.760	0.703	0.362	0.327	0.458	0.508
Observations	3,232	3,232	142	142	32,340	32,340	30,490	30,490

DPS Changes and Future Risk-Taking

VARIABLES	σROA_F3Y	σROA_F5Y	σROA_F3Y	σROA_F5Y	σROA_F3Y	σROA_F5Y	σROA_F3Y	σROA_F5Y
DPS_%Chg	-0.000*	-0.000**	0.000***	0.000*	0.000**	0.000	0.001***	0.000**
	(-2.109)	(-2.409)	(3.489)	(1.783)	(2.138)	(1.702)	(3.029)	(2.833)
Constant	-0.025***	-0.010**	-0.028***	-0.010***	-0.002	0.005**	0.008	0.020***
	(-3.765)	(-2.546)	(-5.204)	(-3.387)	(-0.750)	(2.637)	(1.229)	(3.803)
R^2	0.336	0.311	0.546	0.351	0.340	0.297	0.576	0.551
Observations	3,189	3,189	139	139	32,268	32,269	30,429	30,430

DPS Changes and Future Solvency

VARIABLES	ZScore_F3Y	ZScore_F5Y	ZScore_F3Y	ZScore_F5Y	ZScore_F3Y	ZScore_F5Y	ZScore_F3Y	ZScore_F5Y
DPS_%Chg	0.055*	0.108***	-0.161*	-0.058**	-0.081**	-0.124***	-0.329***	-0.235***
	(1.792)	(9.232)	(-2.029)	(-2.938)	(-2.442)	(-3.270)	(-5.194)	(-3.236)
Constant	16.344***	8.111***	24.946***	3.782	6.204***	1.135	1.109	-3.820**
	(5.408)	(4.958)	(3.233)	(1.159)	(3.508)	(0.845)	(0.444)	(-2.341)
R^2	0.410	0.380	0.322	0.665	0.467	0.450	0.604	0.620
Observations	2,702	2,083	78	56	27,179	22,566	25,547	21,069

2. The Puzzle of Dividend Payouts

Dividend Changes and Profitability

Banks are reluctant to change dividends despite promising profitability expectations. Unsustainable higher payouts could lead to strong market reactions. In the absence of enforced dividend reductions, banks may prefer continued payouts despite inadequate capital positions & debt-to-equity violations. **Market reactions and subsequent negative market price consequences seem to be a severe constraint in dividend policy changes**.

Dividend Changes and Risk-Taking

Banks are reluctant to change dividend policy, even when managerial expectations of higher risk-taking (i.e., higher upward potential for profitability, but also losses) exist. Exposure to such losses could lead to dividend cuts, which in turn could be met with share price pressures.

Dividend changes in CUs are aligned with higher risk-taking. The result could be due to the interest-like nature of such payouts.

Dividend Changes and Solvency

Dividend changes within credit unions have a greater impact on future solvency. Given the existence of depositor discipline in credit unions (Gómez-Biscarri et al., 2020), a credit union with potential solvency issues may decide to keep dividends to avoid a run on deposits (shares).

Listed BHCs would be penalized by investors in the long run (in the form of stock price reductions) if they choose to implement a dividend increase that could not be feasible to maintain in the future (Martinez Peria and Schmukler, 2001). **Dividends increase only when managers are confident in the increase's future viability and when increases would not erode the capital position of the bank**.

The negative relation, which indicates that higher dividends today lead to lower solvency in the future, is consistent with debt expropriation or cheating among commercial banks.

Descriptive Statistics

	1998-2010			1998-2004			2005-2010		
VARIABLES	N	μ	σ	N	μ	σ	N	μ	σ
Δ NPL	14,751	0.099	0.957	8,938	-0.041	0.893	5,813	0.314	1.010
Lend. Growth	14,751	0.092	0.140	8,938	0.103	0.135	5,813	0.073	0.147
Δ Cost	14,751	0.212	15.708	8,938	0.029	4.374	5,813	0.493	24.426
Prem	14,751	0.143	0.034	8,938	0.146	0.034	5,813	0.139	0.033
σCost/Loans	4,802	0.006	0.004	2,744	0.006	0.004	2,058	0.006	0.004
Banker Slope	4,858	0.361	0.615	2,776	0.361	0.616	2,082	0.361	0.616
Size	14,751	13.547	1.299	8,938	13.334	1.277	5,813	13.875	1.265
Solv	14,751	0.091	0.034	8,938	0.092	0.031	5,813	0.089	0.037
LTA	14,751	0.659	0.125	8,938	0.639	0.123	5,813	0.688	0.122
Δ Unemp	14,751	0.035	0.161	8,938	0.011	0.121	5,813	0.073	0.203
Δ Int	14,751	-0.009	0.393	8,938	-0.167	0.175	5,813	0.234	0.496
Inf	14,751	2.439	0.966	8,938	2.360	0.566	5,813	2.562	1.361

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Robustness: Lending Quality & Cost Rigidity

Robustness Analysis: Alternative Model

Arellano and Bond's Two-step GMM Dynamic Panel Data Estimator

$$\Delta NPL_{it} = \Delta NPL_{it-1} + \sum_{j=0}^{2} \beta_{1j} \Delta Loans_{it-j} + \sum_{j=1}^{2} \beta_{2j} \Delta Loans_{it-j} \times Prem_{it-j} + \sum_{j=1}^{2} \beta_{3j} \Delta Cost_{it-j} \times Prem_{it-j}$$

$$+ \sum_{j=1}^{2} \beta_4 Prem_{it-j} + \beta_{5j} Cost_{it-j} + \gamma' Bank \quad Controls_{it} + \delta' Macroeconomic \quad Controls_t + \mu_i + \lambda_t + \epsilon_{it}$$

Data

1998 - 2010
12,234 Observations for 1,894 BHCs

Variables

Short-run Cost Changes (Δ Cost): changes in costs w.r.t. changes in lending.
Cost Structure (Prem): fixed to total costs
Interaction Effects: Δ Cost $\times$ Prem & Lending Growth $\times$ Prem

Results

Positive Relation for Lagged values of lending growth ($\beta_{1j} > 0$);

Negative relation for the interaction between lending growth and cost rigidity with future NPLs ($\beta_{2j} < 0$);

Negative relation for the interaction between short-run cost changes and cost rigidity with future NPLs ($\beta_{3j} < 0$).

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Robustness: Lending Quality & Cost Rigidity (2-Step GMM)

VARIABLES	Δ NPL$_t$	Δ NPL$_t$	Δ NPL$_t$
Lending Growth$_{t-1}$	-0.235	0.157	-0.903
	(-0.316)	(1.313)	(-1.166)
Lending Growth$_{t-2}$	1.016**	0.150*	1.204***
	(2.486)	(1.703)	(3.142)
Prem$_{t-1}$	-2.141	-2.053	-3.384
	(-0.828)	(-0.959)	(-1.402)
Prem$_{t-2}$	-0.648	-1.202	0.021
	(-0.343)	(-0.697)	(0.011)
Lending Growth$_{t-1}$ $\times$ Prem$_{t-1}$	2.602		6.997
	(0.478)		(1.253)
Lending Growth$_{t-2}$ $\times$ Prem$_{t-2}$	-6.281**		-7.698***
	(-2.094)		(-2.701)
Δ Cost$_{t-1}$		0.010	0.012
		(1.054)	(1.439)
Δ Cost$_{t-2}$		0.027***	0.027***
		(3.250)	(3.656)
Δ Cost$_{t-1}$ $\times$ Prem$_{t-1}$		-0.139	-0.161
		(-0.892)	(-1.214)
Δ Cost$_{t-2}$ $\times$ Prem$_{t-2}$		-0.192***	-0.191***
		(-2.600)	(-2.732)
Observations	12,234	12,234	12,234
Number of gvkey	1,894	1,894	1,894

Robustness: Lending Quality & Cost Rigidity

Robustness Analysis: Alternative Cost Structure Measures

Linear Regression

$$Avg.\Delta NPL_i = \beta_1 Avg.\Delta Loans_i + \beta_{2j} Avg.\Delta Loans_i \times Avg.\Delta BankerSlopei + \beta_{3j} Avg.\Delta Cost_i \times Avg.\Delta BankerSlope_i$$
$$+\beta_4 Avg.\Delta Prem_i + \beta_5 Avg.\Delta Cost_i + \gamma' Avg.Bank \quad Controls_i + \delta' Avg.Macroeconomic \quad Controls + \mu_i$$

Data

2005 - 2010
790 BHC Observations

Variables

Banker Slope: Pre-2005 slope between changes in lending and changes in costs;
σ Cost-to-Loans: Pre-2005 St.Dev. of the cost to loans ratio;
Transform baseline variables to average value over the lending growth horizon.

Results

Positive Relation for average lending growth ($\beta_{1j} > 0$);

Negative relation for the interaction between average lending growth and Banker's Slope with future NPLs ($\beta_{2j} < 0$);

Negative relation for the interaction between average short-run cost changes and Banker's Slope with future NPLs ($\beta_{3j} < 0$).

3. Cost Structure and Lending Quality

Robustness: Lending Quality & Cost Rigidity (Banker Slope)

VARIABLES	Avg. Δ NPL	Avg. Δ NPL	Avg. Δ NPL
Avg. Lending Growth	1.013**	0.608*	0.970**
	(2.464)	(1.708)	(2.354)
Avg. Size	0.026**	0.023**	0.024**
	(2.432)	(2.244)	(2.281)
Avg. Solvency	-0.035	0.002	-0.088
	(-0.050)	(0.003)	(-0.124)
Avg. Loan-to-Assets	0.110	0.055	0.083
	(0.862)	(0.438)	(0.652)
Avg. Δ Int	0.312*	0.259	0.270
	(1.739)	(1.415)	(1.496)
Avg. Δ Unemp	1.279**	1.295**	1.297**
	(2.406)	(2.413)	(2.441)
Avg. Inflation	0.113*	0.117**	0.124**
	(1.948)	(1.983)	(2.126)
Banker Slope	0.034	-0.054***	0.040
	(0.750)	(-2.883)	(0.845)
Avg. Δ Cost		0.007***	0.008***
		(4.060)	(4.299)
Avg. Δ Cost × Banker Slope		-0.073	-0.090*
		(-1.459)	(-1.862)
Avg. Δ Lending × Banker Slope	-1.131**		-1.153**
	(-1.980)		(-1.992)
Constant	-0.574**	-0.488**	-0.551**
	(-2.278)	(-1.985)	(-2.209)
R^2	0.103	0.099	0.114
Observations	789	789	789

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Robustness: Lending Quality & Cost Rigidity (σCost-to-Loans)

VARIABLES	Avg. Δ NPL	Avg. Δ NPL	Avg. Δ NPL
Avg. Lending Growth	-0.248	0.373	-0.210
	(-0.293)	(0.963)	(-0.252)
Avg. Size	0.018*	0.018*	0.017*
	(1.806)	(1.688)	(1.697)
Avg. Solvency	-0.172	-0.122	-0.122
	(-0.228)	(-0.162)	(-0.161)
Avg. Loan-to-Assets	0.090	0.053	0.060
	(0.649)	(0.379)	(0.429)
Avg. Δ Int	0.260	0.272	0.265
	(1.363)	(1.442)	(1.391)
Avg. Δ Unemp	1.492***	1.469***	1.480***
	(2.667)	(2.632)	(2.659)
Avg. Inflation	0.154*	0.147*	0.147*
	(1.918)	(1.828)	(1.833)
σ Cost-to-Loans	-10.232	-1.334	-9.562
	(-0.817)	(-0.369)	(-0.793)
Avg. Δ Cost		-0.097**	-0.096**
		(-2.094)	(-2.061)
Avg. Δ Cost $\times$ σ Cost-to-Loans		13.245***	12.948***
		(2.744)	(2.782)
Avg. Δ Lending $\times$ σ Cost-to-Loans	99.428		91.371
	(0.794)		(0.745)
Constant	-0.470*	-0.472	-0.425
	(-1.673)	(-1.642)	(-1.492)
R^2	0.067	0.072	0.075
Observations	790	790	790

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Do Lending Growth Dynamics Influence Lending Quality?

Robustness: Alternative Model

Arellano and Bond's Two-step GMM Dynamic Panel Data Estimator

$$\Delta NPL_{it} = \Delta NPL_{it-1} + \sum_{j=0}^{2} \beta_{1j} \Delta Loans_{it-j} + \sum_{j=1}^{2} \beta_{2j} \Delta Loans_{it-j} \times Prem_{it-j} + \sum_{j=1}^{2} \beta_{3j} \Delta Cost_{it-j} \times Prem_{it-j}$$

$$+ \sum_{j=1}^{2} \beta_4 Prem_{it-j} + \beta_{5j} Cost_{it-j} + \gamma^{'} Bank \quad Controls_{it} + \delta^{'} Macroeconomic \quad Controls_{t} + \mu_i + \lambda_t + \epsilon_{it}$$

$$+\beta_{12} Distance_{it-1} + \beta_{13} \Delta Loans\_Normalized_{it-1} + \beta_{14} Distance_{it-1} \times \Delta Loans\_Normalized_{it-1}$$

Data

1998 - 2010 (Balanced)
12,234 BHC Observations

Variables

Distance from peak (0-1) (Current Year/ (Max - Min Year))
Lend. Growth (Normalized): How Fast Lending Grows? (Current Growth/Total Growth)

Results

Negative relation between Distance in t-1 and Changes in Non-Performing Loans and Leases in t.

Positive relation between the pace of lending growth and changes in non-performing loans and leases.

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Robustness: Lending Quality, Lending Growth Dynamics & Cost Rigidity

(2-Step GMM)

Lending Growth$_{t-2}$	1.204***	1.379***	1.339***
	(3.142)	(3.759)	(3.004)
Prem$_{t-1}$	-3.384	-1.058	1.737
	(-1.402)	(-0.365)	(0.645)
Prem$_{t-2}$	0.021	0.576	-1.368
	(0.011)	(0.294)	(-0.576)
Lending Growth$_{t-1}$ x Prem$_{t-1}$	6.997	3.784	9.099
	(1.253)	(0.411)	(0.830)
Lending Growth$_{t-2}$ x Prem$_{t-2}$	-7.698***	-7.920***	-7.815**
	(-2.701)	(-2.715)	(-2.146)
Δ Cost$_{t-1}$	0.012	0.089	-0.043
	(1.439)	(1.008)	(-0.453)
Δ Cost$_{t-2}$	0.027***	0.039***	0.047***
	(3.656)	(5.085)	(6.417)
Δ Cost$_{t-1}$ x Prem$_{t-1}$	-0.161	-0.818	0.609
	(-1.214)	(-1.055)	(0.646)
Δ Cost$_{t-2}$ x Prem$_{t-2}$	-0.191***	-0.307***	-0.406***
	(-2.732)	(-3.064)	(-4.289)
Distance$_{t-1}$		-0.088	-0.091
		(-0.591)	(-0.533)
Lending Growth$_{t-1}$ (Normalized)			1.290**
			(2.494)
Lending Growth$_{t-1}$ (Normalized) $\times$ Distance$_{t-1}$			-1.420***
			(-2.715)
Lending Growth$_{t-1}$ $\times$ Distance$_{t-1}$		-0.960	
		(-1.545)	
Observations	12,234	6,115	5,263

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Robustness: Lending Quality, Lending Growth Dynamics & Cost Rigidity

Robustness Analysis: Alternative Measures of Lending Growth Dynamics

Linear Regression with Clustered FEs

$$Avg.\Delta NPL_i = \beta_1 Avg.\Delta Loans_i + \beta_{2j} Avg.\Delta Loans_i \times Avg.\Delta BankerSlopei + \beta_{3j} Avg.\Delta Cost_i \times Avg.\Delta BankerSlope_i$$

$$+\beta_4 Avg.\Delta Prem_i + \beta_5 Avg.\Delta Cost_i + \gamma' Avg.Bank \quad Controls_i + \delta' Avg.Macroeconomic \quad Controls + \mu_i$$

$$+\beta_4 Log \quad Growth \quad Horizon_i + \beta_5 Avg. \quad Lending \quad Growth_i$$

$$+\beta_6 Log \quad Growth \quad Horizon_i \times Avg. \quad Lending \quad Growth_i$$

Data

2005 - 2010 (Balanced)
412 BHC Observations 1 Observation per BHC

Variables

Log growth horizon: Log the number of years in the lending growth horizon.

Average lending growth over the lending growth horizon.

Results

Negative relation between Log Growth Horizon and Average Change in NPLs ($\beta_4 < 0$).

Positive relation between Avg. Percentage Growth in Lending and Average Change in NPLs ($\beta_5 > 0$).

Negative relation between Log Growth Horizon $\times$ Avg. Percentage Growth in Lending and Average Change in NPLs ($\beta_6 < 0$).

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3. Cost Structure and Lending Quality

Robustness: Lending Quality, Lending Growth Dynamics & Cost Rigidity

VARIABLES	Avg. Δ NPL	Avg. Δ NPL	Avg. Δ NPL
Avg. Lending Growth	4.381**	4.935*	3.396*
	(2.430)	(1.858)	(1.912)
Ratio Premises (Pre-Growth)	2.374*	2.368	2.381*
	(1.872)	(1.592)	(1.915)
Avg. Lending Growth × Prem (Pre-Growth)	-25.888**	-25.611*	-23.116*
	(-2.039)	(-1.654)	(-1.899)
Avg. Δ Cost	0.017***	0.019***	0.025***
	(5.866)	(5.041)	(7.704)
Avg. Δ Cost × Prem (Pre-Growth)	-0.112***	-0.120***	-0.160***
	(-6.251)	(-5.267)	(-7.782)
Avg. Percent Growth Per Year			2.023**
			(2.193)
Log Growth Horizon		-0.037	-0.220**
		(-0.374)	(-2.202)
Log Growth Horizon × Avg. Percent Growth Per Year			-0.897*
			(-1.948)
Avg. Lending Growth × Log Growth Horizon		-0.354	
		(-0.399)	
Constant	-0.672*	-0.621	-0.112
	(-1.739)	(-1.364)	(-0.248)
R^2	0.106	0.110	0.204
Observations	412	407	345

Robustness: Lending Quality, Lending Growth Dynamics & Cost Rigidity

- ☐ Banks with higher levels of average annual lending growth have higher levels of non-performing loans in the future.
- ☐ But, the association is lower for banks that grew more slowly (i.e., banks with longer log growth horizons).
- ☐ Supports the congestion costs hypothesis.

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3. Cost Structure and Lending Quality

Determinants of Efficiency

Explore bank fundamentals which could be potential drivers of operational efficiency.

Panel model (Bank and Year FEs & Robust Variance Estimator SEs

$$Efficiency_{it} \quad (\Delta Efficiency_{it}) = \beta_1 \Delta Cost_{it} + \beta_2 Diversification_{it} + \beta_3 LTA_{it} + \beta_4 TDTL_{it}$$
$$+\beta_5 Size_{it} + \beta_6 Solv_{it} + \beta_7 LTA_{it} + \beta_8 Unemp_{it} + \beta_9 Inf_{it} + \beta_{10} Int_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Data

1998 - 2010
17,881 Observations for 2,802 BHCs

Variables

Efficiency: Gross Margin (Int + Non-Int. Income) to Total Non-Interest Expense

ΔEfficiency: Annual Log Change of Efficiency

Diversification: Non-Int. Income to Total Income

ΔCost: Log Change Non-Int. Exp scaled by Log Change Loans

Results

Short-run cost changes negatively associated with both efficiency and annual changes in efficiency ($\beta_1 < 0$).

Inflation ($\beta_9 > 0$), size ($\beta_5 > 0$), and loan portfolio size ($\beta_3 > 0$) are positively associated with both the level and changes in efficiency.

Diversification, Deposits to Liabilities , and Solvency affect the level of efficiency differently from efficiency changes.

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Determinants of Efficiency

VARIABLES	Efficiency	Δ Efficiency	Efficiency	Δ Efficiency
Δ $Cost_t$	-0.145***	-0.183***	-0.099***	-0.181***
	(-8.507)	(-13.109)	(-5.485)	(-12.772)
Diversif	-0.161**	0.273***	-0.312***	0.219***
	(-2.326)	(8.444)	(-5.847)	(8.721)
LTA	0.229***	0.126***	0.126***	0.083***
	(6.261)	(7.737)	(3.392)	(5.225)
DTL	-0.053	-0.046*	-0.116**	-0.000
	(-1.211)	(-1.709)	(-2.557)	(-0.005)
Size	0.119***	-0.016***	-0.017***	-0.042***
	(10.446)	(-3.600)	(-2.691)	(-13.995)
Solv	2.128***	-0.120	1.891***	-0.171
	(12.058)	(-0.985)	(10.006)	(-1.391)
Δ Int	0.015	-0.019	-0.007**	0.016***
	(0.636)	(-0.830)	(-1.991)	(6.439)
Inf	0.090***	0.014**	-0.000	0.004***
	(10.316)	(2.268)	(-0.245)	(3.617)
Δ Unemp	0.025	-0.069*	-0.092***	0.035***
	(0.693)	(-1.854)	(-8.657)	(4.296)
Constant	-0.429**	0.141**	1.711***	0.481***
	(-2.429)	(2.057)	(16.825)	(9.914)
R^2	0.144	0.0790	0.0555	0.0487
Observations	17,881	17,881	17,881	17,881
Number of BHCs	2,802	2,802	2,802	2,802
Time FE	Yes	Yes	-	-

Back

Determinants of Efficiency

- ☐ Short-run cost changes are significantly and negatively associated with both efficiency and its annual changes.
- ☐ Inflation, size, and loan portfolio size are positively associated with both the level and changes in efficiency.
- ☐ Diversification, Deposits to Liabilities, and Solvency affect the level of efficiency differently from efficiency changes.

▸ Methodology ▸ Results

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