

Community Banking
in the 21st Century



Rivalry, Market Structure and Innovation: The Case of Mobile Banking

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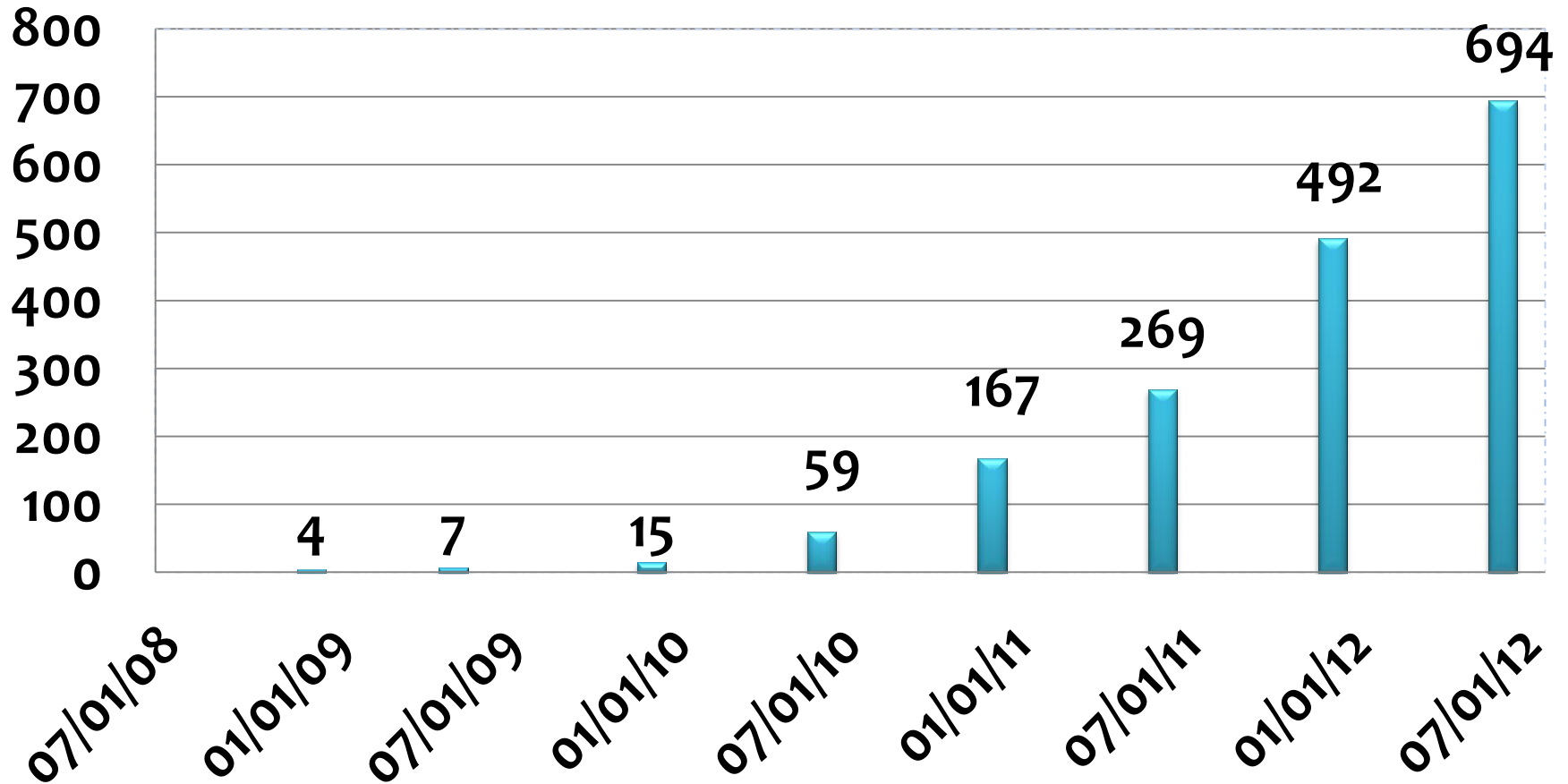


Research Questions

- Whether rivalry and market structure affect technology diffusion.
- Are there any interactive effects of rivalry and market structure during the technology adoption process?

Rapid Growth of Mobile Banking Apps

Cumulative Number of Banks with iPhone Apps

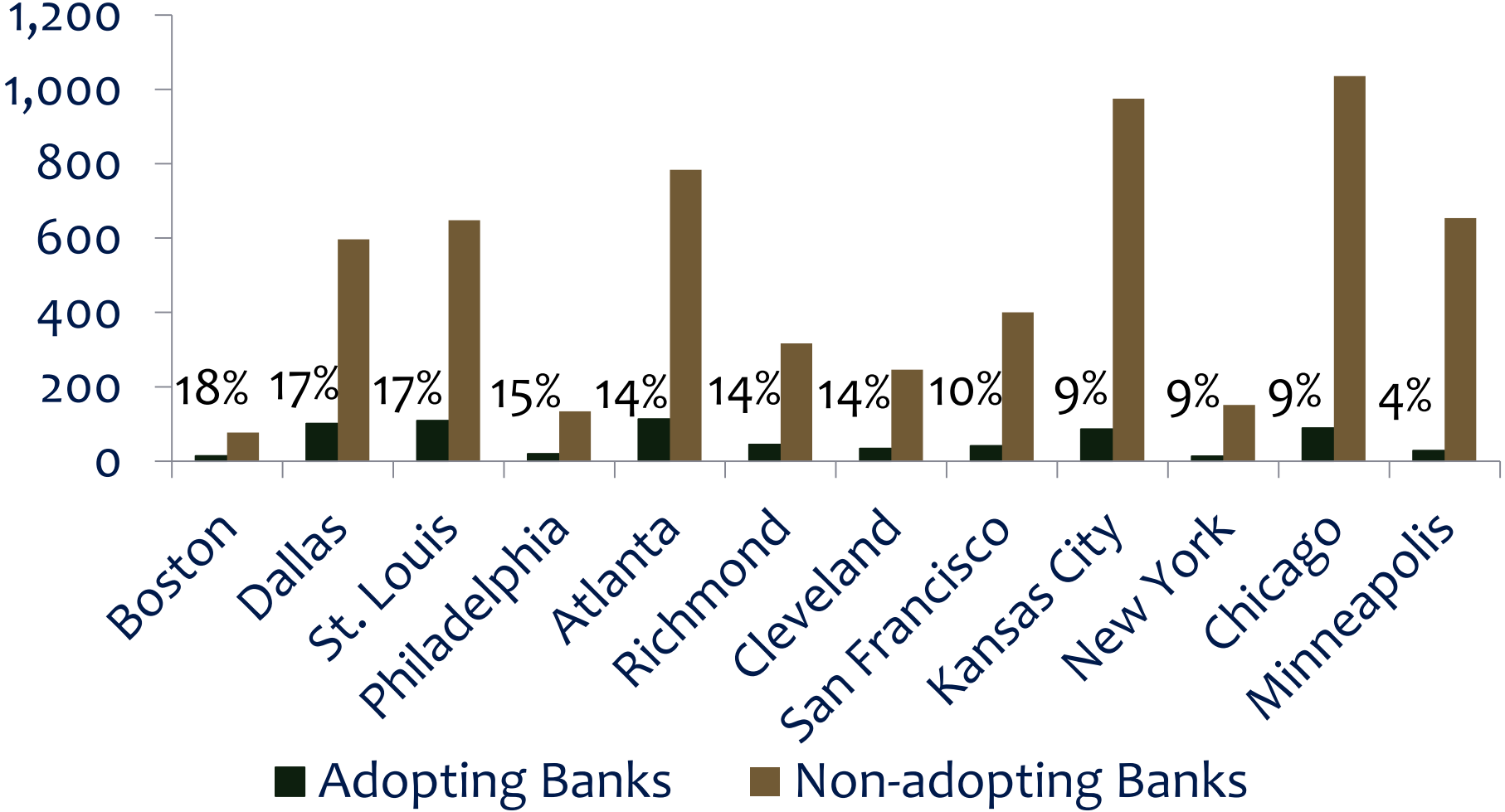


Source: iTunes Store

What Is A Mobile Banking App?

- Definition from the Federal Reserve survey (March, 2012)
 - Mobile Banking: SMS – Mobile Web – Mobile App
- Mobile apps provide customized financial services.
- Mobile apps versus Online banking websites
- Fast customers' adoption of smartphones

Adoption by Regional Fed as of Mid-2012



Why Do Banks Adopt Apps?

- To Enhance Customer Relationship
 - American Banker (February 6, 2012)
- Competitive Pressure
 - American Banker (February 6, 2012)
- To Replace Branches and Labor
 - American Banker (September 10, 2012)

This Paper

- To date, there are no academic research papers on the adoption of mobile banking apps.
- Applying a Cox proportional hazard model to study the joint impact of market structure and rivalry on the probability of adoption.
- Using unique, hand-collected data on mobile app adoption by 694 banks between 2008 and 2012.
- Addressing endogeneity concern that adoptions are simultaneous reactions to unmeasured factors by an instrumental variables approach.

Literature Review

- Mixed evidence on the role of market concentration:
 - **Adoption of ATMs:** Hannan and McDowell (1984)
 - **Adoption of Small Business Credit Scoring:** Akhavein, Frame, and White (2005)
- Mixed evidence on the (dynamic) role of competitive rivalry
 - **Adoption of Internet Banking:** DeYoung, Lang and Nolle (2007)
- **Joint role** of rivalry and market concentration:
 - Hannan and McDowell (1987)

Main Data Source-- iTunes

The screenshot shows the iTunes application window with the following elements:

- Menu Bar:** File, Edit, View, Controls, Store, Advanced, Help.
- Toolbar:** Playback controls (back, play, forward), volume slider, and search bar containing "bb&t".
- Navigation Bar:** Home, Music, Movies, TV Shows, Apps, Books, Podcasts, iTunes U.
- Left Sidebar:** LIBRARY (Music, Movies, TV Shows, Apps, Radio), STORE (iTunes Store, iTunes Match, Downloads), GENIUS (Genius), PLAYLISTS (iTunes DJ, 90's Music, Classical Music, Music Videos, My Top Rated, Recently Added, Top 25 Most Played, untitled playlist).
- Main Content Area:** A grid of free finance apps. The word "Free" is circled in red. The "Sort By: Release Date" dropdown is circled in red. Three app cards are circled in red:
 - The Capital Bank Mobile:** Finance, Updated Aug 30, 2012.
 - Utah First CU Mobile Ba...:** Finance, Updated Sep 24, 2012.
 - Bank of Abbeville Mobile:** Finance, Released Aug 10, 2012.

iTunes—An Illustration

The screenshot displays the iTunes application window. At the top, the menu bar includes File, Edit, View, Controls, Store, Advanced, and Help. The status bar shows the iTunes logo and a search bar containing the text "first national bank". The main content area is titled "All iPhone Apps for 'first national bank'", with the search term circled in red. The left sidebar contains sections for LIBRARY (Music, Movies, TV Shows, Apps, Radio), STORE (iTunes Store, iTunes Match, Downloads), GENIUS (Genius), and PLAYLISTS (iTunes DJ, 90's Music, Classical Music, Music Videos, My Top Rated, Recently Added, Recently Played, Top 25 Most Played, untitled playlist). The main area displays a grid of 24 app cards, each representing a mobile banking application from various banks, including First National Bank of PA, FNB & FCB Mobile Banking, FNB Mobile Banking, First National Bank - Mobile B..., First Victoria National Bank, First Merchants Mobile B..., First National Bank of For..., First Federal Mobile Banking, First Community Bank, First Southern National B..., FHNB Mobile Banking, First National Bank of Hutchi..., First National Bank of St..., First Mobile, The First National Bank &..., First National Bank of Huntsv..., First National Bank Mobil..., First National Bank of Am..., First National Bank (OH), Pine Bluff National Bank, First Dakota National Ban..., First National Bank of Cro..., First National Bank and T..., First National Bank, Hot Sprin..., FNBOTN Mobile, First National Bank of San..., and Sonora Bank Mobile. Each card shows the app icon, name, category (Finance), release or update date, and a "FREE" price tag.

File Edit View Controls Store Advanced Help

iTunes

first national bank

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LIBRARY

- Music
- Movies
- TV Shows
- Apps
- Radio

STORE

- iTunes Store
- iTunes Match
- Downloads

GENIUS

- Genius

PLAYLISTS

- iTunes DJ
- 90's Music
- Classical Music
- Music Videos
- My Top Rated
- Recently Added
- Recently Played
- Top 25 Most Played
- untitled playlist

All iPhone Apps for "first national bank"

App Name	Category	Release/Update Date	Price
First National Bank of PA	Finance	Updated Sep 20, 2012	FREE
FNB & FCB Mobile Banking	Finance	Updated Jun 06, 2012	FREE
FNB Mobile Banking	Finance	Updated May 24, 2012	FREE
First National Bank - Mobile B...	Finance	Updated Feb 24, 2012	FREE
First Victoria National Bank	Finance	Released Apr 25, 2011	FREE
First Merchants Mobile B...	Finance	Updated Aug 01, 2011	FREE
First National Bank of For...	Finance	Updated Oct 18, 2011	FREE
First Federal Mobile Banking	Finance	Updated Oct 26, 2011	FREE
First Community Bank - ...	Finance	Updated Oct 22, 2011	FREE
First Southern National B...	Finance	Updated Jul 24, 2012	FREE
FHNB Mobile Banking	Finance	Updated Oct 21, 2011	FREE
First National Bank of Hutchi...	Finance	Updated Jul 31, 2012	FREE
First National Bank of St. ...	Finance	Updated Sep 25, 2012	FREE
First Mobile	Finance	Updated Jul 18, 2012	FREE
The First National Bank &...	Finance	Updated Apr 30, 2012	FREE
First National Bank of Huntsv...	Finance	Updated Sep 21, 2012	FREE
First National Bank Mobil...	Finance	Updated May 11, 2012	FREE
First National Bank of Am...	Finance	Released Nov 02, 2011	FREE
First National Bank (OH)	Finance	Updated Jun 28, 2012	FREE
Pine Bluff National Bank	Finance	Updated Nov 14, 2011	FREE
First Dakota National Ban...	Finance	Released Apr 17, 2010	FREE
First National Bank of Cro...	Finance	Updated Dec 10, 2011	FREE
First National Bank and T...	Finance	Updated Apr 03, 2012	FREE
First National Bank, Hot Sprin...	Finance	Released Aug 21, 2012	FREE
FNBOTN Mobile	Finance	Released Aug 09, 2012	FREE
First National Bank of San...	Finance	Updated Aug 01, 2012	FREE
Sonora Bank Mobile	Finance	Released Sep 25, 2012	FREE
FNB Mobile Bank	Finance	Updated Sep 18, 2012	FREE

Data

- Adoption data from iTunes Store (694 adopters)
- Other data sources:
 - FDIC (bank financials, branch deposit data)
 - Bureau of Labor Statistics (demographic data)
- Final Sample contains 99,960 bank-quarter observations from 2008:Q3-2012:Q2
- iPhone app as a proxy for the mobile banking app technology

Majority Banks Had iPhone Apps First

	Android apps Adopted FIRST					Both Adopted at Same Time	iPhone apps Adopted FIRST	Total Testing Samples
Time Lag (Month)	<-4	-4	-3	-2	-1	0	>0	
# of Banks	4	5	5	6	5	159	369	553
Percent	0.7%	0.9%	0.9%	1.1%	0.9%	28.8%	66.7%	100%

Hypotheses

- **Market Structure—*HHI_Deposits* (?)**
 - Herfindahl-Hirschman Index of deposits in a local market, defined at the MSA level
- **Competitive Pressure—*Local Rivals* (+)**
 - % of rival banks (using branch presence) in a local market with mobile apps in a given quarter
- **Joint Effects—*Local Rivals*HHI_Deposits* (+)**
 - Banks compete on non-price attributes in concentrated markets (Scherer and Ross, 1929, pp.595).
 - Milliou and Petrakis (2011)

Summary Statistics (Key Variables)

Variables	Adopters (Obs=694)		Non-Adopters (Obs=99,291)		Diff-in- means
	Mean	Std. Dev.	Mean	Std. Dev.	
Local Rivals (%)	33.51	18.48	11.42	13.27	22.08***
HHI_Deposits	0.19	0.10	0.21	0.13	-0.02***

Main Results

Dependent Variable:	Odds Ratios	
	(1)	(2)
ADOPT		
(Predicted) Local Rivals	1.1149*** (7.49)	1.0901*** (5.89)
HHI_Deposits	0.8393 (-0.75)	0.0978** (-2.55)
Local Rivals *		1.0979***
HHI_Deposits		(2.91)
N	99,960	99,960

Instruments for *Local Rivals*=Rivals' outside-market deposit shares, **MSA dummy Controls**= lnAssets, lnAge, Tier1, Core Deposits, Service Revenue, Labor Cost, Workers and Salary, Advertising, Branch Intensity, Asset Growth, market conditions, financial distress, and **MSA & Year FEs**. t-statistics are based on **robust** standard errors **clustered** by **MSA**.

Other Tests

- Sort sample into quartiles by *HHI_Deposits* and estimate the effect of *Local Rivals* on each subgroup
- This interactive effect is stronger for banks headquartered in MSA areas.
- This joint effect exists for the speed of adoption estimated from a Tobit model.

The Impact of Adoption on Performance

Dependent Variables	Profitability			Costs		
	ROA	SERVICE REVENUE	ADVERTISE	BRANCH INTENSITY	WORKER /Branch	LABOR COST
	(1)	(2)	(3)	(4)	(5)	(6)
POST ADOPT	0.0587 (1.62)	0.0477*** (9.79)	0.0589*** (4.67)	0.0265 (0.14)	0.0027** (2.18)	0.0015*** (9.58)
TIME SINCE ADOPTION	0.026** (2.41)	0.0066*** (4.72)	0.0137*** (2.91)	0.1349 (1.33)	-0.0005 (-0.82)	0.0004*** (9.86)
N	10,868	10,868	10,868	10,868	10,868	10,868
Adjusted R ²	0.45	0.68	0.59	0.98	0.95	0.51

Notes: Sample includes adopters only. All Ordinary Least Squares (OLS) regressions include **bank FEs, year FEs**, and full set of **controls**. t-statistics are based on **robust** standard errors **clustered** by bank.

Conclusions

- Rivals spur mobile app diffusion.
- The impact of rivalry adoptions on potential adopters is stronger in more concentrated markets, consistent with the economic theory of the oligopolistic competition.