



Internet Banking: Developments and Prospects

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Outline

- Internet banking “landscape”
 - Definitions and data
 - Trends in Internet banking
 - Small bank/large Internet bank differences, Internet and non-Internet bank differences
 - Projections
- Empirical analyses:
 - Factors explaining bank adoption of Internet banking
 - Factors explaining range of Internet banking services offered
 - Questions about future developments

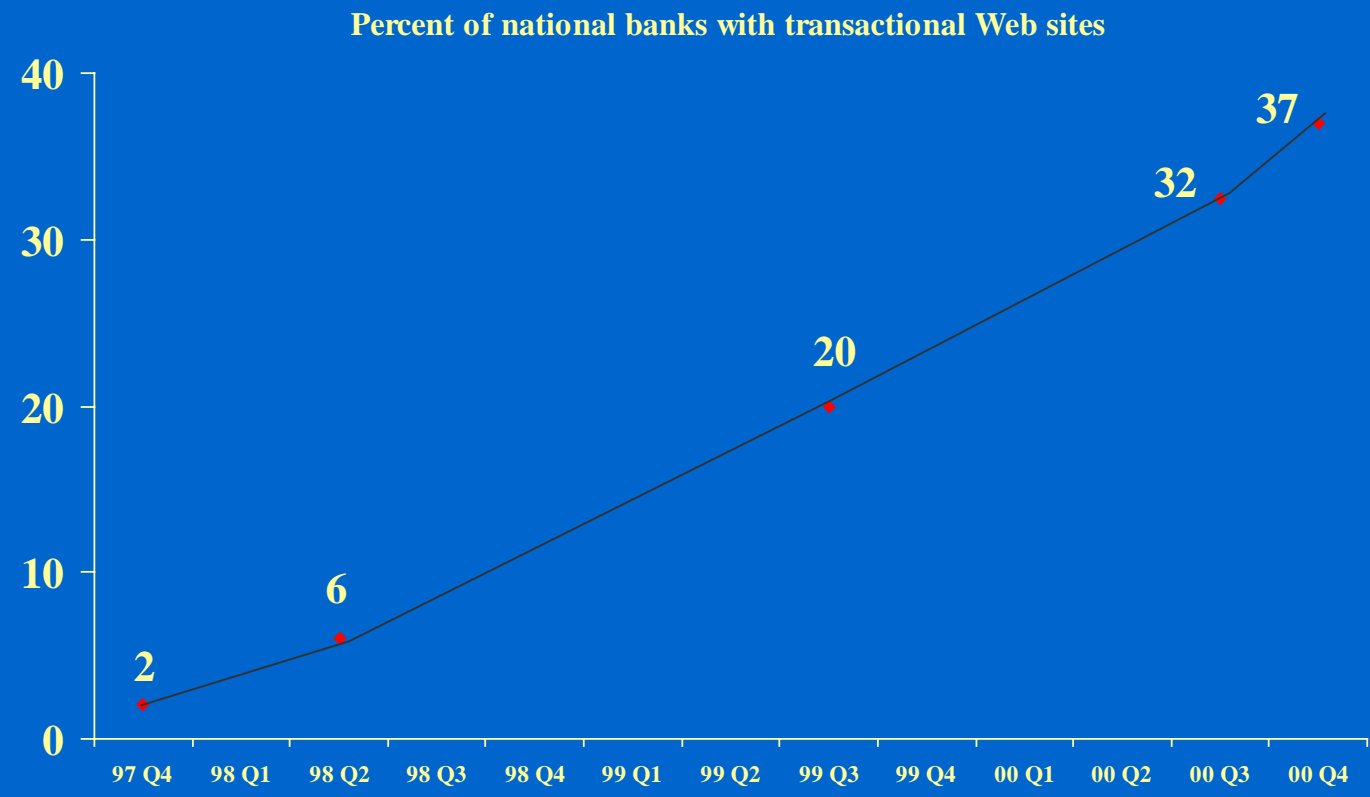


Definitions and Data

- “Internet bank”: *Any* bank offering transactional Internet banking (not just “virtual banks”).
 - “Transactional” = moving money.
- Data: Internet banking activities of all National banks, matched up with Call Report, structure, and supervisory data.
 - From observations by OCC examiners and economists.
 - Paper focuses on Q3 1999 and Q2 1998 data.



Substantial growth of transactional Internet banking



Source: Office of the Comptroller of the Currency



Internet banking: key facts

- Internet banks are a minority of all banks ...
- But they account for over 90% of all bank assets
- And over 85% of all consumer banking accounts



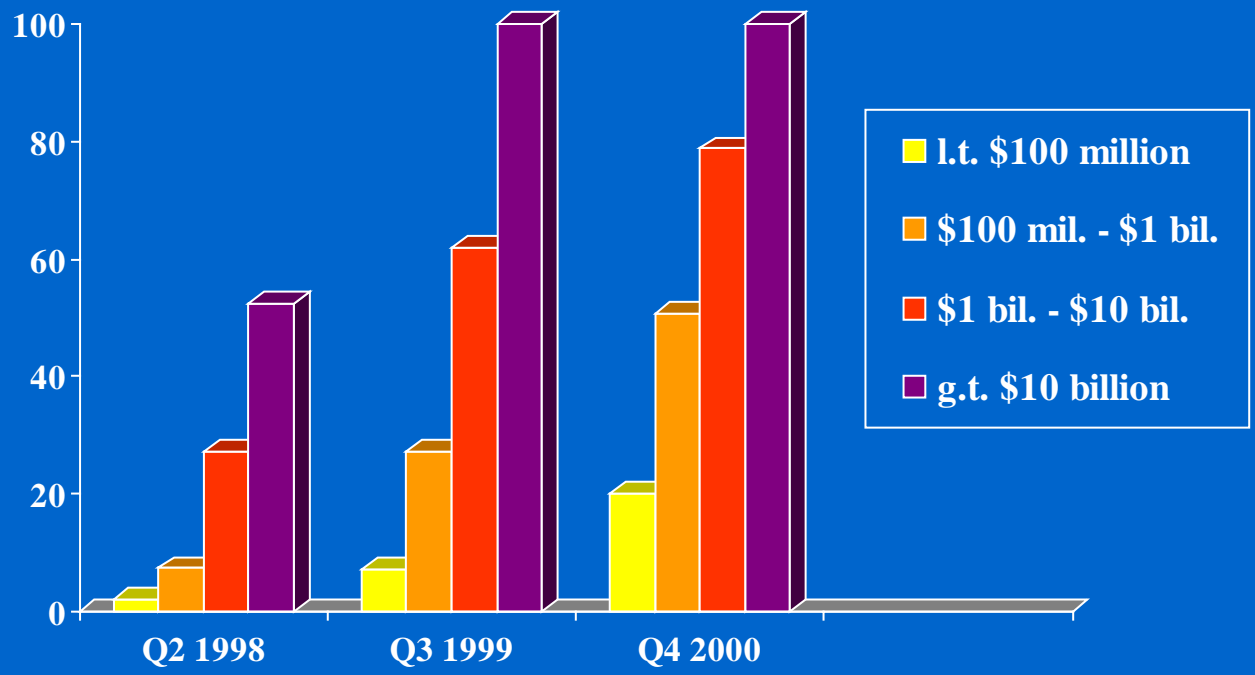
Small Internet/large Internet bank differences

- Proportionally fewer small banks offer Internet banking.
- Small Internet banks offer a narrower range of online services than do large Internet banks.



Small banks lag large banks in offering Internet banking

Percent of national banks offering Internet banking by size category



Source: Office of the Comptroller of the Currency



Internet and non-Internet banks: key differences

- Loan composition -- Internet banks have higher percentage of business loans and credit card loans
- Funding -- Internet banks rely less on deposits for funding, more on purchased funds
- Income -- Internet banks have more fee-generating activities



Internet and non-Internet banks: key differences

- Internet banks are more profitable than non-Internet banks (except for the smallest size banks)
- Smallest size banks (under \$100 million in assets): Internet banks performed worse than non-Internet banks:
 - Less profitable
 - Less efficient



**Table 10. *De novo* national banks:
 Internet banks performed worse than non-Internet banks
 (Q3 1999)**

	Internet banks	Non-Internet banks
Number of banks	9	47
Profitability p-value	-14.70 (0.082)*	-8.64
Accounting efficiency p-value	238.09 (0.024)**	133.14
Premises & fixed assets-to-net operating revenue (percent) p-value	33.36 (0.002)***	19.60
“Traditional” income p-value	87.86 (0.253)	75.99
<p>Memorandum: Among small banks, <i>de novo</i> banks are more than 3 times as likely to offer Internet banking as banks in existence 3 years or more:</p> <p>Percent of <i>de novo</i> banks that offered Internet banking: 19.2 Percent of mature small banks that offered Internet banking: 6.1</p>		



Table 11—Mature small national banks: Internet banks are less efficient, but not less profitable^{a,b} <i>(Q3 1999)</i>		
	Non-Internet banks	Internet banks
Number of banks	1,009	61
Profitability	11.13	10.36
p-value	(0.232)	
Accounting efficiency	64.50	70.50
p-value	(0.000)***	
Premises and fixed assets-to-net operating revenue	9.02	10.41
p-value	(0.000)***	
“Traditional” income	85.51	78.24
p-value	(0.000)***	



Table 12—Mature small national banks: Does Internet experience matter? <i>(Q3 1999)</i>			
	Non-Internet banks	Internet-experienced banks	Internet-inexperienced banks
Number of banks	1,009	11	50
Profitability	11.13	9.95	10.58
p-values		(0.400)	(0.434)
Accounting efficiency	64.50	63.10	71.61
p-values		(0.641)	(0.000)***
Premises and fixed assets-to-net operating revenue	9.02	7.99	10.85
p-values		(0.233)	(0.000)***
“Traditional” income	85.51	75.94	75.25
p-values		(0.000)***	(0.000)***



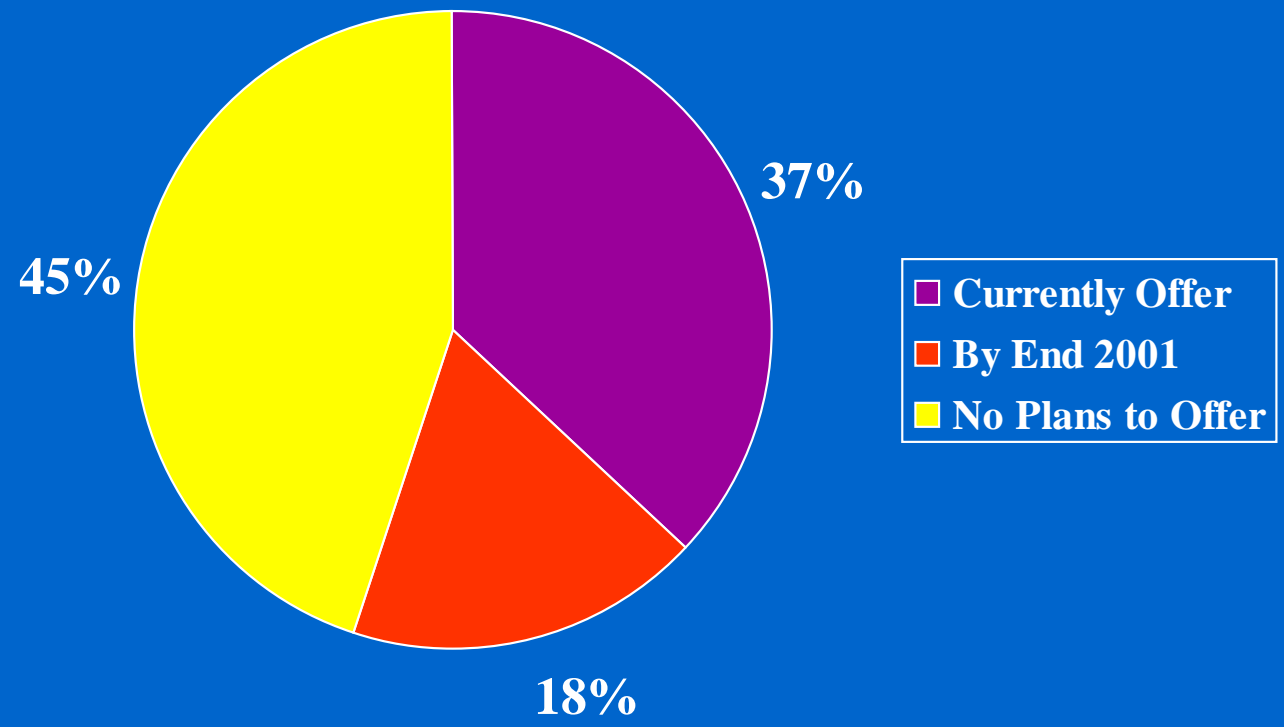
The future of Internet banking

- Projections of “Supply” of Internet banking
 - OCC examiners understanding of Internet banking plans of all national banks
- Small bank/large bank story continues
 - And an important twist
- Internet “haves” and “have nots”?



Internet banking and national banks: current use and planned growth

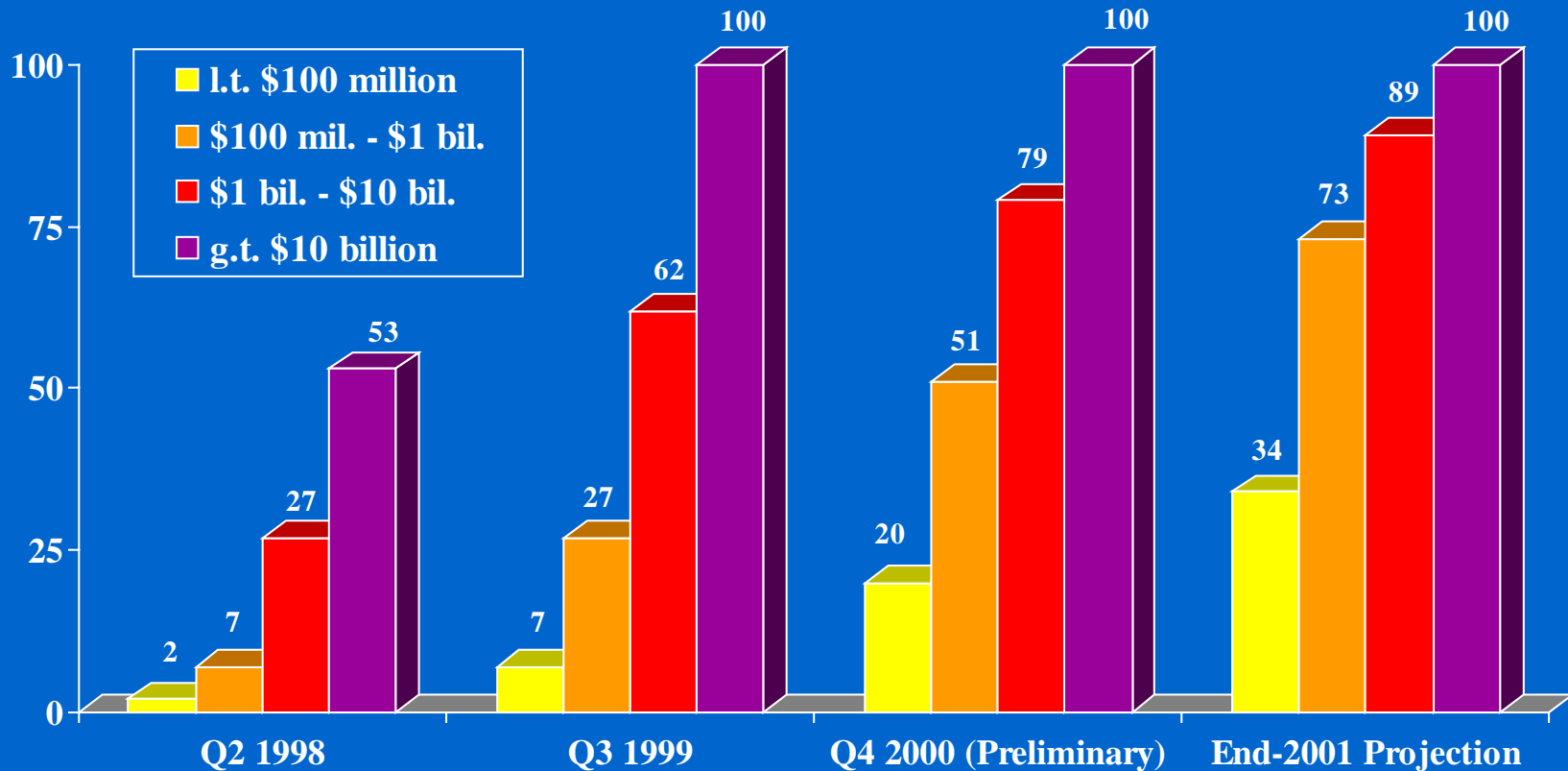
Percent of national banks with transactional Internet banking
(as of fourth quarter, 2000 - preliminary)



Source: Office of the Comptroller of the Currency

Projections: small banks will still lag large banks in offering Internet banking

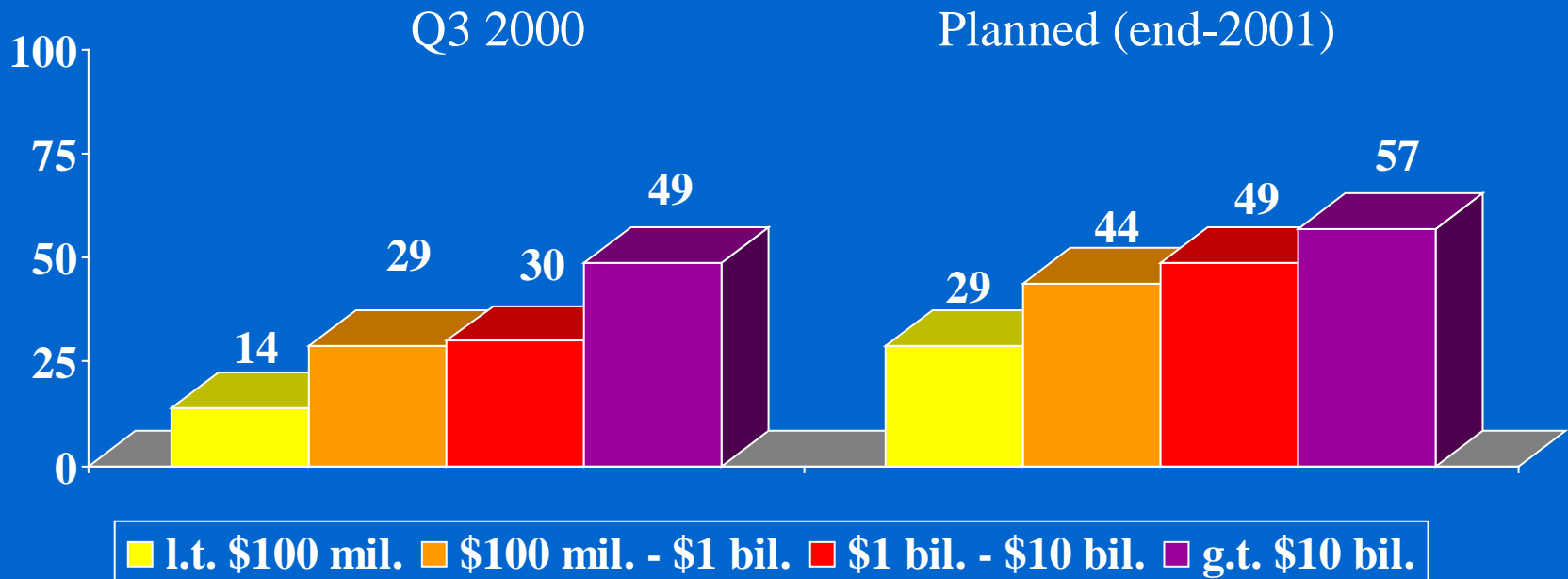
Percent of national banks offering Internet banking by size category



Source: Office of the Comptroller of the Currency

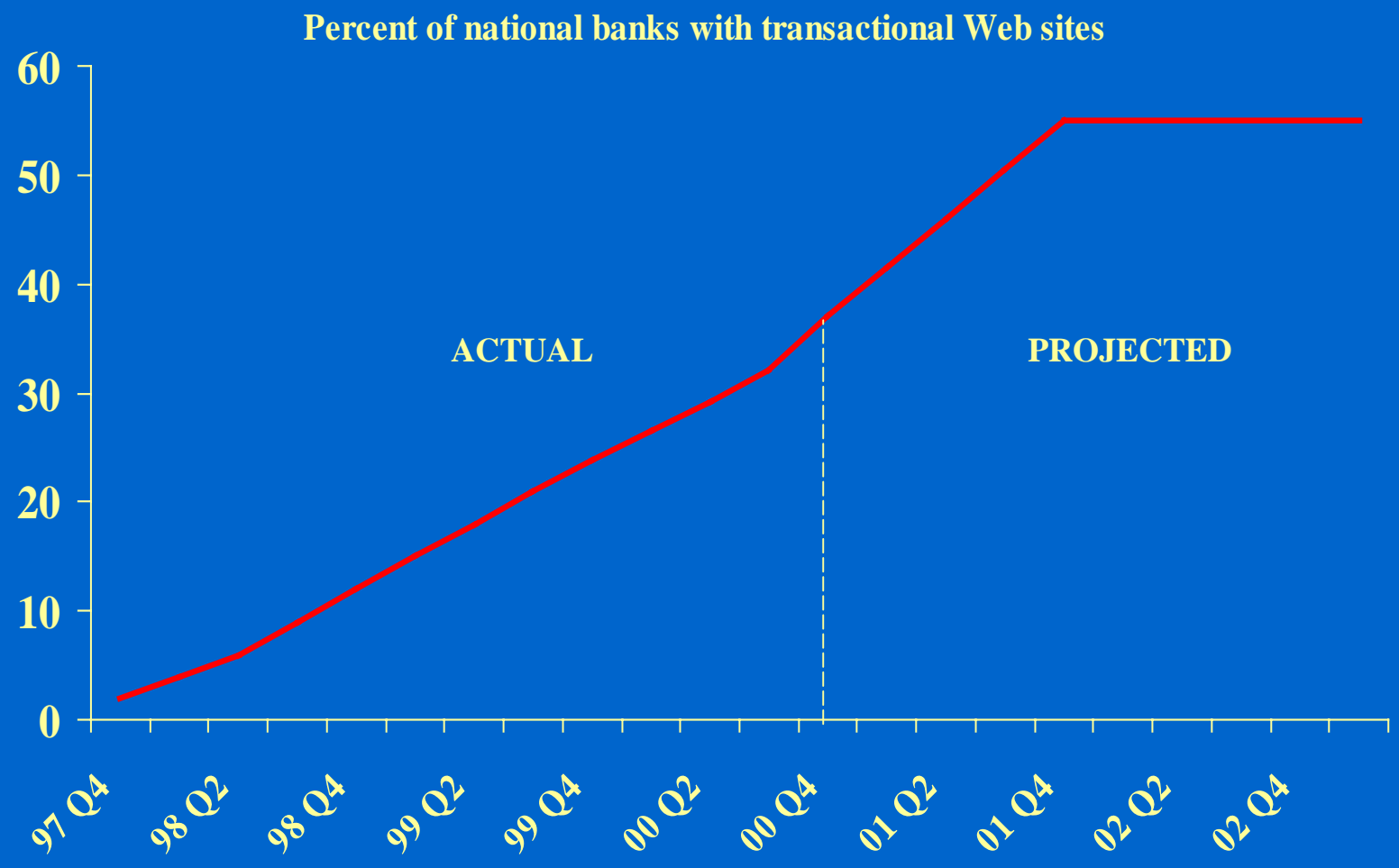
Will small banks lose business customers to large banks via the Internet?

Percent of transactional national banks offering business cash management services





Internet banking “haves” and “have nots”?



Source: Office of the Comptroller of the Currency

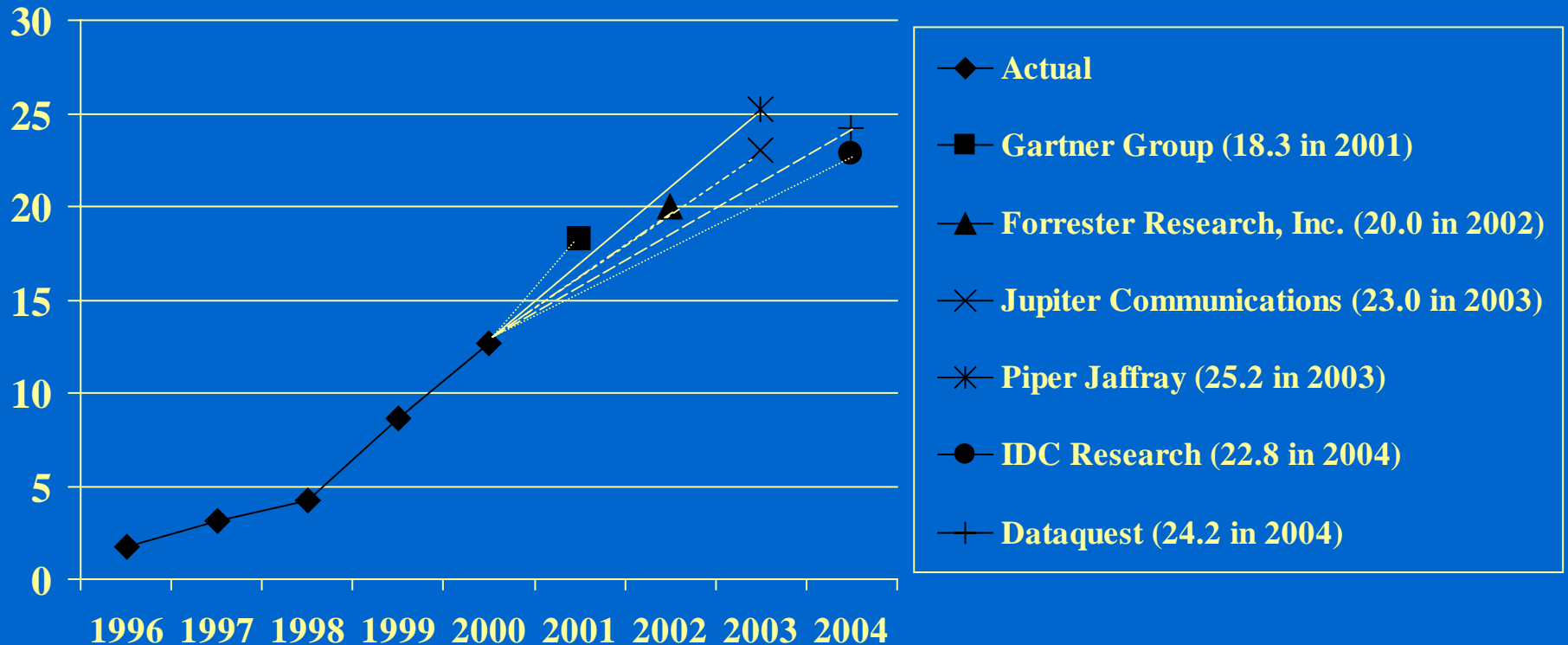


Issues

- “Plateau” or “late adoption” - what are the relevant considerations?
 - Growth of demand
 - Factors explaining bank adoption of Internet banking
 - Are there early adopter advantages?

Projections: Growth of “demand” for Internet banking

Millions of U.S. households banking on-line



Source: Office of the Comptroller of the Currency using data from various industry sources



Growth of “demand” for Internet banking

- Two opposing facts:
- Currently, the vast majority of customers have bank accounts at banks offering Internet banking ... BUT ...
- Even the most optimistic forecasts foresee only partial “household” adoption in the near-to-medium term.



Empirical models

- **Factors explaining which banks choose to offer Internet banking**
- **First movers**
- **Range of services**

An empirical model of the decision to offer Internet banking

- Multivariate (logit) regression analysis.
- Dependent variable (INTNEW): 1 if a bank became transactional after Q2 1998.
 - Excludes “first mover” Internet banks that became transactional before Q2 1998.
 - *De novos* excluded.
- Explanatory variables: as of Q2 1998 (i.e., prior to the adoption of Internet banking).



The model

- **INTNEW = f (Structure and Performance variables)**
- **Structure variables:**
 - **ASSETS** [+] = bank size control variable.
 - **YOUNG** [+] = 1 if the bank is less than 3 years old as of Q3 1999.
 - **BHC** [+] = 1 if the bank is a member of a bank holding company.
 - **URBAN** [+] = 1 if the bank is located in an SMSA
 - **DEPOSITS** [-] = deposits-to-assets ratio
 - **EXPENSES** [?] = ratio of prem. and fixed assets to net op. revenue
 - **NIINCOME** [+] = noninterest income-to-net operating revenue
- **Performance variables:**
 - **ROE** [?] = return on equity
 - **INEFFICIENCY** [?] = noninterest expense-to-net op. revenue
 - **CAMELS** [?] = Composite safety and soundness supervisory rating

An empirical model of the decision to offer Internet banking - results

- “All banks” results:
 - All coefficients have hypothesized signs
 - All but one variable (DEPOSITS) statistically significant
- Structure variables:
 - Size, BHC-membership, urban location - positive signs.
 - YOUNG: the newer the bank, the more likely it is to choose to offer Internet banking.
 - Noninterest income: banks relying less on interest income yielding activities more likely to offer Internet banking.
 - EXPENSES: relatively high fixed expenses may impel a bank to look for cost reductions via Internet banking.



An empirical model of the decision to offer Internet banking - results

- Performance variables: better performing banks more likely to offer Internet banking:
 - ROE: positive sign.
 - INEFFICIENCY and CAMELS: negative signs.
- “Small banks” results: similar to the “all banks” results:
 - DEPOSITS: small banks emphasizing traditional funding less likely to offer Internet banking.
 - BHC, INEFFICIENCY, and CAMELS variables not statistically significant.

Table 14. Which bank characteristics explain the decision to offer Internet banking?

[Dependent variable: INTNEW = 1 if the bank adopted Internet banking between Q3 1998 and Q3 1999]

Variable	All national banks	Small national banks
	<i>Estimate</i>	<i>Estimate</i>
Constant (p-value)	-2.7940*** (0.000)	-3.5852*** (0.000)
ASSETS (p-value)	8.3300 E-7*** (0.000)	0.0016 E-2*** (0.009)
YOUNG (p-value)	0.7051** (0.047)	1.2828*** (0.007)
BHC (p-value)	0.6506*** (0.002)	0.3641 (0.290)
URBAN (p-value)	0.7363*** (0.000)	0.7901*** (0.009)
DEPOSITS (p-value)	-0.7041 (0.294)	-2.5317*** (0.010)
EXPENSES (p-value)	7.5198*** (0.000)	5.7962* (0.091)
NIINCOME (p-value)	2.6809*** (0.000)	3.4385** (0.016)
ROE (p-value)	2.3636*** (0.009)	2.8679** (0.044)
INEFFICIENCY (p-value)	-0.9682* (0.092)	0.0865 (0.937)
CAMELS (p-value)	-0.2692** (0.026)	-0.1518 (0.527)
No. of observations	2089	1169

An empirical model of the decision to offer Internet banking: “first movers”

- Are the pre-Q2 1998 Internet banks different from the more recent Internet banks -- were they “first movers”?
- To test, we re-estimated the model:
 - Dependent variable = INTOLD (1 if a bank offered Internet banking no later than Q2 1998).
 - Lagged regressors are as of Q1 1997.
- Caveats:
 - Time period cutoff is an artifact of the data - there’s no definitive generational classifications.
 - We do not know for sure when each of the “first movers” “moved”



An empirical model of the decision to offer Internet banking: “first movers” results

- Results very similar to previous estimation.
- One big difference -- ROE is negative. One interpretation:
 - When Internet banking was unusual, less profitable banks may have had more incentive to “take the plunge.”
 - As e-commerce, -payments, and -banking grew into significant economic factors, more banks began to view offering Internet banking as a competitive necessity.



**Table 15. Bank characteristics explaining the decision to offer Internet banking:
 “first movers”**

[Dependent variable: INTOLD = 1 if the bank was an Internet banking “first mover,”
 i.e., if it adopted Internet banking before Q3 1998]

Variable	All national banks
	<i>Estimate</i>
Constant (p-value)	-2.4616** (0.026)
ASSETS (p-value)	8.102 E-8*** (0.000)
YOUNG (p-value)	1.6031** (0.047)
BHC (p-value)	1.1615*** (0.001)
URBAN (p-value)	0.8186*** (0.000)
DEPOSITS (p-value)	-1.8007* (0.101)
EXPENSES (p-value)	-1.6204 (0.493)
NIINCOME (p-value)	4.2731*** (0.000)
ROE (p-value)	-2.7173*** (0.001)
INEFFICIENCY (p-value)	-0.0818 (0.881)
CAMELS (p-value)	-0.3723** (0.026)
No. of observations	2346

Explaining the range of services offered

- The Model:
 - Basic approach: Do the factors explaining the decision to offer Internet banking also explain differences between transactional banks in the range of services they offer?
 - Dependent variable is PREMIUM (i.e., offering the “basic three” services plus at least 3 other services online).
 - Additional variable on the r.h.s.: INTOLD, to take account of the possibility that transactional banks that have been offering Internet banking for a relatively longer time will offer a wider range of services.

Explaining the range of services offered - results

- “All banks”:
 - Size is significant, positive, as expected.
 - INTOLD is significant, positive.
 - Other results similar to the explanation for decision to offer Internet banking.
- “Small banks”:
 - Only DEPOSITS and INTOLD are significant.
 - ASSETS and BHC are not significant within this group.



Table 16. What explains the decision to offer a wide range of Internet banking services?

[Dependent variable: PREMIUM = 1 if a transactional Internet bank offered balance inquiry, funds transfer, electronic bill payment and at least 3 other online services]

Variable	All Internet national banks	Small Internet national banks^a
	<i>Estimate</i>	<i>Estimate</i>
Constant (p-value)	-1.0880 (0.527)	1.9895 (0.483)
ASSETS (p-value)	3.6250 E-8*** (0.003)	0.0002 E-1 (0.329)
YOUNG (p-value)	-0.9199 (0.459)	1.4535 (0.467)
BHC (p-value)	2.5340** (0.019)	-0.2816 (0.849)
URBAN (p-value)	0.2480 (0.462)	0.0636 (0.951)
DEPOSITS (p-value)	-4.2718*** (0.001)	-5.3779* (0.079)
EXPENSES (p-value)	6.6602** (0.046)	-4.0052 (0.745)
NIINCOME (p-value)	1.0916 (0.392)	2.8678 (0.563)
ROE (p-value)	-2.2965 (0.184)	-2.0170 (0.746)
INEFFICIENCY (p-value)	-2.5747*** (0.010)	-0.7805 (0.835)
CAMELS (p-value)	0.7081*** (0.006)	-0.6685 (0.496)
INTOLD (p-value)	1.4779*** (0.000)	1.6485* (0.089)
No. of obs.	431	79



Is the value-added proposition for Internet banking compelling?

- For consumers: perhaps not as great as for online brokerage
- For businesses: even small per-transaction cost savings from greater electronification of commerce, payments, and back-office processing may be compelling.



Are there “early adopter” advantages?

- Arguments for:
 - Current market concentration
 - Economies of scale.
 - Marketing and branding are the keys to success.
 - Customers are “sticky.”
 - Development of organizational resources.



Are there “early adopter” advantages?

- Arguments against:
 - Little evidence that leaders are earning excess profits.
 - Ease of comparison shopping.
 - Rapid technological change.
 - Outsourcing.



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occ.treas.gov, click on Internet Banking icon:
site includes supervisory, licensing, legal, and analytic
information

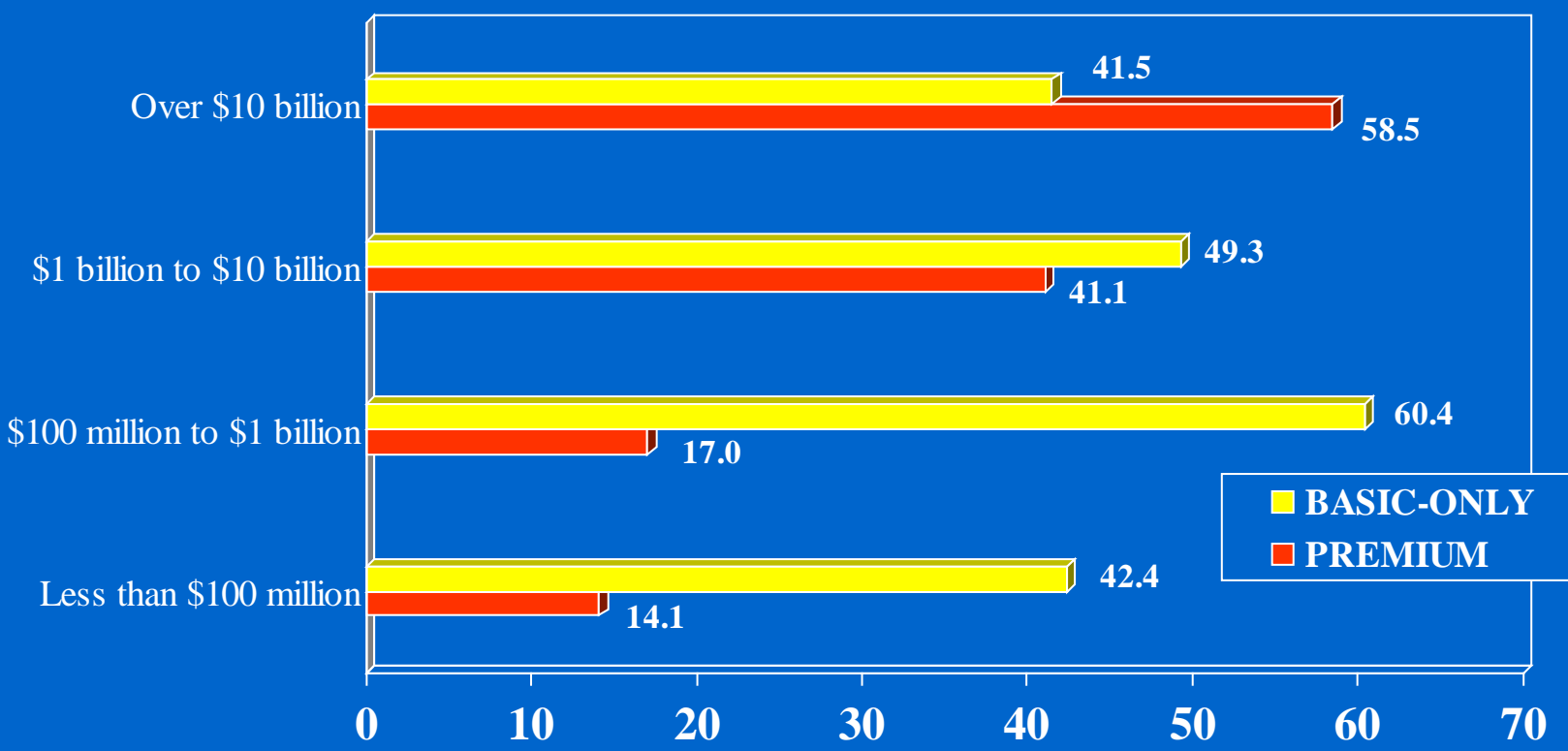


Inventory



Larger banks offer a greater range of Internet banking services

Percent of transactional Internet national banks offering BASIC and PREMIUM service (Q3 1999)*



* BASIC service includes balance inquiry, funds transfer, and bill payment. PREMIUM service includes BASIC and at least three other online services.



Table 5. Key services offered by transactional Internet national banks
(Q3 1999)

Type of service	Percent of transactional Internet banks offering selected services				
	All banks	Less than \$100 million	\$100 million to less than \$1 billion	\$1 billion to less than \$10 billion	\$10 billion and over
Balance inquiry and funds transfer	88.8	74.1	90.2	94.5	100.0
Bill payment	78.2	60.0	77.4	90.4	100.0
Credit applications	60.0	51.8	51.7	75.3	80.5
New account set-up	36.6	29.8	43.9	45.2	43.9
Brokerage	21.6	10.6	14.7	41.1	53.7
Cash management	15.7	14.1	16.2	15.1	17.1
Fiduciary	11.9	3.5	9.8	12.3	41.5
Bill presentment	10.6	7.1	7.9	16.4	24.4
Insurance	5.4	2.4	2.3	6.8	29.3



Table 7. Internet and non-Internet national banks: selected balance sheet ratios^{a, b} <i>(Q3 1999)</i>				
	Loan composition (ratios in percent)		Funding (ratios in percent)	
Asset size category	C&I loans/ loans	Credit card loans/ loans	Deposits/ assets	Fed funds purchased/ deposits
<i>Less than \$100 million:</i>				
Internet banks	20.4	0.5	82.1	2.1
Non-Internet banks	16.9 (0.001)***	0.4 (0.691)	85.1 (0.000)***	1.5 (0.276)
<i>\$100 million to \$1 billion:</i>				
Internet banks	17.9	1.7	78.9	7.4
Non-Internet banks	18.1 (0.209)	0.9 (0.000)***	82.3 (0.000)***	3.9 (0.000)***
<i>\$1 billion to \$10 billion:</i>				
Internet banks	24.5	4.2	68.6	20.4
Non-Internet banks	17.8 (0.003)***	0.9 (0.011)**	71.8 (0.299)	12.1 (0.023)**
<i>\$10 billion and over:</i>				
Internet banks	34.1	2.8	66.1	11.7



Table 8. Income and expenses: Internet and non-Internet national banks^{a, b}
(Q3 1999)

Asset size category	“Non-traditional” income: Noninterest income/ net operating revenue^b (percent)	Expenses: Premises & fixed assets/ net operating revenue^b (percent)
<i>Less than \$100 million:</i>		
Internet banks	22.0	11.7
Non-Internet banks	14.6 (0.000)***	9.3 (0.000)***
<i>\$100 million to \$1 billion:</i>		
Internet banks	23.1	8.2
Non-Internet banks	16.8 (0.000)***	9.1 (0.000)***
<i>\$1 billion to \$10 billion:</i>		
Internet banks	36.8	7.2
Non-Internet banks	23.0 (0.000)***	8.0 (0.111)
<i>\$10 billion and over:</i>		
Internet banks	40.1	8.1



Table 9. Internet banks and non-Internet national banks: performance comparisons^{a, b} (Q3 1999)			
Asset size category	Profitability: Return on equity (percent)	Accounting efficiency: Noninterest expense to net operating revenue^c (percent)	Credit Quality: Noncurrent loans to total loans^d (percent)
<i>Less than \$100 million:</i>			
Internet banks	6.34	77.90	0.52
Non-Internet banks	10.13 (0.000)***	65.52 (0.000)***	0.87 (0.002)***
<i>\$100 million to \$1 billion:</i>			
Internet banks	14.15	59.59	0.68
Non-Internet banks	13.03 (0.000)***	60.57 (0.282)	0.73 (0.249)
<i>\$1 billion to \$10 billion:</i>			
Internet banks	18.26	56.26	0.81
Non-Internet banks	15.68 (0.003)***	54.74 (0.256)	0.56 (0.003)***
<i>\$10 billion and over:</i>			
Internet banks	15.35	57.84	0.82



Table 6. Substantial increases in number of Web site privacy policy statements.			
	Percent of transactional Internet national banks with a privacy policy statement on the Web site		
Asset size category	Q2 1998	Q4 1998	Q3 1999
All	40.9	54.5	83.8
Less than \$100 million	21.4	35.7	75.0
\$100 million to less than \$1 billion	32.6	41.3	79.5
\$1 billion to less than \$10 billion	37.5	62.5	97.7
\$10 billion and over	75.0	95.0	100.0



Table 13—Safety and soundness, and information technology examination ratings: Internet banks similar to non-Internet banks^a
(Q3 1999)

	CAMELS ratings ^b		IT ratings ^c	
Asset size category	Composite	Management	Composite	Management
<i>Less than \$100 million:</i>				
Internet banks	1.72	1.73	1.66	1.81
Non-Internet banks	1.75	1.84	1.81	1.84
p-value	(0.676)	(0.135)	(0.155)	(0.803)
<i>\$100 million to less than \$1 billion</i>				
Internet banks	1.52	1.58	1.64	1.66
Non-Internet banks	1.63	1.68	1.74	1.77
p-value	(0.009)***	(0.023)***	(0.059)**	(0.055)**
<i>\$1 billion to less than \$10 billion</i>				
Internet banks	1.50	1.53	1.70	1.80
Non-Internet banks	1.64	1.70	1.61	1.68
p-value	(0.182)	(0.132)	(0.539)	(0.510)
<i>\$10 billion and over</i>				
Internet banks	1.63	1.56	1.81	1.89



Table 17—Internet banking in 2001?

	Third quarter 1999	Fourth quarter 2000^a
Number of national banks offering Internet banking^b	464	1046
Percent of national banking system assets	89.2	95.2
Percent of small deposit accounts in the national banking system^c	84.1	92.8
Percent of national banks in asset size category:		
All	19.9	44.9
Less than \$100 million	7.1	25.3
\$100 million to less than \$1 billion	27.1	61.1
\$1 billion to less than \$10 billion	61.9	89.9
\$10 billion and over	100.0	100.0
Memorandum:		
46.2 percent of national banks had no plans as of the third quarter of 1999 to offer Internet banking in 2001 or beyond.		



**Table 18. Planned increases in key services to be offered by
transactional Internet national banks by year-end 2000^a**

Type of service	Internet banks offering selected services: actual and planned		
	Actual Q3 1999	Planned Q4 2000	Percent increase
Number of transactional banks	464	1047	125.6
Balance inquiry and funds transfer	412	969	135.2
Bill payment	363	853	135.0
Credit applications	269	646	140.1
New account set-up	170	487	186.5
Brokerage	100	230	130.0
Cash management	73	445	509.6
Fiduciary	55	150	172.7
Bill presentment	49	258	426.5
Insurance	25	95	280.0
Basic^b	360	836	132.2
Premium^c	111	471	324.3



Projections: implications and issues - Early adopter advantages? Market concentration in Internet banking

Banking company	Market shares (Q4 1999)	
	Bank's share of all U.S. online banking customers (percent)	Bank's share of all small deposit accounts
Wells Fargo	13.1	5.0
Bank of America	10.6	8.4
Bank One Corp.	4.4	2.6
Citibank	3.9	1.4
First Union Corp.	3.8	3.8
Top five total	35.8	21.1



Table 19—Top five Internet banks: estimated growth in number of Internet banking customers, and market shares of online customers

Banking company	Customers using Internet banking				Market shares	
	Second quarter 1998	Fourth quarter 1999	Growth from second quarter 1998 to fourth quarter 1999 (percent)	Bank's "active" online customers as a percent of bank's total number of on-line customers ^a	Bank's share of all U.S. online banking customers (percent) ^b	Bank's share of all small deposit accounts ^c
Wells Fargo	655,000 ^d	1,454,100	122.0	55.7	13.1	5.0
Bank of America	700,000 ^e	1,176,600	68.1	46.5	10.6	8.4
Bank One Corp.	144,200 ^f	488,400	238.7	47.3	4.4	2.6
Citibank	350,000	432,900	23.7	63.1	3.9	1.4
First Union Corp.	70,000	421,800	502.6	39.9	3.8	3.8
Top five total	1,919,200	3,973,800	107.1	51.1	35.8	21.1

Does offering Internet banking affect the bottom line?

- ROE = f (Internet and control variables)
 - INTERNET [?]
 - ASSETS, YOUNG, CAPASSETS, LOANASSETS, EXPENSES, NIINCOME, INEFFICIENCY, CREDQUAL
 - Variation on INTERNET: INTOLD and INTNEW
- Result: INTERNET not significant

Does Internet banking affect bank profitability?

[Dependent variable: Return on equity (ROE)]

Variable	All national banks			Small national banks ^a			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant (p-value)	0.1177*** (0.000)	0.1334*** (0.000)	0.3232*** (0.000)	0.1043*** (0.000)	0.1043*** (0.000)	0.0784*** (0.001)	0.3994*** (0.000)
INTERNET (p-value)	-0.0007 (0.917)	-0.0020 (0.745)	0.0012 (0.834)	-0.0294 (0.112)			
OLD INTERNET (p-value)					-0.0124 (0.769)	-0.109 (0.795)	-0.0124 (0.728)
NEW INTERNET (p-value)					-0.0332* (0.102)	-0.0249 (0.217)	-0.0047 (0.784)
ASSETS (p-value)		-2.6953E-11 (0.867)	2.0947E-10 (0.132)			7.81 E-7*** (0.000)	-7.52 E-8 (0.643)
YOUNG (p-value)		-0.0652*** (0.000)	-0.0169 (0.180)			-0.0626*** (0.003)	-0.0066 (0.7140)
CAPASSETS (p-value)		-0.1967*** (0.000)	-0.1403*** (0.001)			-0.1404** (0.048)	-0.1501** (0.016)
LOANASSETS (p-value)		0.0133 (0.450)	0.0220 (0.147)			0.0075 (0.8038)	0.0097 (0.707)
NIINCOME (p-value)			0.1229*** (0.000)				0.1180** (0.046)
EXPENSES (p-value)			-0.1678*** (0.006)				-0.0797 (0.460)
INEFFICIENCY (p-value)			-0.2880*** (0.000)				-0.4127*** (0.000)
CREDQUAL (p-value)			-2.1353*** (0.000)				-2.6252*** (0.000)
No. of obs.	2222	2222	2222	1109	1109	1109	1109
Adjusted R ²	0.000	0.024	0.282	0.001	0.001	0.039	0.325
F	0.011	12.016***	97.721***	2.532	1.365	8.443***	54.379***