Understanding the Economics of Large Banks

November 7, 2011

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Introduction

Supervision of large financial institutions is arguably the central issue in the ongoing debate on bank regulatory reform. Many observers see large banks as prime contributors to the 2007-2009 global economic crisis. Laws and proposals in various stages of adoption or evaluation aim to reduce or avoid such crises. These include Basel III and the Dodd-Frank Act, both of which constrain some large bank activities, increase their capital and liquidity requirements, and subject them to greater oversight.

In aggregate, such measures could compel large banks to shrink, either by reducing the size of their components, or by breaking up into separate lines of business. Some argue that large banks provide minimal benefits to society, and that smaller institutions could provide any benefits they do offer, and it is therefore appropriate to focus on reducing the size of large banks, without significant concern about potential economic costs from size reductions.

In an effort to test the validity of such assertions and to better understand the benefits that large banks provide, we examined their role and contributions to the economy. Four dimensions of size are particularly relevant to analyzing the benefits of large banks: scale in an individual business, scope across multiple businesses, scale in an individual geography, or presence in multiple geographies. The 26 largest U.S. banks, each with more than $50 billion in assets, are large in at least one of these dimensions.

In this report, we make the following major points:

- Due to their size, large banks in some products and markets are able to generate unique benefits, which fall into three categories: they exhibit economies of scale that reduce unit costs, they offer a broad scope of products and services that smaller institutions do not, and they spread innovations throughout the industry.
- Our best estimates for each of these unique benefits indicate that large U.S. banks (as previously defined) provide benefits to companies, consumers, and governments totaling an estimated $50 billion to $110 billion annually.[1]
- Banks larger than $500 billion provide over half of the total benefit amount.
- Only banks larger than $50 billion can provide an estimated 50 to 70 percent of these benefits. Reducing the size of these large banks could have negative economic implications beyond the loss of benefits, ranging from a loss of diversification to reduced global competitiveness of U.S. banks.

We do not imply that smaller banks do not play an important role in the financial system and broader economy. They certainly do. Rather, we contend that large banks play a specific role and add value in ways that would be hard to replicate at a smaller scale.

This study is the first to our knowledge that attempts to look comprehensively at the potential economies of scale, the impact of the breadth of products, and the impact of large banks on innovation, and to do so on a line-of-business-by-line-of-business basis. The

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1 While the benefits from scope of product and services offerings and from the spread of innovation are estimating the value received by customers, economies of scale are reductions in unit cost that may be passed to customers or may be captured as additional profits to shareholders.

analysis draws upon three kinds of evidence: individual case studies (e.g., the historical role of large banks in spreading innovations), internal bank data (e.g., scale curves), and market-conduct data (e.g., market share). We rely on proprietary data from 10 institutions as well as on publicly available data. Our access to proprietary bank data on unit costs and volumes enables us to estimate directly the empirical economies of scale, an analysis that, we believe, is unique in the current literature. We conducted a thorough review of policy and academic literature to understand the current state of knowledge. *(See sidebar ("Review of Literature on Large Banks") and Section A of the appendix for sources.)*

This report contains three sections. Section 1 provides context, discussing large banks and their activities. Section 2 examines the benefits of large banks. Section 3 considers what benefits would be lost in the absence of large banks.

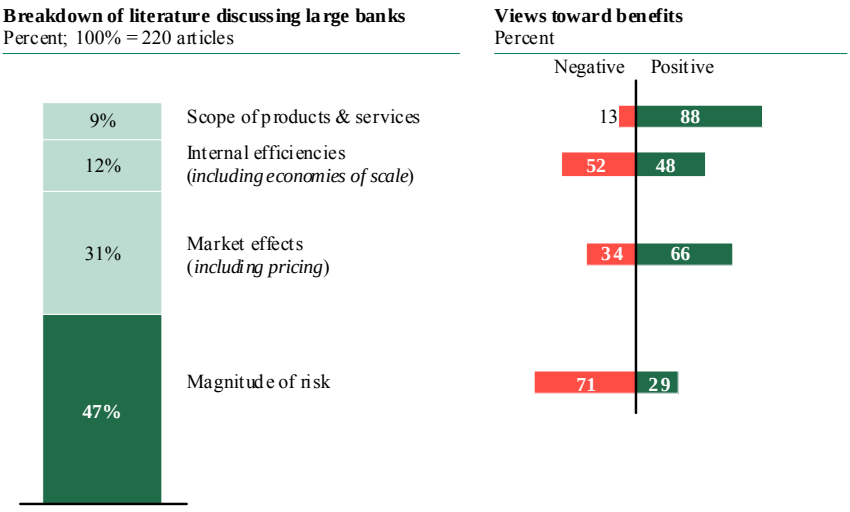
REVIEW OF LITERATURE ON LARGE BANKS

Our survey of policy and academic literature covered the benefits and risks associated with larger banks. We reviewed more than 200 academic articles, most published in peer-reviewed journals. Our review included those articles cited in Financial Stability Oversight Council reports and the Vickers Commission Report on Banking as well as relevant articles from the past three years published in a selection of top economics and finance journals.* Discussion of large banks falls into four general categories: scope of products and services offered, market effects, internal efficiencies, and magnitude of risk. *(Exhibit 1 summarizes articles reviewed.)*

- **Scope of products and services offered** refers to the potential for large banks to offer products that are unique or have unique features.
- **Internal efficiencies** are the potential decrease in unit cost associated with a bank growing in size, either in terms of producing more units of a given product (economies of scale) or more units of different products (economies of scope).
- **Market effects** are the potential effects that larger banks have on the markets in which they participate—for example, their impact on product availability and pricing and their impact on the allocation of capital—which may affect the efficiency of the broader economy.
- **Magnitude of risk** is the potential that large banks have different risk profiles than do smaller banks, including diversification of risks across businesses and geographies, potential increased risk-taking, and increased complexity.

EXHIBIT 1

Much of the academic literature discussing large banks focuses on risk, while evidence on benefits is inconclusive.



SOURCE: FSOC Study of the Effects of Size and Complexity of Financial Institutions on Capital Market Efficiency and Economic Growth, ICB Interim report and references therein

Much of the work we examined focused on discrete topics rather than a holistic view of the role of large banks in the banking system. Thus, while these articles are instructive, they are limited in purview. In summary, we find:

- **More articles focus on the magnitude of risk than on other aspects of large banks.** Nearly half of the literature that we reviewed focused on risk. Of that portion, approximately 70 percent conclude that large banks are riskier than smaller institutions.
- **However, many papers on topics other than risk find that large banks provide benefits.**
  - While just a few studies examine the effects of the scope of products and services offered by large banks, most studies find benefits.
  - Work using the latest methodologies and data find that economies of scale persist even above $100 billion. Older papers tend to find little or no economies of scale.
  - Papers on market effects find that the presence of large banks aids spread of innovation, capital allocation, and increased efficiency in other banks. Some papers find that having more large banks decreases competition, but there was no consensus.

Section A of the appendix provides more detail on the literature reviewed.

* American Economic Review; Econometrica; Journal of Banking and Finance; Journal of Econometrics; Journal of Finance; Journal of Financial Economics; Journal of Money, Credit and Banking; Journal of Political Economy, Quarterly Journal of Economics, and Review of Financial Studies.

1. Large banks and their activities

Banks can be defined as large according to various criteria, and these various kinds of large banks play different roles in the banking system. To understand the benefits that large banks provide requires knowledge of the activities and services they perform as well as the role that size plays in their ability to do these things. This study analyzes to what extent, if any, there are unique benefits that are attributable to large size. In instances where there are unique benefits, large banks are able to add value differentially, relative to the next best option (whether a small bank or a non-bank). In instances where there are not unique benefits, large banks may still benefit customers and markets, but the benefit is approximately the same as that provided by a smaller bank or a non-bank.

BANKING ACTIVITIES

The banking system, with banks large and small—is like the circulatory system of the U.S. and global economies—performing a number of critical activities. These include lending or intermediating to allow businesses and individuals to invest and consume, matching those with savings with those who are worthy borrowers, transferring money among individuals and businesses to enable commerce to function, providing stores of liquidity, and facilitating the longer-term savings and investment of individuals and institutions. Banks are thus rarely more than one or two steps removed from all vital economic activities.

Banking activities fall into four product areas: retail banking, payments & clearing, commercial banking, and capital markets. Retail banking serves both consumers and small businesses, holding deposits of savers and matching them with credit needs of borrowers. Payments and clearing functions are used by all players in the financial system—including consumers, middle-market companies, multinational corporations, pension funds, and governments—to move cash, settle transactions, and register and hold securities. Commercial banking includes cash management, lending, and trade finance, particularly for middle-market and larger companies. Finally, banks are the foundation of the capital markets, underwriting the debt and equity offerings of corporations and governments and enabling funds to be raised from markets.

MEASURES OF BANK SIZE

Bank size can be quantified in multiple ways. Three widely used measures are total balance-sheet size, assets as a fraction of GDP, and assets as a fraction of a country's banking assets.[2] We consider banks with more than $50 billion in assets to be "large" for the purposes of these analyses. We follow Dodd-Frank in this regard but recognize substantial limitations in this definition, which we address in this report.

Over 70 percent of the banking activity in the U.S. is conducted by the 26 banks that each have balance sheets over $50 billion *(Exhibit 2 shows a breakdown)*. They serve more than

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2 There are also variants of these basic measures, adjusting assets to account for risk (e.g., risk-weighted assets) or accounting differences among countries (e.g., applying U.S. GAAP rules to assets of non-U.S. banks). Recently, bank "interconnectedness," the degree to which a bank is linked to others, has been the subject of much discussion, but no simple means of quantifying this attribute yet exists.

70 million households, 85,000 small businesses, and more than 1,000 large corporate customers. Among U.S. banks, the share of activity of banks larger than $50 billion is higher than their asset share in investment banking, international lending, trade finance, and corporate cash management and lower in commercial-real-estate lending, small-business loans, and ATM and branch share. Banks with more than $50 billion in assets employ nearly 2 million people in the U.S.

EXHIBIT 2

The 26 US banks with more than $50 billion in assets comprise 74% of total industry assets.

As of 4Q 2010

	Size range $ Billions	Number of institutions	Total assets[2] $ Trillions	Share of assets[3] Percent	
U.S.-based parent[1]	> $500	6	$9.3	57%	26 banks and 74% of assets
	$100-500	11	$2.1	13%	
	$50-100	9	$0.6	4%	
	< $50	5,201	$2.8	17%	
Foreign-based parent	> $500	11	$1.3	8%	
	$100-500	3	$0.3	2%	

1 Includes only institutions with US parent companies.
2 Excluding MetLife assets of $730 billion.
3 May not equal 100% due to rounding.
SOURCE: SNL Financial

However, the U.S. banking sector is less concentrated and smaller compared to GDP than are the banking sectors of other countries. For example, as a fraction of GDP, the assets of the largest three U.S. banks are 41 percent, whereas the largest three banks in each of France, Germany, the U.K., Canada, and Australia hold assets that exceed 130 to 180 percent of their respective home country's GDP. Similarly, the largest three U.S. banks hold 36 percent of industry assets, compared to the 44 to 61 percent of industry assets held by the largest three banks in Germany, France, Canada, and Australia.

TYPES OF LARGE BANKS

Using total assets to examine the consequences of size can be misleading and unsatisfactory for three reasons. First, what counts as "large" may vary over time and by country. What was large in the U.S. in 2001 is not equally large in 2011 after the effects of inflation and the growth and globalization of the companies that banks serve. "Large" may not have the same meaning in a more concentrated market, such as Canada. Second, institutions with similar asset size may have different business mixes. For example, a monoline credit-card bank and a traditional retail bank might each hold $50 billion in assets. The third reason relates most

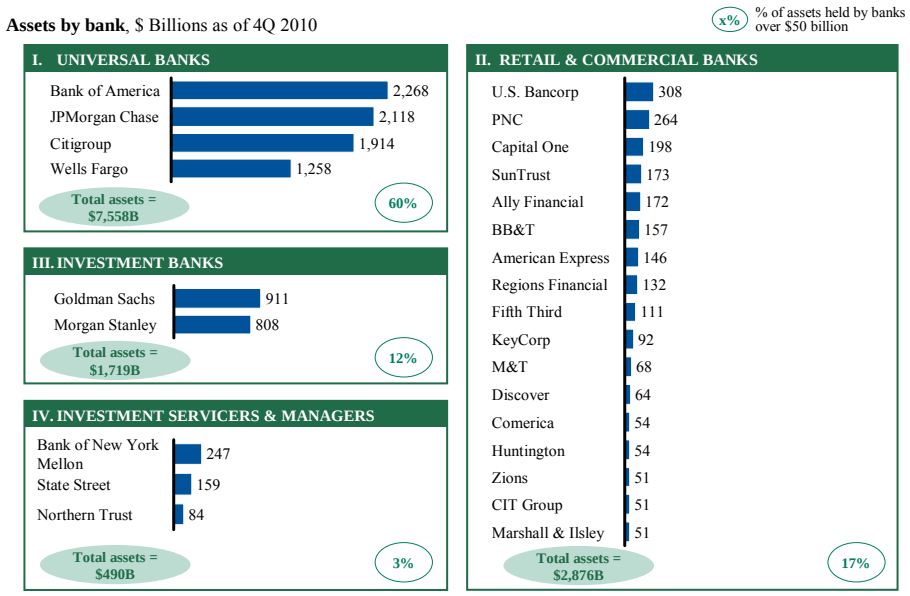
significantly to the purpose of our study: *asset size is not, in and of itself, directly linked to the benefits that large banks provide*.

We need a framework that captures the aspects of size that are most relevant to the benefits that banks provide customers. Consequently, we focus on four aspects of bank size: scale in an individual business, scope across multiple businesses, scale in an individual geography, and presence in multiple geographies, either in the U.S. or abroad. Being big in varying combinations of these dimensions may provide different potential benefits to customers. Growing along any of these dimensions would likely increase total assets. All 26 U.S. banks with over $50 billion in assets, the size threshold set by Dodd-Frank, are large in at least one of these ways.

In aggregate, U.S. banks with over $50 billion in assets hold $12 trillion in assets. Each of these banks is one of four predominant types: universal bank-holding companies (referred to here as "universal banks"), retail & commercial banks, investment banks, and investment servicers and managers. *(Exhibit 3 lists these banks.)* Each such type of bank is large in a characteristic set of dimensions.

EXHIBIT 3

There are 4 types of U.S. banks with more than $50 billion in assets.



Note: Excludes Met Life BHC, which has $731 billion in assets. Includes only those banks with US parent companies.
SOURCE: SNL Financial

- **Universal banks.** Universal banks are large along all dimensions of bank size, operating in multiple regions, often across many countries. Four U.S.-based banks with over $50 billion are in this category: Bank of America, Citibank, JPMorgan Chase, and Wells Fargo. They hold $7.6 trillion in assets, or 60 percent of the total assets of U.S. banks with over $50 billion.

- **Retail & commercial banks.** Large retail & commercial banks typically have a sizable presence in retail banking, commercial banking, and portions of the payments & clearing spaces. In the U.S. they also typically are well penetrated in at least one or more metropolitan areas or regions. Twenty U.S.-based banks with over $50 billion in assets fall in this category and hold an aggregate of $2.9 trillion in assets, representing 17 percent of asset of banks over $50 billion. Examples include U.S. Bank, PNC, BB&T, and KeyBank.

- **Investment banks.** Large investment banks have a sizable presence in the capital-markets space. U.S. investment banks' business also spans multiple geographies. Two banks with over $50 billion in assets are in this category: Morgan Stanley and Goldman Sachs. Together they hold $1.7 trillion in assets, 12 percent of assets held by banks over $50 billion.

- **Investment servicers and managers.** Large banks that act as investment servicers and managers are uniquely at scale in the payments & clearing space. In the U.S. they are also typically sizable across international borders. Three banks with over $50 billion in assets fall in this category: Bank of New York Mellon, State Street and Northern Trust. Together they total $500 billion in assets, or 3 percent of the $12 trillion in assets held by banks over $50 billion.

Banks with non-U.S. parents also play a significant role in the U.S. banking industry, holding $1.5 trillion in U.S.-based assets. In addition, they have more than a 40 percent share of debt-capital-markets transactions, and 3 percent of equity capital markets. Bank holding companies with non-U.S. parents include Taunus, HSBC North America Holdings, TD Bank US, Citizens, ING, RBC US Holdco, Union Bank, BancWest, BMO Financial Corp, and BBVA USA Bancshares.

2. Benefits of large banks

We examine three categories of potential unique benefits from large banks: economies of scale, scope of products and services, and the large banks' role in the spread of innovation across the industry. We further examine each type of benefit across the various lines of business, including retail, commercial, payments and clearing, and capital markets.

For each benefit category and product area of banking, we analyzed areas where large banks provide benefits that others do not. *(Exhibit 4 shows an overview.)*[3] There are areas where large banks do not provide unique benefit. For example, in small-business or commercial-real-estate lending, smaller banks have a relatively higher share of assets; large size is not essential to providing value in these areas.

EXHIBIT 4

Each type of large bank provides different types and sizes of benefits.

Relative size of benefit
✓ Larger ✓ *Smaller*

Product categories	*Types of large banks*			
	I. Universal banks	II. Retail & commercial banks	III. Investment banks	IV. Investment servicers & managers
1. Retail banking	✓ *National product footprint* ✓ Economies of scale ✓ Spread of innovation	✓ *Regional product footprint* ✓ *Economies of scale* ✓ *Spread of innovation*		
2. Payments & clearing	✓ Broad product scope ✓ Economies of scale ✓ Spread of innovation	✓ *Economies of scale* ✓ *Spread of innovation*		✓ Broad product scope ✓ Economies of scale
3. Com-mercial banking	✓ International product scope ✓ *Economies of scale* ✓ *Spread of innovation*	✓ *Regional product scale and scope* (*with international correspondents*)		
4. Capital markets	✓ Broad and international product scope ✓ Economies of scale ✓ *Spread of innovation*		✓ Broad and international product scale ✓ Economies of scale ✓ *Spread of innovation*	

SOURCE: TCH large-bank study-participant data.

- **Economies of scale.** Large banks reduce unit costs by spreading fixed costs, particularly for infrastructure and technology, over a large customer base. Economies of scale in large banks provide an estimated $25 billion to $45 billion of annual value. We estimate this benefit by comparing actual costs to what costs would be in a system with no banks larger than $50 billion. While estimating the amount passed to customers is difficult, we believe that part of this value translates into lower prices for customers or investments in technologies benefiting customers and smaller banks.

3 To avoid double-counting, when scale allows large banks to provide offerings that small banks cannot, we list the associated product areas under either scale or scope. For example, custody falls under scope and funds transfer under scale.

- **Scope of products and services.** Large banks provide a broad set of products and services that others cannot provide at all, or at least cannot provide in an equally integrated and comprehensive manner.[4] The size of large banks may increase the value of certain products to customers, in terms of improved convenience, distinct product features or geographic portability. These benefits are worth an estimated $15 billion to $35 billion in annual direct value to customers, including companies of all sizes, retail consumers, and governments. We reach these numbers by estimating incremental benefits that large banks provide to customers, product by product, compared to the best non-large-bank solution (either non-bank or bank with less than $50 billion in assets). This is an estimate of the value that a large bank provides over and above the value of the next best option. Identifying the portion of the benefit solely attributable to large banks is difficult and subject to ambiguity. We do not estimate potential indirect benefits to the economy, which may also be significant.

- **Spread of innovation.** While often not the initial innovator, large banks help spread innovations industry-wide. Having a large existing customer base may help to create network effects and to expedite new technologies to achieving critical mass of adoption. We estimate that, historically, large banks have contributed as much as $15 billion to $30 billion in annual savings, particularly benefiting retail customers, as well as smaller banks who adopt these innovations.

2.1 ECONOMIES OF SCALE

Economies of scale generally arise in businesses that serve many customers and that require expensive technology or infrastructure because high fixed costs spread over many customers reduces unit cost. We use internal bank data to analyze economies of scale for a selection of products and then to estimate overall economies of scale, including costs for which we do not have data. We estimate overall benefit from economies of scale by comparing actual costs to what they could be in a system with no banks larger than $50 billion.

Internal bank data indicate cost savings of 40 percent to more than 80 percent in each of multiple areas, equivalent to $10 billion to $25 billion annually. Benefits are largest in payments and capital markets. To estimate total economies of scale, we assume that a fraction of costs that we did not analyze directly have economies of scale similar in magnitude to those that we did. This yields total estimated annual benefits of $20 billion to $45 billion, of which 50 percent to 75 percent comes from banks larger than $500 billion. While we have attempted to identify systematically all areas associated with significant economies of scale and to conduct as rigorous an analysis as possible, our total benefit numbers represent only the best estimate we could obtain. *(Exhibit 5 shows a breakdown.)*

It is difficult to estimate how much benefit from economies of scale is passed on to customers in the form of lower prices, as opposed to accruing to shareholders in the form of additional profits. However, scale economies are real value that accrues somewhere and that could be lost in the event that banks are shrunk below efficient scale levels.

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[4] Note that this category of benefit is different from the microeconomic concept of "economies of scope," which refers to the reduction in cost due to the sharing of fixed costs across multiple product areas.

EXHIBIT 5

Economies of scale benefits are largest in payments and in capital markets.

Product examined directly
Approximated indirectly

Estimated benefits from economies of scale from U.S. banks with over $50 billion in assets[1]
$ Billions

1. Retail banking[2]	Online bill payment	$0 - 1
	Other retail (e.g., ATM, mobile banking, mortgage servicing)	*$3 - 4*
	Subtotal	**$3 - 5**
2. Payments[2]	Credit	$2 - 3
	Debit	$1 - 2
	Check	$1 - 2
	ACH	$0 - 1
	Wire transfer	$0 - 1
	Other payments (e.g., custody-related, acquiring)	*$6 - 10*
	Subtotal	**$10 - 20**
3. Commercial banking[2]	*Other commercial banking (e.g., treasury services platforms)*	*$2 - 5*
	Subtotal	**$2 - 5**
4. Capital markets	Trade processing	$5 - 15
	Subtotal	**$5 - 15**
Total		**$20 - 45**

1 Benefits due to banks over $50B; numbers may not sum due to rounding.
SOURCE: TCH large-bank study-participant data.

2.1.1 Product-level economies of scale

Using bank data, we estimate product-specific economies of scale in seven areas: online bill payment, debit cards, credit cards, wire transfers, automated clearing house, check processing, and trade processing. Together these account for approximately 7 percent to 10 percent of total net interest earnings ("**NIE**") of banks over $50 billion. We estimate that associated economies of scale account for $10 billion to $25 billion in annual benefit, or 3 percent to 6 percent of NIE.[5]

Our analysis proceeds as follows. First, in each area analyzed, we fit a scale curve—a curve indicating dependence of unit cost on production volume—to data points for volume and unit cost.[6] In all cases, we find a clean curve demonstrating unit costs decreasing with increased volume *(Exhibit 6 shows example scale curves.[7])*

5 This number includes an estimate of costs not examined in each of the product areas considered.

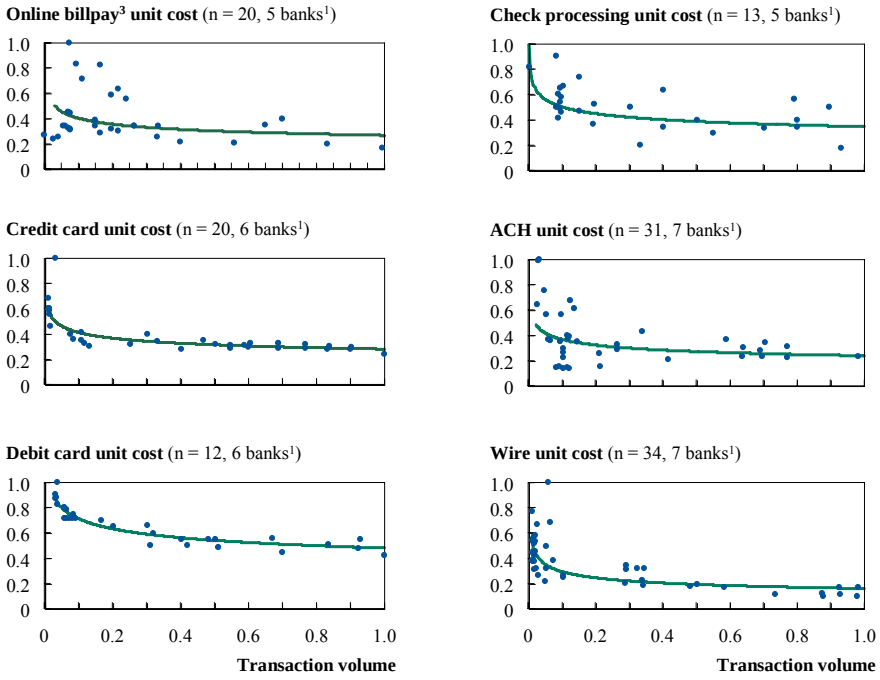
6 We fit curves of the form (unit cost) = b*(volume)$^{-\alpha}$, where b and α are fit parameters.

7 Data are fit using data from six banks spanning the years 2007 through 2011 (n = 22). Points shown include actual data plus 'dummy' observations in order to disguise the identity of any individual bank's information.

EXHIBIT 6

Each product we examined in detail exhibits a scale curve.

Product-specific example scale curves[2], assorted points from 2007-2011



1 Dummy points are randomly generated along curve to disguise participant data.
2 Unit costs and transaction values are normalized to 1.
3 Online-bill-pay unit costs are measured per active user.
SOURCE: TCH large-bank-study participants.

Next, for each product we use the scale curve to estimate the increase in cost in the absence of banks larger than the asset threshold (i.e., $50 billion). In particular, we look at the effect on unit cost of decreasing each bank's production (transaction) volumes by the percent difference between its assets today and the asset threshold.[8] For example, a $300 billion bank would need to reduce assets by 83 percent to reach $50 billion, so we shrink its production volumes by 83 percent.[9] *(Exhibit 7 illustrates this process schematically.)* For each product the estimated percentage cost increase is a weighted average over banks.[10]

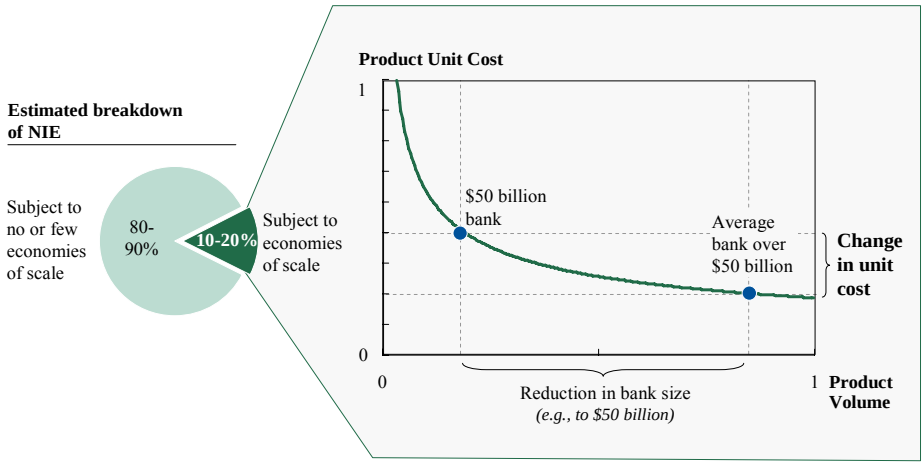
8 Where a bank's cost today is greater than the value associated with the fit scale curve, we evaluate unit cost at the reduced volume associated with the asset threshold. Where a bank's cost today is less than the value associated with the fit scale curve, we increase unit cost by the same percentage by which the fit curve changes under the given percentage reduction in volume. *(See Section C of the appendix for details.)*

9 We have verified this assumption across products for which we have bank-specific data. For ACH, check processing, and debit cards, transaction volume grows linearly with asset size with R^2 values greater than 0.9. For other products we have examined, the linear fit is also strong: credit cards, 0.7; wire transfers, 0.6; online bill payment, 0.42.

10 We do not have data for all banks larger than the asset threshold (e.g., $50 billion). Thus, for each product, to estimate total cost across banks larger than the asset threshold, we (1) fit transaction volume as a linear function of asset size, using data from the banks for which we do have data, (2) use this curve fit to extrapolate an estimated transaction volume for each bank and (3) sum these transactions volumes to get an estimate of total cost to all banks above the asset threshold.

EXHIBIT 7

To estimate benefits from economies of scale, for each product we calculate increase in unit costs associated with a maximum bank size.



SOURCE: SNL Financial; TCH large-bank study-participant data.

Below we outline estimated benefits in the product areas we examine.[11] In some areas data collected from banks did not include all costs. For example, the data for online bill payment did not contain its share of the maintenance cost to support internet-banking platforms. We estimate that, in total, costs not directly examined make up 20 percent to 30 percent of product costs. In our estimates for product-specific economies of scale, we incorporate those costs that are not included in data collected from banks.[12]

Retail

- **Online bill payment.** The scale curve *(Exhibit 6)* indicates that costs would be 45 percent to 55 percent higher in a scenario in which no bank was larger than $50 billion.[13] This translates into an estimated annual benefit of $50 million to $70 million from the associated cost areas we examined directly. Cost data examined may exclude as much as 90 percent of the costs associated with online bill payment, such as, most importantly, its share of the maintenance cost to support internet-banking platforms. Thus we estimate the total annual benefit from online bill pay to be up to $1 billion. This aggregate cost number is small because direct costs for online banking are relatively small. Based on limited data, we also anticipate that online banking more broadly and

11 Due to uncertainty in quantifying the exact fraction of costs examined for each product area, we estimate benefits from each product area examined to the nearest $1 billion.

12 For these indirectly estimated costs, we assume a percentage increase in unit cost that is in line with the minimum percentage increase across all areas we examined; namely, 45 percent, as found for each of online-bill payment, debit cards, credit cards, and check processing. We chose this minimum percentage increase to give a conservative estimate because of the uncertainty in estimating costs for which we do not have complete direct data.

13 This change corresponds to an 11 percent decrease in unit cost associated with a doubling of number of active users.

mobile banking both show similar economies of scale. We discuss the role that large banks have played in spreading online banking in the section on innovation.

Payments & clearing

- **Credit cards.** The scale curve *(Exhibit 6)* indicates that costs would be 45 percent to 60 percent higher in a scenario in which no bank was larger than $50 billion.[14] This translates into an estimated annual benefit of $1 billion to $2 billion from the associated cost areas we examined directly. Cost data examined may exclude approximately 40 percent of banks' costs associated with credit cards, including costs for the supporting technology platform and customer service. Thus we estimate the total annual benefit from credit cards to be between $2 billion and $3 billion.

- **Debit cards.** The scale curve *(Exhibit 6)* indicates that costs would be 45 percent to 55 percent higher in a scenario in which no bank was larger than $50 billion.[15] This translates into an estimated annual benefit of $1 billion to $1.5 billion from the associated cost areas we examined directly. Cost data examined may exclude approximately 30 percent of banks' costs associated with debit cards, including costs associated with supporting technology platforms. Thus we estimate the total annual benefit from debit cards to be between $1 billion and $2 billion.

- **Check processing.** Today banks process most check transactions by exchanging electronic images of checks. However, for approximately 5 percent of transactions, banks still exchange physical paper checks. The scale curve we examine *(Exhibit 6)* accounts for some costs from both sorts of check processing and indicates that costs would be 45 percent to 50 percent higher in a scenario in which no bank was larger than $50 billion.[16] This translates into an estimated annual benefit of $200 million to $300 million from the associated cost areas we examined directly. Cost data examined may exclude as much as 85 percent of the costs associated with check processing, most importantly for image-infrastructure investment. Thus we estimate the total annual benefit from check processing to be between $1 billion and $2 billion. As banks continue to phase out paper check processing, the resulting purely electronic process will likely have greater economies of scale and lower unit costs.

- **Wire transfers.** Wire transfers are a means of transmitting high-value payments securely between institutions. The scale curve *(Exhibit 6)* indicates that costs would be 80 percent to 90 percent higher in a scenario in which no bank was larger than $50 billion.[17] This translates into an estimated total annual benefit of $300 million to $400 million. To account for additional costs associated with wire but potentially excluded from the data we examined, we estimate the total annual benefits from wire

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14 This change corresponds to an 11 percent decrease in unit cost associated with a doubling of the number of purchase transactions.

15 This change corresponds to an 11 percent decrease in unit costs associated with a doubling of the number of purchase transactions.

16 This change corresponds to a 10 percent decrease in unit cost associated with a doubling of the checks processed.

17 This change corresponds to a 17 percent decrease in unit cost associated with a doubling of the number of wire transactions.

transfers to be up to $1 billion. In the section on innovation, we discuss the role that large banks have played in spreading wire transfer.

- **Automated Clearing House.** ACH speeds the delivery of credits and debits to account-holders and automates payments and deposits. The scale curve *(Exhibit 6)* indicates that costs would be 60 percent to 70 percent higher in a scenario in which no bank was larger than $50 billion.[18] This translates into an estimated annual benefit of $80 million to $100 million from the associated cost areas we examined directly. Cost data examined may exclude approximately 50 percent of the costs associated with ACH, most importantly for security and IT security. Thus we estimate the total annual benefit from ACH to be up to $1 billion and likely between $100 million and $200 million. In the section on innovation, we discuss the role that large banks have played in spreading ACH.

Capital markets

- **Trade processing.** Trade processors approve the sale of securities, change records of ownership, and arrange for the transfer of the securities and payment. The scale curve indicates that costs would be 100 percent to 150 percent higher in a scenario in which no bank was larger than $50 billion.[19] This translates into an estimated annual benefit of $5 billion to 15 billion.

[18] This change corresponds to a 14 percent decrease in unit cost associated with a doubling of the number of ACH transactions.

[19] This change corresponds to a 29 percent decrease in unit cost associated with a doubling of trades processed.

2.1.2 Estimates of total economies of scale

We estimate that the aggregate annual benefit from economies of scale is between $20 billion and $45 billion. We do so by extending our product-level analysis in two steps. First, we estimate that 10 to 20 percent of total NIE is subject to economies of scale of a similar magnitude to those in areas we examined directly. Second, we estimate that on average these costs would be 45 to 55 percent higher in a scenario in which no bank was larger than $50 billion. We obtain our benefit estimate by multiplying these percentages by $397 billion, which is the total NIE for all banks over $50 billion.[20] *(See Exhibit 7.)*

We use high-level, industry-reported cost buckets to estimate that 10 percent to 20 percent of total NIE is subject to economies of scale of the magnitude found in our product-specific analysis. Consistent with our product-level analysis, we assume that economies of scale are highest in areas involving processing and technology as well as other forms of equipment. These represent approximately 10 percent of total costs.[21] Other areas—such as marketing, occupancy, documentation, and compliance—will see more modest scale economies. If approximately a quarter of these costs are also scalable, 20 percent of NIE sees economies of scale.[22]

Our product-level analysis covers 35 percent to 70 percent of these estimated total scalable costs. Additional products in which economies of scale likely exist include ATMs, branch costs, the payments function in mortgage servicing, and cash management. Costs associated with such products will be spread over the high-level cost buckets. While we have attempted to identify the fraction of NIE seeing economies of scale systematically, our estimate remains subject to uncertainty. *(See Section C of the appendix for further details of the estimate.)*

We then estimate that these costs would be 45 percent to 55 percent higher if no bank were larger than $50 billion. Forty-five percent is the minimum percentage cost increase across all product areas that we examine directly. Fifty-five percent is the average percentage cost increase across all product areas that we examine directly.[23] To be conservative, we use the average rather than the maximum percentage cost increase across products in setting the upper end of the range.

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20 We estimate benefits to the nearest increment of $5 billion. Some academics and regulators have suggested that diseconomies of scale might exist due to organizational complexity. We do not quantify potential diseconomies, as we did not investigate the issue directly.

21 Bank annual reports; SNL. Processing & technology and equipment costs each represent approximately 5 percent of NIE.

22 Bank annual reports; SNL. Of total NIE, marketing, occupancy and other expenses account for approximately 3 percent, 8 percent, and 20 percent to 25 percent, respectively. Other expenses include both partially scalable expenses (e.g., general operating expenses) and non-scalable expenses (e.g., goodwill impairment and restructuring)

23 Average is cost-weighted by product area.

2.2 SCOPE OF PRODUCTS AND SERVICES

The scope of large banks across multiple businesses, their geographic penetration and reach, and their balance-sheet size allow large banks to offer products and services that are central to the banking system but that smaller players cannot provide. Large-bank offerings are particularly vital in helping companies and asset managers operate internationally as well as in helping companies finance their activities through the capital markets. By our estimation, the scope of large banks' product and services provides $15 billion to $35 billion in direct value to customers annually. *(Exhibit 8 breaks down the components of this estimate across the four product areas of banking.)* We estimate that banks with assets over $500 billion are responsible for $10 billion to $20 billion of the total. These numbers do not include indirect benefits to the economy at large, which may also be significant.

EXHIBIT 8

Benefits from scope of products and services are largest in securities servicing and in capital markets.

Estimated benefits from scope of products and services from banks larger than $50 billion[1]
$ Billions

1. Retail banking	Local branch and ATM density	$1 - 2
	Cross-regional presence	$0 - 1
	Subtotal	**$1 - 3**
2. Payments[2]	Custody	$4 - 8
	Subtotal	**$4 - 8**
3. Commercial banking	Cash management	$2 - 5
	International lending	$1 - 2
	Trade finance	$1 - 3
	Subtotal	**$3 - 10**
4. Capital markets	ECM	$1 - 3
	DCM	$1 - 2
	M&A	$1 - 2
	Syndicated lending	$3 - 4
	Subtotal	**$7 - 11**
Total[2]		**$15 - 35**

1 Benefits due to banks over $50B; numbers may not sum due to rounding.
2 Benefits associated with ACH, wire and check imaging are accounted for under economies of scale.

SOURCE: TCH large-bank study-participant data.

We reach our estimates by looking at the products and services in which large banks provide a unique benefit, estimating the number of customers using the product, the benefit that each customer receives, and the fraction of this benefit that is uniquely provided by large banks.[24] We acknowledge, however, that identifying the portion of the benefit due to large banks is difficult and subject to interpretation.

The remainder of this section discusses both the importance of the areas in which large banks provide differential products and services as well as the benefits that large banks confer in these areas.

24 We include only the fraction of total benefit to the consumer that, we estimate, only a large bank could provide.

2.2.1 Retail banking

Large banks provide minimal product-scope benefits in most areas of retail banking. However, large banks do provide two primary convenience benefits to their retail consumers: easier access to a branch or to no-fee ATMs at home, and branch and ATM availability when customers move or travel. These benefits result from geographic penetration and geographic reach, respectively. In total, we estimate that banks with over $50 billion in assets provide $1 billion to $3 billion in annual benefits in retail banking.

Customers are more likely to find branches or ATMs of national or large regional banks near their homes or work. Both national and large regional banks can provide this benefit because they can establish meaningful branch and ATM presence in the markets in which they participate.[25] Indeed, national and large regional banks are at scale in 80 percent of the markets in which they play, while smaller regional banks are at scale in only about 60 percent of the counties where they are present. In metropolitan areas in which they are present, banks of over $100 billion in assets have networks that are about three times as dense as those of their smaller counterparts. This greater outlet density translates to reduced travel time for customers, equivalent to an estimated $1 billion to $2 billion in total annual savings.[26]

Furthermore, larger banks have greater reach across geographies, saving money and time for many of the 13 million U.S. taxpayers who move each year.[27] This equates to an estimated $0.5 billion to $1 billion in annual savings to large-bank consumers.[28] The greater reach across geographies of large banks' ATM networks also saves money for people traveling. We do not include this benefit in our quantification, however, since small banks are increasingly reimbursing customers for fees paid at foreign ATMs.

2.2.2 Payments & clearing

Within payments & clearing, securities servicing is the primary area of benefit in product scope provided by large banks. Such banks are the near-exclusive provider of securities servicing to large institutional investors, supporting the estimated $40 trillion of assets under custody on behalf of U.S. investors. Their role depends on their uniquely broad international presence and sophisticated analytic capabilities. We estimate that related annual benefits are $4 billion to $8 billion. These benefits generally require either specialist banks of approximately $100 billion or more or larger universal banks.

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25 Empirically, the minimum requirement to capture fair share of deposits is approximately 5 percent, with some variation across markets. Deposit share begins to saturate once branch share reaches around 12 percent, so no further gain comes from the ability to grow beyond that in a given market. This dynamic is consistent with the premise that banks with over $50 billion in assets provide this benefit to customers across all markets in their footprint.

26 We Assume eight branch visits per year, which is the average that those retail-banking study participants with available data report, and an average hourly wage of $20, based on IRS individual tax statistics (available at http://www.irs.gov/taxstats/indtaxstats).

27 IRS U.S. population migration data, available at http://www.irs.gov/taxstats/indtaxstats.

28 We estimate that beginning a new banking relationship costs $50-$80, accounting for both direct costs and time spent. We based this estimate on average fees of $10-$20 to open a new account, a typical time of two hours (an average reported from participating retail banks) and an hourly wage of $20 per hour (IRS). The total cost estimate then accounts for the fact that about 60 percent of deposits are held by banks with over $50 billion in assets.

Large banks also hold a disproportionate share of the market in other payments areas, including credit card and wire transfers. We believe that this prevalence is largely due to substantial economies of scale. We discuss these payments areas in Section 2.1, on economies of scale.

Securities servicing

Institutional investors, including pension funds and money-market funds, as well as broker-dealers, rely on providers of securities servicing to support their estimated $100 trillion of global assets under custody. Securities servicing includes settling and holding securities and providing analytics and reporting. Through sub-custodians and connections with local securities depositories across the world, custodian banks help institutional investors register and safely keep their assets in different regions, while ensuring that they comply with regulations across all jurisdictions. Furthermore, custodian banks can generate aggregated analytics on portfolio positions across multiple asset classes and geographies, helping clients optimize returns on their portfolios.

Large banks' geographic scope, scale in custody, and scope in related products enable them to provide unique benefits to customers in securities services. Thus the top four U.S. banks by assets hold approximately 60 percent of global assets under custody.[29] Furthermore, many institutional-investor clients will work only with large custodians with established reputations because they must answer to shareholders and often are contractually required to choose from among already well-established providers.

The primary benefits in securities servicing provided by large banks include the range of domestic securities processed, cross-border settlement and holding, administration, reporting and compliance, and complementary product and service offerings.

- **Range of domestic securities processed.** Only large custodians process certain types of domestic assets, such as U.S. Treasury securities. Thus, using a large custodian bank improves customers' investment flexibility.
- **Cross-border settlement and holding.** The ability to invest in cross-border as well as domestic assets helps investors optimize their portfolios. Domestic U.S. clients can settle and hold securities abroad, through a global custodian bank's links to foreign securities depositories where these securities are registered. Links may be either via relationships with local custodians or through the bank's own foreign custody offices. However, custody is an extremely low-margin business, so developing and making use of foreign links makes sense only for players with substantial scale.
- **Administration, reporting and compliance.** Sophisticated and costly IT platforms allow large banks to provide global reporting and compliance, helping investors monitor and analyze their positions. Smaller banks could not generate the volumes needed to make worthwhile the investment necessary to develop such reporting systems and global compliance expertise. Dedicated platforms and broad regulatory experience allow large custodians to undertake these activities much more efficiently and expertly than even large customers might on their own.

[29] Available at globalcustody.net, visited July 2011.

- **Complementary offerings.** Large custodians also have scope across related products, such as cash-management products, allowing them to cross-subsidize the low-margin custody business. Lower-volume players or those without related businesses would not be economically viable. Consistent with this claim, securities-servicing activity is highly concentrated in larger banks.

Of the aggregate annual benefits of $4 billion to $8 billion that large banks provide in securities servicing, we estimate the share related to foreign assets at $3 billion to $6 billion annually. Benefits related to domestic assets are somewhat smaller, at an estimated $1 billion to $2 billion annually.[30]

2.2.3 Commercial banking

In commercial banking, large banks play a vital enabling role in international trade and commerce. We estimate the aggregate annual benefit uniquely provided by large banks at $3 billion to $10 billion, over half of which is provided by banks with more than $500 billion in assets. For both large corporations and middle-market companies, large banks provide customized products in cash management, international lending, and trade finance, integrated across countries. They also offer similar white-label services for smaller banks.

Cash management

Cash-management products are fundamental to companies of all sizes, whether operating domestically or internationally. All companies must collect, pool, and manage payments from customers, report on and forecast cash balances, as well as manage their own payrolls. When payments come from many sources, at many varying times, cash management becomes a complex undertaking. Efficient cash management can save companies money by minimizing idle cash and providing smooth process automation, both of which reduce discrepancy rates and lower overhead. Companies operating internationally face particular cash-management challenges: they must accept and disburse payments in different currencies and across multiple countries while conforming to local regulations and predominant payment formats. Correspondingly, their needs are sophisticated: many require a robust platform to manage receivables, payables and cash balances globally. In 2010 the U.S. cash-management market size by volume was approximately $1.6 trillion.

Large banks' geographic scope, scale in cash management, product scope, and large balance sheets enable them to provide benefits to middle-market companies and large corporations in cash management. Furthermore, large banks' provide white-label cash-management systems for smaller banks and other financial institutions. *(See sidebar: "Commercial-Banking Case Studies.")* Case studies indicate that the largest banks—which, for this purpose, we define as those with more than $500 billion in assets—provide the largest benefit in international cash management, while banks with over $50 billion in assets can begin to provide effective regional cash-management products. *(See Section B of the appendix.)* Consistent with large banks' ability to offer products and services that others cannot, the top

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30 We arrive at this range by estimating the number of customers (2,500 to 5,000 large investors with significant foreign assets, and 5,000 to 10,000 with large domestic assets), the benefit per customer ($750,000 to $2 million for investors with foreign assets and $200,000 to $400,000 for large domestic investors), the market share (80 to 100 percent) and the fraction of benefit allocated to large banks (80 to 100 percent for investors with foreign assets and 70 to 90 percent for large domestic investors).

four U.S. banks by assets hold approximately 50 percent of the U.S. cash-management market by revenue.

Primary benefits are automated processes and high visibility into currency and credit positions, international services, complementary product and service offerings, and liquidity provision.

- **Automated processes and high visibility.** Larger banks have more and larger clients, leading to higher cash-management volumes. As a result they have been able to invest in sophisticated and flexible cash management that automates many time-consuming processes, reduces discrepancy rates, increases visibility of the cash position, and improves liquidity and risk management. These translate to lower overhead for customers. For example, technology that replaces paper documentation of exceptions saves many hours of employee time processing and cataloging these items.
- **International services.** Because they have a broad international footprint, large banks can provide cash management across countries and currencies that an individual small bank cannot. Large banks' broad-reaching, integrated IT platforms enhance this capability by helping customers monitor balances and transact payments globally. Companies would need to cobble together services from multiple small banks across countries and provide their own IT solutions if they wanted to see an integrated view. For large corporations this would be inefficient. For middle-market companies it could prevent them from broadening their international activity.
- **Complementary offerings.** Their product scope allows large banks to provide a suite of complementary products. For example, large banks can offer payment hubs that interface with the corporate customer's systems and provide a consolidated package of cash-management services through a single system, integrating legacy systems into a complementary solution for customers. Furthermore, large banks can provide integrated services across product areas, such as trade finance coupled with cash management. *(See case studies in Section B of the appendix.)*
- **Liquidity provision.** Large banks' balance sheets allow them to meet the short-term liquidity needs of multiple companies at once and on short notice, both in the U.S. and abroad. Their ability to enter into overnight repo transactions provides one example.

We estimate aggregate annual benefits in cash management from banks over $50 billion in assets to be $2 billion to $5 billion. This estimate includes large banks' ability to meet more sophisticated needs, such as cross-border cash-concentration structures, and large-scale automation of payables and receivables.[31] These abilities reduce financing costs (e.g., by reducing idle cash balances or lowering foreign loans needed) and reduce overhead through labor-saving solutions. *(See Section B of the appendix for details.)* Estimated annual benefits are $1 billion to $1.5 billion to large corporations and $1 billion to $4 billion to middle-market companies.[32] Nearly half of the estimated benefit to middle-market

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31 We exclude estimations of less-complex cash-management services but note that such services confer more limited additional benefit.

32 We arrive at these ranges by estimating the number of customers (1,000 large corporations and 20,000 to 40,000 middle-market companies), the benefit per customer ($1.2 million to $2 million for large corporations and $120,000 to $240,000 for middle-market companies), the market share (90 to 100 percent for large corporations and 70 to 90 percent

companies comes indirectly, through cash-management systems white-labeled to smaller banks.

for middle-market companies), and the fraction of benefit allocated to large banks (70 to 90 percent for both sizes of company).

COMMERCIAL-BANKING CASE STUDIES

Working with 10 large banks, we have collected case studies illustrating products and services uniquely provided by large banks in commercial banking. This sidebar highlights examples in cash management and trade finance.

1. Large banks provide white-label cash-management systems for smaller institutions.

Situation and needs

Client D, a financial institution, needed a customized platform to meet its customers' complex cash management needs.

- The platform would help Client D earn fee revenue and retain customers by providing them with necessary services.
- Client D did not have sufficient capital or customer demand to justify building its own cash-management platform.

Products and services provided

Bank A provided a customized white-labeled integrated cash-management platform together with trade solutions.

- Displayed Client D's brand
- Combined functions at a single interface, including payments and receivables management (e.g., lockbox and check deposit), information-reporting services, and global payments (e.g., international funds transfer and remittances)
- Offered trade solutions (e.g., letters of credit, global collections) through a global network of affiliates and representatives, and regional trade-processing centers in multiple major foreign cities

Outcome and results

Client D maintained customer relationships while expanding its range of offerings.

- Provided services under its own brand
- Reduced direct operating expenses in some cost categories by outsourcing

2. Large banks offer cross-border supply-chain finance products across many countries to multinational corporations.

Situation and needs

Client A, a major US industrial manufacturer, anticipated that increased demand following the economic recovery would stress the financing abilities of its global supply chain.

- Needed to support the working-capital position and liquidity of suppliers across the world
- Wanted to standardize payment terms

Products and services provided

Bank B provided an online supply-chain management solution, purchasing supplier receivables, and then distributing them to financial institutions and its own credit-trading desk.

- Solution relies on systems requiring significant capital investment.
- Credit can be extended to hundreds of suppliers simultaneously, as a result of Bank B's large balance sheet.
- System can accept payments and extend credit in 8 different currencies, as well as perform foreign-exchange transactions, relying on Bank B's broad geographic reach.
- Multiple departments within Bank B can work on a given transaction, leveraging product scope

Outcome and results

Client A ensured financing for suppliers while standardizing payment terms and is scaling the solution through a global rollout.

- Suppliers obtained cheaper financing sufficient for production ramp-up.
- Client A standardized payment terms to 60 days.
- Client A is rolling out this program to subsidiaries around the world, expecting to add suppliers in China, India, Brazil, and Mexico.

International lending

Nearly all American companies with international operations and aspirations use international lending products. This pattern holds true for both large corporates and middle-market companies that have expanded their sales or production to markets outside the U.S. To obtain foreign-currency-denominated loans and in-market lines of credit, such companies can either assemble relationships with a combination of foreign banks in many countries or turn to a domestic U.S. bank with international operations or relationships. Loans to non-U.S. addresses, including foreign subsidiaries of U.S. companies, reached more than $180 billion in 2010. Based on share of international revenue for select large corporations, we estimate that nearly 50 percent of these loans financed U.S. expansion and operations abroad, facilitating crucial activities such as building bricks-and-mortar presence in a foreign market, paying in-market suppliers, and hiring employees to begin operations. Furthermore, such activities create interest-rate risk and working-capital challenges for companies. Large banks help resolve these issues through cross-border lending, integrated with other products, such as cash-management and trade-finance products.

Large banks' geographic reach and balance-sheet heft, complemented by their broader scope of products, allow them to offer international loans and accompanying services to both middle-market companies and large corporations. Case studies indicate that those banks that hold over $100 billion in assets can provide effective international lending, particularly in a limited range of countries. Banks that provide truly global international lending products have over $500 billion in assets. Consistent with large banks' differential ability to offer international lending products in a way that others cannot, banks over $50 billion are responsible for 97 percent of international lending from the U.S. Banks over $500 billion are responsible for 88 percent of the total.

Primary benefits from large banks include consolidated banking relationships, reduced financing cost, and a range of complementary offerings.

- **Consolidated banking relationships.** U.S. banks can deliver international loans and lines of credit to clients, through either a global banking model or correspondent banks. Both options require either significant geographic reach to establish in-market offices and branches or a breadth of relationships to ensure that correspondent banks are prepared to serve the large bank's clients abroad. Large banks can help organize and maintain the necessary correspondent relationships for access to services in different regions, both domestically and abroad. Furthermore, working with a single bank allows customers increased visibility into their cash and debt position across their footprint, enabling better risk management.
- **Reduced financing cost.** Sizable balance sheets allow large banks to deliver multicurrency loans or to inspire confidence from correspondent banks, which offer companies credit based upon the domestic bank's guarantee. As a result the cost of foreign credit for the customer is reduced.
- **Complementary offerings.** Finally, global banks in particular can combine their product scope with their geographic reach to serve as one-stop shops for companies abroad, providing a range of products and loans. Large banks also offer advisory services to companies going abroad for the first time or entering an unfamiliar market.

We estimate that customers enjoy $1 billion to $2 billion in annual benefit from large banks through international lending products.[33] These numbers account for estimated interest-rate improvements on foreign-currency loans made through a domestic U.S. bank compared to a foreign institution. Estimated annual benefits to large corporations are $0.6 billion to $1 billion and they are $0.2 billion to $1 billion to middle-market companies. While we only estimate benefits to U.S. businesses, large U.S. banks can also help foreign businesses invest in the U.S. and thereby provide potential benefit to the U.S. economy.

Trade finance

Standard trade-finance instruments provide a guarantee of payment to suppliers through letters of credit. More complex instruments involve buyer-organized deals that keep entire supply chains provisioned with sufficient liquidity and credit in a form of structured supply-chain finance. The U.S. structured-trade-finance market is relatively small. It has most recently been reported as $10 billion in annual deal volume, as compared to approximately $800 billion to $900 billion of trade-finance volume in letters of credit and factoring/receivables. However, this market is essential for many large corporations. Many U.S. multinationals and some middle-market companies maintain global supply chains with tens to hundreds of suppliers across dozens of countries. Suppliers can deliver goods on time only if they have enough liquidity to finance their inputs before receiving payment for the delivered output. Through structured trade finance, a bank can extend credit to a company's suppliers at rates based on the company's cost of funding, rather than that of individual suppliers. At the same time, the company can make its own payment cycle to suppliers more regular and potentially longer.

As in international lending, large banks can offer integrated structured trade-finance solutions that others cannot because of their geographic reach and balance-sheet heft, complemented by product scope. Case studies indicate that banks with over $100 billion in assets provide limited offerings and that banks over $500 billion are able to offer comprehensive structured trade financing to multinational companies with complex, global supply chains. *(See sidebar ("Commercial-Banking Case Studies") and Section B of the appendix.)*

Primary benefits derived from large bank size in structured trade finance include improved working-capital management, the potential for large deal size, complementary product offerings, and improved and automated processing.

- **Improved working-capital management.** Banks with broad geographic reach can provide working capital to suppliers across the full global footprint of a multinational corporation. This improves working-capital management by making delivery of supplies to the corporation[34] more regular and by smoothing and potentially lengthening the payment cycle for these supplies. Furthermore, suppliers can benefit from lower borrowing costs.

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[33] We arrive at this range by estimating the number of customers (250-500 large corporations and 2,500 to 5,000 middle-market companies), the benefit per customer ($2 million to $4 million for large corporations and $100,000 to $200,000 for middle-market companies), the market share (90 to 100 percent for large corporations and 80 to 100 percent for middle-market companies), and the fraction of benefit allocated to large banks (70 to 90 percent for large corporations and 60 to 80 percent for middle-market companies).

[34] Delivery of goods will actually be to the buying entities of the corporation in question.

- **Large deal size.** Large banks have sufficient balance-sheet heft to underwrite large facilities for supply chains, in some cases advancing more than $600 million to a supply chain, backed by $1 billion of supplier receivables. The breadth of large banks' relationships also aids distribution capabilities for spreading outstandings over syndicates of partner banks.
- **Complementary offerings.** Large banks also have the product scope to mitigate risks associated with maintaining a global supply chain by offering appropriately tailored derivatives. For example, they can help companies hedge associated foreign-exchange or interest-rate risk.
- **Automated processes**. Since larger banks have more and larger clients operating globally, they have been able to invest in flexible, integrated IT platforms for trade-finance management. Such systems can be configured to a client's particular needs and facilitate trade-document processing. This facilitation can be a significant benefit, especially when dealing with thousands of documents in transit between countries with idiosyncratic customs and regulations. Furthermore, flexible platforms allow easy on-boarding and off-boarding of suppliers, improving vendor relationships, and strengthening buyers' negotiating positions.

We estimate that large banks provide aggregate benefits in trade finance of $1 billion to $3 billion annually.[35] This estimate reflects lower costs of working capital and lower overhead thanks to customized systems for processing trade documentation. Estimated annual benefits to large corporations are $0.5 billion to $1 billion and to middle-market companies $0.3 billion to $1 billion. While we do not explicitly account for the capacity for large deal sizes or complementary product offerings, these factors are included in our estimate of the portion of the benefit consumers receive that comes uniquely from large banks. We exclude an estimate of more common trade-finance products, such as letters of credit and open accounts, since, with the right set of foreign correspondent bank relationships, smaller banks can offer letters of credit. Open accounts are generally used in secure markets, where goods are shipped and delivered before payment, and do not generally require heavy bank intermediation. Thus, while large banks play a dominant role in providing these services as well, alternative solutions are potentially easier to find.

2.2.4 Capital markets

In capital markets, large banks play a central role in allowing companies and governments to raise capital and companies to undertake mergers and acquisitions. In this product area, we estimate that large banks provide from $7 billion to $11 billion annually in benefit to customers. Banks providing these benefits tend to hold more than $500 billion in assets.

To break down these benefits, we consider the scope of products and services across investment banking, including in the debt capital markets ("**DCM**"), in the equity capital markets ("**ECM**"), in aiding mergers and acquisitions ("**M&A**"), and in participation in syndicated lending. Sizable investment-banking deals generally involve 3 to 5 participants.

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35 We arrive at this range by estimating the number of customers (250 to 500 large corporations and 2,500 to 5,000 middle-market companies), the benefit per customer ($2.1 to $4.3 million for large corporations and $110,000 to $320,000 for middle-market companies), the market share (90 to 100 percent for large corporations and 80 to 100 percent for middle-market companies), and the fraction of benefit allocated to large banks (70 to 90 percent for both sizes of company). The upper bound represents potential benefits for this product as the U.S. market matures.

More than half of the deals that are larger than $500 million involve more than one bank, and multi-billion-dollar deals almost exclusively involve multiple players. Groups of more than five participants are rare.[36] Smaller deals will generally involve fewer participants.

- **Equity and debt capital markets.** In these markets new stocks and bonds are sold to investors. Governments and companies use these markets to finance operations or to make long-term investments, such as by building factories, investing in technologies, or financing research and development. A company that conducts an initial public offering (IPO), selling stock, uses the equity capital markets. A government that issues bonds to finance its activities uses the debt capital markets. There are multiple types of stocks and bonds as well as hybrid products, with both debt- and equity-like features. For example, a convertible bond can be converted into shares of common stock. When raising money on the capital markets, companies and governments rely on their banks to help tailor an optimal combination of equity and debt products.
- **Mergers and acquisitions.** M&A transactions bring smaller companies together to form a bigger one that is intended to be more valuable than the sum of the parts. Improved economies of scale, the combination of complementary resources, or increased market share can create value. Potential buyers and sellers may each need external advisory help in identifying acquisition opportunities, screening potential buyers or sellers, negotiating, and valuing and structuring the transactions. Both large investment banks and specialist advisory businesses offer such services. In bigger deals large banks tend to play the advisory role; this tendency is less pronounced in smaller deals.[37] In many cases the buyer also needs a bank to help finance the transaction, generally through an issuance of debt, equity, or some combination of both.[38]
- **Syndicated lending.** In syndicated lending, one or several arranger banks form a larger syndicate of lenders to provide either a direct loan or a line of credit, in return for a fee from the borrower. Syndicated lending spreads risk of borrower default over lenders, and hence, such loans are generally much larger than standard bank loans. Lenders can include banks as well as institutional investors, such as pension funds and hedge funds. Borrowers range from large corporations, to specific large projects, to governments, or other sovereign concerns. When borrowers are little known or require close monitoring, syndicates tend to be smaller, and arrangers tend to chose as members those who already have a tie to the borrower—either through previous

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36 Of deals larger than $500 million in 2010, the following percentages involved more than five banks: 8 percent in DCM, 10 percent in ECM, and 0 percent in M&A. Even in syndicated lending, only 25 percent of deals involved more than five advisor participants (DealLogic; SNL).

37 For example, in 2010, 79 percent of M&A deals over $500 million involved a bank with over $500 billion in assets in an advisory role. On the other hand, large banks played an advisory role in only 16 percent of deals under $100 million, and non-banks were the lead advisor in approximately 70 percent of such deals (DealLogic; SNL). In addition, the dominance of banks playing the advisory role has slipped somewhat over the past 5 years.

38 The literature is mixed on the benefit to having a bank serve as both a lender and advisor in M&A transactions. Allen, Linda, Julapa Jagtiani, Stavros Peristiani and Anthony Saunders, "The role of bank advisors in mergers and acquisitions," *Journal of Money, Credit, and Banking* 36 (2004).

lending relationships or geographic proximity. Furthermore, lead arrangers with strong reputations can generally syndicate out a larger fraction of the loan.[39]

39 Sufi, Amir, "Information asymmetry and financing arrangements: Evidence from syndicated loans," *Journal of Finance* 62 (2010).

CAPITAL-MARKETS CASE STUDIES

Working with 10 large banks, we collected case studies illustrating products and services uniquely provided by large banks across ECM, DCM, M&A and syndicated lending. This sidebar highlights two examples.

1. Large banks can provide multiple investment-banking products to help finance large M&A transactions.

Situation and needs	Products and services provided	Outcome and results
Client C, a large US apparel and lifestyle company, sought a multi-billion-dollar acquisition and simultaneous refinancing of hundreds of millions of dollars in unsecured debt. ■ Needed arrangement and underwriting of significant financing ■ Required a bank with expertise in designing flexible capital structures to accommodate banking needs and market demand ■ Required advisory services	**Bank B served as joint financial advisor to Client C, arranged financing for the transaction, and designed a customized capital structure to meet acquisition and refinancing needs, including:** ■ Cash on hand ■ Secured debt issuance ■ Unsecured notes issuance ■ Perpetual convertible preferred stock issuance ■ Common stock issuance	**Client C financed the acquisition through a favorable product structure without committed financing, resulting in a highly profitable merged entity.**

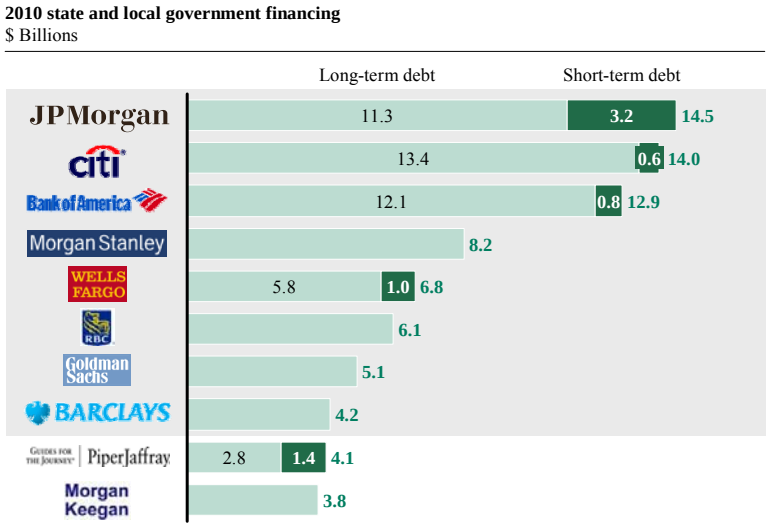
2. Large banks can play multiple roles in delivering equity offerings on a global scale.

Situation and needs	Products and services provided	Outcome and results
Client E, a large supplier of commodities and raw materials, wanted to IPO to support growth.	**Bank A leveraged significant geographic reach and product scope to:** ■ **Arrange intermediate debt financing**, jointly advising and placing more than $2 billion in convertible bonds for Client E and thereby providing liquidity to facilitate the next stage of growth ■ **Generate global demand for the IPO** by meeting about 50 accounts, one-on-one, across Europe, Asia and North America, and launching a road show across 13 countries. Bank A's private-bank division provided more than $2 billion in book orders. ■ **Educate investors** through opinion-leading, highly rated deal research and by visiting more than 200 accounts across major investment centers (e.g., London, Hong Kong and Singapore).	**Client E's IPO was oversubscribed and improved the financial flexibility of the company.** ■ Able to fund future organic and acquisition growth opportunities ■ Developed a permanent equity base

Large banks can offer particular benefit in ECM, DCM, M&A and syndicated lending because of their balance-sheet size, product scope, scale in capital markets, and geographic reach. Case studies indicate that banks must hold more than $500 billion in assets to provide full benefits in such products, while banks larger than $100 billion can provide benefits in smaller, less complicated deals. *See sidebar ("Capital-Markets Case Studies") and Section B of the appendix*. This tendency is consistent with market-share data, which indicates that large banks hold over 90 percent share across investment-banking products originating in the U.S.[40] Furthermore, large banks underwrite the majority of U.S. state and local governments' short- and long-term debt. In 2010 they were responsible for 87 percent of such financing,[41] with the six U.S. banks with over $500 billion in assets among the largest players. *(See Exhibit 9 for a breakdown.)*

EXHIBIT 9

Larger banks underwrite the majority of state and local governments' short- and long-term debt.



SOURCE: Thomson

Primary benefits from large banks include performance of large issuances and deals, tailored product combinations, international options, and broad distribution capabilities.

- **Large issuances and deals.** A larger balance sheet allows for underwriting larger deals. For DCM banks can keep sizable debt issuances on their balance sheets for the holding period before syndicating,[42] or in case the market is disrupted and the sale postponed. For ECM banks must often commit to buying back any part of the offering not sold. Typically, a larger balance sheet also goes along with greater diversification, allowing higher concentration limits, as a proportion of balance-sheet size. Similarly,

40 DealLogic and SNL Financial.

41 Thomson.

42 A typical holding-period length ranges between 20 and 30 days.

in the case of syndicated lending, large banks are able to extend more credit and are likely to be more successful arranging for other creditors to do the same.

- **Tailored product combinations.** Large banks have expertise across multiple equity and debt products, as well as in syndicated lending, alone and in different combinations. Their sophisticated deal-structuring capabilities help optimize integrated financing options, accounting for cost, risk, and flexibility.
- **International options.** Large banks have a presence and experience in multiple geographic markets and a range of expert bankers at their disposal. Cross-market experience can help them find the lowest-cost financing, potentially by splitting a capital-markets issuance across multiple markets or by forming a syndicate with banks from multiple countries.
- **Distribution capabilities.** Finally, factors such as balance-sheet size, geographic reach and product scope combine to ensure that large banks see high deal-flow across a range of deal types in multiple markets. Broad relationships with institutional investors across geographies and markets may provide companies issuing debt or equity with faster execution and lower risk in volatile market conditions.

In principle, large syndicates of smaller banks might underwrite deals of the sort currently underwritten by several large banks. However, there are reasons to question whether this would be possible in practice because of the complexity introduced by the large number of participants that would need to be involved. For example, a cross-border, cross-product, $1 billion deal would require approximately ten $50 billion banks,[43] that together had experience across geographies and in multiple products, creating large coordination challenges. Therefore, for large or complex deals, even if such syndicates could replicate the benefits outlined above, they could do so only at substantial detriment to speed, execution risk, and reaching consensus on deal terms. Speed is important in helping customers to meet tight deadlines and to mitigate risk, and establishment of consensus is critical to helping ensure appropriate deal terms and full subscription to issuances.

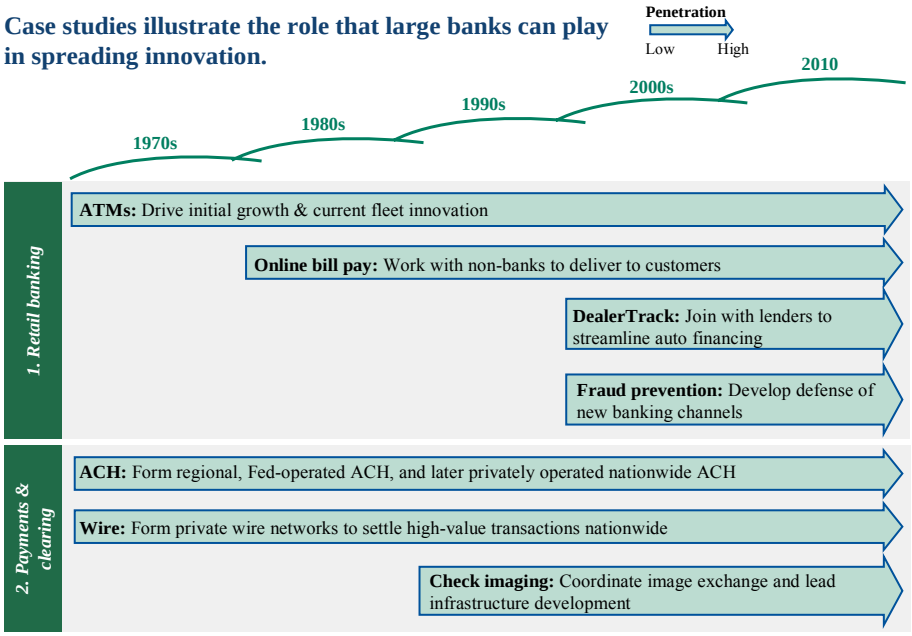
Breaking down our estimate of $7 billion to $11 billion in investment-banking benefits from large banks, we attribute $2 billion to $3 billion to DCM, $1 billion to $2 billion to ECM, $1 billion to $2 billion to M&A, and $3 billion to $5 billion through syndicated lending. We arrive at these numbers by estimating that large banks are uniquely positioned to perform approximately 30 percent of deals and confer more replaceable advantages in approximately an additional 45 percent. *(See Section B of the appendix for details.)*

[43] This calculation assumes a 20-basis-point concentration limit.

2.3 SPREAD OF INNOVATION

While often not the initial innovator, large banks have helped spread innovations industry-wide over the past three to four decades. *(Exhibit 10 illustrates this role for some important innovations in retail banking and payments & clearing.)* It is reasonable to expect that large banks will continue to spread innovation in the future, so long as they retain the characteristics that allowed them to do so in the past (for example, a large embedded customer base and physical footprint over which it is more economical to spread high fixed costs of investments in new products and technologies).

EXHIBIT 10



SOURCE: Hayashi, Sullivan, and Weiner (2003); FRB Philadelphia (2005); OnlineBankingReport (2009); annual reports.

We estimate that historical contributions of large banks in spreading innovation have led to as much as $15 billion to $30 billion in annual savings, particularly benefiting retail customers, as well as smaller banks that adopt these innovations. However, ours is a rough estimate because the contribution of larger banks to the spread of innovation does not submit easily to direct estimation for four reasons. First, banks' asset size today is not directly comparable to historical levels in part due to inflation, along with changes in interstate and other banking regulation. Second, multiple entities play a role in bringing technologies to market, so it is difficult to separate out the role of large banks. Third, it is impossible to know what would have developed without large banks. And fourth, benefits today come from the role of large banks in the past. We cannot measure what future benefits will come from the actions of large banks today. Therefore, we first focus on a qualitative examination of the role of large banks in spreading innovation. We turn to our estimates of benefits from large banks at the end of the section.

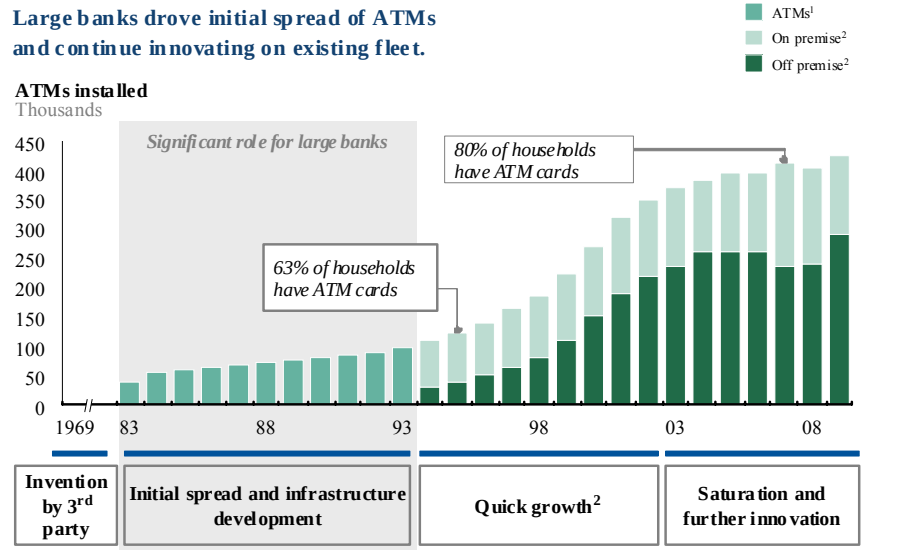
SELECT RETAIL AND PAYMENTS INNOVATIONS SPREAD BY LARGE BANKS

Large banks have played an instrumental role in spreading both retail and payments & clearing innovations over the past three decades. This sidebar highlights some such examples.

- **Automatic teller machines.** In 1969 Docutel created the first automatic teller machine. It was installed at Chemical Bank, one of the largest banks at the time. Eight years later Citibank rolled out a fleet of ATMs across New York City. As ATMs proliferated, large banks of the time, such as Philadelphia National Bank, partnered to form shared networks that would serve customers reciprocally across different bank ATMs. In 1995, the two dominant national networks, Cirrus and Plus, allowed fee surcharges on ATMs, making the economics attractive for smaller banks and independent service providers. A period of quick growth followed but leveled off in the early 2000s. Even today, nearly one in every four ATMs in the U.S. is owned by a large bank. *(Exhibit 11 illustrates the evolution of ATMs.)*

- **Online bill payment** lets consumers and small businesses send money from their bank account to whomever they specify. By the mid 1980s, technology companies such as Checkfree had developed a method of paying bills via personal computers. With the advent of the Internet in the 1990s, large banks started offering online bill payment through third-party providers. By 2001, 40 percent of households were paying some bills online. Bank of America's decision to abolish fees for online bill payment in 2002 caused many other large players to follow suit, causing online bill payment volume to rise significantly and become even more commonplace.

EXHIBIT 11



1 Aggregated ATM deployment data available from FRB Kansas City from 1983.
2 On-premise and off-premise deployment available from EFT databook since 1994.
SOURCE: Hayashi, Sullivan, and Weiner (2003); Federal Reserve Depository Institutions Study (various years); US Census 2011 Statistical Abstract; ATM Marketplace.

- **DealerTrack** links customers, auto dealers and banks across the country via a Web-based loan platform that allows auto dealers and customers to get quotes instantly across a broad range of lenders. Previously, customers and dealers would spend days contacting banks by fax and phone to obtain financing. In 2001 Chase, Wells Fargo, and Americredit formed DealerTrack, providing software and bringing together a broad network of dealers and a large customer base. In response, captive financers for GM, Ford and DaimlerChrysler set up their own version of automated auto-financing via RouteOne. Today DealerTrack processes more than 50 million auto-loan applications annually.

- **Automated Clearing House (ACH).** Large banks established the first regional automated clearing houses then created a nationwide, private ACH network in tandem with the Fed's network. ACH technology speeds up the processing of low-value recurring payments and allows customers to make and receive automatic payments conveniently. Today nearly 75 percent of all ACH originations and distributions pass through a large bank.

- **Check imaging.** In check processing, large banks led the way in setting up an image exchange to replace the slow, costly paper presentment of checks that existed before 2004. Large banks built the necessary infrastructure and protocols needed to scan, transmit, and receive check images, which were later rolled out to smaller banks via the Fed. Today 95 percent of checks are cleared as images, lowering processing costs by a factor of more than three and improving clearing and settlement times by two days for consumers and businesses.

2.3.1 Benefits of innovations spread by large banks

Innovations that large banks have helped to spread tend to offer one of four benefits: serving individual customers better, improving transaction efficiency between already defined transactors, increasing product availability and price transparency, or aggregating and using data more effectively. *(Exhibit 12 breaks these benefits down by banking-product area.)*

EXHIBIT 12

Across all market areas, large banks have driven innovations that offer four distinct benefits.

✓ Profiled in detail

Product categories	*Role of innovation*			
	Serving individual customers better	**Improving transaction efficiency**	**Increasing product availability and price transparency**	**Aggregating and using data more effectively**
1. Retail banking	✓ ATM ▪ Online banking ▪ Mobile banking	✓ Online billpay	✓ DealerTrack	✓ Fraud prevention ✓ Credit modeling and scoring
2. Payments & clearing	▪ Securities servicing platforms	✓ Check imaging ✓ ACH ✓ Funds transfer (wire)	▪ Settlement systems	▪ Collateral management systems
3. Commercial banking	▪ Cash management platforms ▪ Trade finance management platforms			
4. Capital markets			▪ Alternative trading systems; electronics communications networks	

1 Improvement of transaction efficiency when transactors are already set (e.g., a company and it's employees, a consumer and the electric company).
SOURCE: TCH large-bank study-participant data.

- **Serving customers better.** Innovations spread by large banks that improve service are particularly common in retail banking, payments & clearing, and commercial banking. In retail banking and payments, examples include automatic teller machines (ATMs) and, more recently, both online and mobile banking. These advances all considerably improve convenience to customers. ATMs let them withdraw cash or make deposits and payments at any time. Online and mobile banking enable them to perform banking transactions anytime from anywhere, including making payments, viewing statements and reviewing information about deposits. In commercial banking, large banks also have played an important role in developing securities servicing, cash management and trade–finance-management platforms. These innovations provide companies large and small with considerable improvements in transparency, reductions in overhead, and advancements in financial and risk management.

- **Improving transaction efficiency.** Large banks have helped spread innovations improving transaction efficiency in the payments & clearing area. Examples include check imaging, ACH, and wire funds transfer. Check imaging simplifies, quickens, and improves the accuracy and security of check processing by replacing paper checks with electronically transmitted images. It allows consumers and businesses to view and sort checks online as soon as they clear. ACH connects banks and provides a reliable and

secure network for transferring funds. This network processes direct deposits, electronic payments, debit-card payments, business-to-business payments, and some local, state and federal tax transactions. Wire-transfer systems provide more individualized transactions than do check imaging or ACH. Banks use them to transfer money to one another, particularly large amounts of money. Companies and consumers can use them to send money directly from one bank account to another. Online bill payment improves transaction efficiency, allowing customers to pay their bills over the Internet rather than by mail or in person and often occurs nearly instantaneously.

- **Increasing product availability and price transparency.** Large banks, which span market areas, have helped spread innovations **that** increase product availability and price transparency. Examples include DealerTrack in retail banking and alternative trading systems (ATS) in capital markets. DealerTrack links auto dealers and banks across the country, allowing dealers and their customers to get instant quotes and shop for multiple types of financing across a broad range of lenders. An ATS is a non-exchange trading venue, approved by the SEC, that provides a platform for matching buy and sell orders. These systems tend to lower execution costs for institutional investors.

- **Aggregating and using data more effectively.** Large banks also have helped spread innovations that lead to more effective aggregation and use of data. These innovations include fraud prevention and credit modeling and scoring in retail banking and collateral-management systems in payments & clearing. Online banking brought many new opportunities for fraud. Large banks have played a central role in containing these risks through new technologies and pooling of data. Credit-scoring models for small businesses have automated and systematized many of the smaller-value loans offered to small businesses, allowing them greater credit access and lowering associated risk. Collateral-management systems allow banks to see in one place all outstanding activity that demands collateral.

2.3.2 Why large banks are able to spread innovation

Large banks have played a central role in spreading innovation due to their large customer base, the multiple types of customers they serve, their reputations for trust, and their balance-sheet size. These characteristics make it worthwhile for larger banks to spend money in spreading innovation and also mean that they are able to do so more quickly.

- **Large customer base.** A large customer base means that a bank can amortize its investment in a technology over more users, providing the service at a unit price that is lower than that of its competitors. Thus, even before a technology has been fully developed and its price lowered, it can save money for a larger bank. ATMs provide an example. In their early days, they were cost-efficient for those banks with sufficient customer density to justify the investment relative to the cost savings from servicing fewer customers at a branch. ATMs became cost-efficient for many smaller players only after transaction fees were allowed. Similarly, in commercial banking, a single large customer can make it worthwhile for a large bank to develop or enhance a technology that later can help middle-market consumers, either in the hands of banks themselves or as offered by third parties. Some cash-management systems in place today were spurred by the complex needs of large U.S. corporations.

- **Multiple types of customers served. Having** multiple types of customers, spread across multiple geographies, has also allowed large banks to spread technologies. Having customers of different types helps encourage development of products that bring these customers together. In the case of ACH, a network of several large banks had pre-existing relationships with a substantial proportion of both potential payers and payees, making initial development more efficient. Large banks' customer base in many locations also can speed the spread of new technologies. For example, DealerTrack caters to dealerships and consumers across the U.S. Its initial large-bank founders, Wells Fargo, Chase, and non-bank founder Americredit, already had relationships in many parts of the country and so were willing and able to form a system with nationwide reach.

- **Reputation for trust.** In addition, large banks' pre-established reputation and stability inspires trust in customers and a willingness to try something new. In the spread of online bill payment, for example, large banks were able to use relationships with both consumers and the companies they wished to pay. While non-bank payment processors introduced this innovation, they did not spread it successfully until large banks became actively involved. These banks had already established the trust of both payers and payees.

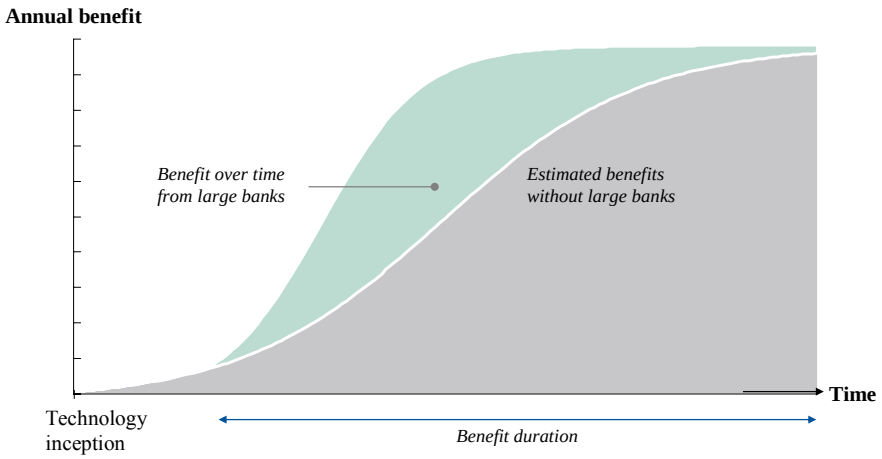
2.3.3 Quantification of innovation benefits

The benefit provided by large banks in spreading innovation is the sum of their contributions to each of the innovations in the process of proliferating them during a typical year. As we describe above, our rough aggregate estimate of this historical contribution of large banks is $15 billion to $30 billion annually. We calculate this estimate as the product of the average annual benefit per innovation times the average number of innovations spreading, with the help of large banks, in any given year.

First, to estimate the average annual contribution of large banks per innovation, we look at a collection of significant innovations over the past 30 years that large banks have helped to scale (ATMs, online bill payment, fraud-prevention, DealerTrack, ACH, check imaging, and wire transfer). For each, we build a hypothetical 'no-large-bank' growth curve based on the historical role of large banks, small banks, and non-banks at key historical inflection points in the innovation's spread. The difference in innovation penetration between actual and hypothetical growth curves corresponds to the total benefit from large-bank participation. *(Exhibit 13 illustrates this concept.)*

EXHIBIT 13

Technologies spread faster with the participation of large banks.



For each innovation we translate a difference in penetration into a dollar amount based on the benefit that the innovation gives compared to the previous best alternative. For example, ATMs save people time compared to using a branch, which translates into a dollar amount based on average wages. *(See Section D of the appendix for calculation details.)* The rough average annual benefit is the total benefit divided by the number of years during which actual penetration exceeded the hypothetical penetration by a meaningful margin.

Second, to approximate the number of innovations spreading during a given year, we take the product of the typical number of new innovations each year, and the typical duration of difference between the actual penetration curve and the hypothetical curve assuming no large banks. We estimate these quantities based on the frequency and duration of significant innovations over the past 20 years, in aggregate and across the four banking-product areas. (*Exhibit 14 breaks down our estimate. Section D of the appendix shows details of how we obtained these estimates.)*

EXHIBIT 14

Spread of innovation benefits are largest in retail banking.

Estimated benefits from spread of innovation from U.S. banks with over $50 billion in assets[1]
$ Billions

1. Retail banking[2]	ATM	$2 - 4
	Online billpay	$1 - 2
	Other retail *(e.g., online banking, mobile banking, DealerTrack, fraud prevention, credit modeling and scoring)*	$7 - 14
	Subtotal	**$10 - 20**
2. Payments[2]	ACH	$0 - 0.5
	Check imaging	$0 - 0.5
	Other payments *(e.g., wire, securities-servicing platforms, settlement systems, collateral-management systems)*	$2 - 4
	Subtotal	**$2 - 5**
3. Commercial banking[2]	Other commercial banking *(e.g., treasury-services platforms)*	$2 - 3
	Subtotal	**$2 - 3**
4. Capital markets	Other capital markets *(e.g., alternative trading systems)*	$1 - 2
	Subtotal	**$1 - 2**
Total[2]		**$15 - 30**

1 Benefits due to banks over $50B.
2 Numbers may not sum due to rounding.
SOURCE: TCH large-bank study-participant data.

2.4 SUMMARY OF BENEFITS

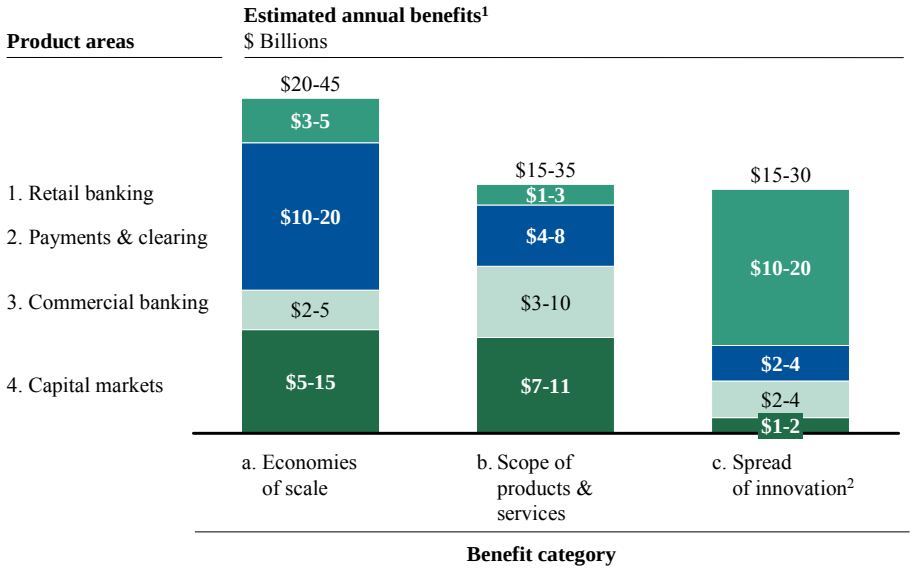
In aggregate, the 26 largest U.S. banks provide an estimated $50 billion to $110 billion worth of marginal value annually to the economy, as compared to banks with $50 billion in assets or alternative non-bank solutions. Beneficiaries include consumers, companies, and governments.[44]

These benefits are distributed across the four product areas of banking: retail banking, payments & clearing, commercial banking, and capital markets. The benefits are largest in payments & clearing, international commercial banking, and capital markets. Scope and scale benefits are relatively modest in retail banking. However, large banks have accelerated the spread of many retail innovations, which increase convenience and save time and money for consumers. *(Exhibit 15 breaks down the value of these benefits.)*

44 The benefits of product scope and innovation measure only those benefits that are received by end-users. For economies of scale, these benefits are split between customers—in the form of reduced pricing and investment in new product innovation—and bank shareholders, in the form of higher profitability. For products with competitive markets, it is likely that portions of these scale economies are passed on to customers.

EXHIBIT 15

Benefits from large banks are distributed across product areas.



1 Numbers may not sum due to rounding.
2 Based on analysis of historical benefit from spread of innovations over the past 30 years.
SOURCE: TCH large-bank study-participant data.

Each of the four types of large bank—universal, retail & commercial, investment banks, and investment servicers and mangers—provides different benefits, varying by their area of focus *(Exhibit 16)*. From the point of view of assets alone, benefits continue growing as banks grow to $500 billion or more *(Exhibit 17)*.

EXHIBIT 16

Each type of large bank provides different types and sizes of benefits.

Relative size of benefit
✓ Larger ✓ *Smaller*

Product categories	*Types of large banks* I. Universal banks	II. Retail & commercial banks	III. Investment banks	IV. Investment servicers & managers
1. Retail banking	✓ *National product footprint* ✓ Economies of scale ✓ Spread of innovation	✓ *Regional product footprint* ✓ *Economies of scale* ✓ *Spread of innovation*		
2. Payments & clearing	✓ Broad product scope ✓ Economies of scale ✓ Spread of innovation	✓ *Economies of scale* ✓ *Spread of innovation*		✓ Broad product scope ✓ Economies of scale
3. Com-mercial banking	✓ International product scope ✓ *Economies of scale* ✓ *Spread of innovation*	✓ *Regional product scale and scope (with international correspondents)*		
4. Capital markets	✓ Broad and international product scope ✓ Economies of scale ✓ *Spread of innovation*		✓ Broad and international product scale ✓ Economies of scale ✓ *Spread of innovation*	

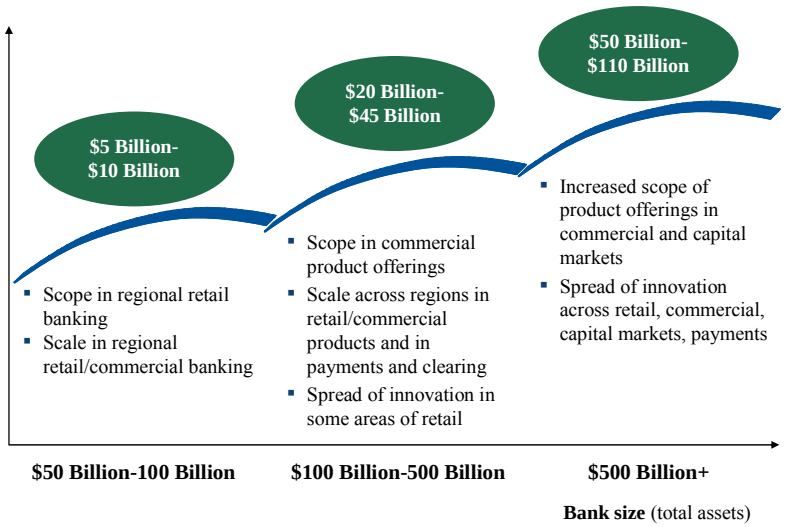
SOURCE: TCH large-bank study-participant data.

EXHIBIT 17

Benefits of large banks continue growing as the size of bank increases.

$Xx Cumulative benefit

Estimated cumulative benefits of U.S. banks with $50 billion+ in assets



3. Benefits lost in the absence of large banks

Do benefits from large banks *necessarily* mean that large banks are required in order to realize these benefits? Could some benefits be provided instead by a "large" non-bank entity, consortiums of small banks, or industry utilities? And what is the likely impact of reducing the size of large banks?

The answers to these questions depend on whether the benefits coming from economies of scale, scope of products, and spread of innovation can be decoupled from the core banking functions of credit provision, intermediation, and payments.

In some cases they clearly can, while in others it is challenging to replicate the economies of scale or product scope without having large banks. We estimate that 50 to 70 percent of the aggregate financial benefits found in this study do require the integration of core banking functions and size and hence could not be realized in the absence of large banks.

IMPACT OF REDUCING THE SIZE OF BANKS

There are several ways to reduce the size of banks. Each has a different impact on these benefits.

- **Reducing geographic scope.** Reductions in geographic scope limit the ability of banks to offer convenience benefits to customers based on the depth and breadth of ATM and branch networks and based on the ability to conduct transactions across borders. Moreover, limiting the geographic scope potentially increases banks' exposure to the risks of specific regional economies or industries and reduces diversification of revenue sources.

- **Shrinking individual businesses**. Reductions of an individual business—either in penetration within geographies or breadth of geographies—would result in the loss of the economic benefits to customers identified here. Large individual businesses are, in many cases, necessary to provide the scope of product offerings and the convenience that customers require. Limiting individual businesses reduces the incentives of banks to invest in innovation because they can no longer realize a reasonable return on investment from a sufficiently large customer base.

- **Splitting multiple businesses into separate banks**. Proponents of "narrow banking" argue that individual businesses (e.g., capital markets, custody, commercial banking) be split into individual banks. Individual businesses could be large. This limitation would still allow banks to maintain a broad geographic scope and provide benefits of scale, product scope, skill, and innovation to their customers within each business. However, the consolidation of business units within a single bank provides diversification of revenue sources, portfolio risks (e.g., consumers, corporations, capital markets), and funding sources. Many of the weakest institutions in the last crisis were effectively monolines and thus overexposed to individual asset classes, or they lacked a diversity of funding sources. Both before and during the crisis, we saw the virtual death of a variety of monoline business models. Some of these companies lacked diversification of product (e.g., Indymac, WaMu, Countrywide). Others lacked diversification of risk,

geography, and funding sources (e.g., monoline credit cards, auto finance, and investment banks).

Many other benefits could not plausibly be offered in the absence of large banks because of the inherent link between credit provision and intermediation. Some examples follow.

- **Custody.** As a natural outgrowth of economies of scale, custodians naturally become larger. Because the service requires fiduciary responsibility, it requires the provider to be a bank.
- **Capital markets.** Large deals performed quickly could not be coordinated from syndicates of smaller institutions.
- **Scale in retail lending.** Credit-card lending, auto finance, and other national lending businesses benefit from benefits of scale and skill in risk management, marketing, and technology in back-office operations. Most of these benefits are directly linked to the provision of credit and hence would be very difficult to decouple from banks.
- **International lending, cash management, and trade finance.** The majority of benefits in these areas come from the scope of multiple product offerings across multiple geographies. These businesses rely upon an integrated view of the customer and provision of credit and transaction services. Large non-banks, syndicates of smaller banks, or industry utilities could not reasonably supply most such features.

BENEFITS THAT MIGHT BE REPLACED BY ALTERNATIVE MECHANISMS

We estimate that, of the annual benefits discussed in this report, those that may be available from other market mechanisms total approximately $20 billion to $40 billion. This portion is approximately 30 percent to 50 percent of the total estimated benefits from large banks today and includes the following.[45]

- **Economies of scale in payments processing.** These could be realized by industry utilities or large non-bank players. For example, TSYS and Visa are non-banks that perform vital payment activities and realize significant economies of scale and network effects. These entities began as parts of large banks and were ultimately reorganized as independent companies. As we discuss above, estimated annual benefits from economies of scale in payments & clearing are $10 billion to $20 billion.
- **Product and convenience benefits in retail.** Some of the convenience benefits of larger banks to retail customers (e.g., distance to the nearest no-fee ATM) could be created through industry consortia of smaller banks (e.g., pooling ATM networks across geographies). We have estimated related annual benefits to be between $1 billion and $3 billion.

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45 We arrive at this percentage range by using, (1) for the lower bound, low-end estimates for all areas except scale in payments & clearing, retail convenience, and innovation, for each of which we assume high-end estimates (giving $20 billion in benefits from non-large banks out of a total annual benefit number of approximately $80 billion), and (2) for the upper bound, high-end estimates for all areas except scale in payments & clearing, retail convenience, and innovation, for each of which we assume low-end estimates (giving $40 billion in benefits from non-large banks out of a total annual benefit number of approximately $80 billion).

- **Innovations.** Many innovations require a large customer base to succeed. Non-bank innovators would need to have a significant customer base—of either many small banks or of several large banks—and a mechanism to capture the benefits of innovation; e.g., outsourcing relationships with many institutions. However, any such non-bank innovator likely would require an embedded customer base to promote initial adoption along with a way to monetize the benefits from the innovation.

Total estimated annual benefits from large banks in spreading innovation are $15 billion to $30 billion. We estimate that a non-bank might provide approximately half of this value, or $10 billion to $15 billion annually.[46]

46 The literature indicates that spread of innovation can be less efficient when it is not driven by individual banks. For example, Ferrari (2007) examined ATMs in Belgium, where all banks coordinated investment decisions so that there were no strategic reasons for investment. They find that banks substantially underinvested in this shared network. See Ferrari, Stijn, Frank Verboven and Hans Degryse, "Investment and usage of new technologies: Evidence from a shared ATM network," Katholieke Universiteit Leuven, Centrum voor Economische Studiën, Discussion Paper ces731 (2007).

Future research directions

To the best of our knowledge, this report represents the first systematic effort to examine and quantify the benefits that large banks provide to consumers, companies, and governments, as well as the U.S. economy as a whole. We believe that it establishes a preliminary fact base that could and should be further extended through additional work.

Continued research and discussion about the benefits of large banks is critically important to understanding the role that they play in the banking system and the economy at large. Measures that would compel large banks to shrink would affect the benefit profile as well as the risk profile of the industry and could have repercussions for the broader economy.

Potential future directions for research exist across all three areas of benefit discussed in this report. Some examples follow.

- **Economies of scale**
  - Continued and expanded investigation of product-level economies of scale across more product areas
  - Investigation of the characteristics of products that are complementary or in conflict, producing either economies of scale or dis-economies of scale
  - Examination and quantification of the distribution of the gain from economies of scale; e.g., among consumers, through reinvestment or to shareholders.
- **Scope of products and services**
  - Survey and quantification of customer views on benefits, both on the product-level and on the level of integrated cross-product services that are provided by a bank
  - Identification, examination, and quantification of any indirect or knock-on benefits stemming from scope of products and services
  - Further investigation of the potential for, and effects of, having small banks, non-banks or foreign banks provide products and services currently offered predominantly by large U.S. banks
- **Spread of innovation**
  - More exhaustive cataloguing of the successful and failed spread of banking innovations, understanding where large banks were essential, where they were inessential, and where, if anywhere, they were detrimental
  - More detailed examination of direct and indirect benefits from past banking innovations
  - Investigation into the potential future role of large banks in spreading innovation, based both on nascent innovations and the potential for other innovations across banking product areas