

**The Future of Banks:
Will Commercial Banks Remain Central to the Financial System?***

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Introduction

The death of commercial banking has been pronounced many times but, to paraphrase Mark Twain, the obituary may be a bit premature. Commercial banks, as well as other institutions and markets, perform important functions in the financial system and those functions are fundamental to promoting economic growth. Commercial banks, along with other institutions and markets, however, can pose risks to the stability of the financial system and the economy more generally. Disruptive competitors and dyspeptic regulators will play crucial roles in determining the viability of existing business models in banking.

Technology and regulation thus hold the keys to the future of commercial banking. Both are notoriously difficult to predict. Rather than provide specific forecasts, I will try to cover the landscape of key challenges and opportunities that commercial banking faces in the next twenty years, and the challenges that these will pose for regulators, supervisors, and central banks.

We are, perhaps, at a “defining moment” in the history of commercial banking. Threats to the role, purpose, and economic viability of commercial banking are rife. On the regulatory side, the US has seen the most extensive change in banking regulation since the Great Depression with the 2010 Dodd-Frank Act. Internationally, regulators around the globe are increasing capital and liquidity requirements, encouraging or mandating banks to leave particular business lines, increasing compliance requirements, restricting payouts to executives and shareholders, reducing the safety net, reaching record legal settlements, and threatening to break up the largest banks.

It is then no surprise that there has been an unusual dearth of entry into commercial banking since the crisis in the US (McCord and Prescott 2014).

On the technology side, “big data” analytics and business-model innovations abound that seem to have the potential to dismember and disintermediate banks (see, e.g., Ryan and Beardsley 2015) As Ali et al (2012, p.18) describe: “With open access to borrower information, held centrally and virtually, there is no reason why end-savers and end-investors cannot connect directly. The banking middle men may in time become the surplus links in the chain. Where music and publishing have led, finance could follow. An information web, linked by a common language, makes that disintermediated model of finance a more realistic possibility.... If eBay can solve the lemons problem in the second-hand sales market, it can be done in the market for loans.” Although virtually of the companies providing these types of services today “are tiny,” they note, “But so, a decade and a half ago, was Google.”

From a macroeconomic perspective, commercial banks – and possibly central banks – face the potential for disruptive competition in the payments system that could affect the traditional channels of monetary policy transmission. Digital currencies, mobile-phone “banking,” crowdfunding, peer-to-peer lending could diminish the role that traditional commercial banks play in the standard “money multiplier” process through which changes in bank reserve affect the money supply and the price level. In addition, advances in data collection, credit modeling, and monitoring technologies by both banks and non-banks could significantly reduce a wide variety of financial frictions, such as information opacity of borrowers and agency costs (as noted above in the quotation from Ali et al 2012). Reducing or eliminating such frictions would mitigate

the so-called “credit channel,” and particularly the “banking channel,” of monetary policy transmission (Bernanke and Gertler 1995). In principle, virtual or cyber currencies like Bitcoin could become the unit of account, medium of exchange, and store of value and largely or completely displace government central bank money.

This breathless survey of much-debated possibilities underscores why we could be at a “defining moment.” I am delighted that the Atlanta Fed is focusing this conference on these significant issues. Although I don’t yet see evidence of a “revolution” in money and banking, I also don’t think that we can rule out fundamental change and the need for central banks and regulators to be aware of and to react swiftly to these in the next couple of decades.

In what follows, I will outline some key forces in technology and regulation shaping and reshaping commercial banking and its role in the economy. I make no attempt to be exhaustive but instead to highlight some critical issues. First, I will describe some longer-term trends in commercial banking in the US and elsewhere. Although commercial banking had faced increasing competition from “shadow banking” in the US for many years (see e.g., Boyd and Gertler 1994 and Gorton and Rosen 1995), changes in regulation and in the marketplace post-crisis have, at least temporarily, reversed that trend. Commercial banks also continue to play a significant role in Europe and Japan where “shadow” banking has not developed as in the US. I will also consider the evidence on economies of scale and scope in banking and how technology and regulation may affect those. Second, I will briefly examine the relationship that banking and finance have with overall economic growth and financial stability. In thinking about both the regulatory and monetary policy issues, it is important

to have a framework to analyze possible trade-offs between policy changes and growth.

Third, I consider the functions and roles of commercial banks in the financial and economic system. In particular, I will draw on the work on what makes “special” in the financial system and the regulatory and technological changes that could erode their “specialness.” I will focus two “special” roles: (a) banks’ as liquidity transformers and providers and (b) banks’ as information processors, analyzers of creditworthiness, capital allocators, and monitors. If technology and/or regulation lead to extensive disintermediation from banks, then this could have important consequences for the transmission mechanism of monetary policy, particularly for the so-called credit or banking channel. Here I will also examine evidence the different roles that large versus small banks may play going forward. I will also focus on a third “special” role of banks – and central banks – in the payments system and the challenges from alternatives like Bitcoin.

Finally, I conclude briefly with some speculations about what the future might hold to suggest that the key to the viability of commercial banks may be for them to act as technology and data analytics firms engaged in financial services rather than as financial services firms simply using technology and data analytics.

Longer Term Trends and Changes in the Competitive Landscape

Commercial banking has certainly not been a hotbed of new entry since the financial crisis. As Figure 1 shows, de novo entry into banking in the last few years is far below where it has been in previous recoveries (McCord and Prescott 2014). In fact, since the passage of the Dodd-Frank Act in 2010, exactly one new bank has been

formed in the U.S. That lone entrant, the Bird-in-Hand Bank, serves the Amish community in Pennsylvania. Rather than being on the cutting-edge of technology, Bird-in-Hand “doesn’t offer online banking, but its sole branch does have a drive through window that can accommodate a horse and buggy” (WSJ, March 29, 2015). The number of banking organizations in the U.S. has continued its long-term decline is now under 6,000 (see Figure 2).

Despite the decline in the number of banks and the lack of entry, commercial banking has shown much greater resiliency in terms of aggregate assets and liabilities. Figure 3 demonstrates that commercial bank deposits as a share of GDP began growing in the early 2000s and demand deposit growth has been strong since the financial crisis. On the asset side, Figure 4 shows that commercial bank lending in the US as a share of GDP has grown since the late 1990s, after being flat for roughly 20 years before that. Thus, commercial banks are still heavily engaged in their traditional role of liquidity transformation, that is, creating liquidity liabilities for depositors and using those to fund longer-term and less liquid loans.

Commercial banks play a larger role in other major economies around the world. In Europe, bank loans as a fraction of GDP are roughly double that in the US and have been rising even more steeply than in the US since the financial crisis (see Figure 4). After falling in the late 1990s and the early 2000s, even in Japan, banking lending as a share of GDP has begun to recover and the level is much higher than in the US.

Looking more broadly at bank assets relative to GDP, this measure has generally increased across Europe since 1990 but has been slightly down for the US and for Japan (Figure 5). Relative to overall household wealth, the picture is similar: bank assets have

increased in much of Europe but have declined a bit in the US and Japan (Figure 6). The concentration of bank assets in Europe is similar to the that In the US for the top five banks but more concentrated in Europe for the top 20 relative to GDP (Figure 7). These international comparisons suggest that commercial banks are even more significant in much of the rest of the world than in the US.

One of the differences between the US and the rest of the world is the larger role played by non-bank financial institutions and markets in the US financial system. The rise of “shadow banking” has been much discussed but is often not well defined. I will rely primarily on the New York Fed definition of Pozsar et al (2010/2012).¹ As Figure 8 illustrates, the shadow banking sector had been growing more rapidly than the traditional banking sector from the 1980s until the financial crisis. Regulatory change and market forces have led to a significant reversal post-crisis: Traditional bank liabilities have grown by roughly 35 percent whereas “shadow bank” liabilities have declined by more than 20 percent. Traditional bank liabilities are now substantially greater than shadow bank liabilities. Using a somewhat different definition (see Nash and Beardsley 2015), Figure 9 provides a longer time series of the relative sizes of shadow banking and traditional banking sectors, but the story is the same: the long decline in the size of traditional banking relative to shadow banking reverses after the financial crisis.

The data for the US and much of the rest of the world certain suggest that commercial banking is not dead. Although technological innovations and regulation have created headwinds for traditional banks, regulation and market adjustments to risks have created even greater headwinds (so far) in the shadow banking sector.

¹ See the Appendix for a description of the components of this definition of “shadow banking” and how they have changed from 2008 to 2014.

Economies of Scale and the Size of Banks

The size of banks has generated much controversy. Are the largest banks “too big to fail”, “too big to manage”, etc? Some have argued that there may be diseconomies, stemming from risks correlations and management challenges, so that banks might want to break up voluntarily in order to maximize shareholder value. Others argue that regulators should reduce the size of the large banks directly, given risks that they may pose to the system, or provide disincentives for growth of large banks. The so-called “SIFI surcharges” which mandate that the “systemically important financial institutions” have higher capital and liquidity requirements, as well as large banks being subject to “stress tests,” are examples.

The keys to the likely future of the size of large banks would then be the existence and magnitude of scale and scope economies as well as regulation. In undertaking empirical investigations of scale and scope economies, it is important to note that the regulation and perceptions of government support for large institutions can affect the estimates of scale and scope economies. Studies analyzing data from before the full implementation of intra-state and inter-state branching deregulation in the 1980s and 1990s, for example, had found little evidence of scale economies beyond a relatively small bank size. A number of newer studies using more recent data, however, suggest otherwise.²

² See Hughes, Lang, Mester, and Moon (1996 and 2000), Feng and Serletis (2010), and Wheelock and Wilson (2012). For a description and analysis of the impact of branching deregulation, see Kroszner and Strahan (1999). A variety of technological and financial innovations, such as the development of credit scoring techniques, also may have increased scale economies in banking (see Strahan forthcoming for an overview). Anderson and Joeveer (2012) use a different approach that relaxes the assumption of a competitive labor market for key bank

Using data from the 2003, 2007, and 2010 and a technique that takes into account banks' risk choices and diversification, for example, Hughes and Mester (forthcoming) find positive scale economies for even the largest institutions. They also undertake robustness checks to see if perceptions of government support in these years could account for the results for the biggest banks and do not find support for that hypothesis. In particular, they apply the funding costs that small banks face to the cost functions for the largest banks, and they still find significant scale economies for the largest banks. This would suggest that funding cost differentials are not driving their finding of scale economies for large banks (see Kroszner forthcoming).

If the data continue to support the results of these newer studies, then we are not likely to see market forces tending to break up or significantly diminish the size of large banks. What would change this? Certainly, greater regulatory requirements and regulatory pressure could be a deterrent to growth of the largest institutions. In addition, innovation could alter information processing and monitoring technologies so that credit analysis and the provision of funding could become more decentralized. Generally, however, the story has been told in the other way, with technological innovations increasing scale and scope economies (e.g., Peterson and Rajan 2002 and Thiel 2014). Of course, the activities of major commercial banks changed in the US in 2008 as large independent investment banks either became or were purchased by commercial banks (see Kroszner 2012).

employees and also find significant scale economies for the largest banks that they argue are not due to perceptions of government support.

Banks, Growth, and Stability: Considering potential trade-offs³

A large body of research suggests that a deep and developed financial system is a driving force behind economic development and growth (see, e.g., the summary in Levine 2005, Kroszner 2012, and Kroszner and Strahan 2014). The primary mechanism for the positive growth impacts appears to be through increasing the efficiency of the allocation of capital to the highest return projects and giving the less affluent and would-be entrepreneurs access to capital that they would not have in a less developed system. (See Levine and Zervos 1998 on the role of banking, rather than finance generally.)

This line of research, however, generally did not address a fundamental issue: Might there be a trade-off with volatility? (See Kroszner and Strahan 2011.) That is, to obtain a higher growth “return” through financial development, is there a cost in terms of greater “risk” in the system? Following the crisis, this is a critical issue to investigate. This issue raises a further and much more vexing question: If there is such a trade-off, then how would we determine the “optimal” size of the financial sector in an economy and the appropriate “macro-prudential” policies that would allow the best risk-return trade-off for the economy as a whole?

Theoretically, greater financial depth and development could either increase or decrease stability. On the one hand, a larger and more developed financial sector could improve risk sharing and diversification and thereby reduce volatility. On the other, a larger and more developed financial sector could allow greater concentrations of risk and generate interconnections, thereby potentially making the

³ This section draws on Kroszner (2012).

entire system more fragile and vulnerable to shocks. Policy makers engaged in financial regulatory reform need to consider these opposing forces in the financial system.

In earlier work with Luc Laeven and Daniela Klingebiel on banking crises (2007), for example, I indirectly addressed this by looking at whether firms that relied more on sources of external finance were hit harder during banking/financial crises than firms that relied more on internally generated cash flows. Not only did we find this generally across countries, we found that this affect was most pronounced in countries with the deepest financial systems. (See also Kroszner 2007.) This evidence thus hints at the possibility of a trade-off. The deeper financial system might create more connections between the real and the financial sectors that could make the firms that rely most heavily on the financial system more vulnerable in a banking crisis. Our analysis, however, did not allow us to address in detail the welfare question of whether these types of firms or the economy as a whole was better off in the long run.

The data from branching deregulation across US states, however, suggests that there is no trade-off but that deepening of the financial sector is a “win-win.” The evidence suggests that state growth rates tend to increase following branching deregulation. Examining the quarter century during which states removed barriers that had prevented banks from branching across states, Morgan, Rime, and Strahan (2007) and Kroszner and Strahan (2014) find that measures of state economic volatility fell as the banking system integrated across state lines. The variability of state employment growth and the growth of gross state product, for example, decreased after interstate branching was permitted. Interestingly, both growth shocks and trend growth rates

become more alike across states as the degree of commonality of the ownership of banks in those states increased.

Some recent work has revisited the earlier cross-country growth regressions research to examine whether there can be “too much finance” (e.g., Arcand et al. 2012 and Cecchetti and Kharroubi 2012). Rather than looking for a linear relationship between finance and growth, these papers allow for more general types of relationships in their estimation procedures. Figure 10, from Arcand et al (2012), shows a “hump” shaped relationship between financial depth, as measured by private credit to GDP, and economic growth. (The dotted lines represent the 10 percent confidence intervals.) The impact of greater financial development turns down after private credit to GDP is in the range around one. More research needs to be done on the impact of banking, rather than finance generally, on growth. Understanding when regulatory change can create “win-win” situations and when there are trade-offs will be crucial in getting the balance right in both micro- and macro- prudential policy going forward.

Are Banks Still “Special”?

Are there unique roles and functions that banks play in the economy? Will technology and regulation erode those special roles? The answers to these questions are crucial to thinking about the future of commercial banking. Broadly, I would suggest there are three categories of “special” roles and functions that banks play and will consider them in turn.

First, the fundamental business of banking is often described as being liquidity provision and transformation. Banks create liquidity liabilities, e.g. checkable deposits, and invest in less liquidity and longer maturity loans. This liquidity “mismatch” is both the

source of one of the key benefits and costs of a fractional reserve banking system (e.g., Kroszner 2008).

Kashyap, Rajan and Stein, (2002), for example, argue that deposits funding is fundamentally linked to the provision of credit lines by banks. In this view, there is a particular synergy between deposit funding and credit extension, not just lending but also a variety of standby or contingent credit facilities. If this is the case, then non-depositories would be at a disadvantage in trying to provide standby letters of credit, etc. and that deposit flows would critically affect banks' ability to provide credit, consistent with their findings. Gatev and Stahan (2006) and Cornett et al (2010) demonstrate the importance of deposit funding for credit creation during times of financial stress. In particular, during the financial crisis, Cornett et al (2010) demonstrate a direct link between a bank's core deposits and its willingness to provide credit (or not withdraw lines of credit) during the crisis. The results in these papers suggest that banks are still "special" in that non-banks without deposits behave differently during liquidity shocks and that this deposit-credit creation link is unique to banks. Score one for the banks.

A second basic function and role of banks is overcoming information asymmetry problems – classic "agency" problem. In particular, by combining deposit-taking and lending in a branch network, banks can specialize in making credit judgments and loans that it would be very difficult for arm's length market lenders to undertake. The "local" knowledge of "soft" information that would be difficult to capture in a credit score, credit rating, or other standardized metric. Local branches allow a bank both to gather and monitor this information at the same time they are gathering deposits.

The impact of technological innovation to reduce the value of this “local” knowledge has been discussed for many years. Peterson and Rajan (2002), for example, demonstrated that the average distance between a borrower and lending had grown over time and attributed this to a reduction in the value of such local knowledge. While this role may have been diminished relative to many decades ago, recent studies have still found an important role for banking lending to local informationally opaque borrowers. Gilje (2011) and Gilje et al (2012), for example, show that following the shale oil boom in the US, local lending continues to be very important. In particular, banks in areas experiencing a “boom” will make loans to in other parts of their branch network to informationally opaque “local” borrowers. This suggests that agency cost frictions continue to be important and that data analytics have not (yet) swept away advantages of local knowledge. (The Bird-in-Hand Bank mentioned above seems to be thriving.) Consistent with this, looking back to Figure 2, the number of branches in the US continued to grow even as the number of banks fell.

The key question going forward, of course, is will there be innovations that allow data analytics to reproduce at much lower cost the functions of a bank branch network? Peer-to-peer lenders have been successful in some markets, but could this become more broad-based? Could a Google, Facebook, Apple, Amazon, a telecommunication firm or an innovator we haven’t heard of be able to build models using the types of information those organizations collect (or that could be purchased by a third party) to significantly improve upon or potentially displace traditional credit scoring for individuals and credit ratings for firms? Are these improvements or displacements likely to be widespread or, perhaps, only for particular niches? Rules on privacy and data protection may play an important role in whether non-banks will be

able to out-compete banks in this sphere and undermine their “specialness.” If banks no longer play a special role in overcoming agency problems and financial frictions, then the so-called “credit channel”, and in particular, the “banking channel” of monetary policy transmission will be eroded (Bernanke and Gertler 1995).

The costs of banking regulation obviously also play an important role here and Figure 15 summarizes regulatory challenges in a number of particular business lines and would tend to tip the balance in favor of new players.

The third special role for banks – and central banks – is in the payments system. Digital currencies such as Bitcoin have developed platforms that permit secured transactions to occur without need for an intermediary, either a bank or a central bank running a payments system (see Ali 2014). While such innovations have great potential, they have not yet fundamentally challenged banks or central banks in their payments and money creation roles. Figure 11 describes key events that have been driving the value of Bitcoin relative to the US dollar. Figure 12 demonstrates how volatile Bitcoin has been and thereby not an effective store of value. As Figure 13 shows, Bitcoin has not (yet) taken off as a medium of exchange. Also, over the last year, Bitcoin has evolved to be primarily a vehicle for transferring funds out of Chinese Yuan, despite actions by the PBOC to try to prevent this (see Figure 14). Also, there is no reason why central banks could use the technological innovations in secured on-line payments and issue digital currencies of their own (Ali 2014 and Mas 2014). Thus, while the potential exists for disruptive change in the money creation and payments process, it certainly has not yet been realized.

Conclusions and Speculations

How will technology and regulation shape banking over the next 20 years? My crystal ball is not that clear. The issues discussed above certainly emphasize how technology and regulation will be fundamental forces affecting the viability and business models of banks going forward. Financial services firms already spend vast sums on “information technology” and I see that likely to increase over time. I think we will see a transformation of many banking firms from being seen as primarily “financial” to being primarily about technology/data analytics, that is, a technology and data analytics firm engaged in financial services rather than a financial services firm engaged in using technology and data analytics.

With the potential for disruptive innovation in banking and payments, regulators and central banks will need to understand how these changes affect the cost-benefit trade-offs of their micro- and macro- prudential regimes – possibly driving activity out of the traditional banking sector – and disrupting the traditional channels of impact of monetary policy on the economy. Technological change in the 1970s altered the political-economy balance which led to the relaxation of geographic restrictions on banks in the US (Kroszner and Strahan 1999) so understanding these linkages will also be crucial to understanding the forces shaping the future of regulatory change.

Commercial banks and central banks are certainly not dead but technological innovators have them in their sights.

Bibliography

- Ali, Robleh, "The Economics of Digital Currencies," Bank of England Quarterly Bulletin, 2014Q3.
- Ali, Robleh, Andrew G Haldane and Paul Nahai-Williamson, "Towards a common financial language," presented at the Securities Industry and Financial Markets Association (SIFMA) "Building a Global Legal Entity Identifier Framework" Symposium, New York, March 14, 2012.
- Anderson, Ronald and Karin Joeveer, (2012), "Bankers and bank investors: Reconsidering the economies of scale in banking," Financial Markets Group LSE, Working paper 172, September.
- Arcand, Jean-Louis, Enrico Berkes and Ugo Panizza, 2012, "Too much finance?" IMF Working Paper No. 12/161.
- Bernanke, Ben and Mark Getler, 1995, "Inside the Black Box: The Credit Channel of Monetary Policy," Journal of Economic Perspectives, Fall.
- Berger, Allen N., Nathan H. Miller, Michell A. Petersen, Raghuram G. Rajan and Jeremy C. Stein, "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," Journal of Financial Economics, 2005, 76(2).
- Boyd, John and Mark Gertler, 1995, "Are Banks Dead? Or Are the Reports Greatly Exaggerated?," National Bureau of Economic Research Working Paper No. 5045, February.
- Cecchetti, Stephen and Enisse Kharroubi, 2012, "Reassessing the impact of finance on growth," Bank for International Settlements working paper 381, July.
- Cornett, Marcia, Jamie McNutt, Philip Strahan, and Hassan Tehranian. 2011. "Liquidity Risk Management and Credit Supply in the Financial Crisis." Journal of Financial Economics 101(2), pp. 297-312.
- Feng, G. and Serletis, A., (2010), "Efficiency, technical change, and returns to scale in large US banks: Panel data evidence from an output distance function satisfying theoretical regularity," Journal of Banking and Finance 34, 127-138.
- Gatev, E., Strahan, P. E., 2006, Banks' advantage in hedging liquidity risk: theory and evidence from the commercial paper market. Journal of Finance 61, 867-892.
- Gilje, E. P., 2011, "Does Local Access to Finance Matter? Evidence from U.S. Oil and Natural Gas Shale Booms," Working Paper.
- Gilje, E. P., Elena Loutskina, Philip E. Strahan, 2014, Exporting Liquidity: Branch Banking and Financial Integration," working paper.
- Gorton, Gary and Richard Rosen, 1995, "Corporate Control, Portfolio Choice, and the Decline of Banking," Journal of Finance, 50 (5), December, 1377-1420.
- Hughes, Joseph P., and Loretta J. Mester, (forthcoming), "Who Said Large Banks Don't Experience Scale Economies? Evidence From a Risk-Return-Driven Cost Function," Journal of Financial Intermediation (Federal Reserve Bank of Philadelphia Working Paper).

- Hughes, J.P., Lang, W., Mester, L.J., Moon C.-G., (1996), "Efficient banking under interstate branching," *Journal of Money, Credit, and Banking* 28, 1045-1071.
- Hughes, J.P., Lang, W., Mester, L.J., Moon C.-G., (2000), "Recovering risky technologies using the almost ideal demand system: an application to U.S. banking," *Journal of Financial Services Research* 18, 5-27.
- Ivashina, Victoria, and David Scharfstein, 2010, "Bank Lending during the Financial Crisis of 2008." *Journal of Financial Economics* 97(3), pp. 319–338.
- Kashyap, A. K., Rajan, R., Stein, J. C., 2002, "Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking," *Journal of Finance* 57, 33-73.
- Kroszner, Randall S., 2006, "The Effect of Removing Geographic Restrictions on Banking in the United States: Lessons for Europe," Federal Reserve Board of Governors, Speech delivered at the Conference on the Future of Financial Regulation, London School of Economics, London, April 6, 2006.
- Kroszner, Randall S., 2008, "Liquidity Risk Management in the Business of Banking," Federal Reserve Board of Governors, Speech delivered at the Institute of International Bankers Annual Washington Conference, Washington, D.C.
- Kroszner, Randall S., "Analyzing and Assessing Banking Crises," speech at Federal Reserve Bank of San Francisco, Conference on the Asian Financial Crisis Revisited, September 6, 2007.
- Kroszner, Randall S., "Challenges for Macro-Prudential Supervision," in *Macroprudential Regulatory Policies: The New Road to Financial Stability?*, Stijn Claessens, Douglas Evanoff, George Kaufman, and Laura Kodres., eds., Hackensack, NJ: World Scientific Publishers, 2011, pp, 379-86.
- Kroszner, Randall S., "Stability, Growth, and Regulatory Reform," in *Financial Stability Review: Public Debt, Monetary Policy, and Financial Stability*, Banque de France, Paris, April 2012, pp. 87-93.
- Kroszner, Randall S., "Fire Extinguishers and Smoke Detectors: Macroprudential Policy and Financial Resiliency," *Banking Perspectives*, 2014 Q4, vol. 2-4, pp. 16-20.
- Kroszner, Randall S., "A Review of Bank Funding Cost Differentials," forthcoming in the *Journal of Financial Services Research*.
- Kroszner, Randall S., Luc Laeven, and Daniela Klingebiel. 2007. "Banking Crises, Financial Dependence, and Growth." *Journal of Financial Economics*, April, 84(1), 187-228.
- Kroszner, Randall S. and William Melick, " "The Response of the Federal Reserve to the Recent Banking and Financial Crisis" in Jean Pisani-Ferry, Adam Posen, and Fabrizio Saccomanni, eds., *An Ocean Apart? Comparing Transatlantic Response to the Financial Crisis*, Brussels: Bruegel Institute and Peterson Institution for International Economics, 2011.

Kroszner, Randall and Philip Strahan, 1999, "What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Restrictions in the United States," *Quarterly Journal of Economics*, November, 1437-67.

Kroszner, Randall S. and Strahan, Philip E. "Financial Regulatory Reform: Challenges Ahead," *American Economic Review, Papers and Proceedings*, May 2011, 101(3), pp. 242-46,

Kroszner, Randall S. and Strahan, Philip E. "Regulation and Deregulation of the U.S. Banking Industry: Causes, Consequences, and Implications for the Future," with Philip Strahan, in Nancy Rose, ed., *Studies in Regulation*, Chicago: NBER and University of Chicago, 2014, pp.485-543.

Kroszner, Randall S. and Robert Shiller. 2011. *Reforming U.S. Financial Regulation: Before and Beyond Dodd-Frank*, Cambridge, MA: MIT Press.

Levine, Ross and Zervos, Sara, *Stock Markets, Banks, and Economic Growth*. *American Economic Review*, Vol. 88, pp. 537-558, 1998.

Mas, Ignacio, 2014, "Why you Should Care about Bitcoin – Even if you don't Believe in it," University of Oxford, Saïd Business School, working paper.

McCord, Roisin and Edward Simpson Prescott, "The Financial Crisis, the Collapse of Bank Entry, and Changes in the Size Distribution of Banks," *Federal Reserve Bank of Richmond Economic Quarterly*, Vol. 100, No. 1, First Quarter 2014, pp. 23-50.

McMillan, Jonathan, *The End of Banking*, Zurich: Zero/One Economics, 2014.

Nash, Ryan and Eric Beardsley, "The Future of Finance: The Rise of the New Shadow Bank," *Goldman Sachs Equity Research*, March 3, 2015.

Petersen, M. A., and Rajan, R. G., 2002, "Does Distance Still Matter? The Information Revolution in Small Business Lending," *Journal of Finance* 57, 2533-2570.

Pozsar, Zoltan, Tobias Adrian, Adam Ashcraft, and Hayley Boesky, 2010, "Shadow banking," *Federal Reserve Bank of New York, Staff Report*, revised 2012.

Thiel, Peter, with Blake Masters, *Zero to One*, New York: Crown Publishers, 2014.

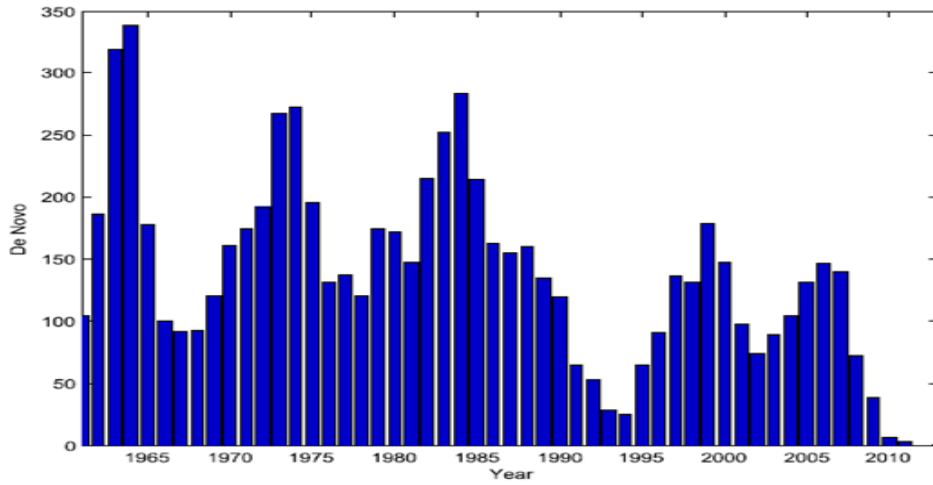
Wall, Larry, 2015, "Liquidity Regulation and Financial Stability," *Notes from the Vault*, Federal Reserve Bank of Atlanta, February.

Wheelock, David C., and Paul W. Wilson, (2001), "New Evidence on Returns to Scale and Product Mix among U.S. Commercial Banks," *Journal of Monetary Economics* 47, 653-674.

Wheelock, David C., and Paul W. Wilson, (2012), "Do Large Banks have Lower Costs? New Estimates of Returns to Scale for U.S. Banks," *Journal of Money, Credit and Banking* 44, 171-199.

Figure 1

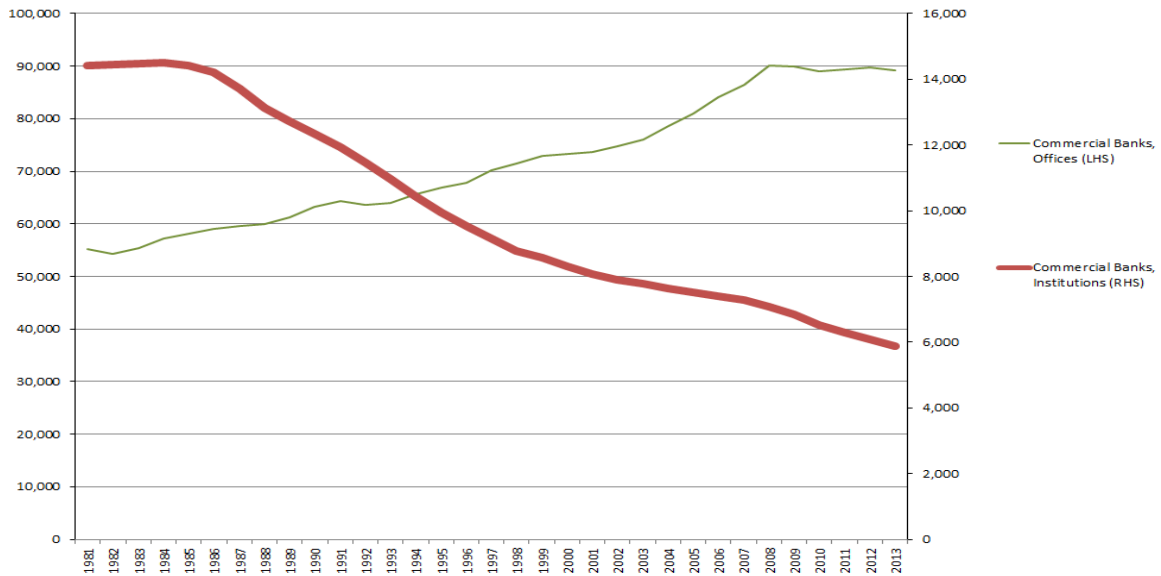
Number of De Novo Entrants by Year



From McCord and Prescott (2014).
 Notes: A *de novo* bank is a newly formed bank.

Figure 2

Number of Bank Organizations and Offices



Source: Number of Offices of FDIC-Insured Commercial Banks and Savings Institutions, FDIC. INSTITUTION and STRUCTURE (Balances at year-end) CB01: Number of Institutions, Branches and Total Offices, FDIC.

Figure 3

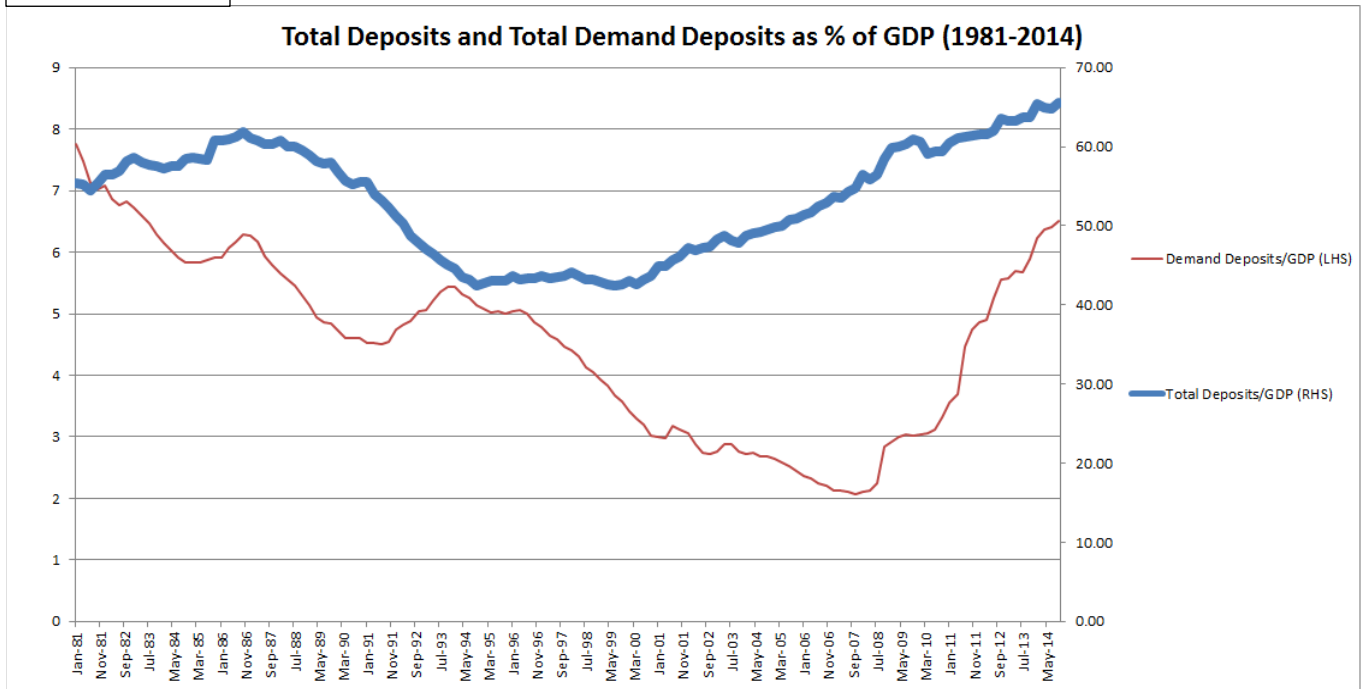


Figure 4

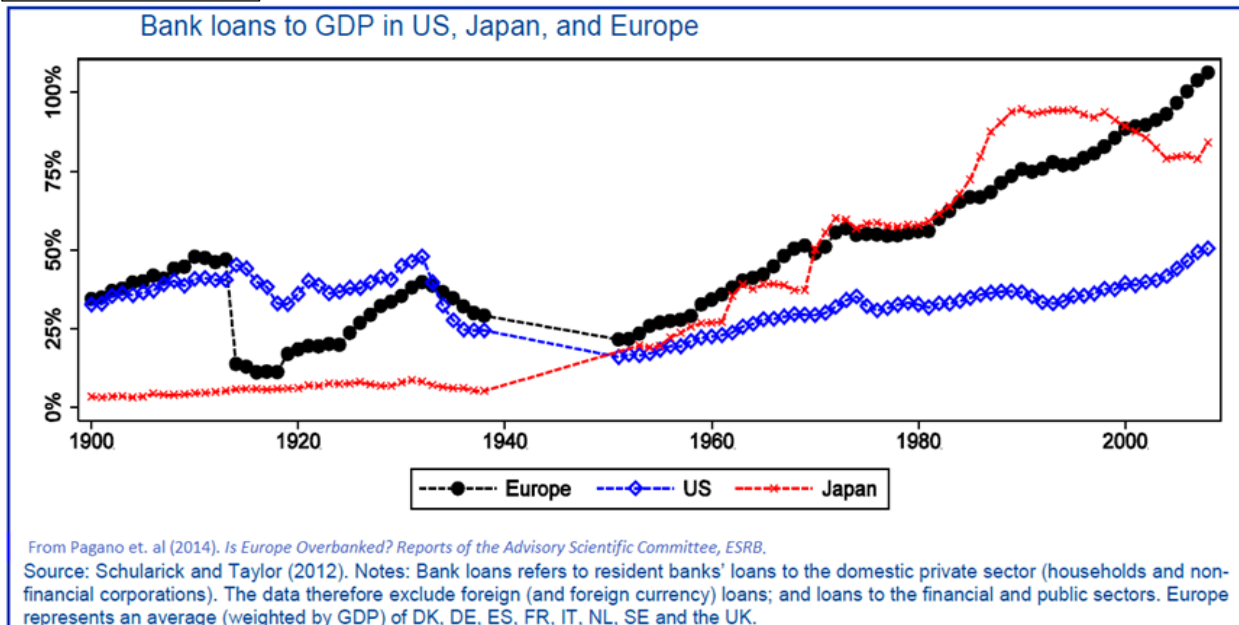
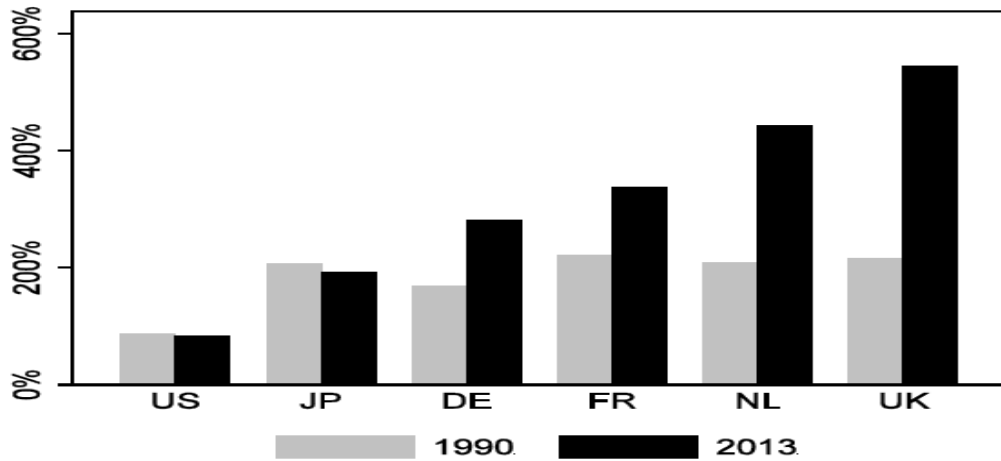


Figure 5

Resident banks' assets as % of domestic GDP

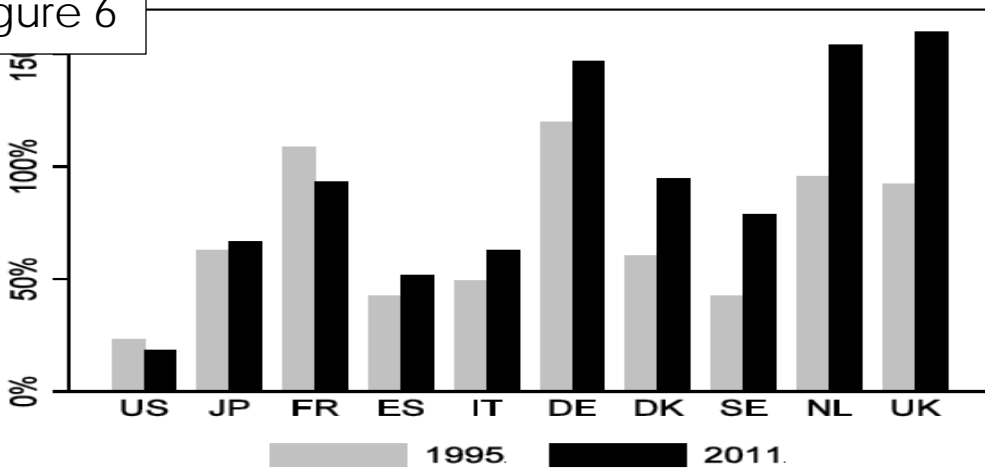


Pagano et. al (2014), *Is Europe Overbanked?* Reports of the Advisory Scientific Committee.

Source: Helgi Library; OECD; national central banks. The US observation in 2013 would increase by 32 percentage points including Fannie and Freddie and by a further 30 percentage points under IFRS-equivalent accounting.

Figure 6

Resident banks' assets as a percentage of net household wealth



Pagano et. al (2014), *Is Europe Overbanked?* Reports of the Advisory Scientific Committee.

Sources: OECD; national central banks; Roine and Waldenström (2014); Helgi Library. Household wealth is the sum of financial and non-financial wealth (including housing) held by households, net of debt liabilities. Wealth data for Sweden are preliminary.

Figure 7

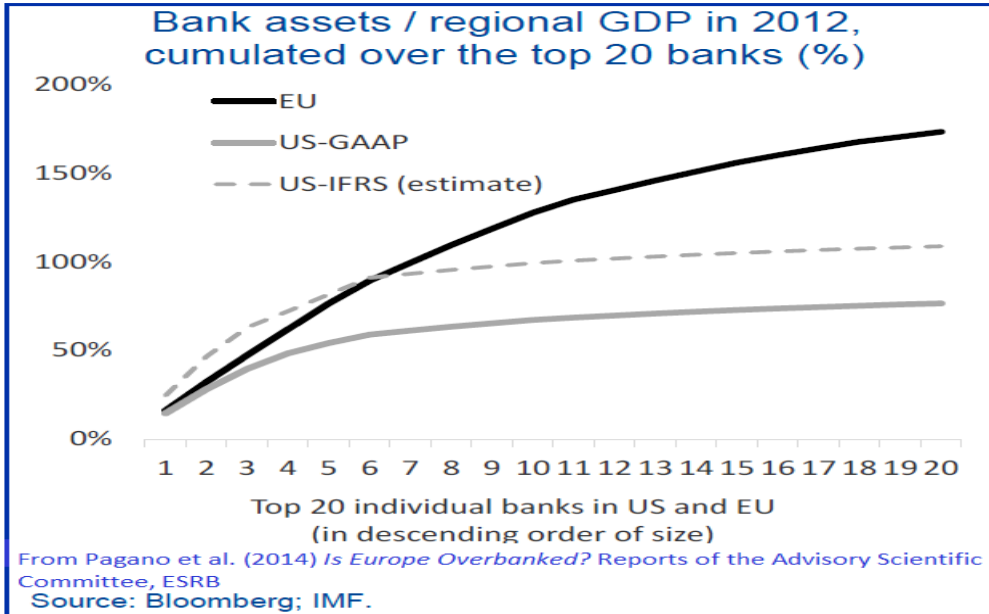


Figure 8

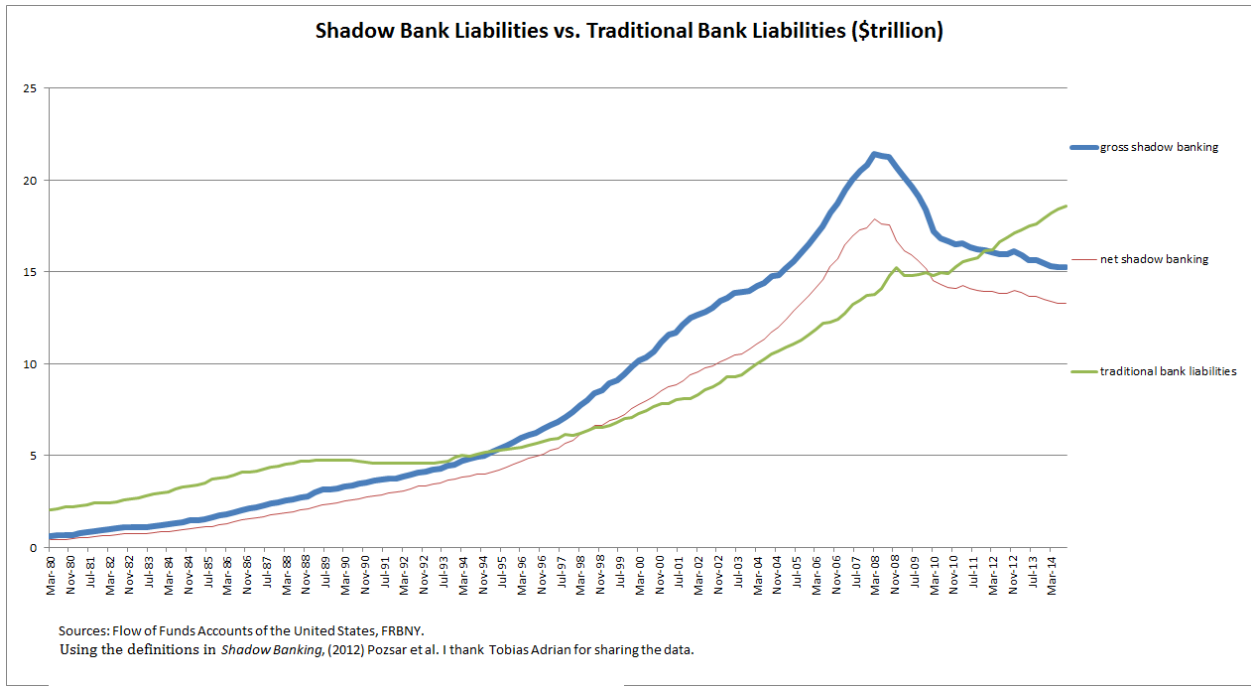
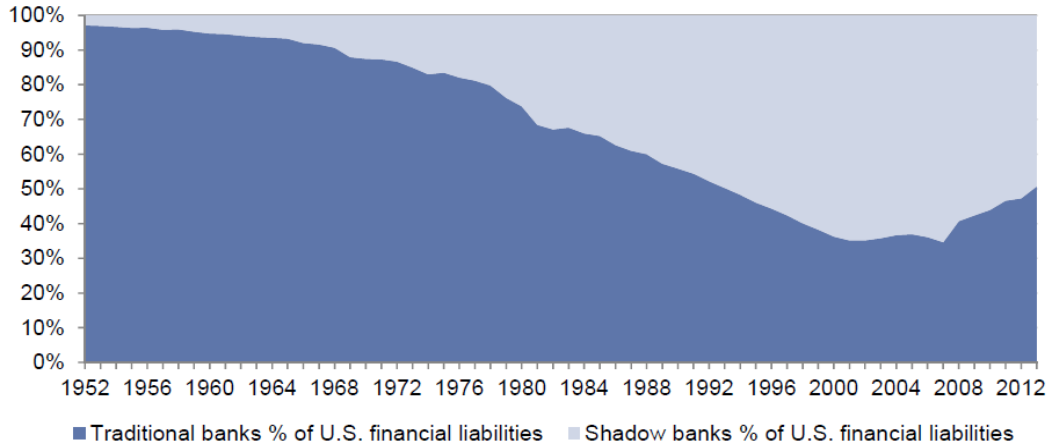


Figure 9

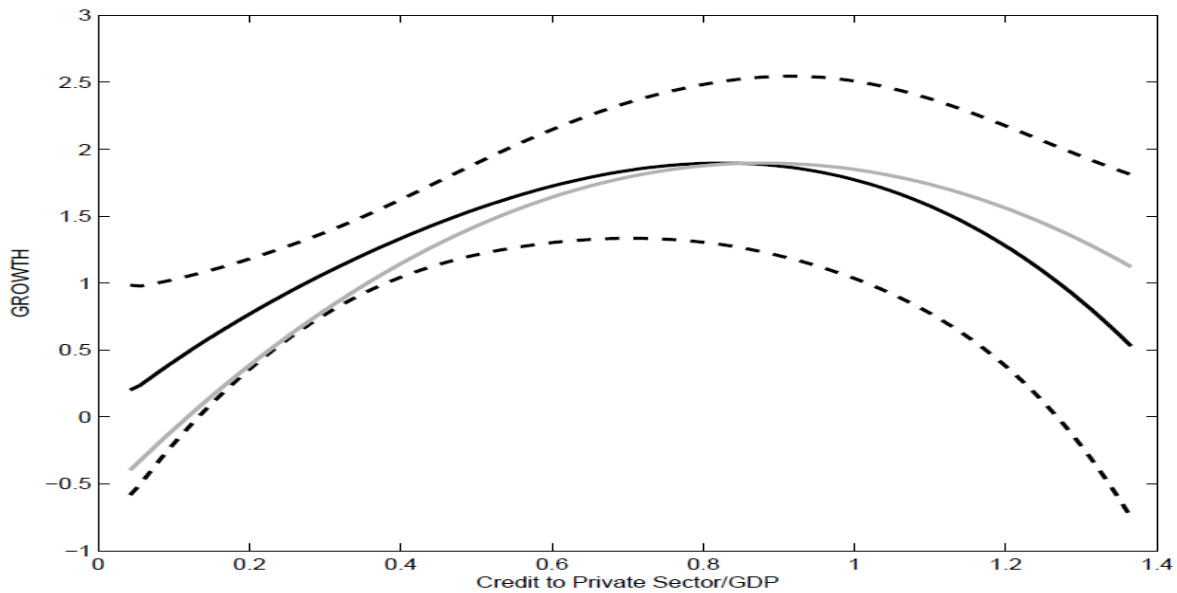
Exhibit 2: The role of the broader shadow banking system has declined as a % of the U.S. financial system since the financial crisis, but it is still significantly larger than history
% of U.S. financial liabilities



From *The Future of Finance, the Rise of the New Shadow Bank*, Equity Research, March 3, 2015, Goldman Sachs

Source: Federal Reserve, Goldman Sachs Global Investment Research

Figure 10: Estimates of Growth Impacts of Different Levels of



Source: *Too Much Finance?* (2012), Arcand et al., IMF Working Paper.

Figure 11

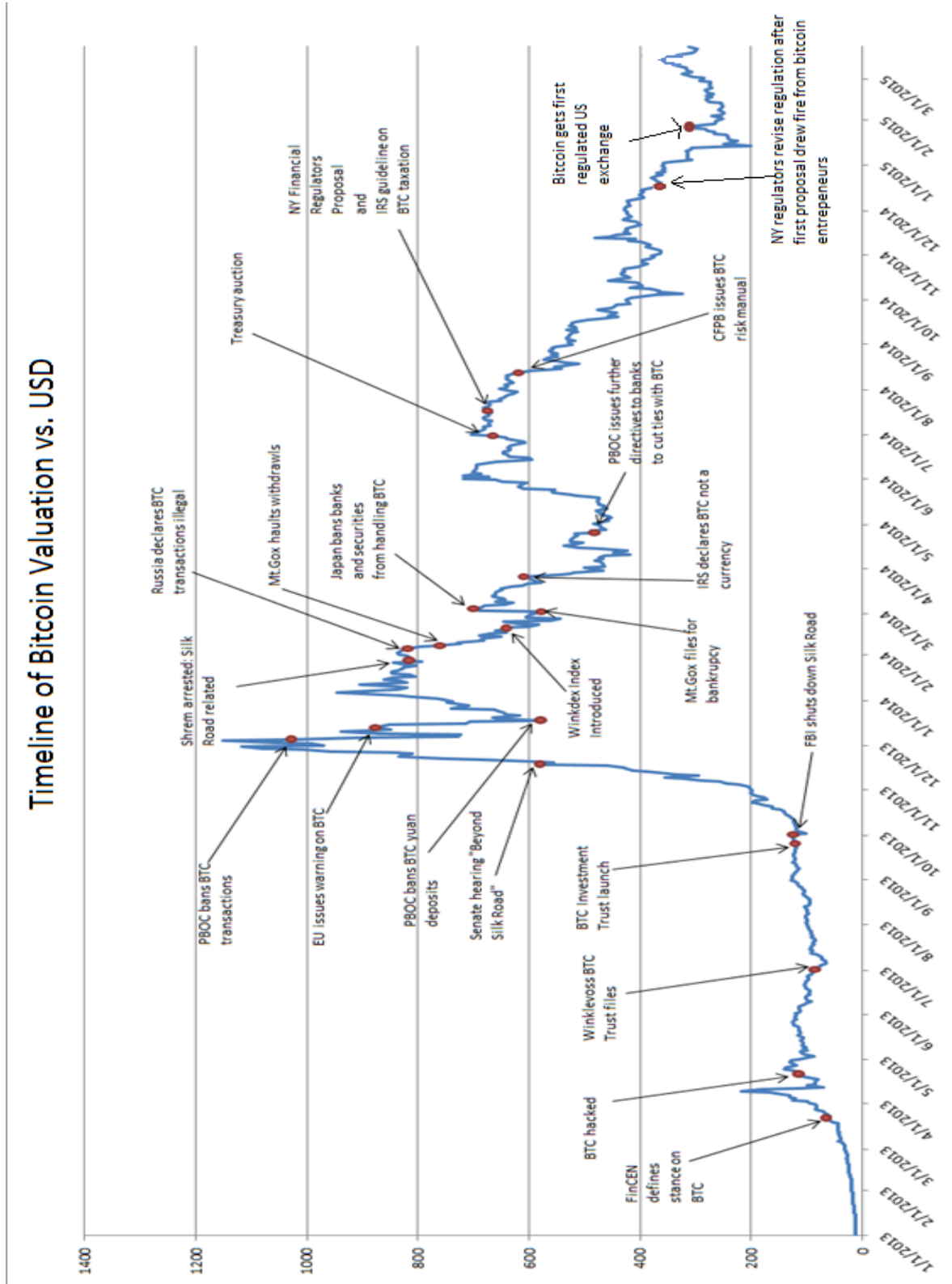
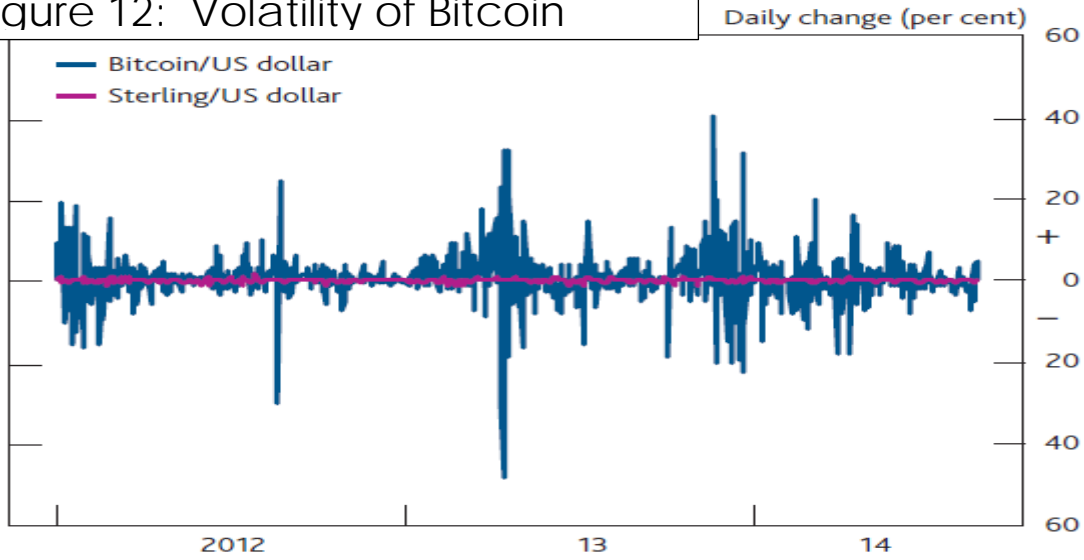
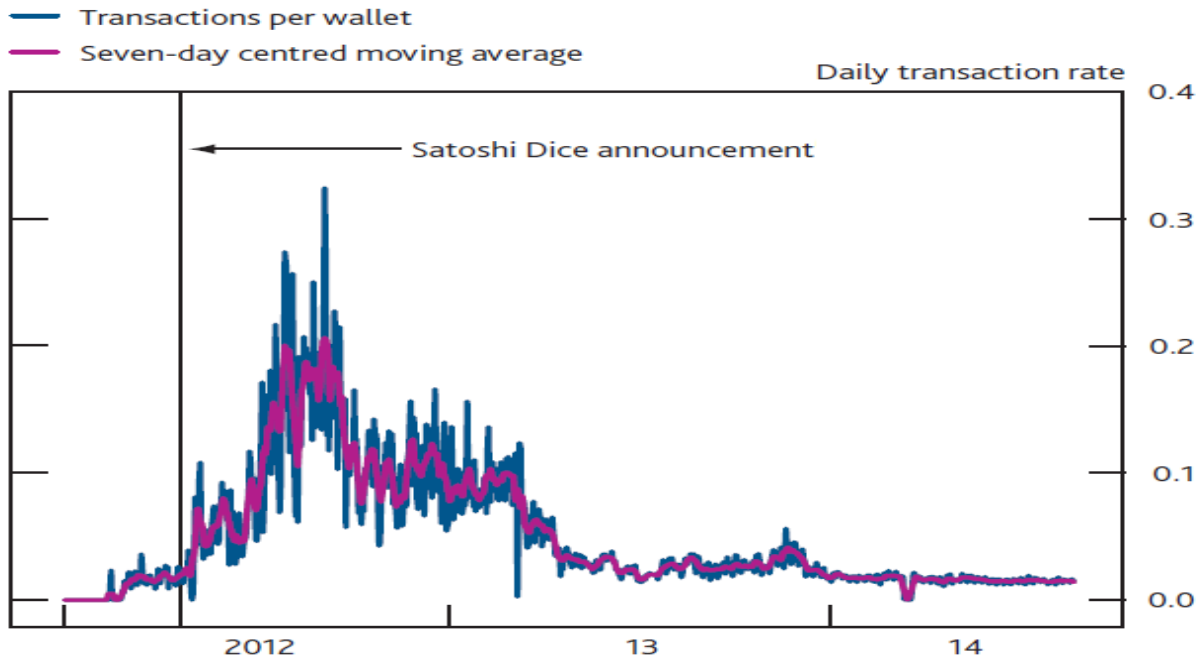


Figure 12: Volatility of Bitcoin



From: *Bank of England Quarterly Bulletin, 2014Q3*
Sources: Bank of England and the BitStamp exchange, via <http://bitcoincharts.com>.

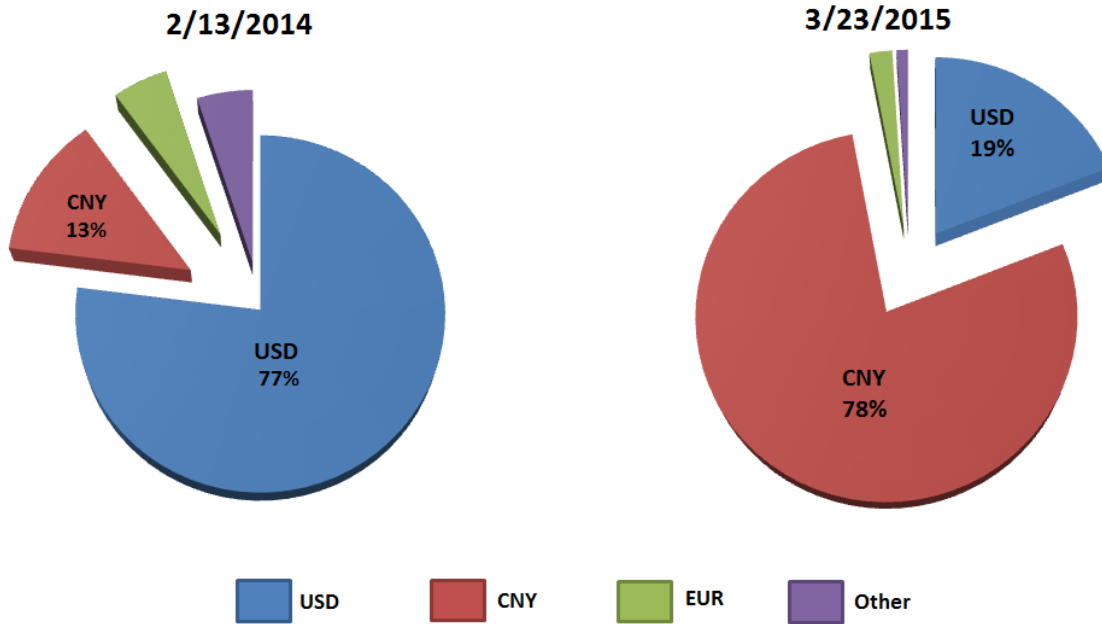
Figure 13: Bitcoin use as a Medium of Exchange



From: *Bank of England Quarterly Bulletin, 2014Q3*
Sources: 'My Wallet' service offered by <http://blockchain.info> and Bank calculations.

Figure 14: Bitcoin now dominated by Chinese Yuan

Exchange Volume Distribution (by currency)



Source: <http://bitcoincharts.com/charts/volumepie>

Figure 15

Regulatory changes are driving activities out of the banking system

Product	Regulation	Who does it impact?	Who does it create opportunity for?
Personal Lending	Stricter capital requirements for consumer loans, CARD Act	Banks have to hold more capital diluting returns Raised credit card interest rates	Non-banks (LC) can circumvent higher capital requirements and price below banks
Small Business Lending	Regulatory focus on concentration and pricing, Fed stress test (CCAR)	Regulated banks are unable to adequately price risk in lower credit loans	Non-banks (ONDK) can charge higher rates on higher risk loans
Leverage Lending	OCC Guidance, CCAR, "Skin in the Game" rules for securitizers	Regulated banks are unable to participate in riskier deals	Non-banks (PE, BDCs, foreign banks) to take riskier deal fees
Commercial Real Estate Lending	Basel III risk weighting, CCAR losses	Banks have to hold more capital diluting returns	Transitional and mezzanine lenders can engage in more complex deals
Mortgage Banking (origination and servicing)	Basel III, Qualified Mortgage rules for underwriting, "Skin in the Game" rules for securitizers, Home Mortgage Disclosure Act	Banks have been selling MSRs and cutting back on mortgage originations.	Non-banks' mkt share of originations has doubled and has reached an all-time high of 42%; Specialty mortgage servicers (OCN, NSM, WAC) have also grown rapidly.
Student Lending	Increased oversight by CFPB, elimination of FFEL loan program in 2010, potential for student loan bankruptcy reform	Larger banks (JPM, BAC, and C) have stopped originating student loans and are now divesting run-off portfolios.	NAVI has been acquiring run-off bank portfolios, and marketplace lenders (SoFi, CommonBond) biz model is focused on refinancing student loans at lower rates

From *The Future of Finance, the Rise of the New Shadow Bank*, Equity Research, March 3, 2015, Goldman Sachs

Source: Goldman Sachs Global Investment Research

Appendix Table 1: Change in Gross and Net Shadow Banking Liabilities

	Peak Shadow Banking (March 2008), Bil \$	Most Recent (Sept 2014), Bil \$	Percentage Change
Money Market Mutual Funds: Shares Outstanding [Liabilities]	3382.5	2565.3	-24.1
All Sectors: Liabilities: Open-Market Paper	1784.6	996.1	-44.1
GSEs: Liabilities; Agency & GSE-backed Securities	2938.1	6186.1	110.5
Mortgage Pools: Assets: Mortgages	4602.2	1623.6	-64.7
Asset-Backed Security Issuers: Total Financial Liabilities	4459.4	1396.4	-68.6
All Sectors: Liability: Fed Funds & Security Repurchase Agreements	4310.0	2907.4	-32.5
Monetary Authority: Liabilities: Security RPs	44.1	410.1	829.9
Total Gross Shadow Banking	21521.0	16085.4	-25.2
Total Net Shadow Banking	17949.2	14125.2	-21.3

