First Quarter 2015
Volume 98, Issue 1

BUSINESS REVIEW

Susquehanna River in Harrisburg, Pennsylvania

Federal Reserve Bank of Philadelphia

INSIDE

ISSN: 0007-7011

The ***Business Review*** is published four times a year by the Research Department of the Federal Reserve Bank of Philadelphia. The views expressed by the authors are not necessarily those of the Federal Reserve. We welcome your comments at PHIL.BRComments@phil.frb.org.

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FIRST QUARTER 2015

New Rules for Foreign Banks: What's at Stake?

BY MITCHELL BERLIN

The financial crisis has led economists and policymakers to think more carefully about how global banks are regulated. Before the crisis, foreign banks had operated their U.S. branches and subsidiaries mainly under rules set by the countries where they were based.[1] But as the crisis made clear, financial shocks are transmitted internationally. And efforts to resolve them can be hampered when there are multiple regulators with opposing interests and different resolution mechanisms. In response to these concerns, the Federal Reserve Board, in accordance with the Dodd-Frank Act, has approved rules to strengthen the regulation of foreign banks operating on U.S. soil in coming years.

The new framework's organizational restrictions and higher regulatory costs may reduce the efficient flow of funds within global banks. These costs and restrictions may also induce global banks to shift activities to other countries, switch from subsidiaries to branches, or take other steps to avoid the full impact of the regulations. However, the new rules reflect heightened concerns about financial stability that came into sharp relief during the crisis. To understand the tradeoffs, this article will examine: How did banking become globally interconnected in the years leading up to the financial crisis? How does the presence of foreign banks benefit a country, and what are the costs? Why had foreign banks been lightly regulated before the crisis? And postcrisis, what are the new regulations' likely costs and benefits?

THE RISE OF GLOBAL BANKING

Global banking expanded dramatically before the crisis. The two decades preceding the financial crisis of 2008-09 have been termed the second age of globalization, a period of rapid economic integration that included a dramatic expansion of international banking.[2] International banks have become truly global, in the sense that they increasingly have branches and subsidiaries physically located in many countries performing a wide range of funding, lending, and capital market activities.

Figure 1 provides a glimpse of this trend. The share of foreign banks operating subsidiaries in a sample of 137 countries increased by 14 percentage points from 1995 to 2008. The rising share was most dramatic in developing countries. However, the trend may be understated for developed countries, because banks often enter foreign markets through branches rather than subsidiaries — more on this distinction later.

For just the U.S., we have data extending further into the past and that include both subsidiaries and branches of foreign banks operating in the U.S.[3] These data reveal a rough doubling of the share of all U.S. assets of foreign banks among all banks doing business in the U.S. between 1980 and 1992 (Figure 2). After a modest decline from 1992 to 2004, foreign banks' share of U.S. assets increased again during the period of explosive growth of U.S. banking assets through 2008. So the dollar amount of foreign banking assets in the U.S. was increasing significantly even as the share increased modestly (Figure 3). Although we observe a slowing and then a quickening of foreign banks' asset growth in the subsequent years, it is too soon to predict future trends.

The modestly increasing share of foreign banks in the U.S. and other developed countries since the 1990s,

[1] I use the terms *foreign* and *global* bank more or less interchangeably. See William Goulding and Daniel Nolle for precise definitions of terms used to describe foreign banks and foreign units of global banks. Their article also contains a description of U.S. foreign banking statistics.

[2] Linda Goldberg uses the phrase "second age of globalization" in her excellent account of the growth of global banking in the period preceding the financial crisis. Maurice Obstfeld and Alan Taylor, among others, date the first age of globalization from 1870 to 1914.

[3] Comparable data for other nations are largely confidential. The Fed, in conjunction with a number of other central banks, the International Monetary Fund, and the Bank for International Settlements, has organized the International Banking Research Network, which seeks to expand researchers' access to international banking data.

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evident in Figures 1 and 2, masks some other important changes, notably in the U.S. In the 15 years preceding the crisis, the share of broker-dealer assets of the 10 largest foreign banks operating in the U.S. increased from 15 percent to 50 percent, and 12 of the top 20 broker-dealers in the U.S. are now owned by foreign banks.[4] During this period, global banks in both the U.S. and the European Union relied increasingly on short-term funds to finance capital market activities with funds flowing freely across national borders.[5]

Why did banks become more globalized? In a nutshell, the world economy was becoming more integrated, and global banks promoted both economic integration and a more efficient financial system. How do banks increase efficiency when they locate abroad? For example, why would a depositor in the U.S. place his funds in, say, Santander Bank, a U.S. subsidiary of Santander Group of Spain? And what can Deutsche Bank's branch office in the U.S. do that JP Morgan can't? More broadly, does an advanced country like the U.S. or a less-developed country like Pakistan benefit when global banks like Santander and Deutsche Bank set up operations there?

Banks follow their customers abroad and then compete for customers there. G Corporation, a (fictional) German automaker, has just opened a number

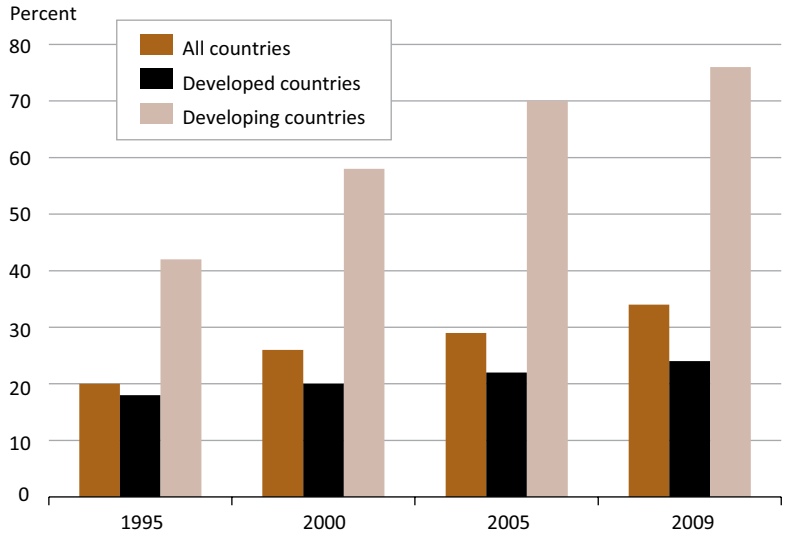
[4] See Fed Governor Daniel Tarullo's 2014 speech. Broker-dealers buy, sell, and trade a wide range of capital market instruments such as bonds, swaps, and futures contracts. As brokers they seek to match buyers and sellers; as dealers they take positions in — that is, have their own stake in — the instruments they buy and sell.

[5] See Tarullo's 2014 speech and Franklin Allen and his coauthors' article for accounts of these trends. Former Fed Chairman Ben Bernanke and his coauthors document the flow of short-term funds from U.S. branches of European banks, which were then used to purchase mortgage-backed securities and other "safe" securities from U.S. banks in the years preceding the financial crisis.

FIGURE 1

Globalization Most Evident in Developing World

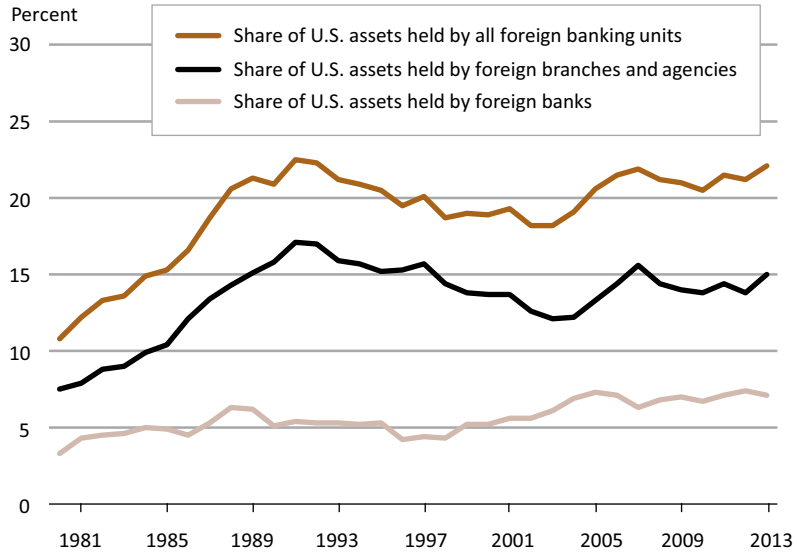
Percent of foreign banks in different types of countries, 1995-2009.



Source: Claessens and Van Horen (2014).
Note: The data include foreign subsidiaries but not branches of foreign banks. The developed countries are proxied by the 34 member nations of the Organization for Economic Cooperation and Development.

FIGURE 2

Share of Foreign-Held Assets Resumed Rising Before Crisis



Source: Federal Reserve Board, Share Data for U.S. Banking Offices of Foreign Entities, www.federalreserve.gov/releases/iba/default.htm.
Note: Agencies include organizational forms grandfathered in under previous legislation to ensure that foreign banks could compete on equal terms with U.S. banks.

of car dealerships in the U.S. The company has a close relationship with Götze Bank (also fictional), which provides G Corporation with a range of capital market services such as financing dealers' floor inventory and customer purchases as well as packaging auto loans into asset-backed securities. Because Götze Bank has built up an intimate knowledge of G Corporation's business over time, it can provide banking services to G Corporation efficiently and therefore at a lower cost than competing banks could. And, of course, Götze Bank would prefer not to lose G Corporation's U.S. business to a U.S. bank. So Götze Bank opens a branch in the U.S. And since it has world-class capital market expertise, Götze Bank USA will also compete for the banking business of other large corporations operating in the U.S.[6]

Global banks can more readily tap global capital. Once a bank has set up shop in foreign markets, new opportunities open up for moving resources across national borders to seize profitable opportunities. Following Russia's (nonfictional) default on its bonds in 1998, financial markets around the world seized up, and firms far from Russia had difficulty securing finance. You might think that this would mean global banks would make fewer loans than would domestic lenders. But when Philipp Schnabl compared the lending behavior of Peruvian banks owned by foreign parents with that of domestically owned Peruvian banks during this episode, he found that foreign-owned banks reduced their lending less than did Peruvian-owned banks. Moreover, Peruvian-owned banks that relied solely on domestic funds reduced their lending less than did Peruvian-owned banks that had depended on international funds before the Russian default. So the decline in lending was most extreme for Peruvian-owned banks that relied on funds from outside Peru.

What accounts for these different lending patterns? As outside creditors pulled back from taking risks in a stressed financial environment, domestically owned Peruvian banks dependent on foreign funds could not secure funds.[7] By contrast, foreign-owned Peruvian banks had access to funds from around the world, routed through their parent companies. Economists call this an *internal capital market*: A global bank collects funds where they can be secured relatively cheaply and shifts them to regions where lending is most profitable. A bank may be able to shift money from one region and put it to work in another region more efficiently through its own internal capital market than financial markets can because information about profitable opportunities flows more easily within organizations and because decisions about allocating capital can be coordinated through the bank's headquarters.[8]

Meanwhile, the Peruvian economy benefited because global banks insulated domestic borrowers from a

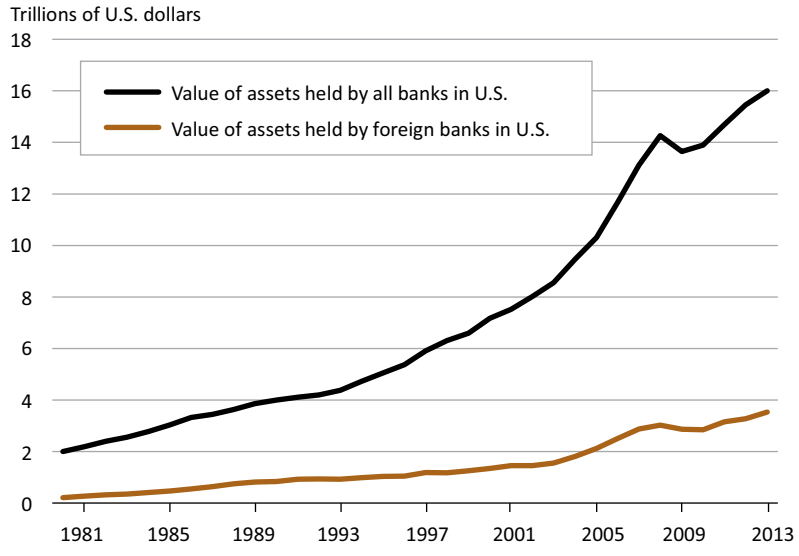
[6] Claudia Buch summarizes the abundant evidence for banks following their customers abroad. The desire to operate in a global banking center such as New York or London is also a major reason why banks locate abroad. Also, international integration has spurred the growth of foreign trade and, in turn, the demand for trade finance from banks with a global reach.

[7] For a larger sample of countries over a longer period, 1991 to 2004, Ralph de Haas and Iman van Lelyveld similarly find that banks' foreign subsidiaries curtailed their lending less than domestic banks did when the host country suffered a negative economic shock. They also find that foreign banks were less likely than domestic banks to keep lending when their own financial health weakened.

[8] There is a large, contentious body of economic literature on the efficiency of internal capital markets. Economists examining banking firms have typically found evidence that they promote efficiency at the firm level. See my *Business Review* article for the pros and cons of internal capital markets.

FIGURE 3

Growth of Foreign Assets Accelerated Before Crisis



Source: Federal Reserve Board, Share Data for U.S. Banking Offices of Foreign Entities, www.federalreserve.gov/releases/iba/default.htm.

foreign economic shock that would have otherwise reduced bank lending more sharply. One reason foreign banks can cushion an economy from an outside shock is that they can diversify geographically.

Geographic diversification of banks can promote economic stability. In an ingenious study, Donald Morgan, Bertram Rime, and Philip Strahan provide evidence of the benefits of geographic diversification during a period in which one could view the United States as a mini-global economy. From 1977 to 1994, many states relaxed restrictions on banks from other states operating within their borders, while others continued to prohibit banking across state lines. We can think of each state that opened its borders as if it were a nation welcoming foreign banks to enter. Morgan and his coauthors find that the interstate banking states suffered milder economic fluctuations than states that barred interstate banks. Their findings suggest that bank customers — and residents within states that permit interstate banking — benefit from geographically diversified banks, which can provide more stable funding in a state that would otherwise be hit much harder by a macroeconomic shock.[9] Although Morgan and his coauthors argue that geographically diversified banks promoted stability in the U.S., they also provide evidence that a bank operating in many states can transmit economic shocks across state lines, an issue that I discuss later.

Global banks compete in underserved markets. Economists have found that when global banks enter less developed nations, they typically increase competition without necessarily driving out domestic lenders. For example, Atif Mian shows that foreign banks entering Pakistan primarily serve large corporations, while Pakistani banks retain their local business customers.[10] In their review of the economic literature on foreign banking, Stijn Claessens and Neeltje Van Horen conclude that the entry of a foreign bank into a country is associated with greater efficiency in the provision of banking services, especially in developing markets.[11] Researchers have cited economies of scale for the large global banks, access to diversified sources of funds, diversified lending opportunities, and the ability to apply best practices to multiple markets as sources of these efficiencies.

Despite a broad consensus among economists that global banks enhance economic efficiency, the basic question, "How should global banks be regulated?" has always been controversial. Even as international integration proceeded and banking became more globalized, periodic crises provoked concerns that unfettered capital flows come at a cost. Indeed, in 2004, as the pace of global banking quickened by all measures, Maurice Obstfeld and Alan Taylor wrote, "At the turn of the twenty-first century, the merits of international financial integration are under more forceful attack than at any time since the 1940s." And as we will see in the next section, some national regulators permitted foreign banks to enter freely but placed relatively stringent controls over foreign banks operating in their national borders, even before the crisis.[12] But the financial crisis highlighted the economic costs of global banking for regulators in the U.S. and Europe, and many economists and policymakers have reevaluated how global banks should be regulated. Before we can see how policymakers' answers to this basic question have changed, we need to briefly explain how banks organize their foreign units.

HOW ARE FOREIGN UNITS ORGANIZED?

As noted earlier, banks structure their foreign units as either subsidiaries or branches.[13] Subsidiaries are owned by the parent organization but are separate legal entities that are capitalized separately from the parent company. For example, Santander Group's U.S. subsidiary, Santander Bank (formerly Sovereign Bank), is legally incorporated in the U.S. and reports an income stream identifiably separate from that of its parent company. Should the U.S. subsidiary fail, the parent company's losses are limited to its equity investment in the subsidiary; that is, the parent can "walk away" from its subsidiary. Santander Bank's U.S. bondholders and depositors have no claim on the assets of the parent company. However, they do have priority over any equity

[9] In a related finding, in their article on monetary transmission, Nicola Cetorelli and Linda Goldberg show that U.S. banks with global operations are less sensitive to U.S. monetary policy shocks than are U.S. banks without global operations.

[10] Mian argues that small local businesses are more "opaque" — for example, they use less formal bookkeeping practices — and require the specialized knowledge of a local banker.

[11] Bang Nam Jeon and his coauthors found that, in a sample of developing nations, the effects of foreign bank competition are stronger when the bank enters *de novo* — that is, under a new charter — than when it enters by purchasing an existing bank. Note that lowering entry costs should increase competition regardless of the home countries of the new entrants. It is a challenge to disentangle empirically the effect of competition from foreign banks from the effect of more competition per se.

[12] For example, prior to the crisis, New Zealand and Mexico required foreign banks to establish local subsidiaries. In both countries, foreign banks dominated their national banking systems. In such situations, host country bank regulators have viewed more intrusive regulation as a lever to ensure that their national interests were adequately protected. See, for example, the entertaining speech by the former governor of the Reserve Bank of New Zealand, Alan Bollard.

[13] I'm simplifying things here. For example, the U.S. permits foreign units to adopt a number of organizational forms, mainly because of regulatory differences between the U.S. and the home countries.

holders (including the parent company) if the U.S. subsidiary fails.[14]

Unlike subsidiaries, branches are not legally separate from their parent companies.[15] Take Deutsche Bank AG New York, a branch of Germany-based Deutsche Bank that engages in wholesale lending and currency and derivatives trading.[16] Deutsche Bank is fully liable for the branch's debts if the branch can't pay its creditors.

How does a bank decide between a branch and a subsidiary? Regulation and taxes appear to be the most important factors in whether a foreign unit is set up as a branch or a subsidiary.[17] Countries differ significantly in restricting foreign banks' organizational choices. At one end of the spectrum, under the European Union's single passport, a member nation's banks are free to open either branches or subsidiaries in any EU country. At the other end of the spectrum, New Zealand, Mexico, and Brazil permit only foreign subsidiaries. Typically, subsidiaries are regulated by the host country, while branches are regulated by the home country.[18] As a result, many countries restrict the activities of foreign branches operating on their soil, which tends to promote foreign entry via subsidiaries. For example, the U.S. does not permit foreign branches to take retail deposits — that is, deposits smaller than $250,000, the limit per customer for FDIC insurance. So a branch such as Deutsche Bank AG New York relies on wholesale deposits, among many other funding sources.

Eugenio Cerutti and his coauthors find that banks are more likely to set up subsidiaries than branches in countries where macroeconomic risk is high. They argue that a parent bank can walk away if a serious economic downturn in the host country causes financial problems at its subsidiary.

> Regulation and taxes appear to be the most important factors in whether a foreign unit is set up as a branch or a subsidiary.

On the other hand, using various measures of the risk of intervention by the host country's political authorities, Cerutti and his coauthors find that in countries where political risk is high, banks are more likely to choose the branch form. Since branches are legal extensions of the parent, they are better insulated against interventions and expropriations, which could range from taxes to nationalization, by the host country.[19] A bank is also more likely to use a branch structure in a country where corporate taxes are higher than at home because it is easier to transfer profits from a branch — which, unlike a subsidiary, doesn't produce a legally separate income stream — back home for tax purposes.

Broad organizational strategies and the history of a bank's global expansion also appear to be important. Some banks have a strict preference for the subsidiary form; for example, Santander Group purchases mainly retail-oriented foreign banks, which it retains as subsidiaries. Other global banks such as Citigroup have amassed a crazy quilt of subsidiaries and branches around the world, which appears to reflect a mix of history and regulatory and tax incentives over decades of headlong growth.

FROM A LIGHT TOUCH TO TIGHTER RULES

Before the financial crisis, the U.S. had a rather hands-off approach to the regulation of foreign banks. See the accompanying comparison, *Before and After: Regulation of Foreign Banks in the U.S.,* for details. Most notably, banks could choose their preferred organizational form for their U.S. operations, and in 1991, foreign banks were no longer subject to U.S. capital regulations, subject to some qualifications.[20] This approach reflected the trends of the second age of globalization — expanding international trade, financial liberalization in developing markets, the opening of markets in Eastern Europe, and broad deregula-

[14] Priority means that in the event of failure, depositors and bondholders must be fully paid off before Santander's stockholders — mainly Santander Group itself — receive a cent.

[15] In this article, *branch* refers to a particular legal structure rather than to the local office of a bank in your neighborhood or a suburban mall.

[16] Retail banking serves small depositors and small businesses. Wholesale banking involves seeking funds in money markets while making large loans and providing other services to large firms.

[17] The empirical literature on the choice of organizational form by global banks is sparse. Here, I summarize the main empirical results of Eugenio Cerutti and his coauthors and Jonathon Fiechter and his coauthors. The latter provide an excellent summary of the factors behind the choice of organizational form.

[18] As a formal matter, this description is too simple, since host country regulators are always given some regulatory oversight role. As a practical matter, the simple description is accurate.

[19] Giovanni Dell'Ariccia and Robert Marquez present a theoretical model of these tradeoffs.

[20] As stated in the Fed Board of Governors' 2001 supervision and regulation letter: "In cases in which the Board has determined that a foreign bank operating a U.S. branch, agency, or commercial lending company is well-capitalized and well-managed under standards that are comparable to those of U.S. banks controlled by [financial holding companies], the presumption will be that the foreign bank has sufficient financial strength and resources to support its banking activities in the United States." Financial holding companies include commercial bank holding companies as well as regulated holding companies in which the parent company is an insurance company or investment bank.

Before and After: Regulation of Foreign Banks in the U.S.

Before 2014	To be phased in

• The Federal Reserve oversaw U.S. operations of foreign banks. Their home regulators had primary oversight of their global operations.
• Foreign banks were not required to meet Fed capital requirements as long as they were deemed well managed and well capitalized and their home regulations were comparable to U.S. regulations.
• Foreign banks were free to choose their organizational structure, subject to approval by the Fed.
• Foreign banks faced restrictions on their asset and liability mix:
  ◦ Branches could not take retail deposits.
  ◦ Branches were required to consistently hold certain amounts of high-quality assets in the U.S.
	• Foreign banks with total combined assets between $10 billion and $50 billion must:
	  ◦ Meet home country capital stress test requirement or perform company-run stress tests.
	  ◦ Have a risk committee for U.S. operations if publicly traded.
	• Foreign banks with total combined assets exceeding $50 billion and combined U.S. assets of less than $50 billion must:
	  ◦ Meet home country capital stress test requirement or perform company-run stress tests.
	  ◦ Have a risk committee for U.S. operations.
	  ◦ Certify to the Fed that they meet home country capital standards consistent with the Basel Accords.
	  ◦ Perform company-run liquidity stress tests for either combined operations or U.S. operations.
	• Foreign banks with total combined assets exceeding $50 billion and combined U.S. assets exceeding $50 billion must:
	  ◦ Meet home country capital stress test requirement or perform company-run stress tests.
	  ◦ Have a risk committee and risk officer for U.S. operations.
	  ◦ Certify that they meet home country capital standards consistent with the Basel Accords.
	  ◦ Perform company-run liquidity stress tests for their U.S. operations.
	• Foreign banks with total combined assets exceeding $50 billion and combined U.S. assets (excluding assets held by branches or agencies) exceeding $50 billion must form an intermediate holding company that:
	  ◦ Satisfies capital and liquidity requirements comparable to requirements for U.S. bank holding companies.
	  ◦ Satisfies capital stress tests run by the Fed.

Source: For the full regulatory rule, including an extended discussion of the rationale, see the Federal Reserve Board, "Enhanced Prudential Standards for Bank Holding Companies and Foreign Banking Organizations."
Notes: The compliance date for U.S. bank holding companies subject to the rule is January 1, 2015. The compliance date for foreign banking organizations is July 1, 2016. Leverage ratios for foreign-owned U.S. intermediate holding companies are generally deferred until 2018. See www.federalreserve.gov/newsevents/press/bcreg/20140218a.htm. Total combined assets include all of the bank's assets worldwide. Combined U.S. assets include those held by U.S. subsidiaries, branches, and other agencies.

tion of domestic and international banking markets. Financial crises in developing countries in the 1990s notwithstanding, most regulators, policymakers, and economists were focused on the efficiency benefits of global banking rather than on the potential costs under crisis conditions. They agreed that a light regulatory touch permitted global banks to operate efficiently at modest risk.[21] Broadly, regulators believed that the international Basel capital standards that were being phased in at the time were sufficiently uniform and that regulators were sufficiently vigilant that the safety and soundness of the global financial system could be assured.[22]

The financial crisis was a shock in a lot of ways, but for regulators the main lessons were that global banks could fail (in droves) and that the international banking system had

[21] Since the crisis, some economists have argued that the widespread support for unfettered capital flows and deregulation had been the result not of a true accounting of the costs and benefits but rather of the vested interests of big banks (Simon Johnson and James Kwak) or of economists' idealized models (Paul Krugman).

evolved beyond the capacities of national regulators. Of course, financial economists and regulators were already aware that global banks could become a source of financial instability, although the developed nations were largely insulated from the worst effects of the international crises of the 1980s and 1990s. But the capital flows from host countries to home countries through banks' internal capital markets, the messy failures of large global banks operating across multiple jurisdictions, and the fact that taxpayer money was used to bail out global banks focused regulators on a more intrusive approach.

For example, Britain has adopted stringent capital and liquidity requirements for foreign banks, including liquidity requirements for foreign branches. These requirements are particularly noteworthy because London is a global banking center, so they affect most global banks. (Indeed, some analysts believe that Britain's regulations will ultimately diminish its role as a global financial hub.) Furthermore, in light of the many EU bank failures during the financial crisis and the poor coordination among national regulators in handling these failures, the EU has given the European Central Bank primary responsibility for supervising large EU banks, including deciding whether a large bank should be placed in resolution.

In the U.S., new regulations the Fed adopted in February 2014 continue to obey the principle of *national treatment and equality of competitive opportunity*, which means that foreign banks have the right to compete on a level playing field with U.S. banks. Of course, moving from principle to practice is not so simple, most notably because parent banks are also regulated by their home countries. So while the principles stay constant, their implementation will change dramatically as the new regulations are phased in.

The most notable change is that a foreign bank with a U.S. presence exceeding $50 billion will be required to group its U.S. subsidiaries under an intermediate holding company subject to precisely the same capital and liquidity regulations as for large U.S. banks.[23] Furthermore, just like large U.S. banks, the holding companies will be required to perform company-run stress tests and be subject to stress tests carried out by the Fed. Although smaller foreign banks will be subject to fewer restrictions, they will be required to set up risk committees to evaluate and manage the risk of their U.S. operations.

While the new regulatory framework is a significant change, foreign banks are still free to decide whether to organize a U.S. unit as a branch or a subsidiary. They need not house U.S. branches in an intermediate holding company, and the $50 billion cutoff excludes branch assets. So, foreign banks retain considerable organizational discretion, although some commentators suggest that U.S. regulators retain an implicit threat to impose further restrictions on branches should foreign banks shift activities from subsidiaries to branches to skirt the new regulations.[24]

> The financial crisis was a shock in a lot of ways, but for regulators the main lessons were that global banks could fail (in droves) and that the international banking system had evolved beyond the capacities of national regulators.

WHAT RISKS DO THE NEW RULES TARGET?

Financial shocks are transmitted internationally through global banks. While I emphasized the stabilizing effect of geographically diversified banks earlier, numerous studies have also found that economic shocks from the home country can be transmitted to the host country through global banks' internal capital markets. This occurs when parent banks suffer financial problems; for example, a banking crisis in the home country leads to declines in the foreign units' capital levels. In the financial crisis, global banks suffered such losses on a grand scale, triggering dramatic capital flows across national lines, in particular from host countries to home countries.

Funds head home in a crisis. Many studies document a "flight home" effect in which global banks withdraw funding from host markets and transfer funds to the home market. This effect is best documented in loan markets. Mariassunta Giannetti and Luc Laeven study syndicated lending

[22] Capital requirements limit the amount of debt (including deposits) that banks can use to fund their loans and other investments. See Ronel Elul's *Business Review* article on capital regulation for more detail about the various iterations of the Basel capital accords.

[23] The Fed's regulations implemented the Collins amendment of the Dodd-Frank Act, which required foreign banks that had been subject to SR 01-01 to be made subject to U.S. capital regulations. At its discretion, the Fed may permit a foreign bank to operate more than one intermediate holding company.

[24] In his 2014 speech, Governor Tarullo argues that there is a credible case for imposing capital and liquidity requirements on foreign branch operations, although the new regulations do not do so.

by global banks during banking crises between 1997 and 2008.[25] They find that a banking crisis in the home market led banks to cut syndicated lending to borrowers in host countries much more than to borrowers at home. Victoria Ivashina, David Scharfstein, and Jeremy Stein compare the lending behavior of U.S. and European banks during the European sovereign debt crisis in 2011. They find that compared with U.S. banks, European banks dramatically cut back dollar lending in global syndicated loan markets and shifted their attention to home lending.[26]

Foreign units can become undercapitalized. While the flight home can have particularly harsh contractionary effects in emerging markets, the flow of funds within global banking organizations may also pose problems for developed countries. There the concern is not so much a collapse of lending to domestic firms dependent on foreign banks, but rather that the foreign units might become undercapitalized. In his 2014 speech, Governor Tarullo argues that U.S. regulators can't be confident that parent banks will act as a *source of strength* for their foreign banking units, leaving U.S. regulators to deal with the resulting financial problems.[27] In the extreme case, parent banks can take funds from their foreign units and then walk away. (That said, we did not witness global banks leaving their U.S. subsidiaries to fail during the financial crisis.)

Regulatory intervention and resolution are complicated for foreign banks. By virtue of its size alone, the failure of a large bank is a messy and complicated affair, completely apart from the international scope of its operations. But global banks pose additional problems that make their failures even messier and more complicated.

The primary dilemma facing regulators is that banks are global in life but national in death.[28] The unifying view behind the Fed's new regulations is that regulators must have more robust techniques for both preventing and resolving failures of foreign units and that this task will fall to U.S. regulators for the foreseeable future.[29] A fundamental reason for this view is that national regulators often have conflicting interests. As Franklin Allen and his coauthors note, "[N]ational regulators care first and foremost about domestic depositors, domestic borrowers, domestic owners, and ultimately, domestic taxpayers." For example, large Icelandic banks had opened branches throughout the EU to collect deposits to fund loans that now seem spectacularly risky, especially given the relative size of the Icelandic banks and the Icelandic economy. When the Icelandic banking system collapsed in 2008, Icelandic bank regulators compensated only Icelandic depositors, leaving other European depositors out in the cold.

The Icelandic case highlights another barrier to the effective resolution of global banking organizations: information flows. Icelandic regulators were slow to recognize the evolving problems in their banking system — in this, they were not alone — but they were even slower in communicating their information to other national banking regulators. Years before the crisis, Robert Eisenbeis and George Kaufman had emphasized how hard it is for regulators to collect timely information about foreign banks operating in their countries — especially branches without separate income flows that could be observed by outside regulators.[30]

With or without information about the financial health of the parent bank, host regulators often have limited power to intervene. U.S. regulators were able to intervene successfully to strengthen large U.S. banks, but they had to depend on European regulators to handle their own banks. In the fall of 2008, U.S. regulators required the largest U.S. banks to accept capital injections through the Troubled Asset Relief Program, and in the spring of 2009, U.S. regulators performed stress tests on 19 large U.S. banks to ascertain whether they would have adequate capital in the event of seriously adverse economic conditions. The capital infusion and stress-testing exercise are widely viewed as successful regulatory interventions that

[25] A syndicated loan is one in which a number of banks lend pro rata shares of a large loan.

[26] There are many unresolved questions about the flight home effect. Among the reasons cited for this effect are stronger relationships between home banks and home borrowers, political pressures to support home borrowers (Giannetti and Laeven; De Haas and Van Horen), and capital market frictions that affect cross-border lending (Ivashina and coauthors). When foreign banks have a large presence in a country, as Swedish banks did in the Baltics, or when foreign banks have subsidiaries, rather than branches, in the host country, the flight home effect is weaker (Claessens and Van Horen and the Committee on the Global Financial System). In their study of internal funding flows at U.S. global banks during the financial crisis, Cetorelli and Goldberg argue that the flight home story must be qualified. They find that these banks tended to shift funds from "core funding markets" to "core lending markets," rather than from foreign to home markets per se. See Claessens and Van Horen's survey for an account of a large body of literature on foreign banks and financial stability.

[27] The source of strength doctrine says that parent companies should respond to financial difficulties at subsidiaries or branches by providing financial support.

[28] Former Bank of England Governor Mervyn King made this observation in a speech in New York in 2010 and, by some accounts, beforehand as well. It also appeared in *The Economist* in 2009, www.economist.com/displaystory.cfm?story_id=13057265.

[29] See Governor Tarullo's 2014 speech for an articulation of the U.S. approach.

[30] Allen and his coauthors suggest that lack of information may have been a larger problem because Icelandic banks operated through branches.

enhanced confidence and mitigated the crisis. In contrast, many European banks — including banks with substantial operations in the U.S. — remained undercapitalized, and a series of stress tests carried out by European banking regulators were viewed as seriously flawed by most economists and market participants.

Meanwhile, the sheer complexity of many foreign banks creates huge coordination problems in the event of failure. Apart from the problems that would arise in any large, complex organizations, foreign banks fall under multiple regulatory frameworks and multiple resolution regimes.[31] For example, when Lehman Brothers filed for Chapter 11 bankruptcy in September 2008, the firm comprised over 700 separate legal entities in over 40 countries.[32] In response to these concerns, the new U.S. regulations place intermediate holding companies under the supervision of the Fed and require them to maintain capital levels identical to those required of large U.S. banks and to carry out stress tests. With all of a foreign bank's U.S. subsidiaries in a single holding company, the Federal Deposit Insurance Corporation would gain a key element of its proposed resolution mechanism, a *single point of entry* through which it can take over the holding company and keep the healthy subsidiaries operating in the event of failure.[33]

CONCLUSION

Although capital flight and the costly failures of global banks convinced policymakers that more intrusive controls were needed, foreign banks will not be passive in the face of the new regulations. Some foreign banks have announced that they will shift some operations outside their U.S. subsidiaries to avoid hitting asset thresholds that would trigger the most restrictive new regulations. And public announcements are only the tip of the iceberg, as other banks can be expected to make similar moves to minimize the impact of the regulations on their bottom line. Indeed, global banks and other global financial firms have the capacity to shift activities toward lightly regulated sectors or nations — the problem of the so-called *shadow banking* sector.[34] Whether more stringent regulations will actually lead to a loss of operational efficiency and whether the regulations will actually enhance financial stability remain open questions.

[31] See Allen and his coauthors for an account of the resolution of Fortis bank that was finally carried out independently by three national regulators.

[32] PricewaterhouseCoopers presentation, (2009).

[33] See David Skeel's working paper for a description and critical discussion of the FDIC's proposed single point of entry approach to the resolution of failing banks.

[34] See Daniel Sanches's *Business Review* article for an introduction to shadow banking.

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The Government-Sponsored Enterprises: Past and Future

BY RONEL ELUL

In September 2008, facing mounting losses and difficulty in rolling over their debt, Fannie Mae and Freddie Mac, also known as the government-sponsored enterprises, or GSEs, agreed to enter government conservatorship and have operated under government control ever since. Their losses through 2012 have been estimated at $300 billion. The role of the GSEs in the housing bubble and ensuing financial crisis has been a source of controversy. Did the GSEs precipitate the crisis? Or perhaps they merely amplified it? Can we quantify some of the benefits of the GSEs in more normal times and compare them with the losses during the crisis? Should the GSEs be phased out? Short of that, how should they be reformed?

To answer these questions, we present a brief history of the GSEs, summarize the benefits they provide to the housing market, and discuss how they lost market share during the boom and then recaptured it during the bust, leading to large losses. Finally, we discuss the advantages and disadvantages of the proposals that have been advanced to reform the GSEs.

A BRIEF HISTORY OF THE GSEs

To understand the role of the GSEs in the housing market, it is first helpful to understand that there are several steps involved when a homeowner takes out a mortgage to purchase a home or refinance an existing mortgage. First, a financial institution *originates* or issues the mortgage to a borrower and then either retains the loan as an asset on its own books or sells it to another investor.[1] Loans that are sold are often bundled into mortgage-backed securities (MBS).[2] As part of this securitization process, the payments on the mortgages underlying these MBS may be guaranteed to encourage investors to purchase them.

[1] One incentive a lender may have to sell a loan is to conserve regulatory capital. Another reason may be to avoid the risk of holding a large portfolio of mortgage loans. See my 2005 *Business Review* article, "The Economics of Asset Securitization," for further detail.

[2] MBS are created by bundling or pooling many mortgages into securities that are sold to investors, who then have a claim on the cash flow from the principal and interest payments homeowners make on the underlying mortgages. These MBS are often further subdivided into securities known as *tranches*, based on priority in case of default or with respect to the allocation of principal and interest payments.

The Federal National Mortgage Association (Fannie Mae) was set up in the Great Depression as a government agency dedicated to purchasing Federal Housing Administration-insured loans from banks so that they could make more loans.[3] Initially, Fannie Mae borrowed money to purchase mortgages guaranteed by the FHA and then held those mortgages on its own books. In 1958, Fannie Mae became a mixed-ownership corporation, with the federal government holding the preferred stock while private investors held the common stock. In 1968, Fannie Mae's role of purchasing FHA-insured loans was spun off into a new federal agency, the Government National Mortgage Association (Ginnie Mae), within the Department of Housing and Urban Development. By 1970, Fannie Mae had become fully privately owned and became able to buy loans issued by private lenders — that is, those not guaranteed by the government. Also in 1970, the Federal Home Loan Mortgage Corporation (Freddie Mac) was set up with a similar charter: to buy mortgages from savings and loans and banks and thereby expand the secondary mortgage market.

That same year, Ginnie Mae issued the first mortgage-backed security; underlying it were loans guaranteed by the FHA. Freddie Mac issued

[3] The Federal Housing Administration (FHA), a government agency set up during the Great Depression, facilitates homeownership by guaranteeing mortgages made by the private sector. It played an important role in the adoption of long-term amortizing fixed-rate mortgages. Today, FHA insurance helps borrowers who have relatively small down payments or relatively weak credit histories qualify for mortgages.

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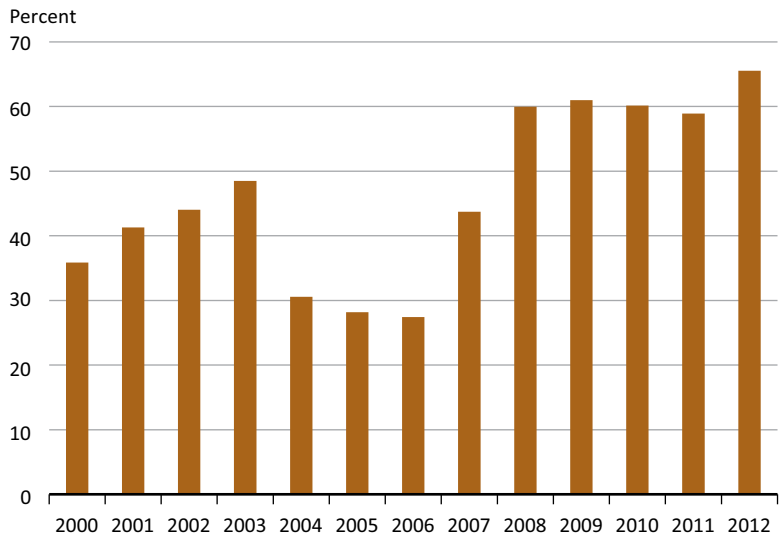
its own MBS in 1971, while Fannie Mae did not begin issuing MBS until 1983. Since the loans they securitized were not FHA-insured, the GSEs themselves guaranteed the timely payment of interest and principal on these loans. Of course, in assessing the strength of this guarantee, investors in these MBS took into account the support they perceived that the GSEs would receive from the government. The securitization of mortgages not guaranteed by either the FHA or GSEs began in the early 1990s, although as we discuss below this market remained small until around 2003. Today about two-thirds of all U.S. mortgages outstanding are securitized, with almost all securitization now conducted through the GSEs or FHA.

The GSEs increased their market share until 2003, by which time they were guaranteeing nearly 50 percent of all new mortgages. From 2003 to 2006, they lost market share (see Figure 1), particularly to the rapidly growing private mortgage-backed securitization sector, which attracted borrowers by offering them riskier loans and then bundling them into MBS. Many of these private securitizations included either subprime mortgages, made to borrowers with poor credit histories, or alt-A mortgages, made to borrowers with better credit histories but who posed other risks such as a lack of income documentation or an interest-only loan in which no principal payments needed to be made. By 2006, the GSEs' share had fallen to only 27 percent of all mortgage originations. Then the collapse of the housing market in 2007 was associated with a dramatic contraction in private securitization, and the GSEs regained their share of the market, in part by buying and guaranteeing riskier loans to resell in their MBS, as we will show. In September 2008, their losses mounting, they entered government conservatorship. With the private securitization market still essentially dormant, the GSEs continue to play a large role in housing markets, guaranteeing over 60 percent of new mortgages.

FIGURE 1

GSE MBS as Share of Total Originations



Source: Inside Mortgage Finance.

THE GSEs' IMPACT ON HOUSING MARKETS

A central motivation behind setting up the GSEs was to facilitate homeownership, particularly for low-income households. Underlying this goal is a belief that society benefits when more people own their homes.[4]

This goal explains both the preferential treatment the GSEs received — mainly implicit government support, which lowered their cost of borrowing, and exemption from state and federal taxes and from securities regulation — as well as the mandates that were placed on the GSEs to promote affordable housing. The GSEs have supported the housing market in various ways: by providing liquidity, facilitating lending to low-income homebuyers, and purchasing privately originated mortgage-backed securities for their own portfolios. As we will see, it is not clear that these efforts have always achieved their goals.

The GSEs' funding advantage: Who benefits? Because of the GSEs' quasi-governmental status, investors believed that the federal government would support the GSEs if they ran into difficulty. So investors were willing to lend to them at lower rates. In principle, much of this funding advantage could have been passed on to homeowners in the form of lower mortgage interest rates. But it is also possible that since the GSEs did not face much competition, some of this advantage accrued to other parties. For example, mortgage rates could have remained high, and the GSEs could instead have used the profit resulting from their low funding costs and the higher mortgage interest rates to pay their employees

[4] It should be noted, however, that promoting homeownership may have social costs; for example, it may divert investment away from other, possibly more productive, uses. For an assessment of the economic costs and benefits of homeownership, see the 2010 *Business Review* article by Wenli Li and Fang Yang.

and management generously or to lobby government officials, or they could have passed it onto their shareholders in the form of higher dividends.

By comparing the yield on the GSEs' bonds with those of other highly rated financial institutions, Wayne Passmore, Shane Sherlund, and Gillian Burgess (2005) first determine that the GSEs' funding advantage was approximately 20 to 40 basis points, depending on the comparison group. Moreover, they conclude that while some of this funding advantage was passed on to homeowners in the form of lower interest rates, much was not. They find that interest rates on mortgages eligible to be purchased by the GSEs (known as "conforming" mortgages) averaged about 7 basis points below rates on mortgages with similar terms (such as loan-to-value ratios) but that were too large to be purchased by the GSEs (known as "jumbo" mortgages).[5] It is also important to note that this lower cost was in essence a transfer from taxpayers, who were on the hook for this implicit guarantee, to homeowners. As we discuss next, however, these lower interest rates do not necessarily capture all of the benefits that the GSEs provided to the housing market.

The GSEs enhanced the secondary mortgage market. By virtue of their size, the GSEs have facilitated the standardization of the mortgage market. For example, through the development of automated underwriting procedures, the GSEs have established fairly clear criteria for which loans they will buy. For homeowners who can meet these standards, as well as for lenders, this standardization substantially reduces uncertainty. (As we will discuss, many of the reform proposals try to maintain these benefits.)

In addition, this standardization enhances liquidity in the secondary mortgage market. James Vickery and Joshua Wright point out that the uniformity of the underwriting standards the GSE used, along with the safety that an implicit government guarantee provided to investors, was important in enabling the GSEs to trade in what is known as the *to-be-announced*, or TBA, market. A unique feature of the secondary market for GSE-guaranteed mortgages is that many MBS pools actually trade before the underlying mortgages are even originated. In this TBA market, the GSEs and the buyers of these securities agree on their general terms — the coupon rate, issuer, approximate face value, and price. However, the parties do not determine the precise mortgages that will be pooled until just before the settlement date, which can be several months after the initial trade. Vickery and Wright state that over 90 percent of all MBS trading takes place in the TBA market. Another reason that GSE MBS are able to trade in the TBA market is that they are exempt from Security and Exchange Commission registration requirements.[6]

By virtue of their size, the GSEs have facilitated the standardization of the mortgage market.

There are at least two benefits from TBA trading of GSE MBS. First, it makes it easier for lenders to hedge their *pipeline risk* — that is, the risk they will be unable to sell the mortgages they originate. Second, it makes it less expensive for homeowners to lock in interest rates. By comparing interest rates on GSE-insured mortgages eligible to trade in the TBA market with those that are not, Vickery and Wright estimate that the overall effect of TBA trading is to lower interest rates on GSE-insured mortgages by 10 to 25 basis points.

In addition to the benefits that arise from TBA trading, the GSEs have provided a backstop for the mortgage market during times of stress. For example, Vickery and Wright find that conforming interest rates fluctuated much less than jumbo ones during the financial crisis. Similarly, Andreas Fuster and Vickery show that the share of fixed-rate mortgages in the conforming mortgage market was stable during the financial crisis, while in the jumbo market the share of fixed-rate mortgages fell dramatically during this period. They attribute this difference to the fact that lenders who offered jumbo loans became more reluctant to originate fixed-rate mortgages during the crisis because of the likelihood that they might be forced to hold them to maturity and thus incur substantial interest rate risk.[7] This was not the case for the conforming market, where the GSEs continued to securitize loans. More generally, Joe Peek and James Wilcox show that residential investment — for example, new home

[5] The GSEs are restricted to purchasing mortgages below the conforming loan limit, which is set yearly by their regulator. Until mid-2007 this limit was the same across most of the United States.

[6] In general, companies seeking to issue securities to the public must file a registration statement detailing the securities' characteristics and the risks the companies face. Were the GSEs not exempt from registration requirements, they would be unable to trade in the TBA market, as the individual mortgages backing the MBS are determined only after issuance.

[7] *Interest rate risk* refers to the tendency of debt securities with fixed interest rates to fall in price when prevailing interest rates in the market rise. For more on interest rate risk, see www.sec.gov/investor/alerts/ib_interestraterisk.pdf.

construction and renovations — as a share of GDP became more stable as the GSEs securitized more mortgages. This stabilization occurred, they argue, because securitization made mortgage lending less dependent on banks and thus less sensitive to both regional and general fluctuations in the economy.

Congressional mandates to promote affordable housing. Starting in 1992, Congress required Fannie and Freddie to dedicate a certain fraction of their mortgage activity to low-income and underserved borrowers and markets. The GSEs were also permitted to meet these affordable housing goals by purchasing portions, or *tranches*, of securities containing privately securitized loans (mainly subprime and alt-A) that met these criteria. These goals were raised over time until 2008, when HUD determined that the collapse of the housing market had made meeting them infeasible.[8]

The adoption of these mandates raises important questions: First, to what extent did the GSEs' affordable housing goals actually expand the supply of credit to households who otherwise would not have received mortgages? Second, did these mandates lead the GSEs to take on more risk than they otherwise would have? That is, did these goals have a significant impact on GSE mortgage purchases and guarantees or on their purchases of mortgage-backed security tranches? And if so, did the purchases and guarantees induced by these goals contribute to their overall risk?

Neil Bhutta considers one goal, the underserved area goal, from the mid-1990s through 2003. A loan counted toward the goal if it was for an owner-occupied home in a census tract where either (a) the median family income did not exceed 90 percent of the median for the whole metro area, or (b) at least 30 percent of the residents were minorities and the median family income did not exceed 120 percent of the median for the metro area. Bhutta compares loans just above and below these thresholds and finds that goal eligibility increased the likelihood that a mortgage was purchased by the GSEs by about 4 percent. This effect is statistically significant but economically very small, suggesting that these goals did not have an important influence on the types of loans that the GSEs directly purchased and thus probably did not increase their risk by very much.

As we have discussed, the GSEs were also able to meet their goals through purchases of privately securitized MBS tranches. So it is also important to determine the extent to which the housing goals influenced the development of this market. Andra Ghent and others study this question also by using the discrete cutoffs for goal-eligible loans. Examining the mortgages included in privately securitized MBS tranches, they do not find any clustering of loans around the eligibility cutoffs for GSE goals.[9] They also do not find that the interest rates for loans just below the cutoffs were lower, which would indicate an attempt to increase the share of goal-eligible loans in these securities. They thus conclude that the GSE housing goals did not have a significant impact on subprime MBS originations.

To sum up, it would be fair to say that the existing evidence suggests the housing goals played a minor role, at most, in expanding the subprime mortgage market and, consequently, in increasing the risk that the GSEs took on.

THE GSEs DURING THE BOOM AND BUST

The GSEs lost market share during the housing boom. During the housing boom, the share of first mortgages originated that were GSE-guaranteed fell dramatically — from 49 percent in 2003 to only 27 percent by 2006. By contrast, the privately securitized share grew dramatically during this time (see Figure 1). There are several possible causes for this shift. First, banks found it more attractive to invest in non-GSE MBS — particularly in the tranches with the highest credit ratings — after the capital requirements for these securities were lowered in 2002. In addition, the GSEs were under increasing scrutiny following accounting scandals in the early 2000s and may have been less able to respond to the growth of the private sector.[10] As discussed by Marsha Courchane, Rajeev Darolia, and Peter Zorn, the Federal Housing Administration also experienced a decline in market share through 2006, followed by a recovery beginning in 2007. They suggest that this decline was due, at least in part, to the rise and collapse of the subprime market.

In Table 1 we examine the evolution of mortgage underwriting standards over time across the various market segments. In particular, we compare characteristics of loans in GSE-guaranteed MBS with those in privately securitized MBS and to

[8] For more on the GSE goals and how they changed over time, see the FHFA's Mortgage Market Note 10-2. Also note that other federal policies that do not involve the GSEs also encourage low-income homeownership, such as the Community Reinvestment Act, which imposes mandates on commercial banks and thrifts.

[9] For example, if the underserved area goal discussed above had a significant impact on the subprime MBS market, then one would expect to see a disproportionate share of mortgages in these private MBS pools that were made to borrowers with incomes just below 90 percent of the area median, which is the cutoff for this goal. The authors do not observe this pattern, however.

[10] For example, on December 21, 2004, the Office of Federal Housing Enterprise Oversight pointed to earnings restatements resulting from Fannie Mae's accounting problems in designating it "significantly undercapitalized"; this subjected Fannie Mae to greater oversight.

loans retained by banks in their own portfolios. Observe that during the boom years of 2003 to 2006, the GSEs did not appear to dramatically reduce their underwriting standards, whereas those mortgages that were sold as part of private securitizations were far riskier: They had lower FICO scores and higher combined loan-to-value (LTV) ratios.[11]

In a paper with Viral Acharya, I examine the dynamics of the GSEs and the private sector during the housing boom and its aftermath and identify the following factors that contributed to the decline in the GSE share. First, we show that as house prices rose, private lenders were able to lend larger amounts than the GSEs were permitted to guarantee, including cash-out refinancings to homeowners who wanted to take advantage of their homes' rise in value by replacing their GSE-guaranteed mortgages with jumbo mortgages. In addition, as can be seen in Table 1, borrowers who took out privately securitized loans from 2003 to 2006 were much more likely to take out second ("piggyback") mortgages at the time of origination than were those with GSE-insured mortgages. This made these loans more attractive to borrowers seeking high-LTV mortgages, because the GSEs typically required such borrowers to take out relatively expensive private mortgage insurance.[12] This strategy may also have benefited from the fact that, until 2006, some credit rating agencies gave little weight to the presence of second mortgages in assessing the risk of private securitization.[13] It also explains why the first-mortgage LTVs were relatively low for borrowers with privately securitized mortgages, whereas their combined LTVs were much higher. Finally, the private securitization sector also expanded into areas with many subprime borrowers and was also more likely to serve borrowers who had never had a prior mortgage.

The GSEs amassed large portfolios. While the GSEs lost market share in mortgage originations, they amassed large portfolios of privately securitized MBS. These portfolios peaked at around $1.6 trillion in 2003

TABLE 1

Risk Profiles of Underlying Loans: GSE MBS vs. Others

		FICO <660	LTV >80%	Piggyback	CLTV >80%	PMI
2003	GSE	12%	12%	8%	23%	14%
	Private Securitized	10	10	11	25	9
	Portfolio	20	16	12	32	12
2004	GSE	15	12	14	30	15
	Private Securitized	26	15	21	42	12
	Portfolio	24	15	17	38	9
2005	GSE	15	12	17	34	13
	Private Securitized	34	17	25	49	8
	Portfolio	19	14	22	43	5
2006	GSE	17	15	19	40	14
	Private Securitized	41	19	27	54	4
	Portfolio	19	22	18	44	5
2007	GSE	20	23	15	45	26
	Private Securitized	26	16	24	47	7
	Portfolio	27	30	16	50	9

Sources: Statistics on FICO, LTV, and PMI are from the Lender Processing Services (LPS) data set. The figures for Piggyback and CLTV are from the merged LPS-Federal Reserve Bank of New York/Equifax Consumer Credit Panel data set used by Bond et al. (2012).

Notes: Values represent the percentage of total mortgages originated in that year and sector with these characteristics. FICO: Fair Isaac and Company consumer credit score. LTV: first mortgage loan-to-value ratio. Piggyback: second mortgages. CLTV: combined first and second mortgage loan-to-value ratio. PMI: private mortgage insurance.

[11] A FICO score is a credit score developed by Fair Isaac and Company that rates a consumer's loan default risk based on his or her credit bureau file, with higher scores being predictive of lower rates of default. LTV denotes the ratio between the mortgage balance and the value of the property securing that mortgage; higher LTV ratios are associated with higher default rates because, for instance, the homeowner has less of his or her own money at stake. See Elul and others (2010), which quantifies the relationship among credit scores, LTV ratios, and mortgage default.

[12] Under their federal charters, the GSEs cannot purchase a mortgage with an LTV above 80 percent unless either (a) the portion above 80 percent is insured by a qualified mortgage insurer, (b) the seller agrees to repurchase or replace the loan in case of default, or (c) the institution that sells the loan retains at least a 10 percent stake. In practice, the GSEs typically require private mortgage insurance if the loan exceeds 80 percent of the value.

[13] For example, until it introduced a new model on July 1, 2006, Standard & Poor's ignored the presence of second mortgages when rating subprime MBS as long as fewer than 30 percent of the underlying borrowers had second mortgages. See Michael Kling (2006).

and remained at that level through 2008.[14] The GSEs generally purchased the least risky, AAA-rated tranches of MBS containing subprime or alt-A mortgages — loans that they were reluctant to purchase and guarantee directly. Notwithstanding their initially high ratings, many of these tranches later defaulted or were downgraded, leading to large losses.

As we discuss, concern regarding the risk of their portfolios certainly played a role in pushing the GSEs into conservatorship. So why did they maintain such large portfolios? One possible reason is that they appeared to be very profitable, as the GSEs were able to issue short-term bonds at low interest rates and use the proceeds to buy AAA-rated tranches of MBS paying high interest rates. According to Dwight Jaffee, the spread between the return they earned on these investments and their funding costs could exceed 100 basis points; by contrast, the spread on their guarantee business was typically only 25 basis points. Furthermore, the required capital for holding the portfolios was sufficiently low that it did not offset the high returns. Nor, as we shall see, was the capital adequate to cover their risks.[15]

Another reason for the growth of the portfolios may be that the GSEs were permitted to use them to meet their housing goals, and the portfolios did indeed contain many mortgages that qualified toward meeting these goals.[16] We have already presented evidence that suggests that the GSE housing goals did not encourage the growth of the subprime MBS market. One might also ask whether the GSEs' large purchases of these MBS encouraged the private sector to make riskier loans than they otherwise would have. Manuel Adelino and his coauthors suggest that the answer is no. They use the fact that many privately securitized pools had tranches designed to cater specifically to the GSEs by including only loans below the conforming loan limit. They then show that the default rate on GSE-eligible MBS tranches was lower than on similar ineligible tranches. This suggests that, if anything, the GSEs looked for safer loans in which to invest. Taken together, this evidence suggests that the GSEs' primary motivation for investing in privately securitized MBS was profit, not housing goals, and that they did not significantly contribute to the development of risky lending practices in this sector.

The GSEs guaranteed risky loans in 2007 and regained much of their market share. Sometime in 2006, the private securitization market peaked and originations began to decline, particularly for subprime borrowers. This trend accelerated in the first half of 2007 and by the middle of 2007 was evident even for prime MBS.[17] In addition, house prices peaked in 2006, after rising for many years. Finally, the share of homeowners who were past due on their mortgages also began to increase in mid-2006 (reaching 10 percent in 2010). As the private sector pulled back, the GSEs expanded and regained market share, guaranteeing 44 percent of all originations in 2007.[18] We will argue that, in doing so, the GSEs purchased and guaranteed loans that were riskier in some dimensions than in the past and may thus have amplified the housing crisis.

In part, they did this by agreeing to guarantee loans with high LTVs; 25 percent of all the loans the GSEs purchased in 2007 had first-mortgage LTVs above 80 percent; the comparable figure for 2006 was only 15 percent. Also, many of these loans were refinancings of existing mortgages,[19] which suggests that this was an attempt to regain market share and not simply a response to high house prices that made it difficult for buyers to come up with larger down payments. These high-LTV loans later led to large losses, as they were made when house prices were close to their peak. Furthermore, unlike the private securitization market in earlier years, in which the combined LTV was often shared between first and second lienholders, borrowers for the GSE-guaranteed loans originated in 2007 were less likely to have second mortgages. Part of the reason was that the GSEs relied more on private mortgage insurance. In addition, banks may have become more reluctant to originate second mortgages in 2007 amid signs that the housing boom was ending. The GSEs also began guaranteeing more loans to riskier borrowers. The share of their loans made to borrowers with credit scores below 660 rose to 20 percent in 2007, from 17 percent in 2006 and just 12 percent in 2003.[20]

These borrowers were also subsequently much more likely to default, and thus these loans made an outsize contribution to the GSE losses. By November 2012, 7 percent of loans the GSEs had guaranteed in 2007

[14] One reason they did not grow after 2003 was that the GSEs were under increased scrutiny following their accounting scandals in the early 2000s.

[15] While the capital requirements for banks were similar in many respects to those for the GSEs, only banks were subject to a leverage ratio requirement (of 3 percent at the time). Indeed, the GSEs had higher leverage than most banks. For more on bank capital regulation, see my 2013 *Business Review* article. And for further discussion of GSE leverage ratios, see Acharya and coauthors (2011).

[16] See Scott Frame (2008).

[17] See the 2013 Mortgage Market Statistical Annual I.

[18] Total mortgage originations fell from roughly $3 trillion in 2006 to $2.4 trillion in 2007. Moreover, the dollar amount of originations not guaranteed by the GSEs, FHA, or Veterans Administration fell 35 percent during this period.

[19] Lender Processing Services data set.

[20] See Table 1.

were either delinquent or already in default, compared with 4 percent of GSE-guaranteed loans originated from 2003 to 2006. However, compared with privately securitized loans, they were still much safer: The default rate on the 2007 vintage for the latter is 16 percent.[21]

Finally, in my paper with Acharya, we show more directly that this expansion in the GSEs' market share led them to guarantee loans that were riskier than those they had insured in the past. We study the performance of loans that the GSEs guaranteed in 2007, specifically by comparing those borrowers who had previously taken out privately securitized loans with those borrowers whose previous loans were GSE-insured. We find that the former were nearly twice as likely to default after just two years.[22]

Summarizing, although the decline in lending standards that led to the housing crisis originated in the private securitization market, the GSEs amplified the crisis as they sought to recapture market share when house prices began to tumble.

GSE losses in the financial crisis. The GSEs experienced large losses in the wake of the collapse of the housing market. Their write-downs on their portfolio holdings totaled $57 billion by the end of 2012. In addition, their losses on loans that they had guaranteed ended up being far larger — reaching $235 billion by 2012. To gauge the magnitude of these losses, it is useful to compare them with the benefits that the GSEs may provide, in particular in the form of lower interest rates.[23]

As discussed earlier, various studies have provided differing estimates of the impact of the GSEs on mortgage interest rates. For example, Vickery and Wright determined that TBA trading lowers mortgage rates by up to 25 basis points. At the start of the financial crisis, there was roughly $4.5 trillion in GSE MBS outstanding, with an average interest rate of 6 percent.[24]

Although the decline in lending standards that led to the housing crisis originated in the private securitization market, the GSEs amplified the crisis as they sought to recapture market share when house prices began to tumble.

So, on the basis of their estimate, the GSE benefit for these borrowers was roughly $11 billion per year. Even assuming that these borrowers had kept these mortgages for 30 years, the present value of these savings would have totaled only $150 billion, or just half of the GSE losses in the crisis. Of course, this comparison does not account for the less tangible benefits the GSEs provided, such as supporting the mortgage market in times of crisis, or the benefits they may have provided to past and future borrowers.

As discussed earlier, many of the loans that the GSEs guaranteed in 2007 were particularly risky. Furthermore, their risk was exacerbated because the GSEs tended to lend the entire balance and relied on private mortgage insurance to cover losses in excess of 80 percent LTV in case of default. However, several of these insurers shut down because of high losses, and the ability of the remainder to pay these claims was called into question.

Even though the GSEs' portfolios ended up being responsible for only a small fraction of their losses — the lion's share was due to guarantees — Diana Hancock and Wayne Passmore suggest portfolio losses played a disproportionate role in the collapse of the GSEs because of the portfolios' size, opacity, and financing by short-term borrowing that needed to be rolled over quarterly. In particular, in July 2008, financial markets became concerned that the GSEs would not be able to roll over their debt; as a result, the Federal Reserve and U.S. Treasury increased their support for the GSEs.

Another factor that exacerbated the losses was weak oversight by the Office of Federal Housing Enterprise Oversight (OFHEO), which did not clamp down on the risky behavior described above and in July 2008 was replaced by the newly created Federal Housing Finance Agency (FHFA), which had stronger regulatory powers.[25] In September of that year, the FHFA determined that the GSEs could not "continue to operate safely and soundly" and announced they would enter conservatorship.[26]

[21] These figures are from the Lender Processing Services (LPS) data set. For further detail on this data set, see Elul and coauthors (2010).

[22] These statistics are from the merged Equifax–LPS data set used in Bond et al. (2012).

[23] Recall, however, that lower mortgage rates might not constitute an unambiguous benefit to society.

[24] See the 2013 Mortgage Market Statistical Annual II and LPS data set.

[25] The FHFA also replaced the Federal Housing Finance Board as the regulator of the 12 regional Federal Home Loan Banks, which lend to local lenders to finance housing and other economic activity. The OFHEO had been subject to criticism since at least 2002, in the wake of the GSE accounting scandals. For further detail on early efforts to strengthen the GSEs' regulator, see Frame and White (2004).

[26] Statement of James B. Lockhart, then director of the FHFA, on September 7, 2008, www.treasury.gov/press-center/press-releases/Documents/fhfa_statement_090708hp1128.pdf.

REFORMING THE GSEs

There have been many proposals that suggest how to reform or replace the GSEs. Although, as we shall see, they differ along many lines, most suggest curtailing the GSEs' portfolios. One reason is that amassing large portfolios does not appear to be central to the GSEs' role in housing markets. Moreover, as noted above, their portfolios were an important contributor to their entering conservatorship.

As early as 2004, Alan Greenspan, then chairman of the Federal Reserve, had suggested that their portfolios be limited to $200 billion each, about a quarter of what they had held at the time. Legislation passed the following year did mention reducing the portfolios as a goal but set no explicit limits or timetable, an outcome widely seen as a victory for the GSEs. Greenspan had also proposed raising their capital ratios to match those required of large banks, which arguably would also have helped prevent their collapse.

Current reform proposals fall into three classes that reflect the extent of government involvement they envision: public, fully private, and hybrid.

Public models. The public proposals favor maintaining the government's role in securitizing mortgages, with an explicit government guarantee. One prominent example is described by Hancock and Passmore. They argue that mortgage securitization is inherently fragile and subject to "runs" in which investors become concerned about risks and become unwilling to supply further funding to the market. There are several reasons for this fragility. First, mortgages are paid back over a long time, but banks tend to fund these long-lived assets with short-term liabilities such as demand deposits that can be withdrawn at any time. In addition, since a steep fall in the housing market such as we saw in the aftermath of the last recession is so strongly correlated with a decline in the rest of the economy, it would be very difficult for a private party to credibly insure against the risk of a decline in the housing market because a private insurer might also founder in the ensuing economic contraction.[27] Thus, they conclude, only the government can stem runs by credibly insuring against the risk of a steep and sustained fall in house prices. Moreover, they point out that without this government insurance, mortgage lending might well end up being concentrated in the largest institutions, with the risk effectively shifted to the Federal Deposit Insurance Corporation (FDIC), since investors would believe that only these too-big-to-fail institutions would be safe. Finally, maintaining a formal government role would allow the GSEs to be restructured in a way that would leverage their expertise and technology, and the TBA market could be preserved.[28]

Private models. Fully private models have also been proposed. One of these, advanced by Jeb Hensarling of the House Financial Services Committee, would wind down the GSEs and set up a privately owned National Mortgage Market Utility that would maintain some of the benefits that the GSEs provided, such as a standardized securitization structure, but would be prohibited from originating, securitizing, or guaranteeing mortgages or mortgage-backed securities. Note that this proposal makes it explicit that there would be *no* government guarantee. The advantages over a public model include: Taxpayers would be protected (at least in theory). There would be less scope for political interference such as housing goals. And without a government guarantee, investors in mortgage markets would be less likely to take the kind of risks the GSEs did such as amassing large portfolios of subprime mortgage-backed securities. Recall, however, that as Hancock and Passmore point out, the risk might shift to the FDIC, and the potential for runs would remain.

Hybrid approaches. Between these extremes lie the hybrid proposals. They generally have some sort of government backstop, but with the private sector absorbing a share of the losses. They all propose winding down the GSEs. One advantage of the hybrid plans is that they maintain a government guarantee, which can help preserve liquidity in the mortgage market, particularly in times of crisis. On the other hand, they also conceive of a role for the private sector, the idea being that private institutions are better run and less subject to political pressure or that it would reduce the risk of moral hazard.

Most hybrid proposals envision the private sector absorbing the first losses and the government providing insurance after that, in the "tail events." For example, the Corker-Warner Senate bill has private entities covering the first 10 percent of losses before the government-provided catastrophic coverage would kick in.[29] A paper by Toni Dechario and others envisions a similar structure but also proposes that a nonprofit cooperative owned by banks that participate in the mortgage market carry out securitization for its members. This approach has several advantages: Having a single entity carrying out securitization would make it easier to set up a structure to continue TBA trading. Individual lenders' mar-

[27] Indeed, this is precisely what happened to several private mortgage insurers during the financial crisis.

[28] Recall that the GSEs' exemption from SEC registration requirements facilitated TBA trading; fully private issuers, however, would not be exempt.

[29] Corker-Warner Housing Finance Reform and Taxpayer Protection Act (s.1217), www.gpo.gov/fdsys/pkg/BILLS-113s1217is/pdf/BILLS-113s1217is.pdf.

ket power would be checked, putting small banks on a more even footing. Members would have an incentive to monitor one another. And insuring against tail risk would be simplified, since the cooperative would buy insurance for its members.

Two other papers propose different hybrid structures. David Scharfstein and Adi Sunderam's paper puts more emphasis on the private market than do other hybrid proposals. The private market would provide credit and guarantee most loans except in times of crisis. During normal economic times, the government guarantor would be limited to 5 percent to 10 percent of the total market. If a crisis were declared, however, the government guarantor would be allowed to expand its market share in order to stabilize the mortgage market. The rationale behind this structure is that, as we have seen, the primary benefit the GSEs provide is during crises, so it makes sense to limit the guarantee to when it is needed. The main disadvantage is that it would be difficult to determine when a crisis is occurring, and the formal declaration would be politically fraught.

Acharya and others (2011) propose a different structure: a public-private partnership that would share risk. A private insurer would guarantee 25 percent of losses. At the same time, the government would provide capital to reinsure the remaining 75 percent of the risk. That is, for every dollar lost, the private sector would cover 25 cents and the government 75 cents. The advantage of this approach is that it would allow the price of the insurance to be set by the private market, which may be better at pricing the guarantee; the government has a history of underpricing it, which creates incentives to take risks.

CONCLUSIONS

One of the significant events of the financial crisis was the collapse of the GSEs in 2008. While the GSEs were not at the forefront of the housing bubble, they had also modestly lowered their lending standards from 2003 to 2006. Nevertheless, their market share shrank in favor of private securitization. And as the housing market was collapsing in 2007 and private securitizers withdrew, the GSEs dramatically increased their market share and risk, which led to elevated default rates. In addition, they amassed large portfolios of privately securitized MBS, which also led to significant losses and played an important role in their collapse. The GSEs' risk-taking, in both the sphere of their guarantee activity and in their portfolios, appears to have been driven primarily by a desire for profit. Evidence suggests that their affordable housing goals played only a small role, at most.

Several proposals aim to reform or replace the GSEs. Many of them envision a continued role for the government in providing a backstop in times of stress, though all of them argue against allowing the GSEs to maintain large portfolios.

What is still not well understood is the interaction between government intervention in the mortgage market and the private sector — both during the bubble years and as the housing market started to collapse — and whether this interaction may have increased incentives for all parties to take risks.

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Smart Money or Dumb Money: Investors' Role in the Housing Bubble

BY WENLI LI

What drove the remarkable 50 percent rise in U.S. house prices from 1996 to 2006 — and their dramatic 30 percent fall by 2011?[1] To explain this historic cycle, most research points to three factors: low interest rates, the growth of subprime mortgages, and increasingly lax lending standards.[2] But there appears to be increasing evidence of another important factor: speculation by individual investors. Investors can improve market efficiency under certain circumstances. Yet, as this article summarizes from recent research, they also have an outsize effect on house price changes. To assess what part investors played in the housing bubble, it will help to understand investor characteristics and what factors drive their buying and selling.

HOW INVESTORS DIFFER FROM TYPICAL HOMEOWNERS

Residential real estate investors buy homes with no intention of living in them. Some investors rent their properties out, but most look to resell them after a short holding period to make a profit. Although ordinary homeowners may also view owning a home as an investment — one that may yield a capital gain or loss when they eventually sell it — their primary motivation for buying a house is to have a place to live — shelter.

For this article, I will focus on individual investors as opposed to institutional investors such as homebuilders, construction contractors, real estate agencies, and financial firms. Because data are limited, relatively little is known at this point about institutional investors' role in the housing crisis. In addition, I will restrict the discussion to single-family homes due to data limitations.

There are at least two reasons to believe that housing transaction and default costs — financial as well as emotional — are lower for real estate investors than for typical homeowners. First, when selling its primary home, a household needs to find an alternative place to live and perhaps a new school for the kids and a new mode of transportation to work. All these activities take time and money. Second, if its house is foreclosed upon, a household may feel more stigmatized if the house is its primary residence. Neighbors will learn of the foreclosure more quickly and may shun the family. Of course, investors also strive to avoid losses on their real estate assets, but for them the fallout is chiefly financial, since they don't live in the house and so it is less likely that other people will learn about the foreclosure.

A simple model of housing investment. These lower costs make real estate investors more price sensitive, as outlined in a simple stylized model that Zhenyu Gao and I constructed. The basic elements of the model are that households consume both housing and nonhousing goods and that they save exclusively by investing in housing, which is a simple way of focusing attention on the role of investment in housing. We assume that households are uncertain about their future income and future house prices, which are standard assumptions in models of household consumption and saving decisions. Our model is specialized to draw out the implications of two basic features of investment in housing. Consistent with my description of real estate investors, our model assumes that households find it more expensive

[1] Calculated using the Federal Housing Finance Agency house price index deflated by the headline consumer price index.

[2] For example, John Taylor cites low interest rates that he attributes to overly expansionary monetary policy (although see Ben Bernanke's 2005 remarks for a different view on the cause of low rates). Yulia Demyanyk and Otto Van Hemert find that mortgage quality had deteriorated for six years before the crisis and that securitizers were aware of the trend. Atif Mian and Amir Sufi closely correlate the increase in securitization of subprime mortgages with mortgage lending growth in zip codes where subprime mortgages were prevalent but income growth was not. Tim Landvoigt finds that expectations of higher-than-average price gains were greater at the beginning of the boom but had nearly evaporated by 2004, two years before the bust, while down payment requirements continued to be relaxed throughout the boom.

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to buy and sell a primary residence than an investment home and to default on a mortgage on a primary residence than on investment housing.

In this setup, only relatively rich households that expect their incomes to fall in the future, such as in retirement, will save by purchasing investment housing. In addition, because of the lower transaction costs associated with investment housing, households that purchase investment housing are more sensitive to current prices and to expectations about future prices in their buying and selling decisions than are households that purchase only a primary residence. For example, in our model, demand for investment homes will rise more than demand for primary residences in response to greater optimism about future house prices.

Our model also makes predictions about household default rates and credit standards. Because households face lower costs when they default on a second home than on a primary home, pessimism about future prices will lead to more defaults on mortgages on investment homes than on ordinary homes. Of course, lenders are not unaware of this phenomenon, so they impose higher standards on borrowers seeking to finance investment homes. Lenders will require investment homebuyers to have higher incomes, lower loan amounts, or higher mortgage interest rates than required of ordinary primary homebuyers.[3]

Real estate investors and market efficiency. Because they are more sensitive to current and expected price movements, investors can significantly influence prices in the residential market. Whether they improve market efficiency, however, depends on whether they act with superior information and on how they act based on that superior information. In economics, *market efficiency* is defined as the degree to which prices reflect all the relevant information.[4] In the case of the housing market, this information would include local demographics, income distribution, the labor market, land availability, zoning restrictions, public services, and so on. Economists refer to such information as *market fundamentals*. Following Friedrich Hayek's Nobel prize-winning insight, each investor's information drives individual buying and selling decisions, which in turn are aggregated in the market into a single statistic — a price. Real estate investors improve market efficiency if they keep prices in line with market fundamentals by possessing and acting on superior information about those fundamentals. That is, the market becomes more efficient if, through their experience or diligence, investors do more than just guess about the ultimate direction in which house prices are headed.

For example, suppose real estate investors correctly predict that there will be an influx of immigrants to the city that will increase demand for housing. If this information is not available to other homebuyers, then investors will be more willing to purchase from sellers and more willing to pay higher prices.[5]

But real estate investors will not improve market efficiency if they simply bet on future house price movements based on past and current price movements without any superior information. For example, when investors bet that the housing boom would continue longer than implied by market fundamentals, they effectively boosted house prices even higher than they would have risen had it not been for investor speculation. Similarly, when investors later bet that the housing bust would last longer than implied by market fundamentals by unloading their properties cheaply or defaulting, they further depressed house prices and exacerbated the bust. As we will see, studies suggest that real estate investors generally did not possess superior information.

Real estate investors will not improve market efficiency if they simply bet on future house price movements based on past and current price movements without any superior information.

One might argue that in comparison with ordinary homeowners, there are relatively few real estate investors and so their effect may not be large. However, Monika Piazzesi and Martin Schneider show that even a relatively small group of real estate investors can have a large effect on house prices. Unlike stocks, houses are not standardized assets traded in highly competitive markets. Instead, households search for individual houses that suit them and bargain with sellers over the price. Once they have found a suitable house, they cannot easily exchange it for an equivalent house. In *search markets*, where buyers search for sellers and then bargain over prices, house prices will reflect only actual transactions, no matter how sparse these transactions are relative to the stock of

[3] This type of prediction illustrates the benefit of examining a formal model in which households and lenders adjust to each other's likely behavior.

[4] See Fama (1965).

[5] Real estate investors often fix up their investment homes before selling, thereby improving the quality of the housing stock on the market. This is, however, a separate argument from market efficiency.

housing for sale. As a practical matter, actual transactions (not the stock of offer prices) are the primary source of information for appraisals.[6]

In summary, real estate investors can drive up house prices without spending substantial wealth or obtaining as large a market share as speculators in other markets, such as the stock market, do.

INVESTOR SHARE OF DEMAND SOARED THEN SANK

Interestingly, as a share of total U.S. households, those that owned investment homes did not fluctuate much in the years leading up to and following the bubble. According to the Survey of Consumer Finances (SCF), 13 percent of households owned investment homes in 1989. The share rose to 14 percent in 2007 but returned to 13 percent in 2010. By contrast, the share of households that owned their primary residence moved up from 64 percent to 70 percent in 2007 and then dropped back to 67 percent in 2010.

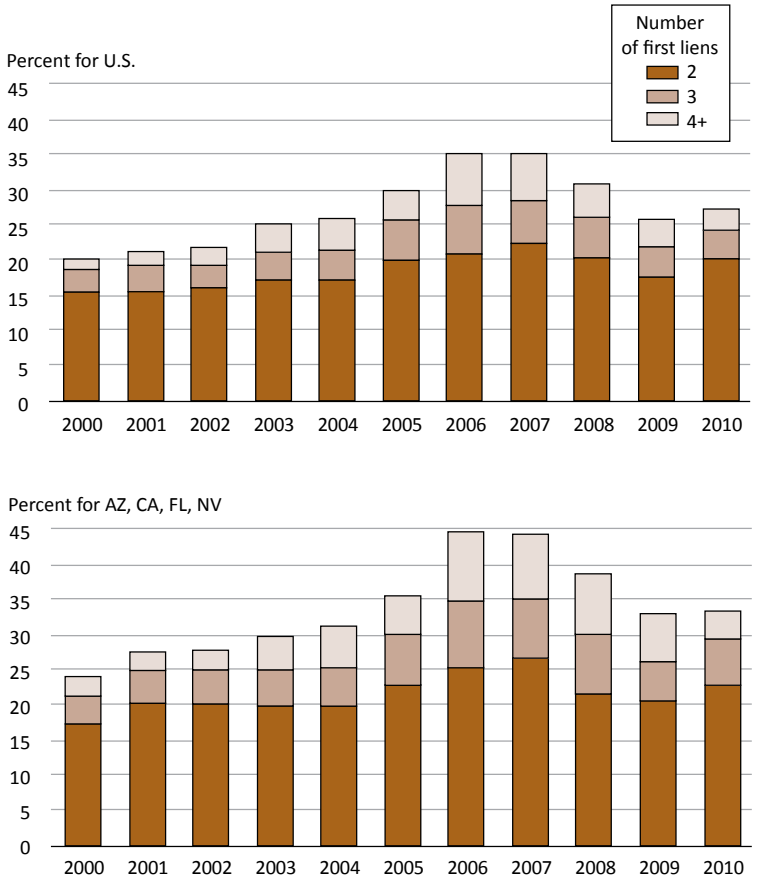
However, this more or less constant fraction of households that invested in residential real estate is misleading. According to the Federal Reserve Bank of New York/Equifax Consumer Credit Panel, the share of new mortgages taken out for home purchases (as opposed to mortgage refinancings) by households with more than one first lien went from 20 percent in 2000 to 35 percent in 2006-07.[7] In the four states with the most dramatic house price movements — Arizona, California, Florida, and Nevada — the rise was from 20 percent in 2000 to 45 percent in 2006-07 (see Figure 1). In other words, although the fraction of households that owned investment homes didn't change dramatically, the average number of investment houses they held increased prior to the crisis.[8] This observation is consistent with William Wheaton and Gleb Nechayev's calculation that in 2005, total housing production exceeded household formation by 60 percent.[9]

Turning to the flow of buying and borrowing for real estate purchases, using Home Mortgage Disclosure Act (HMDA) data, Gao and I calculate the fraction of mortgage applications for nonprimary residences as reported by

FIGURE 1

Average Number of Houses Investors Held Rose Before Crisis

Share of new purchase mortgages taken out by households carrying more than one first lien.



Source: Calculations by Haughwout and coauthors (2011) based on the Federal Reserve Bank of New York/Equifax Consumer Credit Panel data set.

[6] See Leonard Nakamura's 2010 *Business Review* article in which he also discusses the problems that arise in housing markets when too few transactions take place to form accurate appraisals.

[7] See Haughwout and his coauthors.

[8] An alternative but complementary explanation is that investors were buying and selling houses so frequently — that is, *flipping* properties — that the quarterly credit data were capturing multiple mortgages between transactions.

[9] As the U.S. Census Bureau defines it, a household consists of all the people, related and unrelated, who occupy a housing unit, including any lodgers, foster children, wards, or live-in domestic help.

borrowers themselves and find a similar albeit less dramatic pattern than Haughwout and his coauthors find (see Figure 2). The fraction of mortgage applications for nonprimary residences went from a low of 5 percent in 2000 to a high of about 14 percent in 2006, falling to less than 10 percent by 2010. Applications in Arizona, Florida, and Nevada rose and fell more steeply than in the country as a whole.

Investors: Good credit risks who made bad investments. As mentioned earlier, one popular narrative of the housing crisis is that too many homebuyers with low credit scores resulting from poor repayment histories were able to get subprime mortgages. More generally, many researchers have pointed to a decline in credit standards for all homebuyers, even those who qualified for prime mortgages.[10]

Investors appeared creditworthy. An examination of SCF data from 2001, 2004, 2007, 2009, and 2010 reveals that owners of second and investment houses actually had higher incomes than those who owned only their primary residences. For example, the median income for owners of just a primary residence was $31,176 in 2007 in 1980-84 dollars versus $46,645 for owners of second and investment homes. In fact, in 2007, 90 percent of those who owned investment homes already owned their primary residence, consistent with the theory that Gao and I have outlined.

Calculations using HMDA data confirm the pattern that incomes of mortgage borrowers were noticeably higher for investment homebuyers than for typical homebuyers. In 2007, the median income for primary mortgage applicants was $30,316 in 1980-84 dollars and $59,394 for nonprimary mortgage applicants. Other data also indicate that people with second or investment mortgages had higher credit scores on average than those with just a primary mortgage.[11] For example, in 2007 at the height of the mortgage crisis, the median credit score at the time of mortgage origination was 720 for owner-occupants with prime-rate mortgages and 750 for nonowner-occupants with prime-rate mortgages. For subprime borrowers, the median credit score was 630 for owner-occupants as opposed to 663 for nonowner-occupants.[12]

But appearances can be deceiving. Despite their apparently superior risk credentials, there is some evidence that real estate investors may have been more leveraged. All else equal, more leveraged borrowers typically pose more risk, as they are more vulnerable to declines in house prices and in their own financial situation. Additionally, Gao and I find that among prime-rate borrowers, investors tended to take out riskier types of mortgage contracts such as adjustable-rate and interest-only mortgages more often than did noninvestors.[13] Empirically, these types of mortgages have been found to have higher rates of delinquency and default than traditional fixed-rate mortgages.

Another telling phenomenon is that many real estate investors were out-of-town or distant buyers; that is, they bought properties outside the area where their primary residence was located. Alexander Chinco and Christopher Mayer find that 12 percent of

[10] See Ronel Elul's *Business Review* article.

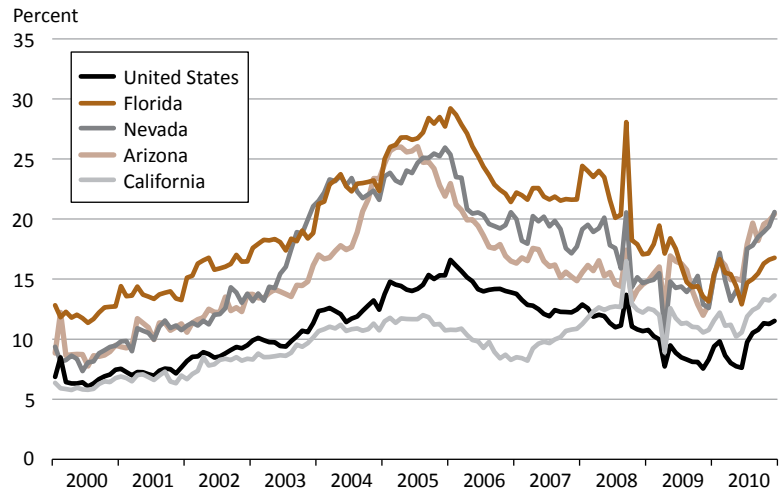
[11] See my paper with Gao for data from LPS and CoreLogic. Also, it is worth noting that both the SCF and HMDA rely on what households report about themselves. Comparing consumer credit bureau data with loan-level mortgage data, Haughwout and his coauthors discover that households underreport how many first liens they have.

[12] Credit scores in those data sets range from 350 to 800.

[13] With an interest-only mortgage, the borrower pays only the interest on the principal for a set period, leaving the principal balance unchanged. We use LPS Applied Analytics data for prime mortgages and CoreLogic data for subprime and near-prime mortgages.

FIGURE 2

Investment Mortgages as Share of Total Applications



Sources: Calculations by Gao and Li (2012) using Home Mortgage Disclosure Act data.

single-family homes purchased in Las Vegas by distant investors in 2000 were resold within 24 months.[14] By 2005, that share had risen to 25 percent. They find that compared with local buyers, distant investors were less likely to be well informed about local market conditions. In that sense, distant investors may behave like so-called noise traders in many financial markets who buy and sell for reasons other than market fundamentals. They speculate and are not well informed.

Indeed, there is significant evidence that, rather than using market fundamentals to predict where and when prices would rise, investors gravitated to areas where prices were already rising rapidly, further fueling excess short-term appreciation. Studying zip code-level mortgage demand, Gao and I find that real estate investors responded more strongly to recent local house price movements than did people buying their primary homes. In other words, investors were more attracted to areas where single-family house prices had risen rapidly.

Patrick Bayer, Christopher Geissler, and James Roberts distinguish between experienced versus inexperienced investors who purchased homes in Los Angeles between 1988 and 2009 with the intention of quickly reselling them.[15] The researchers define experienced investors as those engaged in buying and selling four or more properties at a time.[16] They find that experienced investors bought homes at below-market prices from motivated sellers and resold them quickly and that they invested in housing during both boom and bust years. In doing so, these experienced investors did appear to provide liquidity to the local housing market in addition to contributing to market efficiency. Inexperienced investors, on the other hand, invested in periods and areas of rapid market appreciation. Their speculative activity increased sharply during the boom and fell during the bust.

Finally, Chinco and Mayer document that many more out-of-town buyers than local investors bought homes just before house prices peaked and on average lost money on those investments, with the worst relative performance in those markets where prices fell the most. Put simply, distant buyers seemed overconfident and uninformed about local housing market conditions.

In a nutshell, it appears that real estate investors during the housing bubble tended to buy high and sell low.

EFFECT OF INVESTORS ON LOCAL HOUSE PRICES

All of this raises an important question: Did real estate investors' behavior influence local house prices as theory predicts, fueling the boom and prolonging the bust?

Analyzing house price movements and relative demand by real estate investors by zip code, Gao and I show that even after controlling for local fundamentals including population growth, income growth, and the unemployment rate, real estate investment helps predict house price movements. In the short run — within one to two years — house prices appreciated more in areas with high percentages of investment home purchases than in areas where investment purchases were scarce. However, after three to four years, house prices in these areas on average declined more significantly than in areas where investment home purchases were less prevalent.

For the Los Angeles area, Bayer and his coauthors also find that a greater percentage of purchases by inexperienced investors predicts above-average rates of appreciation for the area over the next one to two years and below-average price increases over the following three years. Unlike experienced investors and traditional homebuyers, inexperienced investors kept buying after prices peaked and held onto their houses well after 2007, when house prices had declined significantly.

Focusing on distant buyers, Chinco and Mayer show that an increase in purchases by distant second-home buyers as a fraction of total sales in a metropolitan area predicts an increase in house price appreciation rates in the following year.

Another channel through which real estate investors affect local house prices is through their propensity to default. There is strong evidence that investors are more likely than owners of just a primary residence to default on their mortgages and thus depress local house prices. For example, using the Federal Reserve Bank of New York/Equifax Consumer Credit Panel, Haughwout and his coauthors show that investor-owned homes accounted for more than 30 percent of mortgages 90 or more days delinquent in 2007. Similarly, Gao and I find that for prime mortgages, 90-day delinquency rates were 14 percent higher for investors than for owner-occupants.[17] Combining our results with those of Atif Mian and Amir Sufi, we conclude that increases in investment home foreclosure rates further slowed house price growth by 1.61 percent. Breck Robinson and Richard Todd also find that defaults and foreclosures occurred more often among investor-owned homes than owner-occupied homes.

Sorting out cause and effect. When we see higher prices in markets where purchases by investors are

[14] They use county deed records from DataQuick.

[15] Bayer and his coauthors use home sales data from DataQuick.

[16] This is obviously not a perfect definition, as those who flip four or more houses at a time can still be very inexperienced. According to their paper, only about 1 percent of purchases are made by experienced investors.

[17] We use LPS Applied Analytics data.

more prevalent, how do we know that expectations of higher prices based on market fundamentals are not causing more investors to enter a particular market? Or perhaps something else altogether is causing both higher prices and higher investor demand. Toward this end, Bayer and his coauthors and Chinco and Mayer analyze the timing of speculative transactions and establish that buying by investors continued to rise after house prices peaked and that sales by investors did not rise until after house prices had begun to decline. Put simply, investors had no better information about local house price dynamics than did traditional homebuyers. Rather than accurately reflecting the long-term outlook for house prices, investor behavior fueled short-term price movements and led to a long-term price correction.[18]

CONCLUSION

Research into the causes of the housing boom and bust has pointed largely to credit-related factors such as low interest rates, the growth of subprime mortgages, and increasingly lax lending standards. However, as this article has shown, recent evidence strongly indicates that intense speculation by individual real estate investors also significantly magnified the boom and worsened the bust.

[18] Gao and I estimate the causal relationship using a different strategy often employed in economics, epidemiology, and other disciplines when controlled experiments are not feasible that relies on *instrumental variables*. We identified two instruments for investor demand — state homestead exemptions, which protect a portion of the value of a primary residence from creditors' claims in personal bankruptcy cases, and the share of local employment in leisure and hospitality — that are reasonably closely related to investor demand but not related to prices through any channel other than investor demand. States with higher homestead exemptions provide greater incentives to buy costlier primary homes and thus should reduce the relative share of investment home purchases. The exemptions by themselves have no direct effect on home prices. Similarly, leisure and hospitality employment in a locality increases the relative demand for vacation homes, which are significantly more likely to be investment homes, but has no other connection to local home prices. See Gao and Li (2012). For the mathematical reasoning behind the instrumental variable approach and the actual implementation, see Greene (2012).

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RESEARCH RAP

Abstracts of research papers produced by the economists at the Philadelphia Fed

Economists and visiting scholars at the Philadelphia Fed produce papers of interest to the professional researcher on banking, financial markets, economic forecasting, the housing market, consumer finance, the regional economy, and more. More abstracts may be found at www.philadelphiafed.org/research-and-data/publications/research-rap/. You can find their full working papers at http://www.philadelphiafed.org/research-and-data/publications/working-papers/.

Using Bankruptcy to Reduce Foreclosures: Does Strip-Down of Mortgages Affect the Supply of Mortgage Credit?

The authors assess the credit market impact of mortgage "strip-down" — reducing the principal of underwater residential mortgages to the current market value of the property for homeowners in Chapter 7 or Chapter 13 bankruptcy. Strip-down of mortgages in bankruptcy was proposed as a means of reducing foreclosures during the recent mortgage crisis but was blocked by lenders. The authors' goal is to determine whether allowing bankruptcy judges to modify mortgages would have a large adverse impact on new mortgage applicants. Their identification is provided by a series of U.S. Court of Appeals decisions during the late 1980s and early 1990s that introduced mortgage strip-down under both bankruptcy chapters in parts of the U.S., followed by two Supreme Court rulings that abolished it throughout the U.S. The authors find that the Supreme Court decision to abolish mortgage strip-down under Chapter 13 led to a reduction of 3% in mortgage interest rates and an increase of 1% in mortgage approval rates, while the Supreme Court decision to abolish strip-down under Chapter 7 led to a reduction of 2% in approval rates and no change in interest rates. The authors also find that markets react less to circuit court decisions than to Supreme Court decisions. Overall, the authors' results suggest that lenders respond to forced renegotiation of contracts in bankruptcy, but their responses are small and not always in the predicted direction. The lack of systematic patterns evident in the authors' results suggests that introducing mortgage strip-down under either bankruptcy chapter would not have strong adverse effects on mortgage loan terms and could be a useful new policy tool to reduce foreclosures when future housing bubbles burst.

Working Paper 14-35. Wenli Li, Federal Reserve Bank of Philadelphia; Ishani Tewari, Yale School of Management; Michelle J. White, University of California, San Diego, Cheung Kong Graduate School of Business; National Bureau of Economic Research.

Enhancing Prudential Standards in Financial Regulations

The financial crisis has generated fundamental reforms in the financial regulatory system in the U.S. and internationally. Much of this reform was in direct response to the weaknesses revealed in the precrisis system. The new "macroprudential" approach to financial regulations focuses on risks arising in financial markets broadly, as well as the potential impact on the financial system that may arise from financial distress at systemically important financial institutions. Systemic risk is the key factor in financial stability, but our current understanding of systemic risk is rather limited. While the goal of using regulation to maintain financial stability is clear, it is not obvious how to design an effective regulatory framework that achieves the financial stability objective while also promoting financial innovations. This paper discusses academic research and expert opinions on this vital subject of financial stability and regulatory reforms. Specifically, among other

issues, it discusses the impact of increasing public disclosure of supervisory information, the effectiveness of bank stress testing as a tool to enhance financial stability, whether the financial crisis was caused by too big to fail (TBTF), and whether the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) resolution regime would be effective in achieving financial stability and ending TBTF.

Working Paper 14-36. Franklin Allen, Wharton School, University of Pennsylvania, Imperial College London; Itay Goldstein, Wharton School, University of Pennsylvania; Julapa Jagtiani, Federal Reserve Bank of Philadelphia; William W. Lang, Federal Reserve Bank of Philadelphia.

Banking Panics and Protracted Recessions

This paper develops a dynamic theory of money and banking that explains why banks need to hold an illiquid portfolio to provide socially optimal transaction and liquidity services, opening the door to the possibility of equilibrium banking panics. Following a widespread liquidation of banking assets in the event of a panic, the banking portfolio consistent with the optimal provision of transaction and liquidity services during normal times cannot be quickly reestablished, resulting in an unusual loss of wealth for all depositors. This negative wealth effect stemming from the liquid portion of the consumers' portfolio is strong enough to produce a protracted recession. A key element of the theory is the existence of a dynamic interaction between the ability of banks to offer transaction and liquidity services and the occurrence of panics.

Working Paper 14-37. Daniel R. Sanches, Federal Reserve Bank of Philadelphia.

Understanding House Price Index Revisions

Residential house price indexes (HPI) are used for a large variety of macroeconomic and microeconomic research and policy purposes, as well as for automated valuation models. As is well known, these indexes are subject to substantial revisions in the months following the initial release, both because transaction data can be slow to come in, and as a consequence of the repeat sales methodology, which interpolates the effect of sales over the entire period since the house last changed hands. The authors study the properties of the revisions to the CoreLogic House Price Index. This index is used both by researchers and in the Financial Accounts of the United States to compute the value of residential real estate. The authors show that the magnitude of revisions to this index can be significant: At the national level, the ratio of standard deviation of monthly revisions to the growth rate of the index, relative to the standard deviation of the growth rate in the index, is 29%, which is comparable to the relative ratio for other macroeconomic series. The revisions are also economically significant and impact measures used by policymakers: Revisions over the first 12 releases of the index reduce estimates of the fraction of borrowers nationwide with negative equity by 4.3%, corresponding to 423,000 households. Lastly, the authors find that revisions are ex-ante predictable: Both past revisions and past house price appreciation are negatively correlated with future revisions.

Working Paper 14-38. Ronel Elul, Federal Reserve Bank of Philadelphia; Joseph M. Silverstein, University of Pennsylvania; Tom Stark, Federal Reserve Bank of Philadelphia.

House-Price Expectations, Alternative Mortgage Products, and Default

Rapid house-price depreciation and rising unemployment were the main drivers of the huge increase in mortgage default during the downturn years of 2007 to 2010. However, mortgage default was also associated with an increased reliance on alternative mortgage products such as pay-option and interest-only adjustable rate mortgages (ARMs), which allow the borrower to defer principal amortization. The goal of this paper is to better understand the forces that spurred use of alternative mortgages during the housing boom and the resulting impact on default patterns, relying on a unifying conceptual framework to guide the empirical work. The conceptual framework allows borrowers to choose the extent of mortgage "backloading," the postponement of loan repayment through various mechanisms that constitutes a main feature of alternative mortgages. The model shows that, when future house-price expectations become more favorable, reducing default concerns, mortgage choices shift toward alternative products. This prediction is confirmed by empirical evidence showing that an increase in past house-price appreciation, which captures more favorable expectations for the future, raises the market share of alternative mortgages. In addition, using a proportional-hazard default model, the paper tests the fundamental presumption that backloaded mortgages are more likely to default, finding support for this view.

Working Paper 15-01. Jan K. Brueckner, University of California, Irvine; Paul S. Calem, Federal Reserve Bank of Philadelphia; Leonard I. Nakamura, Federal Reserve Bank of Philadelphia.

Recourse and Residential Mortgages: The Case of Nevada

The state of Nevada passed legislation in 2009 that abolished deficiency judgments for purchase mortgage loans made after October 1, 2009, and collateralized by primary single-family homes. In this paper, the authors study how the law change affected lenders' decisions to grant mortgages and borrowers' decisions to apply for them and subsequently default. Using unique mortgage loan-level application and

performance data, the authors find strong evidence that lenders tightened their lending standards for mortgages affected by the new legislation. In particular, lenders reduced approval rates and loan sizes for mortgages after implementation of the law. Borrowers, by contrast, did not delay their mortgage applications until after the law change. Furthermore, the law change did not appear to have affected borrowers' default decisions. These results cast a cautionary note on the effectiveness of policy recommendations that intend to use deficiency laws to curb mortgage defaults.

Working Paper 15-02. Wenli Li, Federal Reserve Bank of Philadelphia; Florian Oswald, University College London.

Localized Knowledge Spillovers: Evidence from the Agglomeration of American R&D Labs and Patent Data

The authors employ a unique data set to examine the spatial clustering of private R&D labs, and, using patent citations data, they provide evidence of localized knowledge spillovers within these clusters. Jaffe, Trajtenberg, and Henderson (1993, hereafter JTH) provide an aggregate measure of the importance of knowledge spillovers at either the state or metropolitan area level. However, much information is lost regarding differences in the localization of knowledge spillovers in specific geographic areas. In this article, the authors show that such differences can be quite substantial. Instead of using fixed spatial boundaries, they develop a new procedure — the multiscale core-cluster approach — for identifying the location and size of specific R&D clusters. This approach allows the authors to better capture the geographic extent of knowledge spillovers. The authors examine the evidence for knowledge spillovers within R&D clusters in two regions: the Northeast Corridor and California. In the former, the authors find that citations are from three to six times more likely to come from the same cluster as earlier patents than in comparable control samples. The results are even stronger for labs located in California: Citations are roughly 10 to 12 times more likely to come from the same cluster. The authors' tests reveal evidence of the attenuation of localization effects as distance increases: The localization of knowledge spillovers is strongest at small spatial scales (5 miles or less) and diminishes rapidly with distance. At the smallest spatial scales, the authors' localization statistics are generally much larger than JTH report for the metropolitan areas included in their tests.

Working Paper 15-03. Kristy Buzard, Syracuse University; Gerald A. Carlino, Federal Reserve Bank of Philadelphia; Robert M. Hunt, Federal Reserve Bank of Philadelphia; Jake K. Carr, Ohio State University; Tony E. Smith, University of Pennsylvania.

Housing over Time and over the Life Cycle: A Structural Estimation

The authors estimate a structural model of optimal life-cycle housing and nonhousing consumption in the presence of labor income and house price uncertainties. The model postulates constant elasticity of substitution between housing service and nonhousing consumption and explicitly incorporates a housing adjustment cost. The authors' estimation fits the cross-sectional and time-series household wealth and housing profiles from the Panel Study of Income Dynamics (1984 to 2005) reasonably well and suggests an intratemporal elasticity of substitution between housing and nonhousing consumption of 0.487. The low elasticity estimate is largely driven by moments conditional on state house prices and moments in the latter half of the sample period and is robust to different assumptions of housing adjustment cost. The authors then conduct policy analyses in which they let house price and income take values as those observed between 2006 and 2011. The authors show that the responses depend importantly on the housing adjustment cost and the elasticity of substitution between housing and nonhousing consumption. In particular, compared with the benchmark, the impact of the shocks on homeownership rates is reduced, but the impact on nonhousing consumption is magnified when the house selling cost is sizable or when housing service and nonhousing consumption are highly substitutable.

Working Paper 15-04. Supersedes Working Paper 09-7. Wenli Li, Federal Reserve Bank of Philadelphia; Haiyong Liu, East Carolina University; Fang Yang, Louisiana State University; Rui Yao, Baruch College.

Weather-Adjusting Employment Data

This paper proposes and implements a statistical methodology for adjusting employment data for the effects of deviation in weather from seasonal norms. This is distinct from seasonal adjustment, which only controls for the normal variation in weather across the year. Unusual weather can distort both the data and the seasonal factors. The authors control for both of these effects by integrating a weather adjustment step in the seasonal adjustment process. They use several indicators of weather, including temperature, snowfall and hurricanes. Weather effects can be very important, shifting the monthly payrolls change number by more than 100,000 in either direction. The effects are largest in the winter and early spring months and in the construction sector.

Working Paper 15-05. Michael Boldin, Federal Reserve Bank of Philadelphia; Jonathan H. Wright, Johns Hopkins University.

History and the Sizes of Cities

The authors contrast evidence of urban path dependence with efforts to analyze calibrated models of city sizes. Recent evidence of persistent city sizes following the obsolescence of historical advantages suggests that path dependence cannot be understood as the medium-run effect of legacy capital but instead as the long-run effect of equilibrium selection. In contrast, a different, recent literature uses stylized models in which fundamentals uniquely determine city size. The authors show that a commonly used model is inconsistent with evidence of long-run persistence in city sizes and propose several modifications that might allow for multiplicity and thus historical path dependence.

Working Paper 15-06. Hoyt Bleakley, University of Michigan; Jeffrey Lin, Federal Reserve Bank of Philadelphia.

A Seniority Arrangement for Sovereign Debt

A sovereign's inability to commit to a course of action regarding future borrowing and default behavior makes long-term debt costly (the problem of debt dilution). One mechanism to mitigate the debt dilution problem is the inclusion of a seniority clause in sovereign debt contracts. In the event of default, creditors are to be paid off in the order in which they lent (the "absolute priority" or "first-in-time" rule). In this paper, the authors propose a modification of the absolute priority rule that is more suited to the sovereign debt context and analyze its positive and normative implications within a quantitatively realistic model of sovereign debt and default.

Working Paper 15-07. Satyajit Chatterjee, Federal Reserve Bank of Philadelphia; Burcu Eyigungor, Federal Reserve Bank of Philadelphia.

Credit Risk Modeling in Segmented Portfolios: An Application to Credit Cards

The Great Recession offers a unique opportunity to analyze the performance of credit risk models under conditions of economic stress. The authors focus on the performance of models of credit risk applied to risk-segmented credit card portfolios. Specifically, the authors focus on models of default and loss and analyze three important sources of model risk: model selection, model specification, and sample selection. Forecast errors can be significant along any of these three model-risk dimensions. Simple linear regression models are not generally outperformed by more complex or stylized models. The impact of macroeconomic variables is heterogeneous across risk segments. Model specifications that do not consider this heterogeneity display large projection errors across risk segments. Prime segments are proportionally more severely impacted by a downturn in economic conditions relative to the subprime or near-prime segments. The sensitivity of modeled losses to macroeconomic factors is conditional on the model development sample. Models estimated over a period that does not incorporate a significant period of the Great Recession may fail to project default rates, or loss rates, consistent with those experienced during the Great Recession.

Working Paper 15-08. José J. Canals-Cerdá, Federal Reserve Bank of Philadelphia; Sougata Kerr, Federal Reserve Bank of Philadelphia.

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