

## The 2008 GFC: savings or banking glut?<sup>1</sup>

*This study analyses two hypotheses that ascribe the US financial crisis of 2008 to capital inflows. The Asian savings glut posits that net inflows into high-grade US public bonds from countries running current account surpluses led to the housing boom and bust. In sum, an excess of savings over investment abroad led to an excess of US investment over savings. The (European) banking glut holds that gross inflows into private bonds led to the boom. Leveraging up by European banks enabled the leveraging up of US households. This paper puts the spotlight on European banks as producers of, not just investors in, US mortgage-backed securities. Gross flows from Europe better matched US mortgage market developments: private credit risk, floating interest rates and narrow spreads. European banks leveraging up also provided credit that enabled housing booms in Ireland and Spain. These findings favour the European banking glut hypothesis.*

Large international capital inflows seem to cause or at least enable credit booms and asset price inflation. In the interpretation of Aliber and Kindleberger (2015), this relationship arises because of cross-currency positions.

Such positions can take the form of borrowing or investing. If domestic residents borrow in foreign currency and convert the proceeds into domestic currency under a flexible exchange-rate regime, they put upward pressure on the currency. A stronger domestic currency in turn flatters the balance sheet of the foreign-currency borrower: liabilities in foreign currency fall relative to equity in domestic currency. This can in turn make lenders willing to lend more to the borrowers (Bruno and Shin (2015)).

By the same token, foreign investors who exchange foreign currency for domestic currency and buy domestic bonds push up the exchange rate. Exchange rate appreciation, in turn, produces valuation gains for foreign investors that induce further inflows into bonds. In the mid-2000s, so-called carry traders borrowed dollars or euros and invested in Icelandic kroner, setting in train this self-reinforcing dynamic. Clearly, such dynamics were at work not just in Iceland, but in many other cases in which large international capital flows accompanied domestic credit booms and asset price inflation.

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The interpretation of Dooley (2019) is that the significance of foreign funding lies not in any behavioral difference between resident and nonresident investors or lenders, such as this currency effect. Rather, a larger pool of potential international sources of funding simply increases the elasticity of the supply of bank funding and makes it feasible to leverage up a risky strategy. With sufficient leverage, near-term profits from the risky strategy may be high enough to induce the rational bank manager to choose it. "The problem with international investors is that there are so many of them".

In the Great Financial Crisis (GFC), the key role of the exchange rate in Iceland was the exception, and Dooley's emphasis on elasticity of funding is more relevant elsewhere. Capital flows to the United States were almost entirely dollar-denominated and the highly leveraged mortgages that banks turned into securities were all dollar-denominated. Banks outside the United States who invested in the mortgage-backed securities did so with borrowed dollars. For their part, capital flows to Ireland and Spain were also almost entirely euro-denominated.<sup>2</sup> In none of these cases did the foreign exchange valuations feed back to encourage inflows, as described above. The US dollar actually trended downward from 2002-07, so that unhedged dollar investments gave rise not to valuation gains, as in Iceland, but rather to losses. But this dollar depreciation exerted no first order effect on the returns to European banks who borrowed US dollars to invest in risky US securities.<sup>3</sup>

In the 2000s the United States received two big capital flows from abroad and debate continues over which one deserves more credit for the boom in US credit and housing prices. Was it the savings glut flows or the banking glut flows?

Before the crisis, Bernanke (2005) and others had implicated a set of countries running current account surpluses in the US boom.<sup>4</sup> They argued that a savings glut in Asia (better a dearth of investment in countries hit by the Asian financial crisis in 1997-98) and among some commodity exporters had led to a strong bid for safe US bonds. This one-way investment put downward pressure on US bond yields and stimulated US investment, especially in homes. As a result, US spending rose relative to US output, widening the US current account deficit. An Asian excess of saving over investment thus led to an excess of US investment over saving. On this view, these "trans-Pacific" imbalances ultimately caused the GFC (Wolf (2014); Fergusson (2017)).

Others have pointed instead to two-way trans-Atlantic flows. In the 2000s, European banks leveraged up their equity with dollars borrowed from US and other investors and ploughed them into US private debt. More than anything else, they bought private label mortgage-backed securities (MBS), or complex bonds based on them. Their eager buying of such securities enabled their issuance to surpass that of government agency MBS in 2005. Leveraging up by European banks begat

<sup>2</sup> While Irish banks sourced funding in dollars and sterling, they swapped for euros. See Lane (2015).

<sup>3</sup> However, a second-order effect of the dollar depreciation on leverage actually encouraged European banks' to expand their dollar books. In particular, dollar depreciation allowed such banks to borrow and lend more dollars for a given degree of leverage of their stock of capital, which was mostly held in European currencies. See Fukao (1991).

<sup>4</sup> Bernanke et al (2011) recognised the domestic vulnerabilities that contributed to the crisis; Bernanke (2018) has emphasised the role of financial panic, recalling the "run on repo" of Gorton and Metrick (2012). Several prominent economists in the 2000s worried about current account imbalances and their accumulation into net external debt that would prove unsustainable. Summers (2004), Edwards (2005), Obstfeld and Rogoff (2005), Setser and Roubini (2005), warned of an impending sudden stop of financing that would lead the dollar to plunge and the US economy to enter a recession. Krugman (2007) memorably pictured the dollar reaching a Wile E. Coyote moment and then falling.

unsustainable leveraging by US households: the trans-Atlantic crisis (Bayoumi (2017)). In support of this view, Borio and Disyatat (2011) found that gross capital flows from Europe to the United States dominated the net capital flows from surplus countries; they denied the link between global imbalances and the GFC. Acharya and Schnabl (2010) showed that banks from both surplus and deficit countries, mostly in Europe, set up conduits to hold risky US MBS. Shin (2012) dubbed the alternative hypothesis the banking glut.

This chapter argues that, as an account of key features of the GFC, the savings glut story comes up short and the banking glut story gives more satisfaction. While the flows into US bonds from surplus countries may well have exceeded those from European banks, the latter better match developments in the US mortgage market. There European banks manned the production line of the private label MBS, as well as investing in them. Moreover, the more violent property booms in Ireland and Spain drew on even larger portfolio and money inflows from European banks.

The rest of this chapter analyses the two capital inflows, their imprint on the US mortgage market, and the role of European banks' US securities affiliates. A box sketches the larger but more traditional capital flows into Ireland and Spain. A final section concludes that European bank leverage enabled US, Irish and Spanish booms.

## Comparing and contrasting the two gluts

Let us first compare and contrast the capital flows associated with the savings and banking gluts and then pose two questions. Which flow better matches the big changes seen in the US mortgage market? How did the role of European banks' US securities affiliates as MBS producers enlarge the European footprint in this market?

The differences between the two stories bear emphasis (Table 1). Twice as much official money flowed into US bonds as European banks and others invested in US private asset-backed securities. In the first, official reserve managers purchased safe, longer-term US government obligations, generally funding themselves with domestic currency liabilities. In the second, banks purchased riskier, shorter term bonds backed by US mortgages, commercial real estate, etc, funded by short-term dollar debt. Asian reserve managers took duration risk. European banks took credit risk, buying risky so-called "spread product" to earn a margin over the cost of short-term funding.

The first story presents itself as a current account story, although some countries built foreign exchange reserves despite running current account deficits and some surplus countries did not build up foreign exchange reserves (Borio and Disyatat (2011)). The flow was one-way. The second story is a capital account story, with gross capital flow running in two directions. Current accounts drive long-term changes in countries' net international investment positions, albeit with important valuation effects (Gourinchas and Rey (2014)). The evolution of these positions lends itself to an analysis of sustainability that led to dire predictions of dollar crisis as cited above.

## Asian savings glut vs European banking glut

Table 1

	Asian savings glut	European banking glut
Size of inflow	\$1.7 trillion or 10% of US GDP	\$0.7 trillion or 5% of US GDP
Direction	One-way	Two-way; European banks borrow dollars
Protagonists	Official reserve managers	Commercial banks
Demand for safe assets	Positive	Negative: supply to US money-market funds
Duration of target bond	Medium to long term	Short to medium term
Leverage	Most foreign exchange reserves funded with short-term domestic currency instruments	Short-term dollars borrowed from US money market fund and others
Capital gains/losses	Gains on US Treasury bonds; little private MBS	Huge losses on private label MBS

Sources: Author's elaboration.

By contrast, the current account of the euro area, and of Europe as a whole, approximated balance, and few fretted about a sudden stop of European bank intermediation between US investors and highly leveraged US households. European banks funded portfolios of US assets by "round-tripping" dollar funds from the United States and back again (McGuire and von Peter (2012), Shin (2012) and Avdjiev (2016)). Dollars raised from US money market funds (Baba et al (2009)) flowed back Stateside through purchases of private MBS (Graph 1). Outflows to Europe matched the inflows from Europe, leaving *net* flows negligible. As a result, someone who looked only at the current account balance overlooked these accumulating flows and their risks.

The flows differed in their demand for safe assets. Focusing on the official inflow, Caballero et al (2008) saw it as chasing safe assets that Wall Street had a comparative advantage in producing. In fact, official reserve managers steered clear of risky private MBS, however rated (Ma and McCauley (2014)). Instead they hugged the shore of US Treasury bonds and US government supported agency bonds. Those developing this thesis overlooked European banks' *provision* of safe assets to US money market funds. These banks invested the proceeds in pseudo-safe MBS, many rated AAA, in so-called "credit arbitrage" which proved risky. Official reserve managers demanded dollar safe assets; European banks (ultimately thanks to government support) supplied them.

Official reserve managers had long since extended maturities from Treasury bills to Treasury and agency notes. Their sweet spot on the yield curve was at medium-term maturities (Graph 2), which provided extra yield to cover the cost of domestic liabilities or dollar depreciation. By contrast, European banks preferred to match their mostly short-term dollar funding with floating rate MBS. Below we discuss how the US mortgage market re-shaped itself around their demand, shifting from Treasury bills to Libor as the benchmark reference rate for adjustable-rate mortgages (ARMs).

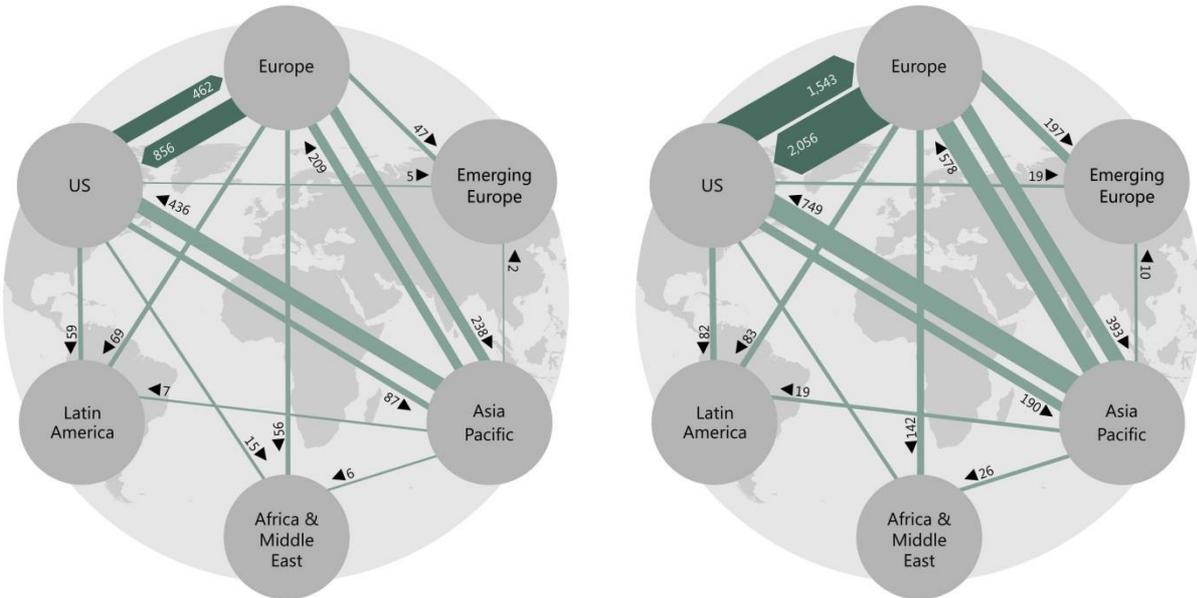
# US dollar-denominated cross-border claims: the transatlantic round-trip<sup>1</sup>

In billions of US dollars

Graph 1

2002

2007



<sup>1</sup> The thickness of the arrows indicates the size of the outstanding stock of claims. The direction of the arrows indicates the direction of the claims: arrows directed from region A to region B indicate lending from banks located in region A to borrowers located in region B.

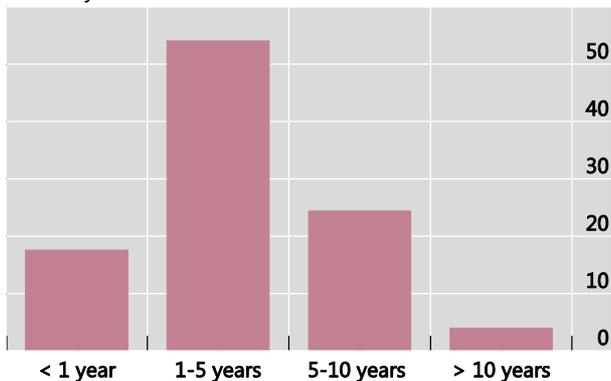
Source: Avdjiev et al (2016), based on BIS locational banking statistics.

The portfolio values diverged in the crisis. Official reserve managers enjoyed capital gains as US Treasury bond yields fell and the dollar rose (Gourinchas et al (2012); Bénétrix et al (2015)). European banks, along with US securities firms and some large US banks, suffered massive losses. The European banks responded by reducing exposures in Europe (Cecchetti et al (2012)), and elsewhere (McCauley et al (2019)).

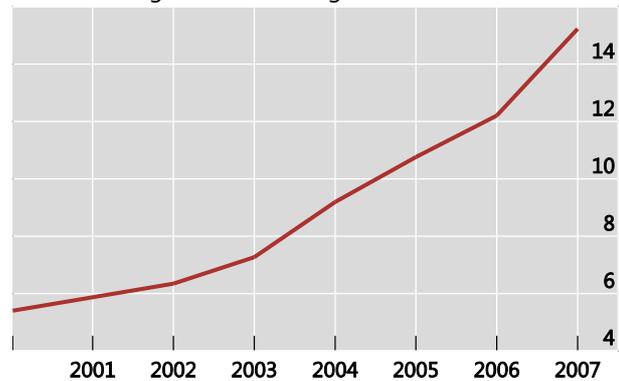
## Foreign official holdings of US Treasury securities, in percent

Graph 2

Maturity<sup>1</sup>



Ratio of foreign official holdings<sup>2</sup> to US GDP



<sup>1</sup> At 30 June 2007. <sup>2</sup> Includes long-term US Treasury and agency debt.

Source: US Treasury et al (2008, p 21); US Treasury et al (2007, p 13).

## Which capital flow matches US mortgage market trends?

Considerable evidence links inflows of bank or more generally debt capital to credit growth within an economy (see Box A). In the lead-up to the GFC, however, two very different capital inflows accompanied the boom in private credit, especially in the mortgage market, in the 2000s. One way of assessing their relative contributions is to compare the expected impact of each flow to the stylised facts of the evolution of the US bond market in those years.

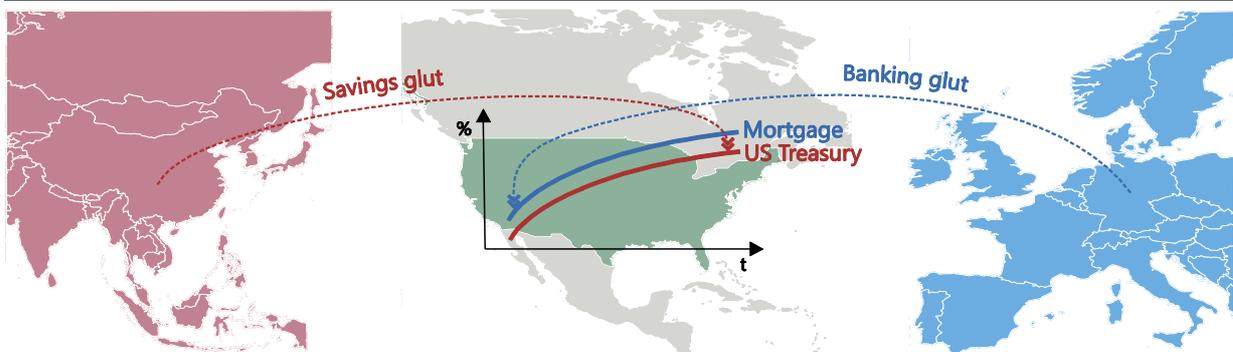
The Asian savings glut story predicted flows into Treasuries and agencies, lower Treasury yields, higher mortgage spreads, and more fixed-rate mortgages (Graph 3, red arrow). Risk-averse reserve foreign exchange managers typically prefer safe assets, including US Treasury and agency securities (McCauley and Rigaudy (2011)). Given their preference for intermediate-term notes, this inflow should have depressed Treasury yields at such maturity. US Treasury rates should have fallen by more than MBS yields (even with the diversification of reserve managers into agency securities). And the decline in fixed-rate mortgage yields should have biased mortgage lending towards those carrying fixed rates.

The banking glut story focuses on the effect of banks as buyers of risky private mortgage debts. Banks favoured the wider spread over US Treasury obligations that unguaranteed mortgages promised. This preference favoured shifting mortgage finance from publicly guaranteed to private label MBS. Since banks' readiest funding source is short-term, a banking glut favoured floating-rate debt. It would tend to narrow the gap between private yields (especially short- to medium-term) and US Treasury yields, and mortgage spreads in particular (Graph 3, blue arrow).

The first two predicted effects of the Asian savings glut – inflows into US Treasuries and lower Treasury yields – did indeed hold. As noted, \$1.7 trillion in official inflows flowed into US Treasury and agency bonds in 2000–07 (Graph 2, right-hand panel). This amounted to about 10% of GDP. Warnock and Warnock (2009) found 10-year yields were 80 basis points lower in 2005 as a result. Predictions regarding mortgage flows and yields did not pan out. Graph 4, left-hand panel shows that the spreads on fixed-rate agency and private jumbo MBS actually *narrowed* in the 2000s.

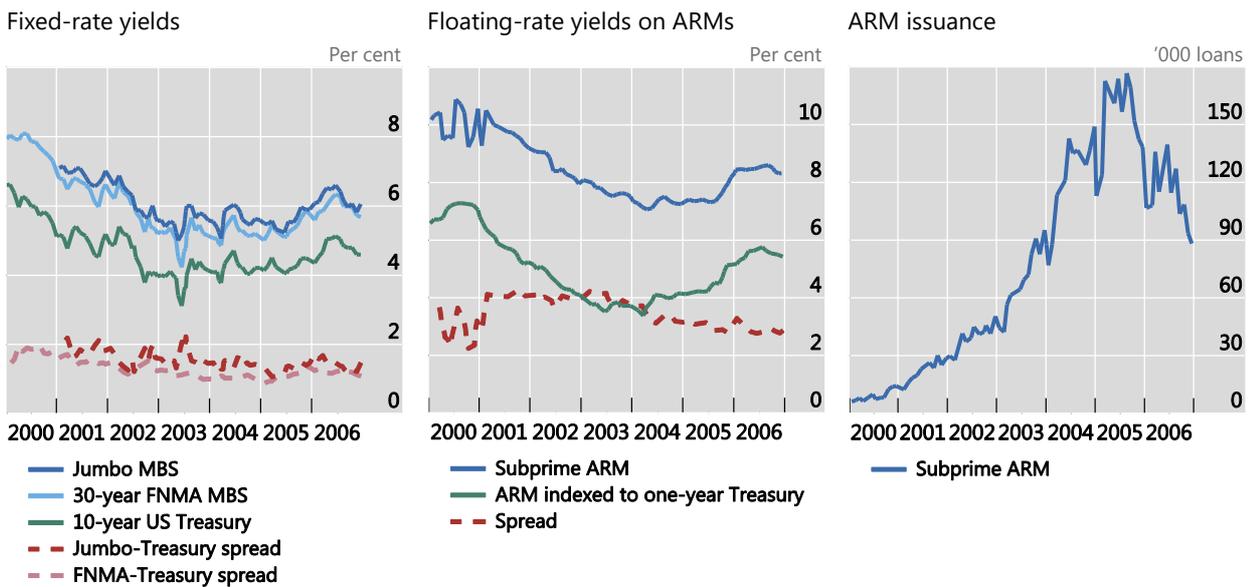
Competing hypotheses: capital flows and the US housing boom

Graph 3



The boundaries shown and the designations used on this map do not imply official endorsement or acceptance by the BIS.

Source: Author's elaboration.

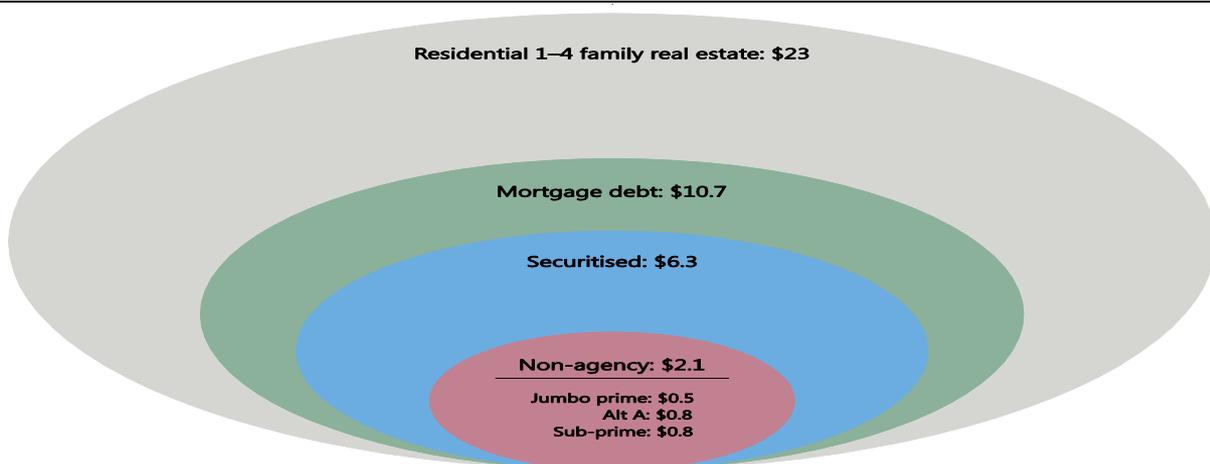


Sources: Berthaut et al (2012, p 227), citing CoreLogic; Bloomberg.

And, rather than this being the heyday of fixed rate mortgages as long promoted by the US agencies, ARMs bulked large among the new mortgages securitised without agency guarantees. As a result, fixed-rate mortgages declined from an estimated 78% of MBS issues in 2001 to just 60% in mid-2007 (Goodman et al (2008, Exhibits 1.2 and 1.5)). Thus, the fixed-rate bonds that reserve managers favoured lost share in the boom. In sum, key mortgage-market developments in the 2000s did not match what might expected from a big official flow into Treasury notes (Table 2, first column).

Value of US residential real estate and mortgages, June 2007

In trillions of dollars



Source: Goodman et al (2008), pp 3-4.

## Which flow matched developments in the US mortgage market?

Table 2

Official investors: buy safe assets		European banks: buy private label MBS	
Favour gov't guaranteed mortgages	☒	Favour wider spread private label MBS	☑
Favour fixed-rate mortgages	☒	Favour adjustable rate mortgages	☑
Widen mortgage-Treasury spread	☒	Narrow mortgage-Treasury spread	☑

Sources: Author

The predictions of the banking glut story perform better (Table 2, second column). First, European banks' demand drove US mortgage finance away from government guarantees to private credit risk. Non-agency mortgages reached 55% of all gross issuance in 2005 and 2006 (Goodman et al (2008, p 6)). In stock terms, non-agency securitisations reached one-third the total (Graph 5). Second, ARMs predominated in private label MBS, at 62% (Goodman et al (2008 pp 6, 10)), matching banks' short-term funding. Turning around the observation above, their rapid growth took the share of ARMs in 2006 up to 40% of all MBS issued. In terms of rates, spreads actually narrowed. For mortgages, this is also observed for non-agency ARMs. Graph 4, centre panel shows that the spread between sub-prime ARMs and "conforming", agency ARMs declined by 100 basis points between 2002 and 2006, even as issuance exploded (right-hand panel). One can infer *very strong demand*.

## Did European banks hog private US MBS?

A key element of the banking glut view is the drive by European banks to load up on risky US mortgages. However, Bertaut et al (2012) report that European investors, including banks, put a weight on private label asset-backed securities (ABS) of 23%, much the same as US investors, at 20% (Table 3, fourth column). ABS include residential and commercial MBS, and bonds backed by car loans, airline leases, etc. These data represent holdings by residence.

The more telling observation, however, requires data compiled on a nationality basis. European bank balance sheets and national borders did not coincide. In particular, six European banks had US securities affiliates that ranked among the top 15 underwriters of sub-prime MBS (Table 4). RBS's Greenwich ranked first with a 12% share, above that of Lehman, Bear Stearns and Morgan Stanley. Greenwich, along with Credit Suisse (ranked fifth). Deutsche (7), UBS, Barclays and HSBC, claimed a 35–40% share. Crucially, they retained that share as the US securities firms grabbed market share from the big US banks and others in 2004–05 (memorandum items on Table 4).

There are three good reasons to suppose that these six European banks held about a quarter of a trillion dollars worth of US MBS in mid-2007 on the balance sheets of their US securities affiliates (see Table 5 for consolidated end-2007 data). First, their business models involved holding such securities on the US book. Second, contemporary observation indicated that one did so. And third, huge aggregate losses by foreign-owned securities firms in 2008 suggest they did.

## Holdings of bonds issued in the United States by European and US investors

At end-2002 and mid-2007

Table 3

	end-2002		June 2007			
	\$ billions	share <sup>1</sup>	Residence-based		Nationality-based	
			\$ billions	share <sup>1</sup>	\$ billions	share <sup>1</sup>
<b>European investors</b>						
Treasuries and agencies	575	57%	704	30%	704	26%
Corporate excluding ABS	340	34%	1,119	47%	1,119	42%
ABS	93	9%	558	23%	853	32%
Total	1,008	100%	2,381	100%	2,678	100%
<b>US investors</b>						
Treasuries and agencies	7,324	54%	8,194	45%	8,194	46%
Corporate excluding ABS	4,349	32%	6,324	35%	6,324	35%
ABS	1,807	13%	3,621	20%	3,326	19%
Total	13,480	100%	18,138	100%	17,842	100%
<i>Memo: ABS outstanding</i>	<i>1,978</i>	<i>12%</i>	<i>4,523</i>	<i>19%</i>	<i>4,423</i>	<i>19%</i>

<sup>1</sup> For European and US investors, this column shows the share of their portfolio of US bonds that is devoted to the instrument in the row.

Sources: Adapted from Bertaut et al (2012, Table 2); Table 4; author's calculations.

First, the business model of underwriting private MBS by of 2007 had evolved to include holding a substantial fraction of the product. What Goldstein and Fligstein (2017) liken to a Henry Ford type production line started with a "warehouse" of mortgages that underwriters would assemble into MBS. Underwriters then sliced and diced these into CDOs and booked them as trading assets. By 2007, underwriters could sell lower-rated, wider spread securities, but mostly ended up holding the "super-senior" tranches in their trading books.<sup>5 6</sup>

Second, observation at the time confirmed this practice. "At least towards the end of the mortgage boom, the CDO securitization business functioned only to the extent that market players such as UBS, Merrill Lynch and Citigroup were willing and able to retain 'unattractive' low-yield Super Senior CDO tranches of individual securitizations on the own (trading) books" (Swiss Banking Commission (2008, p 7); also Zuckerman (2010, p 176)). MBS underwriting strongly predicted senior MBS tranche holdings by US banks (Erel et al (2014)). For UBS the Commission (p 5) reported that "the CDO Desk had not only securitized CDOs and sold such CDOs to investors, but had retained the Super Senior CDOs on its own (trading) books".

<sup>5</sup> By contrast, Cayman Island entities owned MBS held in asset-backed commercial paper (ABCP) conduits, designed to keep the assets off the sponsor's balance sheet. US Treasury (2008) should have captured these holdings in mid-2007 as foreign. In 2007, European banks sponsored ABCP conduits holding at least \$100 billion in US MBS (Moody's (2007), Acharya and Schnabl (2010, p 56) and Acharya et al (2013, p 522). Table 3, last column, thus understates European exposures.

<sup>6</sup> Greg Lippmann at Deutsche Bank wrote about the buyers of MBS tranches in February 2007 (US Senate (2011, p 349): "[T]he other side is all cdos..so it is the cdo investors who r on the other side who buys cdos: aaa-reinsurance, ws [Wall Street] conduits, European and Asian banks, aa-high grade cdos, European and Asian banks and insurers..some US insurers, bbb other mezz [mezzanine] abs [asset-backed security] cdos (i.e. ponzi scheme), European banks and insurers, equity some US hedge funds, Asian insurance companies, Australian and Japanese retail investors through mutual funds."

Non-US banks' US securities affiliates' underwriting of sub-prime MBS deals

Table 4

	1997-2001	2002	2003	2004	2005	2006	2007	Total
Greenwich (RBS) <sup>1</sup>	17	10	16	28	30	30	17	148
Lehman	10	8	16	20	31	31	14	130
Bear Stearns	5	1	6	23	34	27	16	112
Morgan Stanley	3	4	12	29	29	20	13	110
Credit Suisse	10	10	13	23	25	13	6	100
Merrill Lynch	3	0	4	12	31	34	9	93
Deutsche Bank	4	7	13	15	20	24	8	91
Goldman Sachs	0	3	5	17	20	22	9	76
Bank of America	5	8	14	18	11	6	5	67
Citigroup	0	2	6	9	16	17	14	64
JP Morgan	5	7	7	4	8	21	8	60
UBS	0	1	8	13	15	20	3	60
Barclays	0	0	0	8	15	19	8	50
Countrywide	0	4	8	14	5	0	0	31
HSBC	0	0	0	0	4	13	6	23
Others	13	5	6	2	10	27	2	65
<b>Total</b>	<b>75</b>	<b>70</b>	<b>134</b>	<b>235</b>	<b>304</b>	<b>324</b>	<b>138</b>	<b>1280</b>
<i>Memorandum:</i>								
<i>of which foreign bank</i>	31	28	50	87	109	119	48	472
<i>....foreign bank %</i>	41.3%	40.0%	37.3%	37.0%	35.9%	36.7%	34.8%	36.9%
<i>of which US sec firm</i>	21	16	43	101	145	134	61	521
<i>US sec firm %</i>	28.0%	22.9%	32.1%	43.0%	47.7%	41.4%	44.2%	40.7%
<i>of which US bank etc</i>	23	26	41	47	50	71	29	287
<i>....US bank etc %</i>	30.7%	37.1%	30.6%	20.0%	16.4%	21.9%	21.0%	22.4%

<sup>1</sup> Listed separately in the source, Greenwich Capital and RBS Greenwich are combined.

Sources: Nadauld and Sherlund (2013, p 457), based on ABSnet; author's calculations.

Third, the ex post aggregate profitability of foreign-owned securities subsidiaries in the United States points to private MBS having been held on US-resident balance sheets. European broker-dealers racked up large losses in 2008 from write-downs of assets, consistent with their having retained ultimately toxic bonds on their US books. The US Bureau of Economic Analysis reports that European-owned non-banking finance and insurance firms took capital losses from "widespread write-downs of financial assets" (Ibarra and Koncz (2009, p 29)) of no less than \$110.8 billion in that crisis year (Lowe (2011, p 98)).<sup>7</sup>

Write-offs of such scale could easily have been required on the \$249 billion of MBS held by the 6 European banks' securities affiliates at end-2007 (Table 5). No doubt, the data from 2008 annual reports and official or officially mandated reports are not consistent across banks, with Credit Suisse in particular reporting on a net

<sup>7</sup> The presumption is that UBS' US affiliate took losses on the \$25 billion in US ABS transferred at appraised prices by UBS to the SNB-funded Stabilisation Fund in September 2008 (Swiss National Bank (2010, pp 83-85)). In the BEA data, foreign-owned non-banking finance and insurance firms reported overall losses of \$60 billion in 2008. This sum exceeded the net losses of \$40 billion recorded by the rest of foreign-owned firms in the financial sector, including depository institutions. Foreign-owned depository institutions (presumably including ING Direct USA) reported capital losses of \$41 billion (Lowe (2011, p 98)). Asian- and Canadian-owned non-banking affiliates, absent from Table 4, reported capital losses of only \$1.7 billion and \$5.7 billion, respectively.

## Holdings of US non-agency MBS by European banks with US broker-dealers

In billions of dollars at end-2007

Table 5

	Non-agency mortgage-backed bonds			Total assets	Share of assets
	Residential	Commercial	Total		
Barclays	31	11	32	2,458	1.3%
Credit Suisse <sup>2</sup>			9	1,208	0.7%
Deutsche Bank	20	NA	20	2,840	0.7%
HSBC	26	10 <sup>1</sup>	36	2,354	1.5%
RBS			84	3,645	2.3%
UBS			68	2,055	3.3%
Total			249		
<i>Memo: ING</i>	46	NA	46	1,930	2.4%

<sup>1</sup> Estimated from annual reports. <sup>2</sup> Trading book concept; net of hedges.

Sources: Annual Reports: Barclays, 2008, pp 106, 113; Credit Suisse, 2008, p 71; Deutsche, 2008, pp 19–21; HSBC, 2008, pp 152–57; RBS, 2008, p 35; ING, 2008, p 140. Other: FSA (2011, p 52); UBS (2008, pp 6–7); Netherlands House of Representatives (2013).

trading positions basis.<sup>8</sup> Moreover, some of the exposures of the other 5 banks were hedged, though it is not possible to say how much.<sup>9</sup>

If these exposures were held in the US books, then European banks did take on more than their share of the risk arising from leveraged US mortgages. From a nationality perspective, such holdings add to European investors' holdings and subtract from US investors' holdings. This is shown in the modification of the figures reported by Bertaut et al (2012) in the last two columns of Table 3.

On this showing, European investors, including banks, loaded up on risky US MBS. At end-2002, their US bond portfolio resembled that of US investors. Their portfolio consisted of mostly safe Treasury and agency securities, with about a third of it in plain vanilla US corporate bonds. By mid-2007, the profile of European investors' US bonds had veered away from that of US investors towards riskier bonds. Even on a residence basis (middle columns of Table 3), European investors had shifted out of safe Treasury and agency securities into corporate bonds, while US resident portfolios kept Treasury and agency securities in first place. On a nationality basis (right two columns in Table 3), including holdings at US brokers, European investors had promoted ABS to second place, above safe assets in third place.<sup>10</sup>

The US mortgage market reshaped its pricing around the needs of foreign banks in the 2000s, highlighting their importance as investors. Historically, ARMs were priced off of national reference rates, mostly one-year Treasury bills. As securitisation picked up with non-US banks as big investors, US mortgage bankers shifted to using

<sup>8</sup> Lewis (2014) describes how a Morgan Stanley position (sold in part to UBS) took a short position in BBB tranches and netted it against a multiple long position in AAA tranches, with disastrous results.

<sup>9</sup> Deutsche Bank's CDO desk famously put on a multi-billion dollar short (Zuckerman (2010); Dunbar (2011); Lewis (2014)), but US Senate (2011) found that overall the bank was still long and took losses.

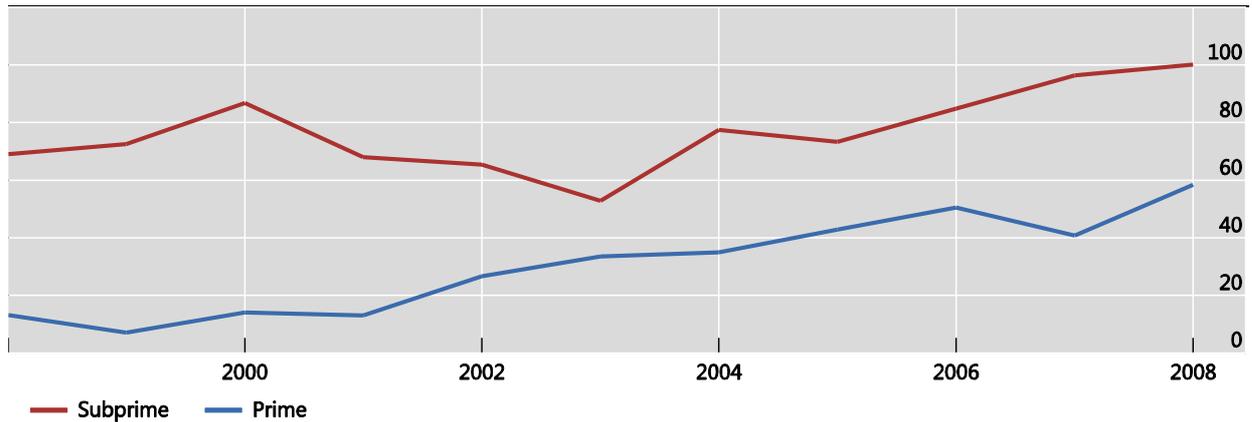
<sup>10</sup> Within ABS, foreign investors had more than their share of ultimately risky mortgage bonds. Beltran et al (2008, Table 6) estimate that non-US investors held 29% of \$2.2 trillion in securitised non-agency home mortgages. Including amounts in Table 5 on the assumption that they were held on balance sheets in the United States takes this share above 40%. This share is well above private foreign investors' 14% of US Treasury bonds outstanding or 9% of agency bonds outstanding.

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## Libor reference rate share of US adjustable-rate mortgages, Ohio, July 2008<sup>1</sup>

In per cent

Graph 6



<sup>1</sup> Alternative to Libor is the one-year Treasury constant maturity rate as published by the Board of Governors of the Federal Reserve.

Sources: Schweitzer and Venkatu (2009), citing McDash Analytics.

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offshore Libor as the reference rate. Thus the stock of Ohio mortgages in July 2008 shows that later vintages of ARMs referred more and more to Libor (Graph 6). The Libor-linked share of subprime reached practically 100%, while that of prime mortgages rose even faster from less than 20% in the turn of the century vintages to 60% by 2008.<sup>11</sup> The benchmark was not “Changed by Wall Street, for Wall Street” as Morgenson (2012) headlined, but rather for Lombard Street (London) and for Taunusanlage (Frankfurt).

In sum, European banks claimed a market share of a third or more in the production of highly leveraged MBS. Like the US securities firms analysed by Nadauld and Sherlund (2013), as these underwriters ramped up production, they sent a signal to mortgage bankers to extend more credit. Moreover, European investors, especially European banks, bulked large as ultimate holders of such paper as well. The influence of European banks in the market helped to propel Libor to displace US Treasury bills as the preferred reference rate in floating-rate US mortgages.

## Why did European banks bet the bank on US mortgages?

Why did European banks do it? Their management aimed at market share and size as ends in themselves, as the means to prestige and compensation and as a defense against takeover. In 2005, a tie-up between Deutsche Bank and Citicorp was seriously considered. Size was a consideration in the rating agencies reckoning of the likelihood of government support in extremis, so getting bigger could help raise the rating.

Nadauld and Sherlund (2013) and Bayoumi (2017) highlight the role of regulation and easy access to repo finance. The application of the international rules known as

<sup>11</sup> “It was all about securitization, especially subprime loans,” said Guy D. Cecala, publisher of *Inside Mortgage Finance*, an industry authority. “You had Wall Street saying, ‘If we want to sell this overseas, we have to pick a more international-flavored index.’ Subprime lenders just started using it overnight, and then it started to spill out into any loan you wanted to securitize” (Morgenson (2012)).

Basel II allowed big banks to use their own models to evaluate the riskiness of their assets and permitted US securities firms and European banks to pile 50 or more dollars or euros on every dollar or euro of equity (see also Dunbar (2011)). Bayoumi (2017) emphasizes an SEC rule change that allowed private label MBS to be used to raise cash in the repo market. However, such regulation was no more than permissive.

Reading official, officially inspired and journalistic reports on European banks that bet their future on US mortgages, one finds variations on the theme of market share and growth. UBS' *Shareholder report on write-downs* (2008), even if only "semi-honest" (Lewis (2014)), is a remarkable document. Management had to assess what went wrong, and did so before Lehman's collapse in September 2008 and the subsequent Swiss government rescue. After his appointment effective July 2005, the new CEO of Investment Banking hired consultants that identified a widening gap between UBS and the top 3 competitors in fixed income, credit and commodities. The consultants recommended that UBS bulk up in its structured credit, with no reference to the associated risks (pp 10-11; Zaki (2008, p 19)). Board approval did not include any specification of sub-prime as part of the strategy. This is classic market-share based growth. The report describes the US operations as revenue-maximising with no hard (risk-weighted or other) asset constraint. Zaki (2008, pp 11, 15) also notes the ambition to rival Goldman Sachs and Merrill Lynch and the conviction that customers want to deal with the global top 5. ...

One symptom of the impulse to growth is that UBS not only kept portions of its own securitisations, as did other underwriters. In addition, it bought the super-senior tranches that other banks underwrote.<sup>12</sup>

The CEO of RBS, which had swallowed Natwest and would swallow much of ABN-Amro, spoke of growing larger than not only JP Morgan but also Barclays (Martin (2013, p 194)). Approached by the head of a 25-person team of mortgage securitisation bankers from Citigroup, RBS management took on a dozen from September 2006.<sup>13</sup> Perhaps the group sought to move because it had loaded Citi's balances sheet.<sup>14</sup> The acquisition of ABN-AMRO attracted RBS management precisely because it would increase their capital market footprint. If headlong growth passed for management strategy, institutional investors imposed no constraint. No less than 94.5 percent of RBS shareholders who voted approved, well above the 50 percent needed.

In November 2003. Barclays' board set as a strategic objective being one of the top 5 global universal banks (Augar (2018, p153)). The reasoning was that clients rewarded scale with scale and that consequently the biggest universal banks did better than those in the second division.

ING backed into US mortgage-backed securities as a means to expand its liability-driven internet banking (Kalse (2009)). When it entered the US market with its proven internet bank account product, it chose to establish its subsidiary as a thrift.

<sup>12</sup> Erel et al (2014) give prominence to the theory that banks held highly rated securitization tranches as a by-product of underwriting. Lewis (2014) reports the horror of many at UBS on learning that the bank had bought a supposedly hedged package of long super-senior tranches and short mezzanine tranches from Morgan Stanley.

<sup>13</sup> FSA (2011, p 140) leads with the "strategic decision [by RBS] to expand aggressively its structured credit and leveraged finance business" in 2006 in its account of losses in credit trading activities.

<sup>14</sup> Erel et al (2014, pp 405-6) note that "Citigroup recorded the largest amount of writedowns among [US] bank holding companies and its holdings of highly rated tranches, including off-balance sheet holdings, amounted to 10.7% of assets, or roughly \$201 billion at the end of 2006"

This required that mortgage assets form the bulk of its assets. At first, it invested in agency-backed bonds. Then it shifted to Alt-A bonds to increase yields, which in turn allowed it to post better rates and to expand its liabilities faster.

European banks played a leading role in the Spanish and Irish real estate and credit booms as well. These combined massive capital inflows through the banking system, vast expansions of domestic credit and booming real estate prices (Box A).

## The Spanish and Irish cases: larger inflows from European banks, bigger booms

The Irish and Spanish cases resembled the US case in several salient respects. Both featured a large increase in private credit, big run-ups in house prices and, one way or another, a huge inflow of bank capital. The securitisation of mortgages in the United States should not obscure the role of banks as buyers of the bonds (Connor et al (2012)). And rather than just a heavy reliance on floating rate mortgage at the margin, these European economies relied entirely on floating-rate mortgages.

The Spanish and Irish booms differed in important respects, however: monetary policy, Asian savings and securitisation. Since both Spain and Ireland were part of the euro area, short-term interest rate setting looked to a broader economic domain than these two booming countries in the periphery. As a consequence, whereas there is a debate over whether the Federal Reserve set policy rates too low in the early to mid-2000s, all observers agree that the ECB set short-term rates too low during this period *for Spain and Ireland* (Regling and Watson (2010)).

The investment of official reserves likely exerted less downward pressure on long-term yields in the euro area than such investment put on US Treasury yields. Dollars attracted about two-thirds of reserves in the 2000s and euros only 20–25%. Add the thoroughgoing reliance on floating rate mortgages in these European countries and it is hard to pin much of their booms on the Asian savings glut.

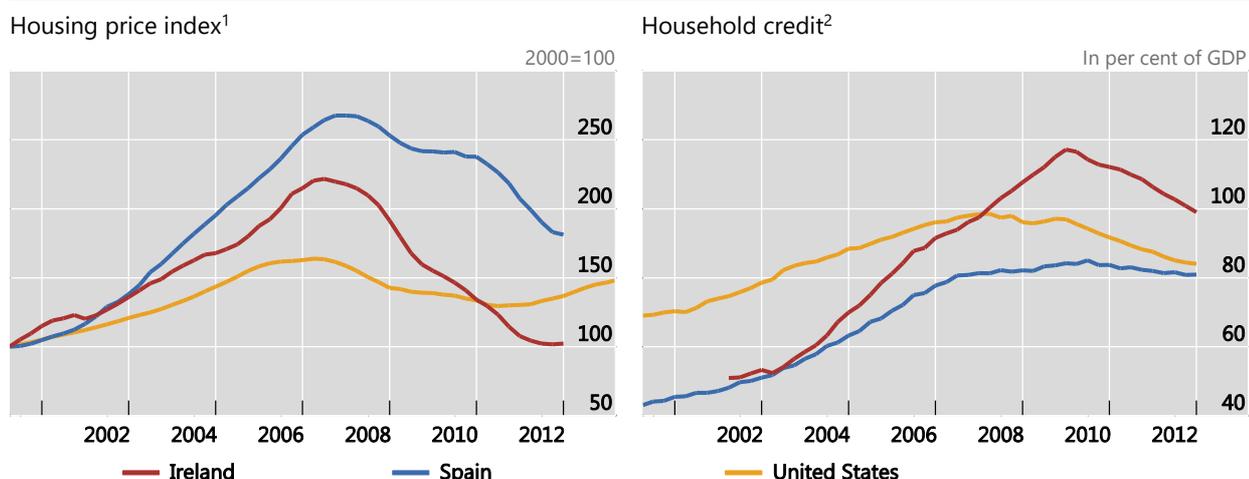
The role of securitisation, the focus of many analyses of the US case, was much reduced in Spain and basically absent in Ireland. In Spain, the regional *cajas* depended heavily on so-called covered bonds to fund their mortgages; and 75% of these were held by foreign investors (Berges et al (2012)), notably German banks. These do not remove the risk of the mortgages from the originator, so they are better viewed as long-term secured funding rather than as securitisation proper. Other forms of securitisation did not qualify for removal of the assets from the balance sheet owing to limited risk transfer (Almazan et al (2015)).

With little risk transfer of real estate credit, the Irish and Spanish banks only shared their boom exposures to the extent that foreign banks participated in the credit booms directly. In Ireland's case, the RBS subsidiary, Ulster Bank, did manage to run up significant losses, for which the UK rather than the Irish taxpayers ended up paying. In Spain, the foreign bank role was limited. The international diversification of the two largest Spanish banks did stand them in good stead as earnings abroad stabilized their profitability.

One aspect that differs in the Irish and Spanish cases from the US case is the exposure of banks to property companies. They brought exposure not only to commercial real estate, but also to the construction of houses. On close inspection, the profitability of the latter in a boom frequently turns on speculation in raw land. This reinforced the banks' exposures to the feedback loop among capital inflows, credit growth and real estate prices.

### Housing price and household credit

Graph A1



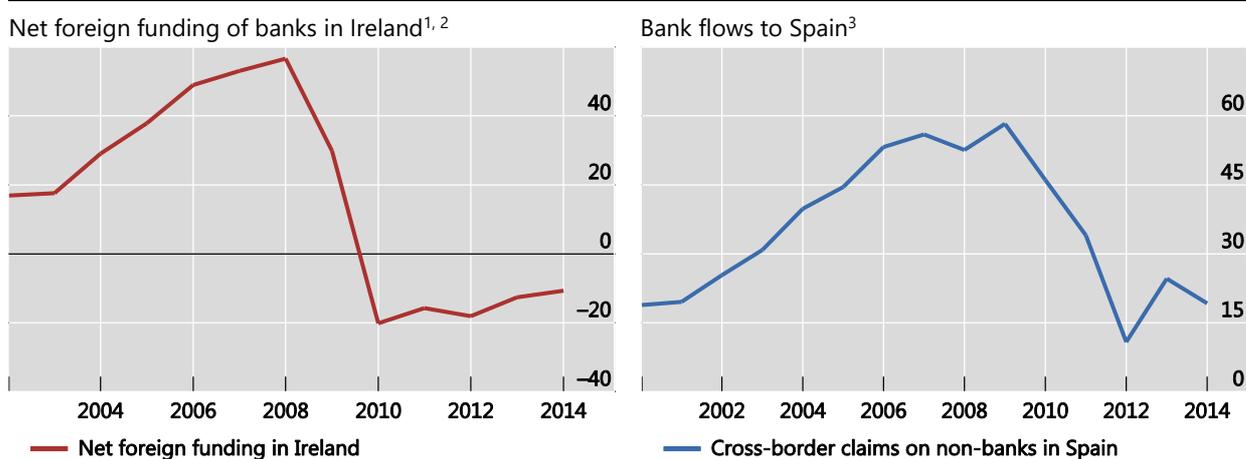
<sup>1</sup> Nominal house price indices, seasonally adjusted. <sup>2</sup> Includes non-profit institutions serving households, not seasonally adjusted.

Sources: OECD; BIS.

## Massive bank flows to the euro periphery

In per cent of GDP

Graph B2



<sup>1</sup> Sum of all non-residents' deposit liabilities, debt securities issued and remaining liabilities less all non-residents' loan claims, holdings of securities and remaining assets by credit institutions (domestic market group). <sup>2</sup> Data in January 2003 used as a proxy for December 2002. <sup>3</sup> Includes net interbank claims on banks in Spain.

Source: Bank of Ireland; IMF; BIS Locational banking statistics.

House prices, household indebtedness and associated capital inflows all traced more extreme trajectories in Ireland and Spain than in the United States. By the lights of the OECD, at least, house prices boomed more in Spain and Ireland than in the United States (Graph A1, left-hand panel). However, the US index conceals significant regional variation: the Case-Schiller 20-city index for the United States more than doubled between 2000 and the peak in mid-2006.

Ireland takes the prize for the largest run up in household debt as a share of GDP (Graph A1, right-hand panel). It rose by 50% of GDP through 2008, even before the ratio surged as the denominator fell. But Spain was not far behind. On this measure, the US experience was again relatively mild.<sup>①</sup>

However, the Irish and Spanish cases distinguish themselves from the US case in the scale of the capital inflow. Graph A2, left-hand panel shows the net foreign liabilities of the banks in Ireland with local lending business.<sup>②</sup> It shows a net inflow of over 50% of GDP (Everett (2017)). Recall that the inflow of official reserves into US Treasuries from end-2000 to mid-2007 amounted to 10% of 2007 GDP, and the change in European investors' holdings of US ABS in the same period amounted to about half that. In other words, even stripping out offshore activity in Ireland, and counting both the transpacific and transatlantic flows to the United States, the inflow of external funding into the Irish banking system was triple that of the United States.

The inflow of bank credit to Spain also reached staggering proportions (Graph A2, right-hand panel). Since Spain does not have a large presence of "offshore" banking, we simply sum the stock of BIS cross-border bank claims on nonbanks in Spain with the net claims of banks outside of Spain on banks in Spain (see Avdjiev et al (2012) for further discussion). This aggregate rose from 15% of Spanish GDP to almost 60%.

Despite the differences, a similarity stands out. European banks enabled credit booms in the United States, Ireland and Spain. US losses crippled many European banks and sapped their defences against strains in Europe.

<sup>①</sup> The US figures include credit to non-profits. <sup>②</sup> This focus on net liabilities of certain banks incorporated in Ireland seeks to exclude the large "offshore" banking presence in Ireland. See Honohan (2006), Central Bank of Ireland (2010) and Lane (2015).

## Conclusions

The GFC was, in DeLong's (2009) phrase, the "wrong crisis" that struck the wrong part of the US bond market (Tooze (2018)). Official reserve managers *could* have staged a sudden stop or even reversal of their purchase of US Treasury bonds. This *could* have imposed a dollar depreciation and a costly adjustment on the US economy. Instead, in 2007-08, highly leveraged European banks scrambled to secure dollar funding as they experienced credit losses—and the dollar appreciated sharply (McCauley and McGuire (2009)). European banks' vulnerability arose from their role as *producers* of the ultimately toxic assets as well as from their role as *investors*. As a result, their affiliates' US balance sheets required massive write-downs in 2008.

The banking glut better than the savings glut accounts for US mortgage market developments of the 2000s. Large official inflows into US Treasury and agency notes should have reinforced a US mortgage market dominated by fixed-rate mortgages that enjoyed government agency guarantees. Instead, we observe a big shift to mortgages priced with floating ("adjustable") interest rates and to more risky, leveraged mortgages that agencies could not guarantee. The dominance of the savings glut with its demand for safe assets should have manifested itself in wider spreads but the spread of the riskiest mortgages over normal mortgages actually narrowed.

The banking glut also better accounts for the parallel real estate booms and busts in Spain and Ireland. True, official reserve managers did invest in euro-denominated government bonds. But the Irish and Spanish mortgage markets work on floating rates closely tied to the policy rates set by the ECB. Again, expansion-minded European banks provide a more compelling account of these banking systems' remarkable ease of external financing. In fact, the Irish and Spanish banking systems experienced capital inflows that were huge in relation to the inflows into the United States in the same years.

The Irish and Spanish credit and real estate booms did not require features much emphasised in the US case (eg FCIC (2010)): securitisation with (or without) risk transfer (Connor et al (2012), Carbo-Valverde (2012), Almazan et al (2015), Acharya et al (2013)), or reliance on faulty, conflicted ratings (UBS (2008)), or a big government role in the housing market (Rajan (2010)); Morgenson and Rosner (2011)). But banks in Ireland and Spain did depend on credit from European banks that were working their equity harder. Occam's razor opts for one account for such similar and simultaneous phenomena.

European banks grew at breakneck rates in the pursuit of market share, spurred by consultants who foresaw a narrow circle of global universal banks. Greater size also improved credit ratings if it increased the prospect of government support. Greater size also reduced the risk of takeover, a far from imaginary risk. Bank managers chose growth and several factors, including regulation, low volatility and access to short-term repo finance all conspired to permit it. In addition to being the much-reported and hapless investors in bespoke mortgage securities produced by US broker-dealers, European banks also manned the production line and, like their US counterparts, kept unsalable "safe assets" on their balance sheets.

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