

The 2008 crisis: transpacific or transatlantic?¹

This study analyses two hypotheses that ascribe the 2008 US financial crisis to capital inflows. The Asian savings glut hypothesis posits that net inflows into high-grade US public bonds from countries running current account surpluses led to the housing boom and bust. An excess of savings over investment abroad led to an excess of US investment over savings. The European banking glut hypothesis holds that gross inflows into private bonds led to the boom. Leveraging-up by European banks enabled the leveraging-up of US households. Gross flows from Europe better matched US mortgage market trends towards private credit risk, floating interest rates and narrow spreads. What is more, European banks produced, not just invested in, US mortgage-backed securities. Their US securities affiliates held huge exposures to such securities that deserve recognition. Furthermore, European banks' leveraging-up also provided credit that enabled housing booms in Ireland and Spain. These findings favour the European banking glut hypothesis.

JEL classification: E44, F34, G01, G21.

The Great Financial Crisis (GFC) divided the world into three different groups. Some countries experienced housing booms in the years before the crisis, and found themselves at its epicentre: the United States, the United Kingdom, Spain and Ireland. Banks in some other countries had exposed themselves to these booms and suffered banking crises: Germany, Belgium, the Netherlands and Switzerland. Finally, the rest of the world played the role of spectators hit by the seizing-up of the US dollar-based international banking system and the subsequent downward spiral of world trade.

Before the crisis, Bernanke (2005) and others had implicated a set of countries running current account surpluses in the US boom.² 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

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² Bernanke et al (2011) recognised that domestic vulnerabilities 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 unsustainable net external debt. Summers (2004), Edwards (2005), Obstfeld and Rogoff (2005) and 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.

Key takeaways

- Substantial capital flowed into safe US government bonds and risky US mortgage bonds in the years to 2008.
- US bond market developments in 2000–07 show more of the imprint of the flows into mortgage bonds.
- European banks not only bought risky US mortgage bonds but also manned the production line through their US securities subsidiaries, which were active in packaging and selling such bonds.
- European bank credit also enabled the real estate booms in Ireland and Spain.

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 excess of Asian saving over investment thus led to an excess of US investment over saving. On this view, these “transpacific” imbalances ultimately caused the GFC (Ferguson (2008), Wolf (2014)).

Others have pointed instead to two-way transatlantic 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 unsustainable leveraging by US households: the transatlantic 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 that held risky US MBS funded by short-term commercial paper. Shin (2012) dubbed the alternative hypothesis the banking glut.

This special feature 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. European banks’ US subsidiaries manned the production line of the private label MBS, issuing them as well as investing in them. Moreover, the more exaggerated property booms in Ireland and Spain drew on even larger portfolio and money inflows from European banks. In contrast to US developments, securitisation played little role in the Irish or Spanish booms, but in common with US developments a strong flow of credit from European banks played a big role.

The rest of this article analyses the Asian and European capital inflows, their imprint on the US mortgage market, the role of European banks’ US securities affiliates and evidence that European investors were over-represented as buyers of US MBS. One box examines the relationship between external credit flows and domestic credit booms, and another sketches the larger but more traditional capital flows into Ireland and Spain. A final section concludes that European bank leverage enabled the US, Irish and Spanish booms.

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 (ie supply to depositors)
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 funds and others
Capital gains/losses	Gains on US Treasury bonds; little private MBS	Huge losses on private label MBS

Source: US Treasury et al (2002, 2008); Table 5; author's elaboration.

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? And how did the role of European banks' US securities affiliates as MBS producers enlarge these banks' footprint in this market?

The differences between the two stories bear emphasis (Table 1). Twice as much money flowed into US bonds from March 2000 to mid-2007 from Asian official holders as flowed into US private asset-backed securities from European banks and others between end-2002 and mid-2007. 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, short-term bonds backed by US mortgages, commercial real estate and other assets, funded by short-term dollar debt. Asian reserve managers took duration risk. European banks took credit and maturity 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 in the United States before the crisis lent itself to an analysis of sustainability that led to dire predictions of dollar crisis as cited above. 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. Large gross flows from Europe to the US were balanced by flows in the opposite direction: European banks funded portfolios of US assets by "round-tripping" dollar funds from the United States and back again (McGuire and von Peter (2009), Shin (2012) and Avdjiev et al (2016)). Dollars raised from US money market funds (Baba et al (2009)) flowed back Stateside through purchases of private MBS (Graph 1). As a result,

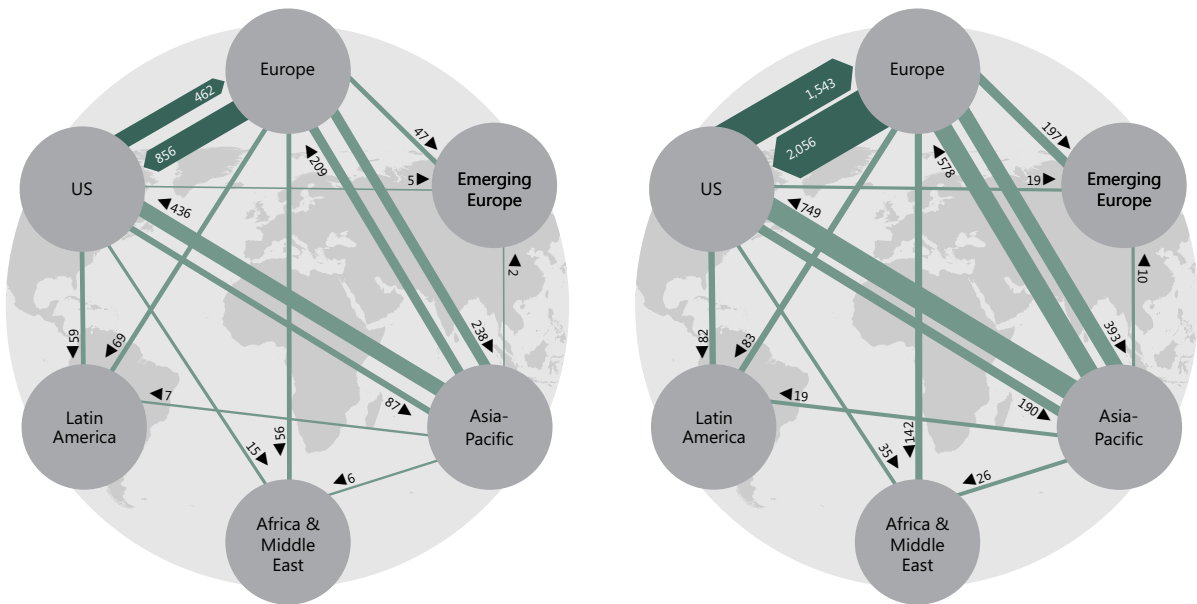
US dollar-denominated cross-border claims: the transatlantic round trip¹

In billions of US dollars

Graph 1

2002

2007



¹ 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.

someone who looked only at the current account balance overlooked the large risk exposures resulting from these accumulating flows.

The Asian and European flows also 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 a so-called "credit arbitrage" strategy which proved far riskier than expected. Official reserve managers demanded dollar safe assets; European banks supplied them.

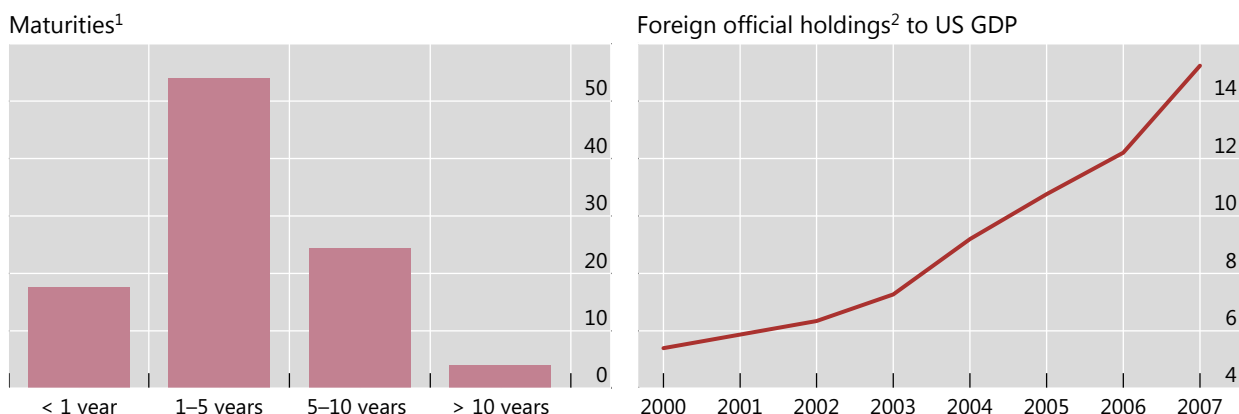
Official reserve managers had long since extended maturities from Treasury bills to Treasury and agency notes. Their sweet spot on the yield curve was at medium-term maturities (Graph 2), which provided extra yield to cover the cost of domestic liabilities or dollar depreciation. By contrast, European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

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 and responded by reducing exposures in Europe (Cecchetti et al (2012)) and elsewhere (McCauley et al (2019)).

Foreign official holdings of US Treasury securities

In per cent

Graph 2



¹ 30 June 2007. ² Comprises long-term US Treasury debt and agency debt.

Source: US Treasury et al (2008), p 11, p 21.

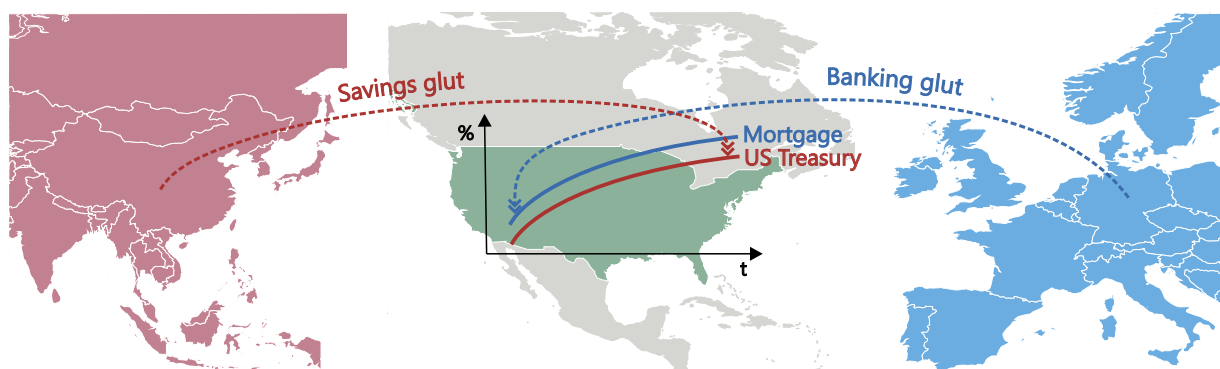
Which capital flow matches US mortgage market trends?

Considerable evidence links inflows of bank credit or of debt capital more generally to credit growth within an economy (Box A). In the lead-up to the GFC, however, two very different capital inflows accompanied the boom in private credit in the United States, 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 foreign exchange reserve managers typically prefer safe assets, including US Treasury and agency securities (McCauley and Rigaudy (2011)).

Competing hypotheses: capital flows and the US housing boom

Graph 3



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

Source: Author's elaboration.

Capital inflows enable domestic credit growth in a boom

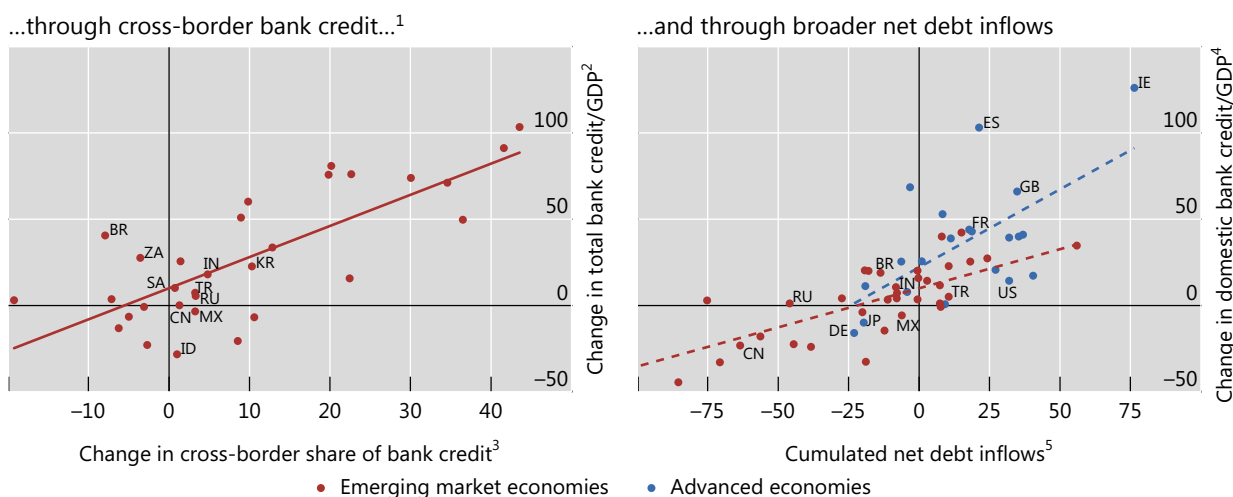
Credit booms and capital inflows tend to reinforce one another (Aliber and Kindleberger (2015)). Inflows of foreign capital to banks free them from the constraint of the domestic funding base and thereby enable domestic credit booms. In a sample of 31 emerging market economies between early 2002 and 2008, Avdjiev et al (2012) found that a rise in the share of cross-border bank funding, extended either directly to domestic non-banks or indirectly through banks, helped boost the ratio of bank credit to GDP, a measure of credit booms (Graph A, left-hand panel). Banks found non-core liabilities abroad to fund credit at home (Hahm et al (2013)).

Lane and McQuade (2014), using a broader sample of 62 countries and a more inclusive measure of international capital flows, found a similar dynamic. Here, the larger the net debt inflows, including both portfolio and bank flows, the larger the increase in a given economy's ratio of bank credit to GDP (Graph A, right-hand panel). The inclusion of Ireland, Spain and the United Kingdom shows that a domestic credit boom's reliance on external financing is not a symptom of financial underdevelopment. In fact, in the subsample of 23 advanced economies the response to capital inflows is greater than among EMEs, as the steeper trend line suggests.

Capital flows enable domestic credit growth during the boom...

In per cent

Graph A



¹ Q1 2002–Q2 2008. ² “Total bank credit” adds to domestic credit (IMF IFS line 32) the stock of cross-border bank credit to non-banks in the country (using the BIS locational banking statistics). ³ “Cross-border share of bank credit” is the share of total bank credit to non-banks received cross-border through direct lending to non-banks and through net lending to banks in the country (if positive). Based on Avdjiev et al (2012). ⁴ Domestic credit from IMF IFS line 32, from end-2002 to end-2008. ⁵ Balance of payments net debt inflows as a share of GDP, cumulated over 2003–08. Net debt flows are calculated by aggregating changes in net portfolio debt assets, net other investment and reserve assets, all expressed as inflows. Extends Lane and McQuade (2014).

Sources: BIS (2015), pp 92–3, citing IMF, *International Financial Statistics* and *World Economic Outlook*; BIS international banking statistics.

Given their preference for intermediate-term notes, this inflow should have depressed Treasury yields at such maturities. 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 a shift in 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.

But predictions regarding mortgage flows and yields did not pan out. The left-hand panel of Graph 4 shows that, to the contrary, spreads on fixed rate agency and private jumbo MBS actually *narrowed* in the 2000s. Furthermore, 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 bond market developments in the 2000s did not match what might have been expected from a big official flow into Treasury notes (Table 2, first column).

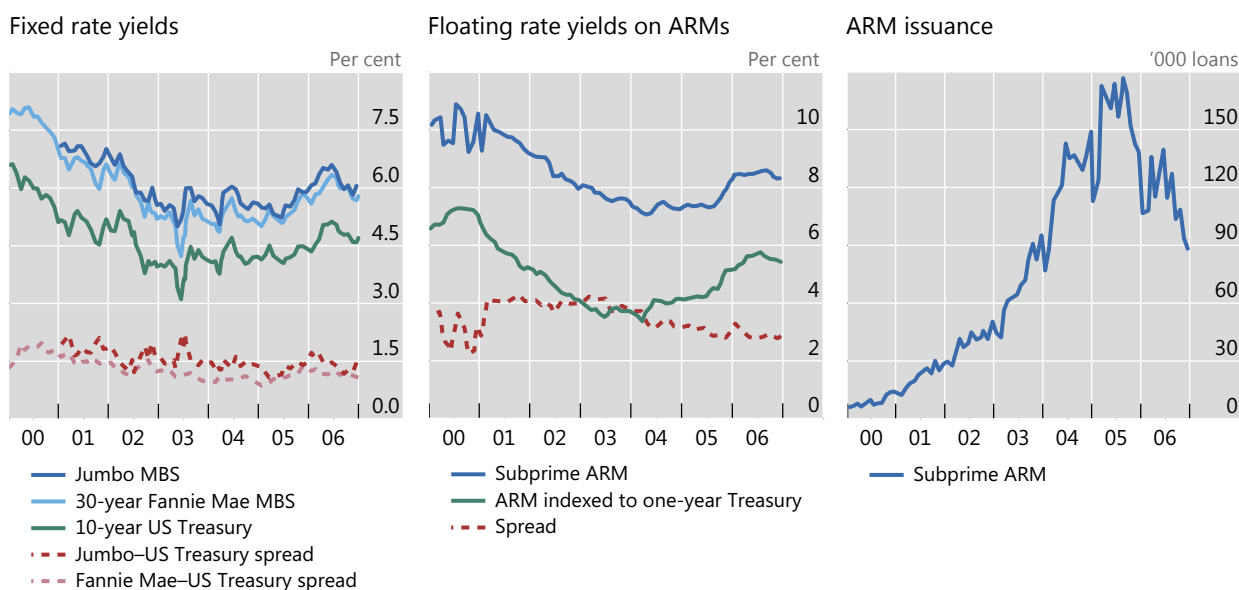
The predictions of the banking glut story perform better (Table 2, second column). First, European banks' demand drove US mortgage finance away from government guarantees to private credit risk. Non-agency mortgages reached 55% of all gross issuance in 2005 and 2006 (Goodman et al (2008), p 6; see also Frankel (2006)). In stock terms, non-agency securitisations reached one third of the total (Graph 5). Second, ARMs predominated in private label MBS, at 62% of private issues (Goodman et al (2008), p 6, p 10), conveniently allowing banks to match their short-term funding. In 2006 ARMs were up to 40% of all MBS issued. In terms of rates, long-term spreads actually narrowed (Graph 4, left-hand panel). Spreads also narrowed for non-agency ARMs relative to agency issues. The centre panel of Graph 4 shows that the spread between subprime 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.

Which capital inflow lines up with developments in the US mortgage market?			
Official investors: buy safe assets		European banks: buy private label MBS	
Favour govt-guaranteed mortgages	✘	Favour wider-spread private label MBS	✓
Favour fixed rate mortgages	✘	Favour adjustable rate mortgages	✓
Widen mortgage–Treasury spread	✘	Narrow mortgage–Treasury spread	✓

Source: Author's elaboration.

Mortgage spreads and issuance, 2000–06

Graph 4



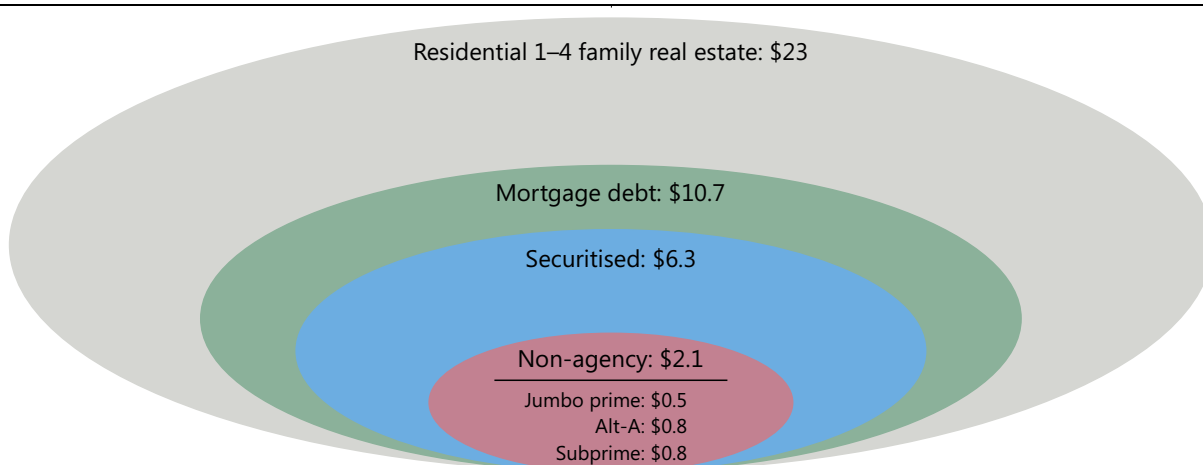
Sources: Bertaut et al (2012), p 227, citing CoreLogic and JPMorgan ABS Research; Bloomberg.

That demand gained strength from European investors in general, and European banks in particular. To appreciate this requires that we recognise that the geography of European banks' balance sheets did not coincide with the borders of Europe (Avdjiev et al (2016)). A full accounting of the role of European banks requires taking the measure of their securities subsidiaries within the United States, mostly funded in the United States. Like the US-owned securities firms with which they competed, their securitisation production lines drove mortgage originators to deliver the raw material (Nadauld and Sherlund (2013)).

Value of US residential real estate and mortgages, June 2007

In trillions of US dollars

Graph 5



Source: Goodman et al (2008), pp 3–4.

European banks as producers of MBS

The usual image of European banks as hapless investors in US MBS in the mid-2000s needs thorough revision. In Zuckerman (2009), Lewis (2010), Dunbar (2011) and US court cases, banks from Dusseldorf or Kiel play the role of sophisticated investors in name only, serving as, in market parlance, “stuffers”. However, certain European banks played quite a different role (Bank of England (2007), p 37).

Six European banks produced private label MBS out of their US securities affiliates. They ranked among the top 15 underwriters of subprime MBS (Table 3). RBS’s Greenwich ranked first, with a 12% share, above that of Lehman Brothers, Bear Stearns and Morgan Stanley. Collectively, Greenwich, Credit Suisse (ranked fifth), Deutsche Bank (ranked seventh), 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 (Table 3, memorandum items).

By 2007, banks’ business model of underwriting private MBS had evolved to include holding a substantial fraction of the product on their balance sheets. What Dunbar (2011) and Goldstein and Fligstein (2017) liken to a Henry Ford-type

Non-US banks’ US securities affiliates’ underwriting of subprime MBS deals¹

Table 3

	1997–2001	2002	2003	2004	2005	2006	2007	Total
Greenwich (RBS) ²	17	10	16	28	30	30	17	148
Lehman Brothers	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
JPMorgan	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
Total	75	70	134	235	304	324	138	1,280
<i>Memo:</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%

¹ Shaded rows indicate European bank ownership. ² 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.

production line started with a “warehouse” of mortgages that underwriters would assemble into MBS. They then sliced and diced these into collateralised debt obligations (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.^{3,4}

Contemporary observation and subsequent research confirmed the nexus between underwriting and MBS holdings. The Swiss Federal Banking Commission commented (2008, p 7): “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” (see also Zuckerman (2009), p 176). In a study of the holdings of highly rated securitisation tranches across US-owned bank holding companies, MBS underwriting strongly predicted holdings (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”.

The six European banks had \$251 billion of private MBS at end-2007 (Table 4). A seventh, ING, held a further \$46 billion in its US internet banking thrift. 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 trading positions basis.⁵ Moreover, some of the exposures of the other five banks were hedged, though it is not possible to say how much.⁶

There are good reasons to suppose that these six European banks held this quarter of a trillion dollars’ worth of US MBS in mid-2007 on the balance sheets of their US securities affiliates. As described above, their business models involved holding such securities on the US book, and contemporary observation placed them there. In addition, the ex post aggregate profitability of foreign-owned securities firms in 2008 suggest they did.

In particular, European-owned broker-dealers racked up large losses in 2008 from writedowns of assets, consistent with their having retained ultimately toxic bonds on their US books. The US Bureau of Economic Analysis (BEA) reports that European-owned non-banking finance and insurance firms took capital losses from

³ 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 et al (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, Acharya et al (2013), p 522). The last column of Table 3 thus understates European exposures.

⁴ Greg Lippmann at Deutsche Bank emailed 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”.

⁵ A position could be short over a certain range of prices, but long thereafter. Lewis (2010, Chapter 9) describes how Morgan Stanley took a short position in BBB tranches “netted” against multiple long positions in AAA tranches (sold in part to UBS), with disastrous results.

⁶ Deutsche Bank’s CDO desk famously put on a multi-billion dollar short (Zuckerman (2009), Lewis (2010), Dunbar (2011)), but US Senate (2011) found that overall the bank remained long and took losses.

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

In billions of dollars at end-2007

Table 4

	Non-agency mortgage-backed bonds			Total assets	Share of total assets
	Residential	Commercial	Total		
Barclays	31	1 ¹	32	2,458	1.3%
Credit Suisse ²	...	...	9	1,208	0.7%
Deutsche Bank	20	...	20	2,840	0.7%
HSBC	26	10 ¹	36	2,354	1.5%
RBS	...	...	84	3,645 ³	2.3%
UBS	...	...	68	2,055	3.3%
Total	...	...	251	...	...
<i>Memo: ING</i>	46	...	46	1,930	2.4%

¹ Estimated from annual reports. ² Trading book concept; net of hedges. ³ Assets of RBS before merger with ABN AMRO.

Sources: Barclays (2009), p 106, p 113; Credit Suisse (2009), p 71; Deutsche Bank (2009), pp 19–21; FSA (2011), p 52; HSBC (2009), pp 152–7; ING (2009), p 140; Netherlands House of Representatives (2013); RBS (2009), p 35; UBS (2008), pp 6–7.

“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).⁷

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 private label asset-backed securities (ABS) represented 23% of US bond holdings of European investors in mid-2007, similar to US investors at 20% (Table 5, fourth column). ABS include residential and commercial MBS, and bonds backed by car loans and airline leases.

These data represent holdings by residence. The more telling observation, however, requires data compiled on a nationality basis. As noted, European banks did not confine their balance sheets within European national borders.

If the exposures discussed in the previous section were held in the US books, then European banks did indeed 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 last two columns of Table 5, which add to the figures reported by Bertaut et al (2012) on a residency basis the exposures booked on US affiliates from Table 4.

⁷ The presumption is that UBS’s 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 83–5). 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 reported capital losses of \$41 billion (Lowe (2011), p 98). Much of this loss was presumably accounted for by ING Direct USA, which had boosted returns at its US internet banking thrift, ING Direct, by switching its assets from agency paper to risky Alt-A MBS (Kalse (2009)). 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 bonds issued in the United States by European and US investors

At end-2002 and June 2007

Table 5

	End-2002		June 2007			
	USD bn	Share ¹	Residence-based		Nationality-based	
			USD bn	Share ¹	USD bn	Share ¹
European investors						
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%	855	32%
Total	1,008	100%	2,381	100%	2,678	100%
US investors						
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%	3,324	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>

¹ Share of the investors' portfolio of US bonds that is devoted to the instrument in the row heading.

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

On this showing, European investors, including banks, loaded up on risky US MBS in the years before the GFC. 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 (Table 5, centre columns), 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 (two right-hand columns), including holdings at US affiliates, European investors had promoted ABS to second place, above safe assets in third place.⁸

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 offshore Libor as the reference rate. For example, within the stock of Ohio mortgages in July 2008, 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 2008.⁹ The benchmark was not "Changed by Wall Street, for Wall Street"

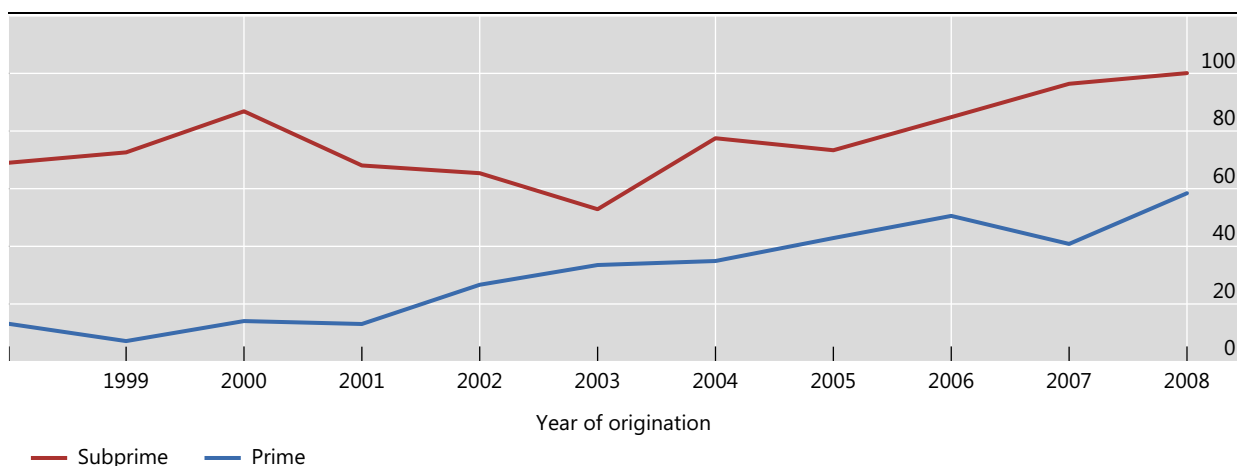
⁸ Within ABS, foreign investors had more than their share of ultimately risky mortgage bonds. Beltran et al (2008), Table 6, estimate that non-US investors held 29% of \$2.2 trillion in securitised non-agency home mortgages. Including amounts in Table 4 on the assumption that they were held on balance 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.

⁹ "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,

Libor reference rate share of outstanding US adjustable rate mortgages,
Ohio, July 2008¹

In per cent

Graph 6



¹ Alternative to Libor is the one-year Treasury constant maturity rate as published by the Board of Governors of the Federal Reserve System. Source: Schweitzer and Venkatu (2009), citing McDash Analytics.

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 take on so much exposure to private MBS? Dunbar (2011) and Nadauld and Sherlund (2013) highlight the role of leverage regulation, and Bayoumi (2017) easy access to repo finance. However, while regulation and the repo market permitted risky strategies, they do not explain why bank managers chose them. Part of the answer could be that bank managers took aim at market share (UBS (2008), pp 10–11, Zaki (2008), p 11 and p 15, Martin (2013), p 194 and Chapter 13, Augar (2018), p 153) and size, possibly as a defence against takeover. One perceived advantage of size was that it could boost the credit rating since rating agencies considered size when reckoning the odds of government support in extremis (Hau et al (2013), King et al (2016)).

Certainly, European banks did not confine their expansion to US assets or securitised assets. This is evident from their leading role in funding the Spanish and Irish real estate and credit booms. In these cases, they did not rely on securitisation of the US variety, but still contributed to large capital inflows as well as outsize domestic credit and property price booms (Box B).

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)).

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 mortgages at the margin, these European economies relied entirely on floating rate mortgages.

The Spanish and Irish booms differed from the US boom in several important respects, however. For one thing, 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 (Regling and Watson (2010), p 24, Bank of Spain (2017), p 30).

Second, the investment of official reserves from Asia probably exerted less downward pressure on long-term yields in the euro area than such investment put on US Treasury yields. The dollar attracted about two thirds of reserves in the 2000s and the euro only 20–25%. Add the thoroughgoing reliance on floating rate mortgages in these European countries, rather than the long-term fixed rate debt favoured by official reserve managers, and it is hard to pin much of their booms on the Asian savings glut.

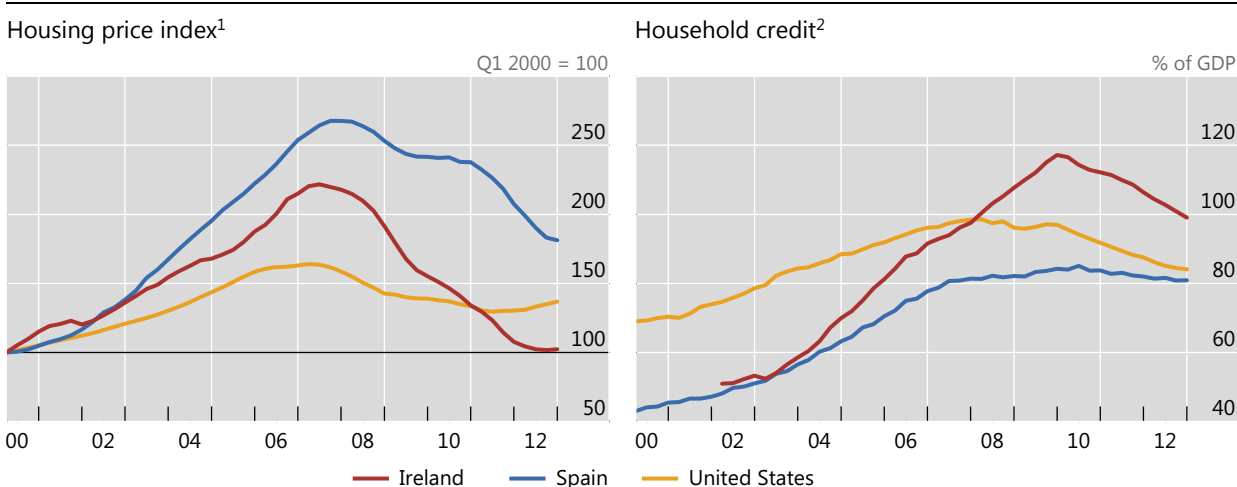
Third, the role of securitisation, the focus of many analyses of the US case, was much reduced in Spain and basically absent in Ireland. In Spain, the regional cajas depended heavily on so-called covered bonds to fund their mortgages, and 75% of these were held by foreign investors (Berges et al (2012)), 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, an 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, however, the foreign bank role was limited. On the contrary, the international diversification of the two largest Spanish banks stood them in good stead as earnings abroad stabilised their profitability.

A further aspect that distinguishes the Irish and Spanish cases from the US one 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 these 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 prices and household credit

Graph B1



¹ Nominal housing price indices, seasonally adjusted. ² Includes non-profit institutions serving households, not seasonally adjusted.
Sources: OECD; BIS.

Fifth, house prices and household indebtedness 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 B1, 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 of the three as a share of GDP (Graph B1, 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.^①

A final way in which the Irish and Spanish cases distinguish themselves from the US case is in the scale of the capital inflow. The left-hand panel of Graph B2 shows the net foreign liabilities of the banks in Ireland with local lending business.^② 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 foreign banks' 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 these capital flows into the United States.

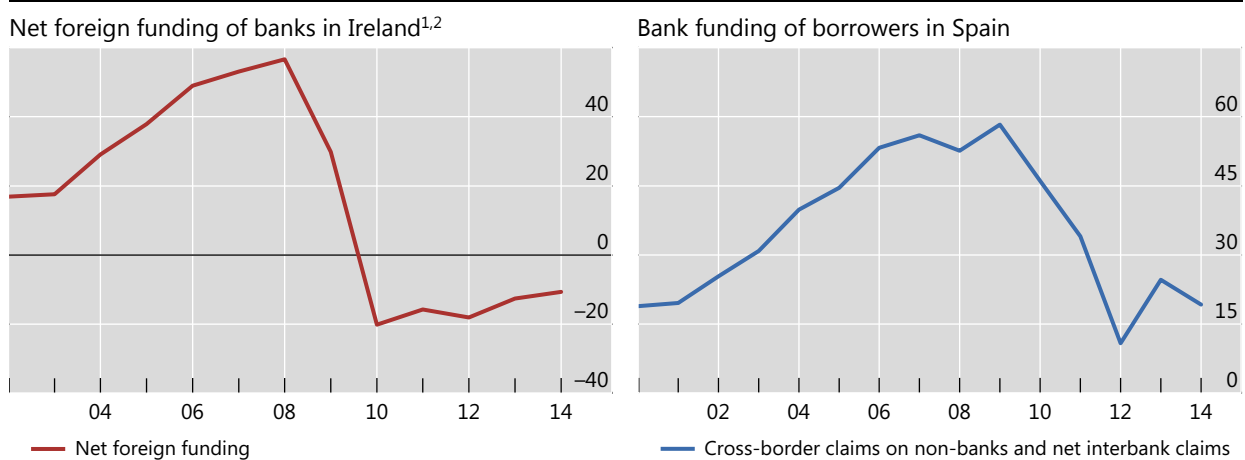
The inflow of bank credit to Spain also reached staggering proportions (Graph B2, right-hand panel). Since Spain does not have a large presence of offshore banking, we simply sum the stock of BIS reporting banks' cross-border claims on non-banks in Spain with their net cross-border claims on banks in Spain (see Avdjiev et al (2012) for further discussion). This aggregate rose from 15% of Spanish GDP to almost 60%.

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

Massive bank flows to the euro periphery

As a percentage of GDP

Graph B2



¹ Deposit, debt security and other liabilities to non-residents less all claims on them of domestic market banks. ² January 2003 data proxy for December 2002 data.

Sources: Central Bank of Ireland; IMF; BIS locational banking statistics.

① The US data include non-profits. ② Excluding offshore banks; 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 writedowns in 2008.

The banking glut offers a better account than the savings glut 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 ones 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.

It would be wrong to argue the banking glut to the exclusion of the savings glut. Along the line that Bertaut et al (2012) argue, the huge inflow into safe assets compressed the term premium on safe assets (lowering the return to taking duration risk), and thereby induced a search for yield in credit. But it would also be wrong to claim that US and European investors responded to this incentive in the same manner. European investors shifted their US bond portfolio in the direction of credit risk markedly more than US investors did.

The Irish and Spanish credit and real estate booms did not require features much emphasised in the US case (eg FCIC (2011)): securitisation with (or without) risk transfer (Connor et al (2012), Carbó-Valverde et al (2012), Almazan et al (2015) and Acharya et al (2013)), 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 cuts in favour of one account for such similar and simultaneous phenomena.

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