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Do Global Banks Spread Global Imbalances? Asset-Backed Commercial Paper during the Financial Crisis of 2007–09

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The global imbalance explanation of the financial crisis of 2007–09 suggests that demand for riskless assets from countries with current account surpluses created fragility in countries with current account deficits, most notably in the United States. This paper examines this explanation by analyzing the geography of asset-backed commercial paper (ABCP) conduits set up by large commercial banks. The paper shows that banks in surplus countries as well as banks in deficit countries manufactured riskless assets, totaling over $1.2 trillion, by selling short-term ABCP to risk-averse investors, predominantly U.S. money market funds, and investing the proceeds primarily in long-term U.S. assets. As negative information about U.S. assets became apparent in August 2007, banks in both surplus and deficit countries experienced difficulties in rolling over ABCP and as a result suffered significant losses. The paper concludes that global banking flows, rather than global imbalances, determined the geography of the financial crisis. [JEL G21, G28, G3, F3, F1]
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Ben Bernanke (2005) argued in a famous speech that the "savings glut" in Asia, most notably in China, and several European countries with current account surpluses, had created severe and persistent global imbalances. These imbalances have by and large found their way through capital flows into the U.S. economy (Caballero, Farhi, and Gourinchas, 2008). Importantly, unlike capital flows to emerging markets, a large share of these flows have been invested in effectively risk-free assets, such as U.S. Treasuries, U.S. government agency debt, and money market fund shares. Some observers (for example, Caballero and Krishnamurthy, 2009) have argued that this demand for risk-free assets coming from surplus countries left the U.S. economy fragile by concentrating the real risks in its financial sector. Together, these observations constitute the global imbalance explanation of the financial crisis of 2007.[1]

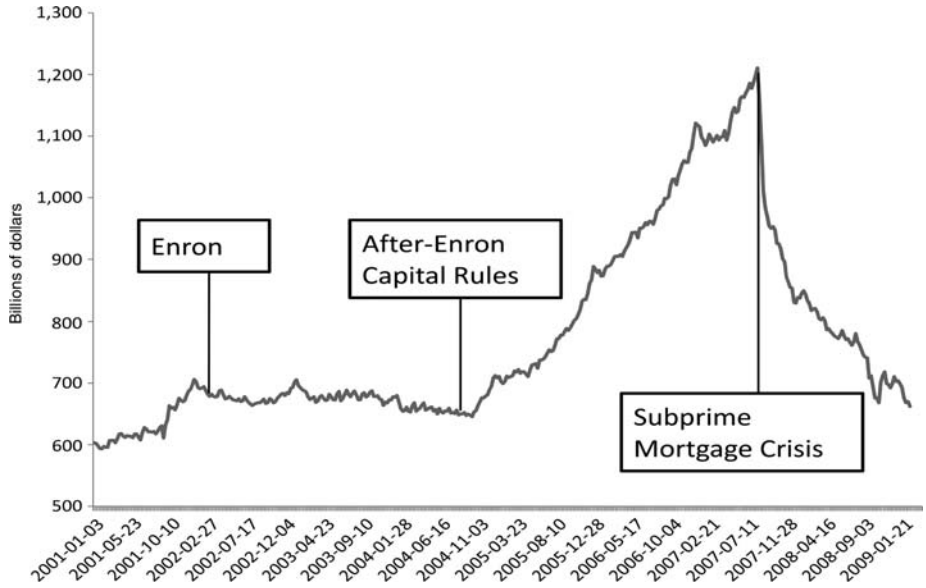
We argue in this paper that global imbalances fall short of explaining why the financial crisis took such a global form right from its inception. To understand the global spread, we analyze how financial sectors around the world became exposed to the crisis. We show that large commercial banks in both current account surplus and current account deficit countries manufactured risk-free assets by setting up asset-backed commercial paper (ABCP) conduits. These conduits are a form of securitization in which banks use off-balance-sheet vehicles to purchase long-term assets financed with short-term debt. However, contrary to other forms of securitization, such as mortgage-backed securities (MBS) or collateralized debt obligations (CDO), banks effectively retain the credit risk associated with conduit assets. Hence, as long as banks are solvent, conduits are risk-free for outside investors but can generate significant risks for banks. In exchange for bearing these risks, banks have access to low-cost funding via the ABCP market.

ABCP conduits are an interesting laboratory for studying the geography of risk-free assets for two reasons. First, before the financial crisis of 2007, ABCP was the largest short-term debt instrument with more than $1.2 trillion outstanding in January 2007. By comparison, the second largest instrument was Treasury bills, with about $940 billion outstanding. Second, we show that the risks associated with ABCP conduits were primarily borne by large commercial banks. Hence, one can construct the geography of risk-taking using bank headquarters' locations. These data are not available for other safe assets such as AAA-rated tranches of securitized assets.

Our analysis shows that most ABCP was issued in U.S. dollars and sold to risk-averse investors such as money market funds. Most of the proceeds were used to invest in long-term financial assets of current account deficit countries, such as the United States and the United Kingdom. However, the

[1]Bernanke (2009) and Portes (2009) also argue that it is impossible to understand the financial crisis fully without appealing to global imbalances and that they are the underlying cause of the crisis. Jagannathan, Kapoor, and Schaumburg (2009) argue that imbalances in labor supply can help to explain the financial crisis.

Figure 1. The Rise and Collapse of Asset-Backed Commercial Paper



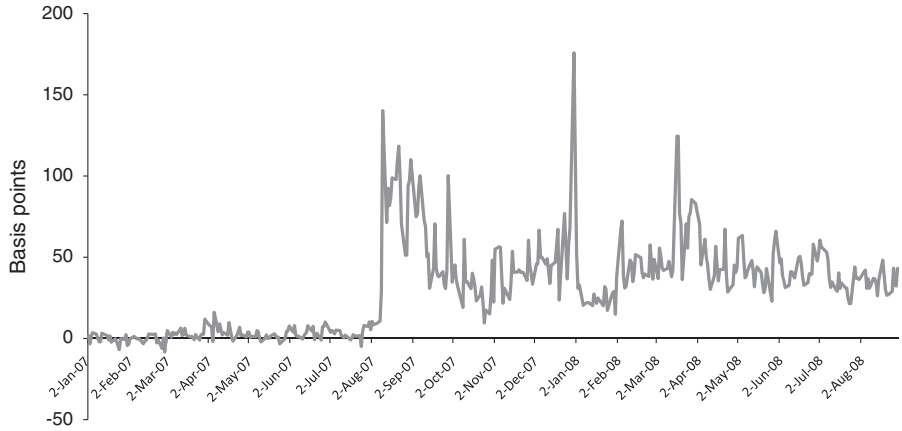
Note: This figure shows total asset-backed commercial paper outstanding in the period from January 2001 to February 2009. The figure is based on aggregate data provided (ABCP) by the Federal Reserve Board. The figure indicates the date of the Enron Bankruptcy (November 2001), the announcement of new accounting rules for liquidity enhancement provided to conduits (April 2004), and the start of the subprime crisis (August 2007).

sponsoring commercial banks were based *both* in current account surplus countries (for example, Germany, Japan, and the Netherlands) and current account deficit countries (for example, the United States and the United Kingdom). In fact, we find that the country-wide level of ABCP outstanding, our proxy for the scale of production of risk-free assets, was effectively uncorrelated with a country's current account balance.

Hence, when information about the deteriorating quality of U.S. subprime assets traveled across the financial markets in the summer of 2007, it was not just banks in the United States that suffered losses. On August 9, 2007, the French Bank BNP Paribas announced its suspension of net asset value calculation,[2] following which risk-averse investors stopped refinancing maturing ABCP. After the announcement, ABCP outstanding decreased sharply in August 2007 (Figure 1), and the cost of issuing overnight ABCP relative to the U.S. Federal Reserve Funds rate increased from 10 basis points to 150 basis points within one day of the announcement (Figure 2).

[2]See "BNP Paribas Freezes Funds as Loan Losses Roil Markets," Bloomberg.com, August 9, 2008.

Figure 2. Yield on Overnight Asset-Backed Commercial Paper over Federal Funds Rate



Note: This figure shows the yield on overnight asset-backed commercial paper (ABCP) over the U.S. Federal Reserve funds rate from 8/1/2007 to 8/31/2008. The figure is based on yields data provided by the Federal Reserve Board. Note the large increase in the yield on August 9, 2007.

The first banks to collapse and be bailed out by their government were IKB Deutsche Industriebank and Sachsen Landesbank based in Germany (Acharya and Schnabl, 2009). These banks had provided credit guarantees more than three times their equity capital in order to issue ABCP of the risk-free variety. The German banks were unable to fulfill promises under these guarantees and were rendered insolvent. Other large banks in both Europe and the United States, such as ABN Amro (eventually Royal Bank of Scotland) and Citibank, survived the decline in the ABCP market but suffered significant losses because their credit guarantees to outside investors required them to pay off maturing ABCP at par independently of underlying asset values (the so-called securitization without risk transfer, a term employed by Acharya, Schnabl, and Suarez, 2009, to describe ABCP). In our empirical analysis, we find that a one-standard deviation increase in a bank's exposure to conduits, measured as the ratio of ABCP to bank equity in January 2007, reduces stock returns in August 2007 by 0.8 percent.

Thus, contrary to the global imbalance explanation, we find that countries with current account surpluses such as Germany, Japan, and the Netherlands did as badly in terms of bank stock returns as deficit countries like the United States and the United Kingdom, with Germany in fact doing the worst. Indeed, there is no correlation between the extent of safe asset "manufacturing" measured by ABCP outstanding and global imbalances measured by current account balances.

Instead, we conjecture based on descriptive evidence of the regulation of ABCP conduits across countries, that bank risk-taking was driven primarily by "weak" regulation in the sense that it allowed banks to hold assets in conduits with little capital relative to the required capital for assets on bank balance sheets. We describe the capital regulation for conduits in the United States, the United Kingdom, Germany, Spain, and Canada and show how it affected the likelihood of banks in these countries to set up conduits.

Lastly, we document that the inability to roll over ABCP led to "dollar shortages" among European banks that had sponsored conduits (Baba, McCauley, and Ramaswamy, 2009; McGuire and von Peter, 2009). As a result, U.S. subsidiaries of European banks increased their borrowing from the U.S. Federal Reserve, which eventually prompted the Federal Reserve to set up dollar-swap facilities with a large number of central banks in other countries, especially in Europe.

Overall, our results suggest that the geography of the financial crisis depends on the incentives of global banks to manufacture riskless assets rather than the direction of capital flows. According to the pure global-imbalance view, the financial sectors of current account surplus countries should have been shielded from the financial crisis. Instead we observe that banks in surplus countries are at least as affected as banks in deficit countries. Thus, in a world with global banking, the financial sectors of surplus countries are themselves at substantial risk from capital flows into deficit countries.

In terms of related literature, Rose and Spiegel (2009a and 2009b) document that the crisis does not seem to have spread through contagion from the United States. They document that countries that had disproportionately high amounts of trade with the United States in either financial or real markets did not experience more intense crises. Our paper employs a nuanced version of financial exposure to the United States—the extent of ABCP conduit activity undertaken by banks in different countries—and shows that it explains performance of country- and bank-level stock returns in the early phase of the crisis. However, we too do not view this as a "transmission" from the United States, but rather as a direct financial exposure to the United States that is uncorrelated with trade exposure to the United States.

Gorton and Souleles (2005), Gorton (2008), Brunnermeier (2009), and Adrian and others (2010) provide descriptions of the shadow banking sector. Ashcraft and Schuermann (2008) present a detailed description of the process of securitization of subprime mortgages, of which conduits were one component. Nadauld and Sherlund (2008) study the securitization by investment banks of AAA-rated tranches—"economic catastrophe bonds" as explained by Coval, Jurek, and Stafford (forthcoming)—and argue that the change in the Securities and Exchange Commission (SEC) ruling regarding capital requirements for investment banks spurred them to engage in excessive securitization. In contrast, Shin (2009), Acharya and Richardson (2009), and Acharya and Schnabl (2009) argue that banks were

securitizing without transferring risks to end investors and, in particular, ABCP and the purchase of AAA-rated tranches were a way of taking on tail-natured systemic risk of the underlying pool of credit risks.

In an analysis that focuses on the economic causes of the financial sector's increasing propensity to take such risks (in one class of conduits, the "credit arbitrage" vehicles), Arteta and others (2008) provide evidence consistent with government-induced distortions and problems of corporate governance. They also present an overview of the location of credit arbitrage conduits, but do not relate it to global imbalances, the focus of this paper. Acharya, Schnabl, and Suarez (2009) document that ABCP was indeed risk-free in that only 3 percent of losses were borne by ABCP investors. They also illustrate the important role played by bank guarantees in enabling conduits to issue ABCP by showing that rollovers of ABCP that had weaker guarantees ("extendible notes" and "structured investment vehicles"—SIVs) were more difficult during the crisis than those of ABCP with stronger guarantees ("credit guarantees" and "liquidity guarantees"). Finally, Covitz, Liang, and Suarez (2009) document the "run" in the shadow banking sector and link it to the deterioration of asset quality in conduits.

I. Institutional Background

ABCP conduits form an integral part of financial intermediation that has over time come to be called "shadow banking." Put simply, shadow banking is that part of the intermediation sector that performs several functions (for example, maturity transformation which involves borrowing short and lending long) traditionally associated with commercial and investment banks, but which runs in the "shadow" of the regulated banks in that it is off balance sheet and less regulated. Adrian and others (2010) provide an excellent summary of shadow banking. We focus here on a few headline facts that help position the important role of ABCP conduits in shadow banking.

Adrian and others (2010) document that shadow banking assets grew from an amount close to zero in 1980 to somewhere between $15 trillion to $20 trillion by 2008. These include assets managed or owned by conduits, prime money market funds, asset-backed securities (ABS), CDOs of both mezzanine and high-grade types, enhanced cash accounts, and securities lending. In 2007, of the total assets newly transported to shadow banking, conduits represented about 25 percent. In terms of the "stock" of assets, as of July 2007, ABCP conduits held over $1.2 trillion, compared with securities lending of $600 billion, broker-dealer repo of $2.5 trillion, and financial commercial paper of $400 billion.

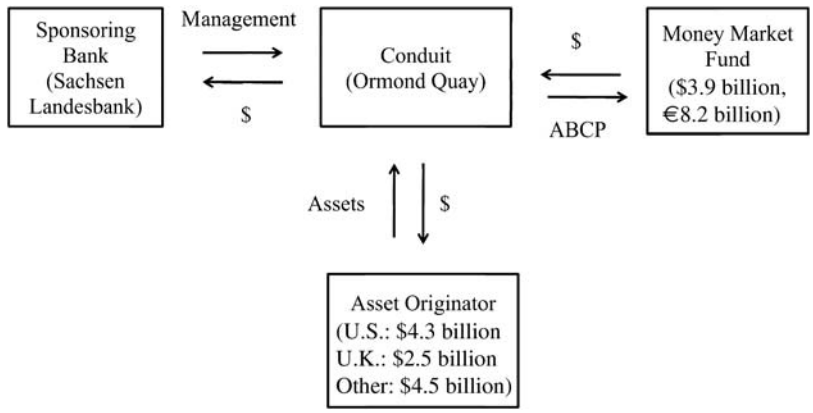
The next section describes the organizational structure of ABCP conduits on both assets and liabilities sides, and discusses how these conduits remain linked to the sponsoring institutions through credit and liquidity enhancements.

Conduit Structure

Figure 3 depicts the typical structure of an ABCP conduit and its relation to its sponsoring financial institution, asset sellers, and outside investors. We describe this structure using the conduit Ormond Quay as an example. Ormond Quay is a conduit set up in May 2004 and managed by Sachsen Landesbank, a large regional bank in Germany. Sachsen Landesbank's management responsibilities consist of selecting the assets to be purchased by Ormond Quay and issuing short-term ABCP in order to finance the assets. Sachsen Landesbank sells the ABCP to outside investors, such as money market funds, and rolls over the ABCP at regular intervals.

Panel A of Table 1 shows the composition of Ormond Quay's investments by asset type as of July 2007. Ormond Quay invested almost exclusively in ABS with a total value of $11.4 billion. The majority of the securities were backed by residential mortgages (55.5 percent) and commercial mortgages (23.8 percent). The remainder was split between corporate loans (4.1 percent), consumer loans (4.1 percent), CDOs (2.7 percent), and a mix of equipment lease receivables, car loans and leases, student loans, credit card receivables, and other asset types. As shown in Panel B of Table 1, the majority of Ormond Quay's assets were originated in the United States (37.7 percent) and the United Kingdom (22.1 percent). The remainder was split between unspecified countries in Europe (11.2 percent), Italy (9.3 percent), Spain (8.4 percent), the Netherlands (3.9 percent), and other European and Asian countries. All assets had the highest "AAA" rating from at least one certified credit rating agency.

Figure 3. Asset-Backed Commercial Paper Structure



Note: This figure illustrates the flow of funds to and from conduits. The sponsoring bank is usually a large commercial bank that provides management services to the conduit and receives a fee in return. The sponsoring banks usually also provides a credit guarantee to outside conduit investors. Asset originators sell both securitized and unsecuritized assets to the conduits. Most assets purchased by conduits are originated in the United States and the United Kingdom. Conduits finance themselves by selling asset-backed commercial paper to outside investors. The main outside investors are money market funds. The names and values in brackets refer to the conduit Ormond Quay, which is described above.

Table 1. Ormond Quay's Asset Composition

Asset Type	Amount (millions of dollars)	Percent
Panel A: Asset type		
Residential mortgages	6,298	55.5
Commercial mortgages	2,699	23.8
Consumer loans	463	4.1
Commercial loans	461	4.1
Other asset-backed securities	407	3.6
Collateral debt/loan obligations	307	2.7
Student loans	268	2.4
Equipment lease receivables	137	1.2
Car loans and leases	136	1.2
Credit card receivables	104	0.9
Bonds (corporate/municipal/sovereign)	70	0.6
Total	11,351	

Country	Amount (millions of dollars)	Percent
Panel B: Asset origin		
United States	4,277	37.7
United Kingdom	2,509	22.1
Europe	1,276	11.2
Italy	1,059	9.3
Spain	956	8.4
Netherlands	443	3.9
Germany	426	3.8
Australia	121	1.1
Portugal	70	0.6
Singapore	69	0.6
France	68	0.6
Ireland	41	0.4
Korea	20	0.2
Sweden	14	0.1
Total	11,351	

Note: This table documents the asset composition of the asset-backed commercial paper conduit Ormond Quay as of July 2007. Panel A shows the breakdown by asset type and Panel B shows the breakdown by assets' country of origin. All assets held by Ormond Quay are asset-backed securities (with the exception of corporate, municipal, and sovereign bonds). The information is based on Moody's July 2007 rating report of Ormond Quay.

On the liabilities side, Ormond Quay financed the assets almost exclusively by issuing short-term ABCP. As of July 2007, total ABCP outstanding was $12.1 billion, of which 32 percent were issued in dollars and 68 percent were issued in euro.[3] We estimate that Ormond Quay only had a

[3]We do not have information on the maturity of Ormond Quay's ABCP but, according to the Federal Reserve, most conduits have ABCP outstanding with a maturity of 30 days or less. The majority of issuance is with a maturity of 1 to 4 days. Regarding outside investors, we have no information of their identity but according to the Federal Reserve's *Flow of Funds,* the main investors in ABCP are U.S. money market funds.

sliver of equity, around $36 million, or 30 basis points of its asset value. There were no other liabilities. We have no information on Ormond Quay's hedging strategy but, like most conduits, Ormond Quay is likely to have hedged its currency risk and interest rate risk.

Ormond Quay benefits from a credit guarantee provided by Sachsen Landesbank which guarantees that Sachen Landesbank pays off maturing ABCP if Ormond Quay is unable to do so. Hence, as long as Sachen Landesbank is solvent, outside investors are expected to be repaid. This structure is different from traditional commercial paper which is considered safe because of its seniority in the capital structure because of its short-term maturity (Kacperczyk and Schnabl, 2009). Instead, ABCP is considered safe because it is backed jointly by conduit assets and a bank guarantee.

As a result of the bank guarantee, Moody's awarded the conduit the highest possible short-term rating "P-1." Moody's also explicitly mentions in its report that the guarantees provided by Sachen Landesbank are required for the "P-1" rating and notes that these guarantees are considered sufficient because Sachsen Landesbank itself benefits from a grandfathered state guarantee. The rating is important for the sponsor of ABCP because many outside investors, such as U.S. money market funds, have regulatory constraints which require them to buy only highly rated securities (Kacperczyk and Schnabl, 2009).

The structure of Ormand Quay is typical for ABCP conduits. Most conduits, with the exception of SIVs, are financed almost exclusively with ABCP. Also, most conduits benefit from a credit guarantee provided by a large commercial bank which guarantees them Moody's highest short-term rating (Acharya, Schnabl, and Suarez, 2009). Unlike Sachsen Landesbank, most sponsors do not have an explicit state guarantee, but they are typically large enough such that they are considered very unlikely to fail. Also, many sponsors may benefit from implicit too-big-to fail guarantees by their respective governments.

Like Ormand Quay, most conduits invest in "AAA"-rated securitized assets, unsecuritized assets of similar quality, or a combination of both. Ormand Quay is a credit arbitrage conduit, which is a type of conduit that invests almost exclusively in securitized assets. Other types of conduits are multiseller conduits or single-seller conduits that usually invest in unsecuritized assets. In the case of multiseller conduits and single-seller conduits (sometimes also called loan conduits), a large share of the assets are bought from customers of the sponsoring financial institution.

Regarding asset types, many conduits invest in mortgages but not all conduits do. Other common asset types are trade receivables, credit card receivables, student loans, auto loans, home equity loans, corporate loans, and consumer loans. Most conduits are diversified across several asset classes. Regarding investment strategies, credit arbitrage conduits tend to invest more in long-term assets such as mortgages, whereas multiseller conduits and single seller conduits tend to invest more in medium term assets such as trade receivables.

Overall, conduits are similar to regular banks in the sense that they hold long-term and medium-term risky assets and finance themselves via issuing short-term debt.

Data

We use several data sources for the empirical analysis in this paper. The primary data sources are conduit ratings reports from Moody's Investor Service covering the period from January 2001 to March 2009. The rating reports are typically three to five pages and contain information on conduit sponsor, conduit type, conduit assets, credit guarantees, and a general description of the conduit. Moody's Investor Service publishes the first report when it first issues a rating and subsequently updates the reports at regular intervals. For some conduits, Moody's Investor Service publishes monthly monitoring reports. Monthly reports are typically one page and comprise information on conduit size, credit guarantees, and conduit assets. In addition, Moody's Investor Service publishes a quarterly spreadsheet that summarizes basic information on all active conduits.

To construct our data set, we start with the universe of conduits collected by Moody's Investor Service. We merge conduits that have more than one funding operation (79 out of 9,536 observations). We drop South African conduits because they are rated on a different scale (72 out of 9,536 observations). We drop ABCP issued by CDOs because the credit guarantees provided to CDOs are different from the credit guarantees provided to conduits (292 out of 9,536 observations).

For each conduit, we identify the sponsor and match the sponsor to the consolidated financial company (for example, we match Deutsche Bank New York to Deutsche Bank in Germany). We use several data sources such as Bankscope and Osiris to identify sponsors. Once we identify a potential match, we verify the information using the company website.

We match sponsors to sponsor characteristics using the Bankscope database. We use the ISIN identifier to match Bankscope data to stock return data from Datastream. If a bank does not have an ISIN identifier, we verify with the company website that the bank is not listed on a stock exchange. We use the headquarters of the consolidated financial company to identify the location of the sponsor.

Summary Statistics

Table 2 provides summary statistics for all conduits authorized to issues ABCP as of January 1, 2007. Panel A shows that there are 296 conduits with total ABCP outstanding of $1,235 trillion. The average conduit size is $4.2 billion with a standard deviation of $5.2 billion. The largest conduit type is multiseller conduits with $548 billion in ABCP. Multiseller conduits purchase assets from more than one seller. The assets are often not securitized and the sellers are usually clients of the conduit sponsor. The main asset types held by multiseller conduits are trade receivables (15 percent), securities (12 percent),

Table 2. Conduit Characteristics

	Market Total		Size Per Conduit (millions of dollars)			
	No. of conduits	Size (millions of dollars)	Mean	Std.	Min	Max
All Conduits	296	1,235,281	4,173	5,129	0	37,872
Type						
Multiseller	135	547,970	4,059	4,380	0	21,415
Single seller	63	173,549	2,755	3,964	0	18,931
Arbitrage	35	213,823	6,109	8,397	0	37,872
Hybrid	27	148,380	5,496	5,631	302	22,596
SIV	28	92,645	3,309	3,351	0	12,279
Other	8	58,914	7,364	6,323	2,373	20,337
Currency						
U.S. dollar	234	972,977	4,158	4,627	0	22,596
Euro	33	219,959	6,665	8,424	0	37,872
Yen	16	22,941	1,434	2,014	0	5,976
Australian dollar	12	19,253	1,604	1,302	142	3,944
NZD	1	151	151	0	151	151

Note: This table includes all conduits that were rated by Moody's and authorized to issue commercial paper on 1/1/2007. It does not include conduits in South Africa (six conduits) and collateralized debt obligations (CDOs) authorized to issue commercial paper (35 CDOs) is self explanatory. Size denotes total outstanding asset-backed commercial paper (ABCP) in millions of U.S. dollars. Mean denotes the average size by program, Std. the standard deviation, Min the minimum size, and Max the maximum size.

auto loans (11 percent), credit card receivables (10 percent), and commercial loans (9 percent).

The second-largest type is credit arbitrage conduits with $213 billion in ABCP. Credit arbitrage conduits usually purchase securitized assets from many sellers. The main asset types held by credit arbitrage conduits are residential mortgage loans (26 percent), collateralized loan obligations and collateralized bond obligations (21 percent), commercial mortgage loans (12 percent), and commercial loans (11 percent). The third-largest type is single-seller conduits with $173 billion in ABCP. Single-seller conduits are often used by mortgage originators to warehouse assets before they are securitized.

Table 3 presents summary statistics per sponsor. We define a sponsor as a single consolidated financial company and we aggregate ABCP at the holding level. In total, there are 126 sponsors with average ABCP outstanding of $9.8 billion. The largest sponsor type is commercial banks. Commercial banks sponsor $903 billion, or 73 percent, of ABCP. The second largest group is structured finance groups with $181 billion in ABCP. Other sponsors are mortgage lenders ($71 billion), insurance companies and monoline insurers ($14 billion), and investment banks ($11 billion).

Table 3. Sponsor Characteristics

	Total		Average	
	No. of sponsors	Size (millions of dollars)	Mean	Standard
All Programs	126	1,235,281	9,804	14,764
Sponsor type				
Commercial banks	64	903,291	14,114	17,853
Structured finance	27	181,739	6,731	11,725
Mortgage lender	16	71,120	4,445	6,131
Insurance and monoline	3	14,118	4,706	3,914
Investment banks	4	11,039	2,760	2,257
Country of origin				
United States	68	488,535	7,184	14,608
Germany	15	204,103	13,607	11,593
United Kingdom	10	195,678	19,568	17,045
Japan	5	40,820	8,164	10,606
Other	28	306,180	10,935	5,096

This table aggregates ABCP from Table 2 by sponsor. Size denotes total outstanding asset-backed commercial paper (ABCP) in millions of U.S. dollars. Mean denotes the average size by program and Standard the standard deviation.

II. Understanding the Geography of ABCP Conduits

As explained at the outset in our introductory remarks, the global imbalance view of the crisis attributes the financial crisis to the fragility of the financial sector in the United States as it faced a pressure to meet the persistent and heightened demand for "safe" assets from the rest of the world, most notably from surplus countries such as China. A pure global imbalance view—based primarily on the direction of capital flows—would suggest that other than through an indirect exposure to the U.S. financial sector (for example, through interbank linkages or complementarities across countries in trade), surplus countries should not have been exposed to the fragility of the United States.

Some researchers (for instance, Mendoza, Quadrini, and Rios-Rull, 2008) view the large and persistent global imbalances as an efficient outcome of the financial integration in which advanced financial markets accumulate foreign liabilities as a gradual process concomitant with their (further) financial deepening, resulting in sizable welfare gains for developed countries.

More recent accounts of the global imbalance view, such as in Caballero (2009), do attribute the financial crisis to the insatiable demand for safe debt instruments that put an enormous pressure on the U.S. financial system, but recognize that the system caved in to this pressure due to poor design of incentives and regulatory mistakes in the financial sector.

Obstfeld and Rogoff (2009) argue that both global imbalances and the financial crisis are rooted in common causes linked to economic policies

adopted in several countries such as the low-interest rate environment in the United States and the undervaluation of its currency by China. Obstfeld and Rogoff (2001, 2005, 2007) also note the systemic risk imposed to the global economy because of untested developments in financial markets during 2000s.

In contrast, we contend that it was lax financial sector regulation in a world with global banking that contributed to the fully global nature of the crisis right from its inception. In particular, we argue below that weakly regulated financial sectors—of both capital surplus and deficit countries—expanded rapidly by taking in capital flows into the United States and creating assets there. Hence, when the U.S. assets experienced deterioration in 2007, the geography of the crisis was determined by global banking flows. That is, it was determined on the basis of which financial sectors were weakly regulated—and thus allowed to build significant leverage exposure to the U.S. assets—rather than by the global capital flows, as predicated by the global imbalances view of the crisis.

The Role of Financial Sector Regulation

There is considerable variation across countries in their regulatory treatment of ABCP conduits. One important component of regulation in all countries is the distinction between credit enhancement and liquidity enhancement. In the context of conduits, credit enhancement is an *unconditional* guarantee by the sponsoring bank to pay off maturing commercial paper if the conduit is unable to do so. In almost all countries, credit enhancement is considered equivalent to on-balance-sheet financing and therefore requires the same amount of regulatory capital.

However, there is important variation across countries in the regulatory treatment of liquidity enhancement. In the context of conduits, liquidity enhancement is a *conditional* guarantee by the sponsoring bank to pay off maturing commercial paper if the conduit is unable to do so. The condition is that conduit assets are deemed performing when the sponsor is called upon to provide liquidity. In practice, conduits usually stipulate assets as performing if the delinquency rate is below a pre-specified level (unsecuritized assets) or if the assets are rated as investment grade (securitized assets).

This structure of liquidity enhancement ensures that liquidity enhancement is effectively providing the same level of insurance to outside investor as credit enhancement. The reason is that most assets in conduits are considered high quality, which ensures that there is a considerable time lag between the first signs of a decline in asset quality and the date on which assets are deemed nonperforming. As commercial paper is short term, this means that the commercial paper almost always expires before assets are deemed nonperforming. Consistent with this interpretation, Acharya, Schnabl, and Suarez (2009) find that there is not a single bank-sponsored conduit in which the liquidity enhancement expired before ABCP investors were repaid.

We therefore focus on bank regulation regarding liquidity enhancement. We summarize the relevant regulation regarding liquidity enhancement for the countries which are the main three sponsors of conduits: the United States, the United Kingdom, and Germany. We also describe the regulation for Canada and Spain, which differs in their treatment of liquidity enhancement, and then, we summarize regulation for other countries.

United States

Before 2001, bank regulators in the United States made a strict distinction between credit enhancement and liquidity enhancement. Credit enhancement was considered equivalent to on-balance sheet financing, resulting in an 8 percent capital charge for assets covered by credit enhancement. Liquidity enhancement was considered off-balance-sheet financing, resulting in a zero percent capital charge for assets covered by liquidity enhancement. Most conduits primarily used liquidity enhancement to provide insurance to outside investors against nonrepayment of maturing ABCP, which resulted in low capital charges for assets in conduits relative to assets on balance sheets.

In 2001, the energy company Enron declared bankruptcy because of fraud and regulators uncovered the role of Enron's off-balance-sheet vehicles in hiding Enron's financial liabilities. As a result, regulators decided to re-examine the regulatory treatment of ABCP conduits because conduits shared many structural features of Enron's off-balance-sheet vehicles.

In January 2003, the Financial Accounting Standards Board (FASB) issued final accounting guidance on variables interest entities (FASB Interpretation No. 46 or FIN 46), which would have required the consolidation of conduits on bank balance sheets under U.S. Generally Accepted Accounting Principles (GAAP). Industry publications around that time discussed the likely possibility that new regulation would require the same capital charges for assets in conduits as for assets on balance sheets. Consistent with this interpretation, Figure 1 shows that there is no growth in ABCP outstanding during the period from 2001 to 2004.

In October 2003, U.S. bank regulators—the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, the Office of the Comptroller of the Currency, and the Office of Thrift Supervision—issued an interim ruling that permitted banks sponsoring ABCP conduits to ignore the consolidated conduit assets for the purpose of calculating risk-weighted assets. In July 2004, these agencies issued a final ruling that required banks to hold capital against eligible liquidity enhancement at a 10 percent conversion factor. This ruling implied that assets in conduits required 90 percent less capital than assets on balance sheets. Moreover, this ruling allowed banks to leave conduits off the bank balance sheet under U.S. GAAP.

Hence, the new regulation continued to mandate much lower capital for assets in conduits relative to assets on balance sheets. As shown in Figure 1, there was a large increase in ABCP outstanding after these agencies issued

this ruling. This increase suggests that banks interpreted the ruling as a confirmation that they could continue to use off-balance-sheet vehicles without holding significant capital against them.

United Kingdom

Before 2004, the United Kingdom had the same capital regulation as the United States. Assets in conduits covered by liquidity enhancement were exempted from capital charges. Contrary to the United States, the United Kingdom did not revise this regulation after 2004. Furthermore, there are two important developments that are different from the United States.

First, in the early 2000s, several U.K. banks started adopting new accounting standards based on International Financial Reporting Standards (IFRS). IFRS does not recognize the transfer of assets to a conduit as a true sale in the accounting sense, which means that U.K. banks using IFRS were required to consolidate conduits on its balance sheet for the purposes of financial reporting.[4] However, the U.K. bank regulator did not update the rules for computing capital requirements following the consolidation under IFRS. Hence, for the purpose of computing regulatory capital, conduits continued to be treated as off-balance-sheet even though for financial reporting purposes they were on the balance sheet.

Second, in 2007, most U.K. banks started adopting the new regulatory framework based on Basel 2. Under the standardized approach, Basel 2 mandates a 20 percent capital charge against liquidity enhancement covering assets in conduits.[5] Hence, the standardized approach still maintained an 80 percent lower capital charge for assets in conduits relative to assets on the balance sheet. However, if a conduit was holding highly rated assets, the absolute reduction in required capital was lower, because highly rated assets had lower risk weights under Basel 2 than under Basel 1. Hence, even though the relative incentive to put assets off balance sheet remained significant under Basel 2, the absolute reduction in regulatory capital decreased.

Germany

The history of the regulatory framework in Germany is similar to that in the United Kingdom. German banks were not required to hold capital against liquidity enhancement. In the early 2000s, some large German banks started adopting IFRS but, similar to U.K. banks, conduits continued to be off

[4]As noted in a report by Price Waterhouse on the "Great Accounting Debate: Conduits off or on balance sheet under IFRS," IFRS does not recognize the usual structure employed by U.S. banks to circumvent consolidation under FIN 46.

[5]Under the internal-ratings-based approach, the difference in regulatory capital between off-balance-sheet and on-balance-sheet financing may be even lower, because this approach is based on modeling assumptions which make less distinction between credit and liquidity enhancements. In 2007, however, the regulatory treatment of ABCP conduits under the internal ratings based approach was still under discussion.

balance sheet for regulatory purposes even though they were on the balance sheet for financial reporting purposes. Also, starting in 2006 and 2007 German banks adopted Basel 2 which reduced the difference in regulatory treatment of assets on the balance sheet relative to assets in conduits.

Contrary to other countries, Germany has a large number of regional banks called Landesbanken, which are owned by state governments. Importantly, before 2005, German Landesbanken operated with guarantees by their respective state government, which significantly lowered their funding costs. In 2001, the European Union (EU) decided that such guarantees violated EU competition law and required state governments to abandon state guarantees by 2005. However, all debt issued prior to 2005 still benefited from grandfathered state guarantees until 2015. As a result, many Landesbanken issued debt before 2005 in order to raise financing at low funding costs.

Apparently, many Landesbanken chose to invest these funds in conduits. As discussed above, the grandfathered state guarantees were of critical importance in the ratings agencies' assessments of whether Landesbanken could support conduits. Owing to the guarantees, Landesbank were able to take on significantly more conduit assets relative to their size, which resulted in significantly higher exposure to conduit. This was the reason why German banks were among the first banks to be bailed out by their government.

Spain

The regulation in Spain with respect to IFRS and Basel 2 was similar to that in the United Kingdom and Germany. Contrary to these countries, however, in the early 2000s, the Spanish banks' regulator decided to require an 8 percent capital charge against assets in conduits. Reportedly, the regulator was worried about a domestic housing boom and wanted to prevent Spanish banks from taking on additional exposure via conduits. As a result, in Spain there was effectively no difference in capital requirements for assets on balance sheet and assets off balance sheet.

Interestingly, we find no exposure of Spanish bank to conduits. This observation is consistent with lower benefits from conduits in Spain because of this regulation. However, we observe that one Spanish bank, Santander, had exposure to conduits via its wholly owned U.K. subsidiary Abbey National plc. It is not possible to determine whether the Spanish regulator required capital against conduits sponsored by Abbey National but, if not, this may be another example of the limitation of national regulation in dealing with global banks.

Canada

Before 2004, bank regulation in Canada was similar to that in the United States. If support to conduits was structured via liquidity enhancements, the bank was not required to hold any capital against the conduit. In 2004, the

Canadian bank regulator, the Office of the Superintendant, introduced capital charges for banks that had used standard liquidity enhancements. However, the Office of the Superintendant suggested that financial institutions can structure liquidity enhancements such that they are only paid out if there is a general market disruption. These "Canadian-style" liquidity enhancements did not require a capital charge.

As a result, most Canadian conduits adopted the new Canadian-style liquidity enhancement. In response, the international rating agencies—Moody's and S&P—decided to leave the Canadian market (that is, not rate any Canadian ABCP) because the Canadian-style liquidity enhancements were insufficient to safeguard outside investors. However, the local rating agency—Dominion Bond Rating Services—continued to rate Canadian issuances.

At the start of the financial crisis in 2007, many Canadian conduits experienced difficulties in issuing ABCP. Some Canadian banks decided to provide liquidity, either because they determined that they were legally required to do so or because they wanted to protect the franchise value of their conduits. However, some banks did not provide liquidity with the argument that the crisis did not qualify as a general market disruption. Hence, there were two groups of conduits. The first group defaulted on their ABCP, which triggered significant losses for outside investors, such as Canadian money market funds. The second group of conduits restructured their liquidity enhancement according to U.S. rules and managed to remain in the market.

Other Countries

To the best of our knowledge, most other countries had similar regulations as the United Kingdom and United States. Under Basel 1, liquidity enhancements were considered off balance sheet and bank regulators required no capital charge against them. Under the standardized approach of Basel 2, which was implemented in parts of Europe, there was an 80 percent lower capital charge for assets in conduits relative to assets on the balance sheet. According to industry publications, the only exception to this regulation apart from Spain was Portugal, which may have been following Spain's lead. Consistent with this regulation, we do not find any Portuguese bank sponsoring conduits.

III. Location of Sponsor, Investors, and Asset Originators

Summary Statistics

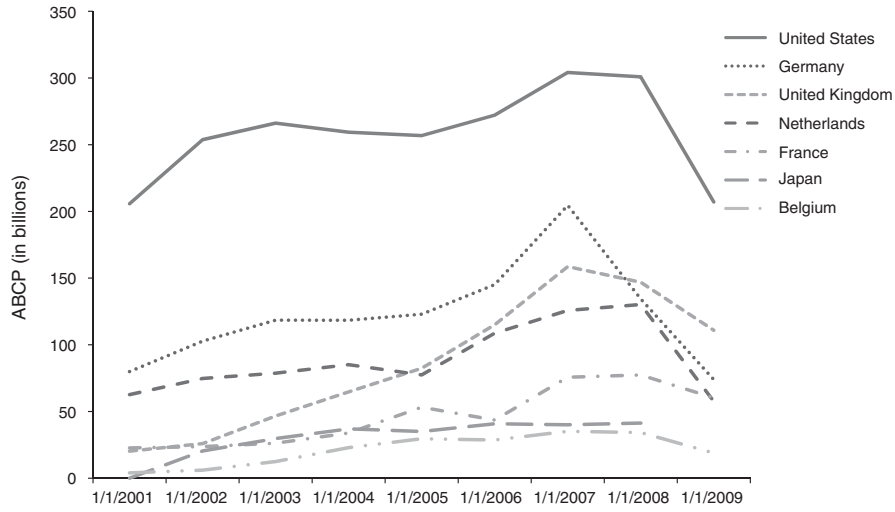
To analyze the location of sponsors empirically, we restrict the sample to commercial banks. The reason is that sponsors other than commercial banks usually do not have the financial strength to support conduits. To get a sense of the potential selection bias from this restriction, consider the example of the Dutch Bank ABN Amro. In January 2007, ABN Amro directly

sponsored conduits with ABCP of $68.6 billion outstanding. At the same time, the rating agency Fitch reported that ABN Amro provided total credit guarantees of $107.5 billion to conduits. Hence, the difference of $38.9 billion is credit guarantees provided by ABN Amro to conduits other than its own. Typically these credit guarantees are for conduits sponsored by structured finance groups, which accounted for about 14 percent of ABCP outstanding as of January 2007. To the best of our knowledge, conduits managed by structured finance groups are similar in terms of asset composition to credit arbitrage conduits sponsored by large commercial banks. We therefore do not expect a selection bias from restricting the analysis to commercial banks.

We identify the location of a sponsor as the location of the headquarters of the sponsoring bank. For example, if the sponsor is Deutsche Bank New York, then we aggregate the ABCP at the level of the holding company of Deutsche Bank in Germany. The reason for this classification is that subsidiaries usually do not have the financial strength to sponsor a conduit. Hence, credit guarantees provided by subsidiaries are usually backed, either explicitly or implicitly, by the holding company.

Figure 4 shows the time-series of ABCP outstanding per country for the seven largest countries by ABCP outstanding. We find that the majority of sponsors are located in the United States, Germany, the United Kingdom, the Netherlands, France, Japan, and Belgium. In all countries, ABCP outstanding increased significantly until August 2007 and dropped steeply afterwards.

Figure 4. Growth in Bank-Sponsored Asset-Backed Commercial Paper by Country



Note: This figure shows the growth in asset-backed commercial paper (ABCP) by country-based reports provided by Moody's Investor Service. The data are restricted to the seven largest countries. The data are restricted to ABCP sponsored by commercial banks.

Table 4. Sponsor Location and Funding Currency

	Funding Currency				
Sponsor Location	U.S. dollars	Euro	Yen	Other	Total
Belgium	30,473	4,729	0	0	35,202
Denmark	1,796	0	0	0	1,796
France	51,237	23,670	228	557	75,692
Germany	139,068	62,885	0	2,566	204,519
Italy	1,365	0	0	0	1,365
Japan	18,107	0	22,713	0	40,820
Netherlands	56,790	65,859	0	3,116	125,765
Sweden	1,719	0	0	0	1,719
Switzerland	13,082	0	0	0	13,082
United Kingdom	92,842	62,298	0	3,209	158,349
United States	302,054	0	0	2,996	305,050
Total	714,871	219,441	22,941	12,444	969,697

Note: This table shows asset-backed commercial paper outstanding by the location of the sponsor and the funding currency. The analysis is based on Moody's rating reports as of 1/1/2007. The data are restricted to ABCP sponsored by commercial banks.

Independent of the sponsor location, however, we find a common strategy regarding the funding source. We use Moody's reports to identify the funding currency as of January 2007. If a conduit issues in more than one currency, we separately account for each currency. Table 4 reports total ABCP outstanding by the location of the sponsor and the funding currency as of January 2007. For example, German banks sponsored $204 billion in ABCP of which $139 billion was issued in dollars, $63 billion in euros, and $2.5 billion in other currencies. In total, $714 billion out of $969 billion, or 74 percent, was issued in dollars. We note that most European banks financed their conduits by issuing ABCP in dollars rather than in euros.

Next, we examine the country of origin of assets held by conduits. Unfortunately there is no comprehensive data on conduits assets' country of origin. However, Moody's publishes monthly reports for some larger conduits, in particular for credit arbitrage reports, which often contain information on assets' country of origin. Table 5 lists the 10 largest conduits by ABCP outstanding for which information on assets' country of origin is available. For each conduit, the table reports the sponsor location and the allocation of assets across countries. We find that all conduits have a significant share of assets invested in U.S. assets independent of whether the sponsor is located in the United States or elsewhere. For almost all conduits, investments in the United States represent the largest share for a single country. We also note that most conduits invest most of their portfolio in assets with the highest "AAA" ratings. These results suggest that conduits invest primarily in high quality assets of current account deficit countries, in

Table 5. Asset Allocation by Country of Origin

	Asset Allocation			
Conduit	Sponsor (location)	Size	Country	Rating
Grampian	HBOS (U.K.)	37.0	U.S. (70.4%), others (29.6%)	Aaa (99%)
Amstel	ABN Amro (Netherlands)	20.4	Netherlands	Aaa (99.1%)
Scaldis	Fortis (Belgium/ Netherlands)	18.4	U.S. (51.1%), Global (14.9%), U. K.(10.1%), Spain (6.3%), Various (17.5%),	Aaa (99.8%)
Atalantis One	Rabobank (Netherlands)	15.7	U.S. (40.5%), Netherlands (27.1%), Australia (9.1%), Great Britain (5.4%), Switzerland (2.9%), New Zealand (2.6%), Others (12.4%)	
Thames Asset No1	Royal Bank of Scotland (U.K.)	17.9	U.K. (57.8%), U.S. (35.8%) Global (3.5%), Germany (2.5%), Spain (0.4%)	
Solitaire Funding	HSBC (U.K.)	15.4	U.S. (68.9%), U.K. (24.9%), Germany (3.3%), Europe (0.9%), Netherlands (0.7%), Australia (0.5%), Global (0.5%), Portugal (0.2%)	Aaa (100%)
Stanfield Victoria	Stanfield and Deutsche Bank (U.K./ Germany)	21.9	U.S. (96%), U.K. (2%), Netherlands (1%), Others (1%)	
Cancara Asset Securitisation	Lloyds (U.K.)	15.3	U.S. (76%), U.K. (19%), Netherlands (5%)	
Cullinan Finance Limited	HSBC (U.K.)	13.4	U.S. (62%), U.K. (23%), Japan (3%), Germany (3%), Others (9%)	
Ormond Quay	Sachsen Landesbank (Germany)	12.1	U.S. (38%), U.K. (22%), Europe (11%), Italy (9%), Spain (8%)	

Note: This table shows the asset allocation and ratings for the nine largest conduits as of 1/1/2007 for which this information is available. The share of "AAA"-rated assets is reported if this information is available. The information is collected from Moody's ratings reports.

particular the United States and the United Kingdom.[6] However, we note that this analysis relies on credit arbitrage conduits only and that we have little data on assets' country of origin for other conduits.

[6]To validate these findings, we also consult a market-level report issued by Moody's Investor Service (2007). The report provides summary statistics on assets held by credit arbitrage conduits in March 2007. Based on conduits with assets outstanding of $196 billion or more Moody's find that 53 percent of assets measured by outstanding principal amount are originated in the United States and that 99 percent of rated assets are rated "Aa" or higher. These results support the findings based on conduit-level data.

Finally, we examine the identity of investors in ABCP. We identify the broad investor classes using the Federal Reserve's *Flow of Funds*, which aggregates ABCP and regular commercial paper that have a total value of $2.2 trillion in early 2007. Assuming investors hold both types of commercial paper in constant proportions, the *Flow of Funds* provides information of the relative importance of different investor classes.

Table 6. Investor Characteristics

Investor	Holdings (billions of U.S. dollars)	Percent
Panel A: Commercial Paper Holdings by Investor Class		
Money Market Funds	608.4	27.5
Mutual Funds	114.1	5.1
Funding Corporations	584.3	26.4
Household Sector	187.7	8.5
Non-financial Corporate	122.6	5.5
State Government	186.2	8.4
Foreign Investors	226.5	10.2
Other Investors	186.1	8.4
Total	2,215.9	

Fund	Assets (millions of U.S. dollars)	ABCP	Percent
Panel B: Asset-Backed Commercial Paper Holdings by 20 Largest Prime Funds			
Fidelity Cash Reserves	89,088	12,472	14.0
Columbia Cash Reserves/Class A	62,519	3,751	6.0
Schwab Value Adv MF/Instit Prime	43,498	13,919	32.0
Bear Stearns TempFund/PremierChoice	37,273	13,418	36.0
Fidelity Instit MMF II	27,736	5,270	19.0
Goldman Sachs FS Prime Oblig/Adm	27,113	13,285	49.0
Morgan Stanley Inst Liq/Prime/Part	26,261	12,080	46.0
Reserve Primary Fund/Inv II	25,622	512	2.0
Dreyfus Instit Cash Adv/Adm	25,482	5,606	22.0
Centennial Money Market Trust	25,106	8,285	33.0
Columbia MM Reserves/Trust	22,923	2,522	11.0
Federated/Prime Oblig Fund/Inst Svc	21,985	5,276	24.0
Schwab Money Market Fund	21,634	6,058	28.0
AIM STIT Liquid Assets/Reserve	21,460	4,507	21.0
DWS MM Series/Premium/Cl S	19,447	194	1.0
Citi Cash Reserves	18,891	189	1.0
Northern Instit Divsfd Assets/Cl C	17,302	5,364	31.0
First Amer Prime Oblig/Cl I	16,695	1,503	9.0
Fidelity Prime Fund/Cap Reserves	16,690	3,338	20.0
Schwab Cash Reserves	16,642	5,325	32.0

Note: Panel A shows commercial paper holdings by investor class. Commercial paper holdings include both asset-backed commercial paper (ABCP) and other commercial paper. The analysis is based on the *Flow of Funds* data provided by the Federal Reserve. Panel B shows holdings of ABCP by the 20 largest prime funds with non-euro ABCP holdings. The analysis is based on iMoneyNet holdings data.

Panel A of Table 6 shows that the largest investor class is money market funds and mutual funds which account for $722 billion (32.6 percent) of the market. Other important investors are funding corporations (26.4 percent), foreign investors (10.2 percent), and state governments (8.4 percent). Relative to their size, households and nonfinancial corporations hold little commercial paper directly but they are large investors via money market funds.

We use holdings data from iMoney Net to examine the importance of ABCP to money market funds. Panel B of Table 6 lists the 20 largest prime funds with nonzero holdings of ABCP. The share of the portfolio invested in ABCP varies between 1 and 49 percent with most funds investing between 10 and 30 percent of their portfolio in ABCP. Overall, we interpret this finding as evidence that ABCP is an important asset class for risk-averse investors, such as money market funds.

ABCP Activity and Global Imbalances

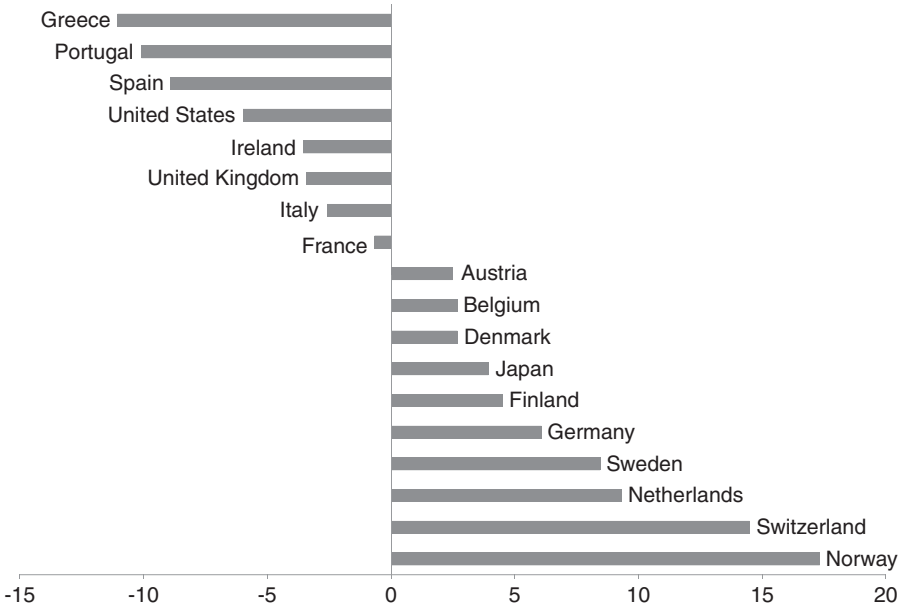
The previous section shows that conduits finance themselves primarily in dollars and purchase financial assets in current account deficit countries such as the United States and the United Kingdom. However, the main risks associated with ABCP conduits remain with the sponsors, which are located in both Europe and the United States. To put ABCP activity in the context of global imbalances, we examine the relation between ABCP activity and global imbalances using both country- and bank-level data.

We measure global imbalances as the current account balance in 2006. We restrict the sample to banks located in countries in the euro zone (as of 2006), Denmark, Japan, Sweden, the United Kingdom, and the United States (excluding countries with populations smaller than 1 million). We choose this sample because most large banks are based in these countries. Among countries with banks that sponsor conduits, we exclude Australia, Canada, and South Africa because credit guarantees to conduits in these markets are not comparable to credit guarantees in the United States and Europe. Among countries with large banks, we exclude China because Chinese banks do not sponsor conduits.

Figure 5 shows the current account surplus in 2006. The two largest deficit countries in our data set are the United States and the United Kingdom and the two largest surplus countries are Japan and Germany. There is significant variation in the data ranging from a current account deficit of –11.1 percent (Greece) to a current account surplus of 17.3 percent (Norway).

Figure 6 presents total ABCP as of January 2007 relative to the current account balance. The figure shows that ABCP is unrelated to a country's current account balance. Thus, the fragility of a country's banking sector, as measured by its exposure to ABCP conduits, is unrelated to the direction of the global imbalances. Both banks in surplus countries and banks in deficit countries sponsor ABCP conduits. To correct for the relative size of countries, Figure 7 shows the correlation of ABCP activity, measured as ABCP outstanding relative to total bank equity, and the current account balance. We

Figure 5. Global Imbalances



Note: This figure shows global imbalance, measured as the current account balance in 2006. The current account deficit data are from the Organization for Economic Cooperation and Development's Economic Outlook database.

scale ABCP outstanding by the size of banking sector measured by its equity.[7] Again, we find that ABCP activity is unrelated to the current account balance.

In order to control for bank observables in the geography of ABCP conduits, we examine the bank-level decision to sponsor conduits. We define an indicator variable *Sponsor* equal to one if a bank sponsors ABCP conduits worth 10 percent or more of its equity and zero otherwise. We choose this cutoff because a few banks have conduits worth far less than 10 percent of their equity. However, we only want to identify banks as sponsors that have significant exposure to conduits. We note that our results on the geography of conduits are robust to choosing alternative cutoffs of 0 and 50 percent.

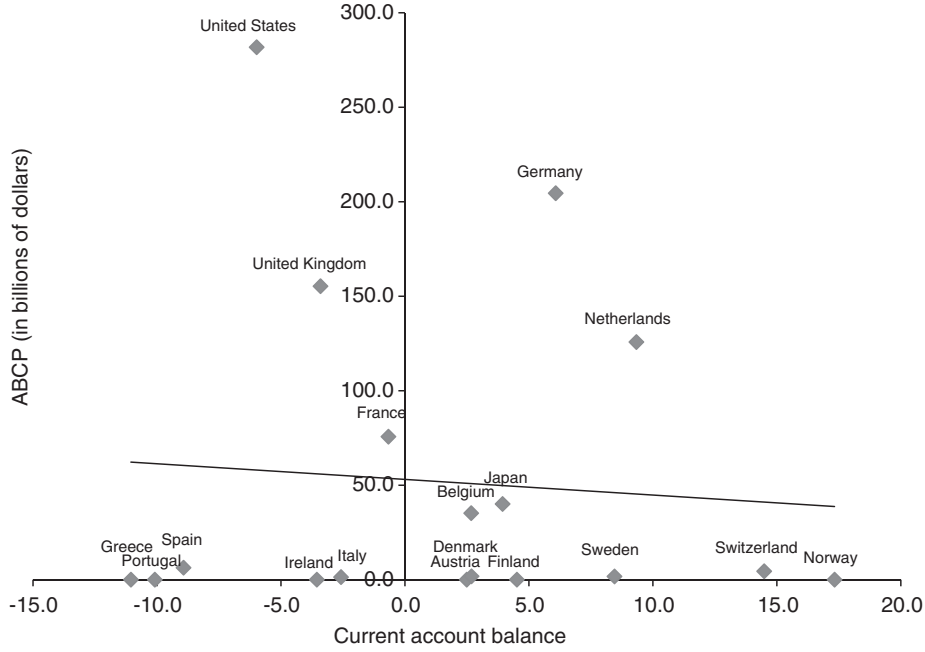
We estimate the regression

$$Sponsor_i = \alpha + \beta X_i + \gamma I_c + \varepsilon_{ic},$$

where X_i are bank-level observables such as the share of deposits, the share of short-term debt, the capital ratio, the natural logarithm of bank assets, and the natural logarithm of equity. The variables I_c are country-level fixed

[7]An alternative measure of the size of the banking sector is bank assets. For our purposes, we prefer bank equity because, as discussed above, countries vary in their financial reporting of ABCP on bank balance sheets.

Figure 6. Asset-Backed Commercial Paper and Global Imbalances, Unweighted



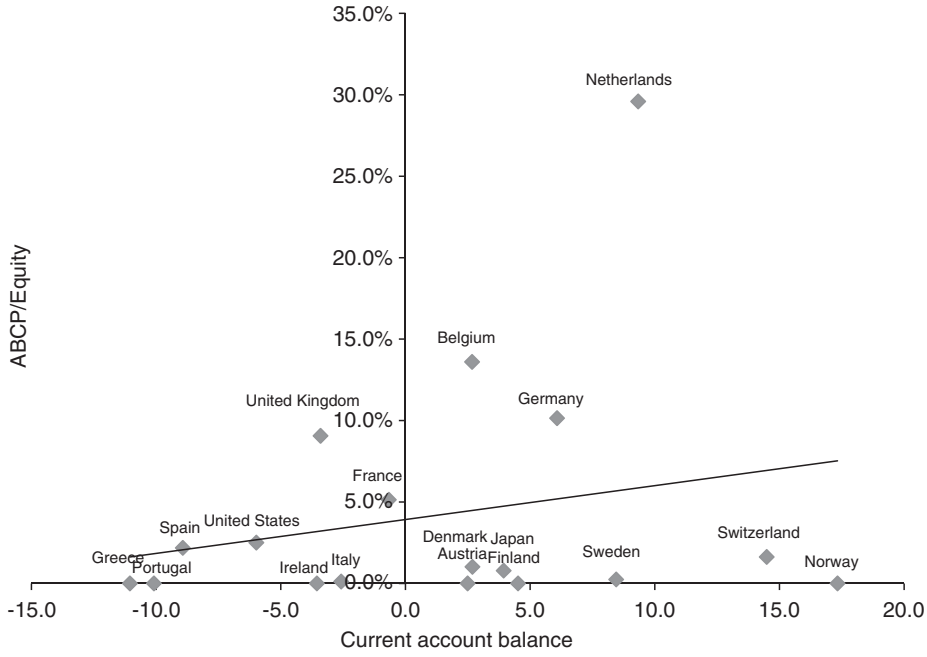
Note: This figure shows the correlation between global imbalances, measured as the current account balance in 2006, and off-balance-sheet activity, measured as asset-backed commercial paper (ABCP) as of 1/1/2007. The current account deficit data are from the Organization for Economic Cooperation and Development's (OECD) Economic Outlook database. The GDP country data are from the OECD's Statistical Database measured at current prices and exchange rates. The ABCP data are based on Moody's data and is restricted to ABCP sponsored by commercial banks and mortgage lenders.

effects for the five countries with the largest ABCP exposure. We restrict the sample to banks with total assets of at least $10 billion.

Table 7 presents the results. Column (1) shows that the country indicator variables are statistically significant at the 1 percent level for all countries with the exception of France. Column (2) adds bank size measured as the natural logarithm of bank assets. The coefficient on bank size is statistically significant, which suggests that larger banks are more likely to sponsor conduits, but the bank size control does not affect the country fixed effects. Columns (3) to (6) add further control variables such as the natural logarithm of equity, the capital ratio, profitability, and the share of liabilities financed with deposits. Importantly, the coefficients on the country indicator variables remain statistically significant and the economic magnitude of the coefficient even increases. Column (7) restricts the sample to banks with at least $100 billion of assets and finds similar results.

Overall, these results suggest that both banks located in surplus countries and banks located in deficit countries manufacture riskless assets by issuing

Figure 7. Asset-Backed Commercial Paper and Global Imbalances, Weighted by Bank Equity



Note: This figure shows the correlation between global imbalances, measured as the current account balance in 2006, and off-balance-sheet activity, measured as asset-backed commercial paper (ABCP) as of 1/1/2007 relative to total bank equity in 2006. The current account deficit data are from the Organization for Economic Cooperation and Development's (OECD) Economic Outlook database. The GDP country data are from the OECD's Statistical Database measured at current prices and exchange rates. The ABCP data are based on Moody's data and is restricted to ABCP sponsored by commercial banks and mortgage lenders.

ABCP. These results are robust to controlling for bank-level observable characteristics.

IV. Conduit Exposure and the Financial Crisis

Our hypothesis is that banks with large conduit exposure would be more adversely affected by the crisis in the ABCP Market which took hold on August 9, 2007, and this would be true regardless of their geographic location. The difficulty in testing this hypothesis is that the financial crisis has many different aspects and ABCP is only one of them. Hence, if we observe that banks with conduit exposure have lower returns during the financial crisis, then this result may be driven by other bank activities that negatively affect stock prices and are correlated with conduit exposure. For example, starting October 2007, banks started taking write-downs also on their exposure to AAA-tranches of subprime assets. As shown in Figures 1 and 2, on August 9, 2007, ABCP investors reduced purchases of newly issued ABCP

Table 7. The Effect of Bank Observables on Exposure to Asset-Backed Commercial Paper Conduits

	Dependent Variable: Indicator Variable (ABCP/Equity > 10%)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Assets (billions of dollars)	> 10	> 10	> 10	> 10	> 10	> 10	> 100
U.S. bank	0.226	0.288	0.279	0.280	0.262	0.272	0.394
	(0.083)**	(0.071)**	(0.078)**	(0.078)**	(0.080)**	(0.080)**	(0.129)**
U.K. bank	0.440	0.282	0.282	0.287	0.282	0.276	0.379
	(0.126)**	(0.109)*	(0.112)*	(0.113)*	(0.113)*	(0.113)*	(0.143)**
German bank	0.501	0.427	0.431	0.441	0.464	0.460	0.544
	(0.097)**	(0.084)**	(0.093)**	(0.095)**	(0.096)**	(0.096)**	(0.118)**
Dutch bank	0.501	0.296	0.296	0.300	0.320	0.333	0.342
	(0.194)*	(0.167)	(0.169)	(0.170)	(0.170)	(0.171)	(0.189)
French bank	0.187	−0.026	−0.027	−0.022	−0.029	−0.029	0.020
	(0.122)	(0.108)	(0.110)	(0.110)	(0.110)	(0.110)	(0.123)
Log(assets)		0.196	0.186	0.155	0.152	0.185	0.006
		(0.025)**	(0.059)**	(0.082)	(0.082)	(0.086)*	(0.193)
Log (equity)			0.012	0.042	0.041	0.015	0.24
			(0.059)	(0.080)	(0.080)	(0.083)	(0.181)
Capital ratio				−0.372	−0.225	0.057	−4.769
				(0.691)	(0.701)	(0.742)	(3.430)
Profitability					0.436	0.454	0.248
					(0.373)	(0.373)	(0.519)
Share deposits						0.178	0.07
						(0.153)	(0.243)
Constant	0.099	−0.895	−0.865	−0.752	−0.823	−1.052	−0.34
	(0.050)*	(0.133)**	(0.198)**	(0.288)**	(0.294)**	(0.354)**	(0.871)
Observations	132	132	132	132	132	132	92
R-squared	0.138	0.386	0.386	0.387	0.394	0.395	0.412

Note: This table analyzes the decision to sponsor asset-backed commercial paper (ABCP) conduits. The dependent variable is an indicator variable equal to one if ABCP relative to bank equity is larger than 10 percent or zero otherwise. The sample is restricted consolidated banks with total assets of at least $10 billion in 2006. The country variables are indicator variable equal to one if bank is headquartered in that country and zero otherwise. The control variables are the natural logarithm of assets, the natural logarithm of equity, the ratio of equity to assets, the ratio of pretax profits to equity, and the ratio of deposits to assets. *significant at 5 percent; **significant at 1 percent.

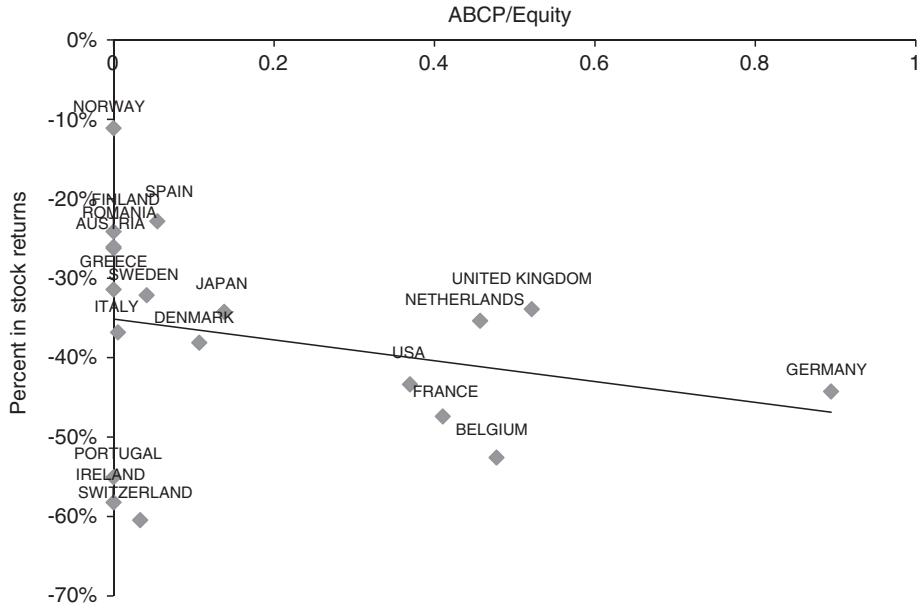
and spreads jumped from 10 bps to 150 bps. Therefore, in order to avoid other confounding effects, we focus only on the month of August 2007 when testing for the impact of conduit exposure on banks.

We restrict our sample to the 300 largest financial institutions because only those institutions had the financial strength to support conduits. We restrict our analysis to commercial banks based in Europe and the United States because these were the main sponsors of conduits. We restrict the sample to banks with share price data and more than $10 billion in assets (93 observations). We measure conduit exposure as ABCP outstanding relative to equity capital as of January 1, 2007.

Country-Level Response

First, we illustrate that the effect of the ABCP crisis was felt globally wherever ABCP exposure was high. This can be seen in Figure 8, which employs as the dependent variable the average stock return performance from July 1, 2007 to July 31, 2008 of all banks in a given country and as the independent variable the average ABCP to equity exposure of that country's banks. Countries that have nontrivial exposures are the United States, the United Kingdom, and France and Belgium (deficit countries), Netherlands

Figure 8. Stock Returns and Asset-Backed Commercial Paper from July 2007 to July 2008, by Country



Note: This figure shows average stock returns for the period from July 2007 to July 2008 and asset-backed commercial paper (ABCP) exposure, measured as ABCP outstanding relative to bank size, per country. Stock returns and ABCP exposure are weighted by bank assets. The stock return index data are from Datastream, the ABCP data are from Moody's Investor Service, and the bank data are from Bankscope.

and Germany (surplus countries). Most other countries are close to zero in terms of ABCP exposure. Nevertheless, there is a reasonably negative relationship between country-level stock price reaction and ABCP exposure. This underscores our main thesis of the paper that the financial crisis materialized at the very onset—in August 2007—also in many of the surplus countries, and that it was not just the United States (and the United Kingdom) that got affected by the production of risk-free ABCP to meet the inflow of global imbalances into the U.S. money market funds.

Bank-Level Response

To verify that the stock price responses in August 2007 were indeed because of ABCP exposure, we examine the bank-level stock price response and its relationship to bank-level exposure. Our baseline specification is

$$R_i = \alpha + \beta ConduitExp_i + \gamma X_i + \varepsilon_i,$$

where R_i is the cumulative stock return of bank i computed over the month of August 2007, $ConduitExp_i$ is bank i's ABCP conduit exposure relative to equity, X_i are banks i's observable characteristics (measured as of January 1, 2007) and ε_i is an error term. We estimate the specification using robust standard errors to allow for correlation across error terms.

Table 8 presents the results. Column (1) shows that a one-unit increase in conduit exposure reduces the cumulative stock return by 1.8 percentage points. The cumulative stock return for this sample was –1.7 percentage points in August 2007 with a standard deviation of 4.7 percent. A one-unit increase in exposure is approximately two standard deviations in the exposure variable or the difference between the exposure of Citibank (high exposure) and Wells Fargo (no exposure). Hence, conduit exposure had a statistically and economically important effect on bank stock returns over this period.

Column (2) controls for bank size with the natural logarithm of assets and the natural logarithm of equity. The coefficient of interest decreases to 1.6 percent but remains statistically significant. In Column (3), we add controls for the equity ratio and this coefficient remains unchanged. In Columns (4) and (5), we add control variables for funding sources such as deposit funding and short-term debt funding and the results are again unaffected. To test if exposure explains *within-country* variation in stock price reactions, Column (6) adds indicator variables for the country of bank headquarters. Again, the coefficient of interest is unaffected and remains statistically significant. We interpret these results as evidence that banks with higher conduit exposure were more negatively affected by the ABCP crisis. The coefficient may in fact constitute a lower bound of the realized impact because investors may have underestimated the severity of the downturn or may not have been fully aware of the (relatively opaque) credit guarantees provided to conduits.

Table 8. Impact of Asset-Backed Commercial Paper on Stock Returns at the Start of the Financial Crisis

	Dependent Variable: Stock Return					
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	−0.018	−0.016	−0.015	−0.011	−0.012	−0.024
	(0.004)**	(0.004)**	(0.005)**	(0.004)**	(0.004)**	(0.006)**
Log(assets)		−0.011	−0.044	−0.033	−0.041	−0.049
		(0.011)	(0.036)	(0.033)	(0.032)	(0.045)
Log(equity)		0.016	0.049	0.044	0.051	0.052
		(0.013)	(0.037)	(0.034)	(0.033)	(0.045)
Capital ratio			−0.514	−0.408	−0.516	−0.757
			(0.545)	(0.497)	(0.485)	(0.601)
Short-term debt (%)				−0.149	−0.172	−0.054
				(0.046)**	(0.048)**	(0.059)
Deposits share (%)					−0.043	0.003
					(0.025)	(0.029)
Constant	−0.014	0.007	0.134	0.098	0.154	0.175
	(0.005)**	(0.033)	(0.135)	(0.124)	(0.122)	(0.170)
Country FE	No	No	No	No	No	Yes
Observations	93	93	93	93	93	93
R-squared	0.045	0.068	0.079	0.15	0.175	0.431

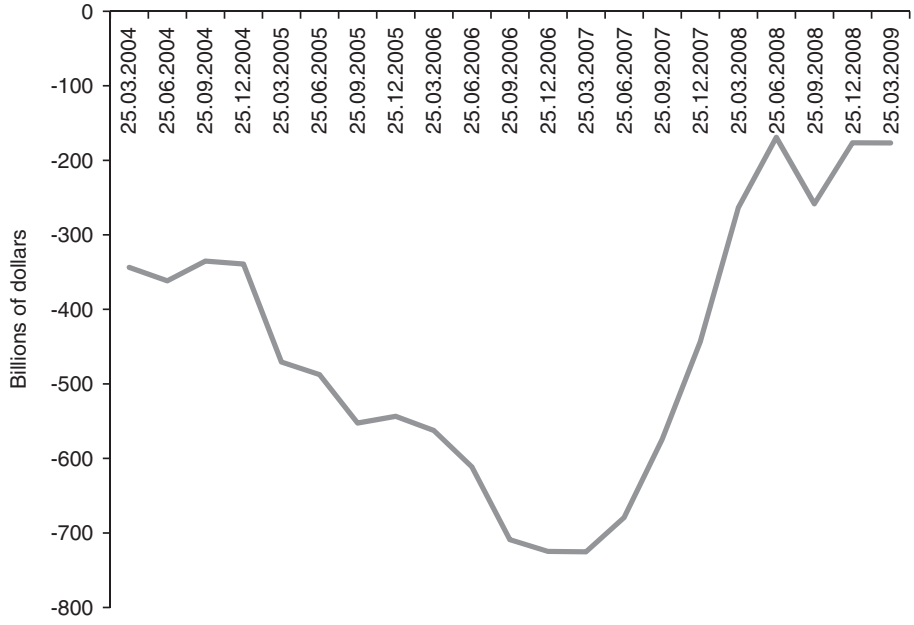
Note: This table shows the effect of conduit exposure on stock return in August 2007. The sample is restricted to consolidated banks with total assets of at least $10 billion in 2006 that have stock returns available. The dependent variable is the total stock return in August 2007. We measure conduit exposure as bank-sponsored asset-backed commercial paper outstanding relative to equity. Columns (2) to (6) include control variables for the ratio of short-term assets to debt, the ratio of equity to assets, log(Assets) and log(Equity). All control variables are measured on 1/1/2007. Column (6) includes country fixed effect. Robust standard errors are in parentheses below coefficients. *significant at 5 percent; **significant at 1 percent.

Dollar Shortages

As discussed above, most conduits financed themselves in dollars but many sponsoring banks were located in European countries. To the best of our knowledge, conduits usually hedge their currency exposure. For example, if a conduit owns long-term assets in dollars and finances the assets by issuing short-term ABCP in dollars, the conduit is considered hedged from a currency perspective. However, this structure exposes the sponsoring bank to the risk that the commercial paper cannot be rolled over and that the bank has to provide liquidity in dollars. Consistent with this interpretation, the Belgian-Dutch bank Fortis, a large sponsor of ABCP, states in its 2006 annual report that "the Fortis policy for banking activities is to hedge via short-term funding in the corresponding currency where possible."

As a result, we expect a large demand for dollar funding by European banks around the start of the financial crisis in 2007. In particular, if assets held by conduits are illiquid or can only be sold at fire-sale prices, banks need to secure dollar funding from sources other than the ABCP market. In fact, McGuire and von Peter (2009) document a significant dollar shortage during

Figure 9. Net Borrowing of European Banks' U.S. Offices in Dollars



Note: This figure shows total liabilities in dollars minus total assets in dollars of European banks' U.S. offices. The data are based on data collected by the Bank of International Settlements. The figure is based on the left-hand panel of Figure 6 in McGuire and von Peter (2009).

the financial crisis. One way to measure the extent of the dollar shortage is as the total borrowing in dollars by European banks' U.S. offices.

Figure 9 shows total borrowing by European banks' U.S. offices, measured as total liabilities in dollars minus total assets in dollars. The figure shows that total borrowing increased significantly at the start of the financial crisis in August 2007. McGuire and von Peter (2009) argue that at least some of the increase in borrowing of European banks' U.S. offices was borrowing from Federal Reserve facilities to which several European institutions had access to in their capacity as primary dealers. This evidence suggests that European banks substituted financing from the ABCP with financing from the Federal Reserve. As discussed by McGuire and von Peter (2009), such dollar shortages became particularly severe after the Lehman bankruptcy, which prompted the Federal Reserve to establish swap lines with other central banks, in particular in European countries.

V. Discussion: Bank Incentives to Concentrate Risks through Securitization

We have presented evidence that the geography of the financial crisis of 2007–09 had more to do with banking flows rather than with global

imbalances. Hence, we avoid reiterating the question asked elsewhere—what has caused the global imbalances and how to fix them? Instead, we ask—what incentives did large, global banks have to concentrate risks while deploying securitization methods such as ABCP conduits to absorb the capital inflows? In this section, we discuss a few possibilities including the changing nature of banking business, erosion of margins in traditional lending activity because of competition and securitization, risk-taking incentives induced by such erosion of bank franchise values, weak enforcement of capital requirements, bank size and government guarantees, and finally, globalization of banking. More empirical work is needed in order to tease between these different possible explanations.

To understand the surge in setting up of conduits in the period preceding July 2007, it is useful to start with the traditional banking model. In traditional banking, banks held on to the loans they originated while performing the role of delegated monitoring and screening on behalf of depositors (Diamond, 1984). In modern banking, there was a fundamental change in that banks originated loans and then distributed them to outside investors. In particular, banks began transferring financial assets, such as mortgages, trade receivables, consumer loans, corporate loans, and consumer loans off their balance sheets into separate legal entities called special-purpose vehicles (SPVs), of which ABCP conduits are one example. SPVs own the financial assets and issue ABS structured using several layers of tranches with higher tranches having priority over lower tranches in case of default of the underlying assets. This process of securitization was deemed to improve the safety of the financial system by allocating the financial risks to investors best able to hold those risks.

Financial system regulators have long recognized the benefits of securitization and provided incentives for financial institutions to shed risk and securitize assets. In practice, these incentives take the form of lower capital requirements if assets are securitized. This is beneficial from the bank's perspective, because issuing equity is generally costly relative to issuing debt. The downside of securitization is that it reduces bank incentives to properly monitor and screen borrowers relative to the traditional banking model (Stiglitz, 1992). Indeed, Berndt and Gupta (2008), Dell'Ariccia, Igan, and Laeven (2008), Keys and others (2008), and Mian and Sufi (2009) provide evidence that securitization and credit risk transfer weakened bank monitoring incentives in the run-up to the financial crisis of 2007–09.[8]

However, this explanation cannot fully explain the large losses on securitized assets realized *within* the banking sector in the ongoing financial crisis. Krishnamurthy (2008) shows that 39 percent of securitized mortgages

[8]For example, Keys and others (2008) show that loans eligible for securitization had higher default rates relative to comparable loans not eligible for securitization. If outside investors are unable to assess loan quality properly and instead rely on information provided by banks or rating agencies, banks have an incentive to originate low quality loans and sell them at inflated prices.

were held on bank balance sheets as of June 2008. In fact, many banks securitized assets but effectively were exposed to significant risk of assets after securitization (as with ABCP conduits in our paper) or explicitly continued to hold the risks after securitization (as with holdings of AAA tranches of subprime mortgages).[9] This suggests that reduced monitoring incentives only provide a partial explanation for why banks decided to originate *and* hold securitized assets.

We conjecture that in modern banking, while securitization freed up costly equity capital that banks could deploy elsewhere, at the same time, banks no longer collected revenues from holding and managing risk, thus operating at weaker margins in their traditional business. As a result, banks started to explore how to reduce capital requirements while still earning compensation for holding risk. For example, in the case of ABCP conduits, banks sold credit and liquidity guarantees so that short-term debt investors in the conduits' assets had effectively close to full, contingent recourse to bank balance-sheets but banks benefited from lower capital requirements in the short run. In particular, if asset quality deteriorated in the future, then the end investors in securitization vehicles would not roll over debt, a form of a "run" in the shadow banking sector, and the asset risks would be brought back by banks on to their balance sheets (Covitz, Liang, and Suarez, 2009).

This most modern banking model—which Acharya, Schnabl, and Suarez (2009) call "securitization without risk transfer"—evidently violates the defining characteristic of securitization, namely, the transfer of credit risk to outside investors. It is however consistent with banks wanting to risk shift (Jensen and Meckling, 1976) or pay out private profits at the expense of transferring hidden debt risks on to others (for example, on to taxpayers, as argued by Akerlof and Romer, 1993). Such incentives in turn might have arisen because of heightened competition and cross-border banking leading to a thinning of margins in traditional banking business (Keeley, 1990; Gorton, 2009),[10] short-termism on part of bank management and risk-takers (Gorton and Rosen, 1995), and the presence of government guarantees such as deposit insurance and the too-big-to-fail doctrine (Arteta and others, 2008; Philippon and Schnabl, 2009).

[9]For example, a report commissioned by the Swiss Banking Regulator documents that UBS, one of the world largest banks by assets in 2006, actively sought to keep and purchase assets they had previously securitized.

[10]Stiroh (2002) shows, for example, that the component of revenues earned through interest payments by commercial banks in the United States has been dwindling steadily, and it has been replaced by fee-based income and trading revenues. While interest and fee income is relatively stable over the business cycle, trading revenues are highly volatile and in fact much lower in Sharpe ratios. This can be considered evidence supportive of a gradual trend in banking to engage increasingly in short-term, speculative activities, a phenomenon only further facilitated by the repeal of the Glass-Steagall Act (separating commercial and investment banking activities) and enactment of the Gramm-Leach-Bliley Act in 1999 (allowing commercial, investment and insurance activities within a single bank).

Also, as stressed earlier in the paper, banks found ABCP conduits especially attractive as risk-free assets were created with very little capital on balance-sheet. Although this practice was legal, it was clearly an exploitation of a loophole in capital requirements since the accordance of such guarantees did not constitute a complete credit risk transfer and capital treatment of conduits should thus have been identical to assets on balance-sheet. Indeed, Spain and Portugal adopted national capital standards to rule out any preferential treatment of conduits, and had little conduit activity, whereas other regulators chose to allow the ''regulatory arbitrage.''

Viewed through this lens—that of global banks and bankers wanting to take excessive risks to transfer value away from creditors and taxpayers—global imbalances could in fact be considered as a catalyst or amplifier of the financial crisis of 2007–09 rather than the root cause.

VII. Conclusion

In this paper, we provided evidence that while global imbalances may help to explain the capital flows from surplus to deficit countries, they fail to explain the geography of the financial crisis of 2007–09, in particular, why surplus countries such as Germany and their banks were as heavily involved as the U.S. banks in the business of creating risk-free securities and concentrating risks in the process. We examined the ABCP conduits—one production technology for risk-free assets to meet the needs of U.S. money market funds—as a way of illustrating this point.

We note that global banks may also have taken on similar risks via investing in other assets. For example, some banks actively invested in AAA rated tranches of MBS and CDO.[11] This strategy is similar to that of selling liquidity enhancements to ABCP conduits: banks take on highly levered bets on the economy because AAA rated tranches yield a premium over Treasuries in good times and only suffer in case of an economic catastrophe. Although the crisis in the ABCP market constituted the first important phase of the crisis starting August 2007, the losses on AAA-rated tranches took center stage beginning in October 2007. Owing to lack of bank-level data, we are unable to provide an in-depth analysis of global banking flow patterns linked to AAA-rated tranches. However, if such data become available, it would be important to extend our analysis and analyze whether risk-taking is uncorrelated with global imbalances. To the extent possible, such an analysis should also include other safe assets such as U.S. treasuries and U.S. agency debt.

We conclude that while it is useful for future reforms to take head on the issue of reducing global imbalances, such reforms are no panacea for ruling

[11]For example, the Swiss bank regulator issued a detail report on how the universal bank UBS suffered huge losses because of its exposure to the U.S. housing backed AAA-rated tranches.

out global financial crises that seem more attributable to an increasing propensity of the global banking sector to "manufacture tail risks"[12] (or synthesize "carry trade" style payoffs) coupled with its weak or ineffective regulation. Maturity mismatch of the ABCP conduits and their effective recourse to sponsor bank balance sheets can be considered a canonical example of such propensity. Addressing this propensity might reduce incidences of global financial crises even in a world where global imbalances persist. Although many reforms to the financial sector are being proposed, one seems most important to us: the quality of enforcement of capital requirements (and not just their level). Not allowing global imbalances to find their way into the poorly capitalized shadow banking world of ABCP conduits might have simply reversed or at least blocked the pattern of capital flows, and enabled financial regulators worldwide to effect a (relatively) market-based correction to the global imbalances.

It is sometimes easier to guard against a disease than to eradicate it. Global imbalances may be a case in point.

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[12]The term "manufacturing tail risk" is used by Acharya and others (2010) to describe the evolving model of banks and financial firms as regulation restricting risks effectively weakened whereas access to government guarantees remained or in fact strengthened.

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