Cross-Border Bank Flows and Systemic Risk[1]

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Abstract

We examine the impact of cross-border bank flows on recipient countries' systemic risk. Using data on bank flows from 26 source countries to 119 recipient countries, we find that bank flows are associated with improved financial stability (i.e. lower systemic risk) in the recipient country. The impact of bank flows is stronger in recipient countries with weak regulatory quality and fragile banking sectors; weak evidence suggests that the impact is more pronounced when bank flows come from source countries with relatively stronger regulatory quality and more stable banking sectors. In addition, we document that bank flows reduce systemic risk of larger banks, with poor asset quality and more volatile sources of funds. The evidence suggests that bank flows reduce systemic risk by improving banks' aggregate funding mix and by reducing reliance on non-traditional revenue sources for banks domiciled in fragile countries. Overall, our evidence supports the benign view of regulatory arbitrage in international bank flows.

Keywords: Cross-border bank flows, financial institutions, bank regulation, systemic risk, financial crises

JEL Codes: G21; G28; G34; G38.

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1. Introduction

A major policy question exists as to whether opening up to global influences strengthens or destabilizes a banking system. The recent global financial crisis underscores the importance of such a question. Given the vast differences in banking regulation and supervision across countries, there are concerns about banks from countries with stricter regulations engaging in cross-border activities in countries with fewer regulations. Thus, regulatory arbitrage may be a problem, as these banks may invest in countries with looser regulations and increase their risk-taking, destabilizing the financial system (Acharya, Wachtel, and Walter, 2009). Regulatory arbitrage has been shown to be an important determinant of both cross-border bank flows and merger and acquisition activity (Houston, Lin, and Ma, 2012; Karolyi and Taboada, 2015). Little is known, however, about the economic consequences of those flows linked to "regulatory arbitrage" on the host markets. In this paper, we take the first major step at filling this gap in the literature.

There has been a large increase in the flow of bank capital across countries since the mid-1980s; banks' foreign claims increased from $750 billion as of 1983 to a peak of $34 trillion as of 2007, tapering off since the financial crisis to $31 trillion in 2013 (see Figure 1).[2] Bank flows to developed countries have seen a large decline since the financial crisis, driven primarily by retrenchment of European banks (IMF, 2015). In contrast, as Figure 1 shows, flows to developing countries have continued to increase since 2008 reaching a peak of $5.9 trillion as of 2013. International bank flows continue to be an important channel for the transfer of capital across countries even after the global financial crisis. Using these data on bank flows, Houston et al. (2012) find evidence that banks engage in regulatory arbitrage by transferring funds from countries with stricter regulations to those with a lax regulatory environment. Such activity could have

[2] Bank for International Settlements Quarterly Review, 2015.

positive or negative consequences for the recipient country. On one hand, banks engaging in such forms of regulatory arbitrage could be doing so to escape from costly regulations in their home country that prevent them from investing in certain risky, but profitable projects. If this motive is the driver of regulatory arbitrage, we should observe positive economic consequences for the recipient country, as banks engaging in such activities can maximize value for shareholders and improve capital allocation. On the other hand, banks could engage in regulatory arbitrage to pursue value-destroying activities in the form of excessive risk-taking, for example. This form of regulatory arbitrage could have adverse consequences on bank performance and shareholder value and destabilize the recipient country's financial system.

In this study, we shed light on the economic consequences of regulatory arbitrage by examining the impact of cross-border bank flows on the financial stability, or aggregate systemic risk, of recipient countries. Specifically, we assess how bank inflows and outflows affect the systemic risk of the recipient country's financial system and its member banks. Building upon prior studies (Houston, et al., 2012; Karolyi and Taboada, 2015), we model the predeterminants of cross-border bank flows and explore the unexpected flows relative to their predeterminants for risk and risk-taking. We find that unexpected flows are related to lower aggregate systemic risk in the recipient markets. This effect is concentrated in recipient countries with weaker regulatory quality and more fragile banking sectors. We further document that this impact is driven by a reduction in systemic risk for banks in recipient countries that are larger, riskier, and rely more on volatile funding sources. Finally, we find evidence that bank flows impact systemic risk in the recipient country by reducing the potential for liquidity problems in all countries, and by reducing banks' reliance on trading income in fragile countries.

To estimate residual bank flows, we use a sample of 119 recipient countries over the period from 2000 through 2013 and follow a two-stage process. We first estimate cross-border bank flows using the gravity model from Houston, et al. (2012). Following this, we extract the residuals, or unexpected flows from the model and examine the effect of the residual flows on systemic risk in the recipient country's banking system. While several measures of systemic risk have been developed and used in research over the recent past (see e.g. Bisias, Flood, Lo, and Valavanis, 2012), we focus on two measures that allow us to capture aggregate systemic risk at the country level: 1) *SRISK* – from Brownlees and Engle (2015), and 2) *MES* - the marginal expected shortfall from Acharya et al. (2010).[3] *SRISK* estimates the amount of capital needed during a crisis for a bank to maintain an 8% capital-to-assets ratio. *MES* measures the average bank return on days when the market is in the 5% left tail of its distribution; in our analyses we use the negative value of *MES* so that both of our measures are increasing in systemic risk. These measures have been widely used in the literature and have been shown to be suitable measures of systemic risk (see e.g. Acharya et al., 2010; Brunnermeier, Dong, and Palia, 2012; Engle, et al. 2014).[4] Figure 2 shows the evolution of our two measures of systemic risk. The two measures are highly correlated and both reach a peak during the 2008-09 global financial crisis, when realized systemic risk escalated.

We first examine the impact of actual and unexpected flows on systemic risk and find that both are related to lower *SRISK* (*MES*) in recipient markets, thus allaying concerns that cross-border bank flows are related to instability in host countries' financial systems. We next examine the impact of bank flows that are in line with regulatory arbitrage. To do so, we divide the sample

[3] Given our large cross-section of countries, data availability prevents us from using another commonly used measure of systemic risk, *CoVaR* (Adrian and Brunnermeier, 2009).
[4] Engle et al. (2014) compare different measures of systemic risk, including tail-beta (De Jonghe, 2010), Z-score and *MES*. They find that *MES* is the most suitable measure.

by the regulatory quality of the source and recipient countries. Specifically, we aggregate residuals from the estimation of cross-border bank flows at the recipient-country-year based on source (recipient) countries' regulatory quality. Following Karolyi and Taboada (2015), we group countries using four *de jure* measures of regulatory quality from Barth, Caprio, and Levine (2013); in addition, we use six *de facto* measures of banking system stability to divide our sample. Moreover, we use the first principal component of both the *de jure* and *de facto* variables as a way to divide the countries by their aggregate regulatory quality or stability. When sorting by source country, we find that cross-border bank flows are always statistically significant and negatively related to systemic risk in the recipient country, regardless of the regulatory quality of the source country. However, we find that flows coming from source countries with stronger aggregate regulatory quality and stability have a larger economic impact on the recipient countries. In addition, we find that recipient countries with more fragile banking sectors benefit more from flows coming from source countries with more stable banking sectors. However, we are not able to infer that there is a statistically significant difference between the coefficients on the flows to high- and low regulatory quality recipient countries.

Because we are unable to see a difference between high- and low-quality recipient countries, we turn to bank-level tests. It may be the case that bank characteristics within the recipient countries are more important than recipient country characteristics. Indeed, we find that banks that are larger, are more reliant on volatile short-term funding sources, and have higher proportion of non-performing loans are more heavily influenced by cross-border bank flows. These types of banks have a higher ex-ante level of exposure to systemic risk.

Next, we study the channels through which cross-border flows reduce systemic risk in recipient countries. We posit that risk reduction may stem from a reduced reliance on non-

traditional income, higher quality loan portfolios, or a reduction in the potential for liquidity problems. Our results suggest that cross-border bank flows are associated with reduced liquidity risk (less reliance on volatile short-term funding and lower leverage) for banks in all countries and reduced reliance on non-traditional income (lower trading income) for banks in fragile recipient countries. In all of our analyses, cross-border bank flows are negatively related to these outcome variables.

Finally, we examine the robustness of our methodology. Our main results use the *entire* time series of data from 1983-2013 to estimate *all* of our residuals. This introduces the potential for a look-ahead bias in our results. Accordingly, we estimate residual flows using a number of techniques, including a 15-year rolling window, 10-year rolling window, and expanding windows with fixed starting points of 1990 or 1983. In all cases, we find our results to be robust to these alternative estimation techniques. In a further robustness test, we sort the source countries in our sample by additional regulatory characteristics and find our results to be robust. We address concerns about potential endogeneity and reverse causality in our tests by employing instrumental variables for cross-border bank flows using proxies for trade barriers and merger control as exogenous instruments. While this solution cannot completely eliminate concerns that bank flows may endogenously respond to changes in recipient countries' systemic risk, our key findings are resilient to these alternative identification approaches.

We contribute to several strands of the finance literature. First, we contribute to the literature on international banking sector regulation (Barth, Caprio, and Levine, 2004, 2006, 2008; Beck, Levine, and Levkov, 2010; Laeven and Levine, 2009; Morrison and White, 2009) and to the related literature examining regulatory arbitrage (Houston et al., 2012; Ongena, Popov, and Udell, 2013; Karolyi and Taboada, 2015). Cross-border studies about bank regulation have shown that

tough regulatory restrictions on bank activities and barriers to foreign entry hurt banking sector performance (Barth, et al. (2006)). Laeven and Levine (2009) find that tougher bank regulation reduces bank's risk-taking behavior, although the impact of regulations on risk-taking depends critically on each bank's ownership structure. More recently, Houston, et al. (2012) examine international bank flows and find evidence of regulatory arbitrage, as banks tend to predominantly transfer funds to countries with fewer regulations. They argue that the direction of the flows could signal a harmful "race to the bottom." Ongena, et al. (2013) examine the impact of home country regulations on lending activity abroad by European banks with presence in 16 Eastern European countries. They find that banks from countries with tighter restrictions on bank activities and more capital requirements tend to make riskier loans abroad, which is in line with the race to the bottom view of regulatory arbitrage. However, they also find that stronger supervision at home reduces risk-taking abroad. Karolyi and Taboada (2015) explore regulatory arbitrage in the context of cross-border bank acquisitions. They find that regulatory arbitrage is a motive behind cross-border bank acquisition flows, but their evidence on stock price reaction to deal announcements is more in line with a benign form of regulatory arbitrage than a potentially destructive one.

Our study expands on the findings in the above studies by more directly exploring the economic consequences of regulatory arbitrage in cross-border bank flows. As such, we contribute to the debate on whether this form of regulatory arbitrage should be a source for concern as regulators around the world continue to push for more stringent government oversight of financial institutions that aim to promote stability in the banking sector. Our findings show that regulatory arbitrage in cross-border bank flows may not be a cause for concern, at least from the perspective of financial system stability.

Our study also sheds light on the debate about the benefits and costs of cross-border lending activities. On one hand, cross-border lending may facilitate risk-sharing and diversification and reduce banks' exposure to domestic shocks (Allen, et al., 2011; Schoenmaker and Wagner, 2011). On the other hand, through cross-border lending, banks may transmit foreign shocks to host markets (Bruno and Shin, 2015). In line with the prior argument, several studies find that cross-border lending is less stable than local lending (Schanbl, 2012; Peek and Rosengren, 2000; De Haas and van Lelyveld, 2006; McCauley, McGuire, and von Peter, 2012). We shed light on this debate by providing evidence of a positive impact of cross-border bank flows on the stability of the recipient country's financial sector. Importantly, our results show that bank flows are beneficial for recipient countries that are more fragile and have weaker regulatory environments.

We also contribute to the growing literature that explores the determinants of systemic risk. Many studies have focused on how non-traditional banking activities affect banks' systemic risk. Since non-traditional banking activities may allow banks to circumvent capital regulations (Acharya, Schnabl, and Suarez, 2013), engaging in such activities may lead to increases in systemic risk. Consistent with this view, several studies find that higher levels of non-interest income lead to increases in systemic risk exposures (Brunnermeier et al., 2015; De Jonghe, 2010), or to increased risk-taking (DeYoung and Roland, 2010; Demirgüç-Kunt and Huizinga, 2010; Stiroh, 2004)). More recently, Engle, et al. (2014) show evidence of heterogeneity in the relation between non-traditional banking activities and systemic risk based on a country's market structure. Specifically, they document that the positive relation between non-interest income and systemic risk is driven by banks in less concentrated banking sectors. They find that increased reliance on non-traditional banking activities may reduce systemic risk in countries with more concentrated banking sectors. The latter result adds some support to the diversification benefits view of bank

activities, which argues that through the provision of non-traditional banking services, banks can obtain more information that helps reduce information asymmetry inherent in banks' lending relationships (Boot, 2000; Degryse and Van Cayseele, 2000; Bhattacharya and Thakor, 1993). What our study adds to this literature is global evidence on another important determinant of systemic risk−cross-border international bank flows. We find that bank flows mitigate systemic risk in recipient countries through improvements in liquidity and through a reduction in non-traditional income sources for banks in fragile countries.

2. Data and Methodology

Our data comes from various sources. We obtain data on international bilateral bank flows from the consolidated banking statistics published by the Bank for International Settlements (BIS). The data provide details of the credit risk exposures of banks headquartered in 26 BIS reporting countries.[5] Data are available on a quarterly basis since December 1983. The consolidated foreign claims (loans, debt securities, and equities) include: 1) cross-border claims − claims granted to non-residents; 2) international claims − local claims of foreign affiliates in foreign currency; and 3) local claims of foreign affiliates in local currency (BIS, 2009). We obtain data on foreign claims from 1983 through 2013. The initial sample consists of total claims from 26 source countries to 198 recipient countries. We exclude 79 countries with missing data on our main country-level variables. Our final sample consists of bank flows from 26 source countries to 119 recipient countries, totaling 44,559 country-pair-year observations. Using these data, we follow Houston, Li, and Ma (2012) and construct our measure of bank flows, $Bank\ Flows_{s,r,t}$, as the annual

[5] The 26 source countries are: Australia, Austria, Belgium, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Mexico, Netherlands, Panama, Portugal, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom, and United States. BIS no longer provides data on foreign claims for banks in Norway.

difference of log total foreign claims for each source-recipient combination. Specifically, *Bank Flows*$_{s,r,t}$ is computed as the log difference (i.e. difference in log from *t-1* to *t*) of total foreign claims from source country *s* to recipient country *r*. In our main analyses, we aggregate the annual bilateral data at the recipient country-year level. We also obtain estimates of unexpected bank flows to a recipient country (as explained in the next section) using the bilateral bank flows data.

We also gather data for two instrumental variables which we use in a two-stage least squares methodology. First, we use *Restrictions*, an index of restrictions on trade from the KOF Index of Globalization from Dreher (2006) and updated in Dreher, Gaston and Martens (2008). The index is a subcomponent of the Economic Globalization index and measures barriers to trade which include hidden import barriers; tariff rates; taxes on international trade, and capital account restrictions, including limits on foreign ownership of domestic companies. We multiply the index by negative one such that higher values are associated with more restrictive regimes. Second, we use a proxy of merger controls following Karolyi and Taboada (2015). Specifically, we use *Failed deals*, the sum of all failed non-financial M&A deals in year *t* in country *i* as a proportion of all non-financial deals announced in country *i* in year *t.* In both cases, the instrument is related to bank flows but is not obviously related to the systemic risk of the financial system in a given country.

We obtain data on our main measure of systemic risk, *SRISK*, from The Volatility Institute at NYU- Stern (V-LAB). The data on *SRISK* is available for 56 recipient countries in our final sample starting in 2000.[6] Coverage varies by country with 32 of our countries having data available since 2000.[7] *SRISK* is the expected capital shortfall of a bank conditional on a crisis;

[6] *SRISK* data is available for all but two (Australia and Panama) of the 26 BIS source countries.
[7] Data on *SRISK* starts in 2001 (four countries), 2002 (two), 2003 (three), 2004 (two), 2005 (two), 2006 (one), 2007 (one), 2008 (five), and 2009 (two). Data for Slovenia (Jordan) is only available since 2011 (2012). We include these last two countries in our main analyses for completeness, but our results are unaffected if we exclude them.

specifically, *SRISK* measures how much capital would be needed in a crisis for a bank to maintain an 8% capital-to-assets ratio. *SRISK* is calculated at the bank level and then summed up to the country level.[8] The components of *SRISK* are bank size, leverage, and long run marginal expected shortfall (*LRMES*). *LRMES* is the expectation of the bank equity multi-period return conditional on a systemic event. Formally, *SRISK* is given by:

$$SRISK_{i,t} = kD_{it} - (1-k)W_{it}(1 + LRMES_{it}) \quad (1)$$

where *D* is the book value of debt, *W* is the market value of equity, and *k* is the prudential capital fraction (Brownlees and Engle, 2015). The data are available on a daily basis, and we use the year-end value for each country. We then scale this measure of systemic risk by the country's real Gross Domestic Product (GDP).

Our second measure of systemic risk is the marginal expected shortfall (*MES*) from Acharya, et al. (2010). We compute *MES* as the average bank return during the worst 5% of market return days in a year. We estimate *MES* for all banks with available data on stock price returns from DataStream. We then aggregate *MES* at the country level each year by computing the market value-weighted average *MES* of all banks in the country. We are able to compute country-level measures of *MES* for 65 countries with at least three banks with available data.[9] For ease of interpretation, we take the negative value of *MES* to ensure that both of our measures are increasing in systemic risk.

Our measures of regulatory quality are from Barth, et al. (2013). Following Karolyi and Taboada (2015) we use four measures of the quality of bank regulation: 1) *Restrictions on bank activities*, an index that measures regulatory impediments to banks engaging in securities market activities (underwriting, brokering, dealing, mutual funds), insurance activities (underwriting and

[8] We are only able to obtain the aggregated country-level data on *SRISK* from V-LAB.
[9] In our regressions, our final *MES* sample consists of 60 countries with available data on all country-level variables.

selling), and real estate (development or management); 2) *Stringency of capital regulation*, an index measuring how much capital banks must hold, as well as the sources of funds that count as regulatory capital; 3) *Official supervisory power*, an index that measures whether supervisory authorities have the power to take actions to prevent or correct problems, and 4) *Private monitoring*, an index that measures whether there are incentives for the private monitoring of banks. We also use a composite index of the strength of bank regulation, *Regulation overall-PCA*, which is the first principal component of the four indices. Because the indices are not available annually, we use the value of the variables from the first survey (data as of 1999) for the period 2000 to 2001, the value of the variables from the second survey (data as of 2002) for the period 2002 to 2004, the value of the variables from the third survey (data as of 2005) for the period 2005 to 2010, and the value of the variables from the last survey for the period 2011 to 2013. These and other variables used in our analyses are described in detail in Appendix A.

We also obtain various country-level measures that have been show to influence systemic risk (see e.g. Engle, Jondeau, and Rockinger (2015); Brunnermeier, Dong, and Palia (2015)). To control for financial development and growth we use the log of GDP per capita (*Log GDP per capita*) and the growth in real GDP (*GDP growth*) obtained from the World Bank's World Development Indicators database. From the World Bank's Global Financial Development Database (Beck, Demirgüç-Kunt, and Levine (2009), Čihák et al. (2012)) we obtain the total credit provided by deposit money banks to the private nonfinancial sector, scaled by GDP (*Bank credit*), as a proxy for banking sector size, and the non-interest income to total income (*Non-interest income*) to proxy for the extent of noncore banking activities. We obtain stock market index returns from DataStream to compute the annual market return (*Market return*) and stock market volatility (*Volatility*) − annualized standard deviation of weekly stock market index returns. We

also obtain data on measures of banking sector fragility from the Global Financial Development Database: 1) *Regulatory capital* – the ratio of regulatory capital-to-risk-weighted assets; 2) *Z-score* – the sum of the mean return on assets and the mean ratio of equity to assets, divided by the standard deviation of the return on assets (Roy, 1952; Laeven and Levine, 2009); 3) *Liquid assets-to-deposits* − the ratio of the value of liquid assets-to-short-term funding plus total deposits; 4) *Bank assets* − total assets held by deposit money banks as a share of GDP; 5) *Provisions-to-NPL*− provisions for loan and lease losses as a proportion of non-performing loans, and 6) *Concentration* − the assets of the three largest commercial banks as a share of total commercial banking assets. We also use a composite index of banking sector stability (*Stability PCA*) that is the first principal component of these six banking sector indicators. All variables used in our analyses are defined in Appendix A. Appendix C shows descriptive statistics of the international bank flows, systemic risk, regulatory quality, and banking sector fragility measures for our final sample of 70 countries with available data on at least one of the measures of systemic risk.

Panels A and B of Table 1 show descriptive statistics of our main country-level variables for the *MES* sample and for the subsample of countries with available data on *SRISK*, respectively. On average, *SRISK* represents approximately 5% of GDP. The average *MES* is 2.7% for the *MES* sample and a slightly higher 3.0% for the *SRISK* subsample. In general, most of the variables are comparable across the two samples, although countries in the *SRISK* subsample tend to have larger banking sectors; the average bank assets-to-GDP ratio is 90.9% for the *MES* sample, but 104.6% for the *SRISK* subsample.

3. Results

3.1. The Determinants of Systemic Risk

To assess the impact of actual and unexpected bank flows on the recipient country's systemic risk, we run various specifications of the following regressions:

$$SRISK_{r,t} = \alpha + \beta Flows_{r,t-1} + \gamma X_{r,t-1} + \delta_t + \theta_r + \varepsilon_{r,t} \quad (2)$$

where *SRISK* refers to our measures of systemic risk– *SRISK* and *MES*. $Flows_{r,t-1}$ refers to *actual* or *residual* (as explained later) bank flows into recipient country *r* in year *t-1*. $X_{r,t-1}$ is a vector of recipient country controls that have been shown to impact systemic risk of the financial system: *Log GDP per capita, GDP growth, Volatility, Market return, Non-interest income,* and *Bank credit*. *Volatility*, *Market return*, and *Bank credit* are variables used to estimate the systemic risk of a country by Engle, Jondeau, and Rockinger (2015); non-interest income has been shown to impact systemic risk at the bank-level (Brunnermeier, Dong, and Palia, 2015). Finally, δ_t and θ_r are year and recipient country fixed effects, respectively. In all regressions, we cluster standard errors at the recipient country level (Petersen, 2009).

Our main results from the estimation of equation 2 are presented in Table 2. The dependent variable in all regressions is the systemic risk of the *recipient* country's financial system. In Models (1)-(6), we use *SRISK-to-GDP* to measure systemic risk and in Models (7)-(12) we use *MES (%)* to measure systemic risk. Models (1), (2), (7), and (8) use only variables that have been used in previous work to forecast systemic risk. Models (3)-(6) and (9)-(12) include the actual cross-border bank flows, *Flows* (difference in log of total foreign claims to recipient country from *t*-1 to *t*) as the key dependent variable. This variable represents the sum of all flows entering a recipient country regardless of the source. The addition of this variable to the regression is one of the main points of departure from other work in the literature. Models (3), (4), (9), and (10) use

the OLS regression methodology, and models (5), (6), (11), and (12) use the two-stage least squares methodology. We instrument for flows by using our two instruments defined earlier: *Restrictions*, and *Failed deals*. The first-stage *F*-statistics consistently support the relevance of the instrumental variables we have selected and we are unable to reject the joint null of their validity using the Hansen's *J*-test of overidentifying restrictions in any of our four models. We report the corresponding first-stage regressions results in Appendix D.

Across this set of regressions, we find strong evidence that positive cross-border bank flows are related to a reduction in *SRISK-to-GDP* in the recipient country. Across all model specifications in which flows are included, the coefficient on *Flows* is negative and statistically significant at the 1% level. This result sheds more light on cross-border bank flows as a form of regulatory arbitrage. Houston et al. (2012) find that on average bank capital tends to flow from countries with strong regulations to countries with lax regulatory environments. They argue that this type of behavior on the part of source country institutions may be detrimental to the recipient country, leading to a possible destructive race to the bottom in global banking regulations. Our results do not support this view. We show that these cross-border bank flows actually reduce the systemic risk of the recipient's financial system. Economically, this effect is large. Taking the coefficients in Model (3) as an example, a one-standard-deviation increase in *Flows* (2.358) is associated with a reduction in *SRISK* of 1.20, which represents 14.77% of its standard deviation (8.143).

Our results are similar when using our alternate measure of systemic risk− *MES* (Models (7)-(12)). Taking the coefficients in Model (9), a one-standard-deviation increase in *Flows* (2.093 for this sample) is associated with a reduction in *MES* of 0.232, which represents 13.83% of its

standard deviation (1.680). Overall, our results using *MES* are of slightly smaller magnitude, but consistent with those using *SRISK* as our measure of systemic risk.

3.2. Systemic Risk and Unexpected Cross-Border Bank Flows

We focus next on *unexpected* bank flows between country-pairs. To estimate unexpected bank flows, we first run regressions of bank flows by country-pair-year using various specifications of a gravity model, which follows Houston et al. (2012). We proceed to estimate bank-flows by country-pair-year using various specifications of the following model using all available data from 1983 to 2013:

$$Bank\ Flow_{s,r,t} = \alpha + \beta_1 \Delta X + \beta_2 DIST + \beta_3 SAME\ LANGUAGE + \gamma_t + \delta_s + \theta_r + \varepsilon_{s,r,t} \quad (3)$$

where $Bank\ Flow_{s,r,t}$ is the log difference (from *t-1* to *t*) of total foreign claims from source country *s* to recipient country *r*. ΔX is a vector of controls that have been shown to influence bank flows, measured as differences between source county *s* and recipient country *r*, which includes: 1) the creditor rights index (*Creditor rights*) from Djankov et al. (2007) to control for the power of secured creditors; 2) the depth of credit information (*Credit depth*) from the World Bank's Doing Business database to control for the information content of credit information; 3) the property rights index (*Property rights*) from the Fraser Institute as a proxy for the quality of legal institutions; 4) the *log of GDP per capita*; 5) real *GDP growth*, and 6) the natural log of population (*Population*). We also use two variables that are commonly used in the trade literature to explain resistance to greater cross-border trade flows, which we obtain from Mayer and Zignago (2011). These include the log of the circle distance in kilometers between countries' capitals (*Distance*) and an indicator variable for countries that share the same language (*Same Language*). Finally, γ_t, δ_s, and θ_r refer to year, source, and recipient country fixed effects, respectively.

We provide the results of these regressions in Table 3, Panel A. Models presented here replicate the prior work of Houston, et al. (2012). We obtain results that are consistent with the literature. The coefficients on *Credit depth*, *log of GDP per capita*, *GDP growth*, *Population*, and *Distance* are generally significant and negative. The coefficient on *Same language* is positive and significant in all regressions. Model (6) introduces regulatory variables, and we find that the coefficients on *Bank activities restrictions*, *Stringency of capital regulation,* and *Strength of external audit* are all positive and statistically significant, confirming the findings in Houston et al. (2012) that banks transfer funds to countries with fewer regulations. Models (7)-(9) include combinations of regulatory variables.

We construct various measures of residual bank flows by aggregating the residuals from each of the estimations of equation (3), specifically Model (9), at the recipient country-year level. Our measure of residual flows is given as:

$$Residual\ Flows_{rt} = \sum_{s=1}^{26} \varepsilon_{s,r,t} \times \frac{GDP_{s,t}}{TOTGDP_t} \quad (4)$$

where *r* refers to recipient country; *s* refers to source country; ε_{srt} are the residuals from Eq. (3); $GDP_{s,t}$ is the GDP of source country *s* in year *t*, and $TOTGDP_t$ is the total GDP of all source countries in year *t*. In robustness tests, we aggregate residuals using equal weights for all source countries. Results using this approach are similar, although the magnitude of the results is smaller. Table 3, Panel B presents summary statistics at the recipient country-year level for our estimates of residual cross-border flows for both the *MES* sample and the *SRISK* subsample. To mitigate endogeneity concerns, we again turn to a two-stage least squares setting for some regressions. We use a proxy for restrictions on trade (*Restrictions*) from the KOF Index of Globalization and a proxy for merger controls (*Failed deals*) as our instruments. We use these variables as exogenous instruments that should affect bank flows, but should not have a first-order impact on systemic

risk. The use of this approach, in addition to using residual flows from regressions that control for known determinants of bank flows, while far from perfect, should alleviate concerns that bank flows may endogenously respond to changes in systemic risk in the recipient country.

Given our interest in determining the effect of bank flows that are in line with regulatory arbitrage, we also construct measures of unexpected flows into a recipient country conditioning on the quality of the source country. Specifically, we use our five *de jure* measures of regulatory quality, and the seven *de facto* measures of banking sector stability to sort source countries into groups of high and low quality each year, based on the median values of these measures. Importantly, to better capture flows from countries with high regulatory quality to those with low regulatory quality, we only classify a source country as *High regulatory quality* (*Stable*) if its measure of regulatory quality (stability) is above the cross-country median *and* if the measure is *higher* than that of the recipient country. We then aggregate residuals using Eq. (4) at the recipient country-year level separately for flows from high (above median and higher than recipient country) quality source countries−*Flows High*− and for flows from low quality source countries − *Flows Low.*

The impact of international bank flows on systemic risk may depend on whether there is a net inflow of capital into the recipient country or whether there is a net outflow of capital. To assess whether there is a differential impact of bank inflows relative to bank outflows, we construct a third measure of unexpected flows, following the same methodology. Specifically, we aggregate residuals from the estimation of equation 3 at the recipient country-year separately for inflows and outflows. *Residual Inflows (Residual Outflows)* are residuals from the estimation of equation (3) aggregated at the recipient country-year level across all source countries from which the recipient country experienced an increase (decrease) in bank flows from year *t-1* to *t*.

We then take measures of the total residual flows, total residual inflows, and total residual outflows and incorporate them into the regression specifications found in Table 2. This set of regressions studies the effect of unexpected cross-border flows on the aggregate systemic risk of a country. We replace total cross-border flows in each regression with the residual flow variables we created. Models (1)-(4) focus on *SRISK-to-GDP* and Models (5)-(8) focus on *MES (%)*. We report the results of these tests in Table 4. We find that the coefficients on *Residual Flows* are negative and statistically significant in Models (1) and (5). Using the coefficient in Model (1), a one-standard-deviation increase in *Residual Flows* (1.220) is related to a 0.89% decrease in *SRISK-to-GDP* in the recipient country, which is 10.95% of its standard deviation. Likewise, using the coefficient from Model (5), a one-standard-deviation increase in *Residual Flows* (1.091 for this subsample) is related to a 0.147% decrease in *MES* in the recipient country, or 8.77% of its standard deviation. Models (2) and (6) study this relation in a two-stage least squares setting. We again instrument for bank flows by using *Restrictions* and *Failed deals* as our instruments. We find that flows are negative and statistically different from zero in both models when using this instrumental approach, thus alleviating concerns of endogeneity driving our results. We use Hansen's *J*-statistic overidentification test (χ^2) of the joint null hypothesis that the instruments are valid. We reliably reject the null in all of our specifications and the first-stage *F*-statistics consistently support the relevance of our instrumental variables.

We also study the difference between residual inflows and residual outflows. We find that in Models (3) and (7), the coefficient on *Residual Inflows* is negative and statistically significant. Alternatively, in Model (4) the coefficient on *Residual Outflows* is negative, but not statistically different from zero, while in Model (8) the coefficient on *Residual Outflows* is positive, although

not statistically significant. We believe this is evidence to suggest that the inflows from source to recipient countries have a stabilizing effect on the financial system of the recipient nation.

3.3. Flows and Systemic Risk - Source Country Quality

To more directly assess the impact of bank flows that are in line with regulatory arbitrage on systemic risk, we proceed to classify source countries by their regulatory quality and by the stability of their banking sectors. If regulatory arbitrage in international bank flows is detrimental, we should observe that flows coming from countries with better regulatory quality should adversely affect the recipient country's financial system by increasing systemic risk. To examine this, we divide our sample according to various source country characteristics. We use five *de jure* and seven *de facto* regulatory characteristics to divide our sample into high and low regulatory quality subsamples. In each case, we use the median of the variable of interest as the cutoff point between high- and low-quality sources. We follow Karolyi and Taboada (2015) in our choice of *de jure* regulatory variables. Specifically, we use the following five regulatory variables: 1) *Regulation overall (PCA)*; 2) *Restrictions on bank activities*; 3) *Official supervisory power*; 4) S*tringency of capital regulation*; and 5) *Private monitoring*. All *de jure* regulatory variables come from Barth, Caprio, and Levine (2013). For our *de facto* regulatory characteristics, we choose: 1) *Stability PCA*; 2); *Regulatory capital;* 3) *Liquid assets-to-deposits*; 4) *Bank assets*; 5) *Concentration; 6) Z-score,* and *7) Provisions-to-NPL.* These variables are obtained from the Global Financial Development Database. Using these measures, we compute our residual flows measures by aggregating residuals from the estimation of equation 3 at the recipient country-year level separately for flows from high (above median and above recipient country quality) source countries and for flows from low quality source countries.

Panel A of Table 5 presents our first set of results related to subsample splits by source country quality. We split the source countries by their *de jure* regulatory characteristics. The control variables are the same as those found in our main results from Table 3 and are not reported in this table to conserve space. Across all regressions, residual flows are negative and statistically significantly related to systemic risk, regardless of source country quality when they are included in separate regressions. For example, in Model (1) in Panel A of Table 5 we observe that the coefficient on *Flows- High regulation overall* is negative and significant, as is the coefficient on *Flows- Low regulation overall* in regression (2), suggesting that bank flows are associated with a reduction in systemic risk regardless of the quality of the regulatory environment in the source country. However, when we include flows from high- and low- regulatory quality sources simultaneously (Model (3)), the coefficient on *Flows-High regulation overall* remains statistically significant, while the coefficient on *Flows- Low regulation overall* is not statistically different from zero, suggesting that bank flows from countries with better regulatory quality have more of an impact on systemic risk. We find similar results in Models (4) and (7) in which source countries are grouped by *Private Monitoring* and *Restrictions on bank activities*, respectively. The results are not consistent across all *de jure* characteristics, however. The results using *Official Supervisory Power* and *Stringency of Capital Regulation* are not significant. The results in Panel A of Table 5 also show that the magnitude of the impact of residual flows from high quality source countries is not statistically larger. At the bottom of Panel A we report *p*-values from F-tests on the difference between the coefficients on high and low quality source countries.

Panel B of Table 5 presents results related to dividing our sample by the *de facto* regulatory characteristics of the source countries. We again find that unexpected flows are statistically significant and negatively related to the systemic risk of the recipient's financial system.

Additionally, we find that flows from countries that are more stable according to our composite PCA variable (*Stability PCA*) seem to impact the financial stability of their recipient countries, while flows from fragile countries do not, when including both types of flows in the same regression (Model (3)). The results also show negative and significant coefficients on *Flows-High Regulatory Capital*, *Flows-Low concentration*, and *Flows-High Z-score*, suggesting that funds from more stable banking sectors reduce systemic risk in recipient countries. The results are not consistent across all *de facto* characteristics, however. We do not find statistically significant results on flows for countries with high liquid assets to short-term funding, low bank assets, or high provisions to NPL. Note, however, that we are again unable to confirm that the differences between high- and low-quality countries are statistically significant given the results of the *F*-tests reported in the table.

Overall, our results in this section cast doubt on the destructive view of regulatory arbitrage in international bank flows. Our results suggest that recipient countries benefit from inflows of foreign capital, especially when the foreign capital comes from countries with better regulatory quality. This evidence adds support to the more benign view of regulatory arbitrage. Although we do not find the difference in magnitude between high- and low-quality source countries to be statistically significant, we believe that this provides some evidence that countries with better regulation or stability are able to positively influence riskier countries. We provide further evidence of this below, when we drill down to the individual bank level in the target markets for those flows.

3.4. Flows and Systemic Risk - Recipient Country Quality

The evidence from Houston et al. (2012) suggests that less stringent bank regulations in recipient countries tend to induce more bank inflows. In light of this, we next examine whether

the impact of bank flows on systemic risk is associated with the quality of the recipient country. To do so, we classify recipient countries based on their regulatory quality and on the stability of their banking sector, following the same approach used in the previous section. Table 6 presents results related to sample splits by recipient country regulatory quality. We find evidence that recipient countries with low regulatory quality benefit more from cross-border bank flows than do countries with high regulatory quality. Models (1) and (4) focus on total residual flows. We find that the coefficient on *Residual Flows* is negative but not statistically significant for high-regulation recipients, but that it is negative and statistically significant for low-regulation countries. The economic impact of these flows is again not trivial. From the coefficients in Model (4), a one-standard-deviation increase in *Residual Flows* (1.329) is related to a decrease in systemic risk of 0.565 in countries with low regulatory quality, which represents 7.56% of its standard deviation (7.467 for this subsample). In addition, we examine flows to high- and low-regulation recipients also sorted by the quality of the source country. Models (2) and (5) examine flows from high-regulation sources, and Models (3) and (6) examine flows from low-regulation sources. We again find that the coefficients on flows to high-regulation recipients is negative but not statistically significant. The coefficients on flows to low-regulation recipients is negative and statistically significant, but only for high-quality source countries. Across regressions, χ^2 tests for the difference between low- and high-quality recipients are not conclusive. Nonetheless, we believe that the regression results above provide basic evidence to suggest that the regulatory quality of the recipient country matters for reductions in systemic risk. In addition, the results show that bank flows from source countries with better regulatory quality have a positive impact on countries with weak regulatory quality; this suggests that flows that are in line with regulatory

arbitrage have a positive impact on recipient countries' banking sectors. This adds support to the benign view of regulatory arbitrage.

In Panel B of Table 6 we examine whether the impact of bank flows differs based on the stability of the recipient countries' banking sector. We find evidence to suggest that recipient countries with fragile banking systems benefit more from cross-border bank flows than do countries with more stable banking systems. As before, Models (1) and (4) focus on total residual flows. We find that the coefficient on *Residual Flows* is negative and statistically significant for the subsample of fragile countries (Model 4), but not statistically different from zero for the subsample of stable recipients (Model 1). We also find evidence to suggest that flows from stable sources matter more to the recipient countries than those from fragile sources. Models (2) and (5) examine the impact of flows from stable sources, and Models (3) and (6) examine flows from fragile sources. The χ^2 tests show that the impact of flows from stable countries is larger in fragile recipient countries (*p*-value of 0.003). These results are further evidence to suggest that not only the quality of the recipient is important, but also the quality of the source country.

3.5. Bank-Level Results

Given that we do not find compelling evidence that the quality of the recipient country matters for the relation between systemic risk and cross-border banking flows, we turn our attention to the banks within the recipient countries. We study whether certain banks within recipient countries are more likely to benefit from cross-border flows than others. We posit that the impact of bank flows should be stronger on larger banks, banks with unstable funding sources, and banks which are riskier either in terms of their asset quality or their leverage. We assess the impact of bank flows on banks' systemic risk. We measure systemic risk using *MES* at the bank level; *MES* is defined as the bank's average stock return when the stock market is in the 5% left

tail of its return distribution. As before, we take the negative value of *MES* as our measure so that it is increasing in systemic risk. Table 7 provides summary statistics for the bank-level variables we use in the ensuing analysis.[10] Panel A shows results for the full sample, while Panel B shows results for banks in fragile countries. Our sample consists of large banks, with average (median) total assets of $3.2 billion ($2.6 billion). The average capital-to-assets ratio is 17.1% and deposits comprise 69.8% of total funding.

In our analysis, we first examine the average effect of bank flows across all banks in the country. Next, we divide our sample of banks based on proxies for size (*Large*), asset quality (*NPL-to-GL*), non-traditional banking activities (*Trading Income*), efficiency (*Cost-to-assets)*, funding (*Short-term funding*), and total debt-to-assets (*Leverage*). Specifically, we create indicator variables that take a value of one if the bank is in the riskiest (top) quartile of the distribution in its country as of the prior year-end, and interact these variables with the bank flows measures.

Table 8 presents our bank-level results. All regressions are OLS estimates that include country and year fixed effects.[11] Standard errors are clustered at the country level. We include several country and bank-level variables that have been shown to impact systemic risk (see e.g. Laeven, Ratnovski, and Tong, 2014; Anginer and Demirgüç-Kunt, 2014). Firm-level controls include: *Size* (log of assets); *Loan-loss provisions-to-assets*; *Non-interest income-to-income*; *Deposits-to-assets*; *Loans-to-assets*, and *Total capital-to-assets*. We also incorporate country-level controls, including: *Log GDP per capita*, *GDP growth*, *Volatility*, *Market return*, *Non-interest income*, and *Bank credit*. Models (1)-(3) in Panel A study all banks unconditionally. We find that, on average, cross-border bank flows are negatively related to the systemic risk of

[10] Consistent with the literature (e.g. Engle et al., 2014), we define banks as firms with SIC codes 6000, 6020, 6021, 6022, 6029, 6081, 6082, or 6712.

[11] In results available in our online appendix, we run regressions using bank- and year-fixed effects. Our results are similar, although of smaller magnitude than those reported in Table 8.

individual banks. Moreover, as we find with flows to the aggregate banking system, we find that residual inflows matter for individual banks, while outflows do not. The economic effect of total flows is economically significant. We estimate, using the coefficient in Model (1), that a one-standard-deviation increase in *Residual Flows* (1.956) is related to a 0.11% decrease in *MES*, which is 6.34% of its standard deviation (1.756). Moreover, Models (4)-(6) study banks that are in fragile recipient nations (below median *Stability- PCA*). We find again that the coefficients on R*esidual Flows* and R*esidual Inflows* are negative and statistically different from zero. The magnitude of the impact of bank flows on *MES* is larger in fragile countries. Taking the coefficients in Model (7), a one-standard-deviation increase in *Residual Flows* (2.189) is related to a 0.16% decrease in *MES* for banks in fragile countries, which is 9.12% of its standard deviation (1.729).

We next examine how bank flows affect different types of banks. Panel B of Table 8 presents results using our interaction terms for various bank characteristics. These banks are typically those that have a greater ex-ante exposure to systemic risk. Models (1)-(2) examine the effect of cross-border flows on large banks for the full sample and for fragile countries, respectively. We include a dummy variable, *Large,* that is equal to one for banks that are in the top size quartile in their country as of the prior year-end and zero otherwise; we interact this indicator with *Residual Flows*. We find that overall flows reduce systemic risk for larger banks, as the coefficient on our interaction term between large banks and bank flows in Model (1) is negative and statistically significant. From Model (1) we find that bank flows do not reduce systemic risk for small banks, as the coefficient on *Residual Flows* is negative, but not statistically significant. However, we do observe that bank flows are associated with a reduction in *MES* for large banks, as the interaction term is negative and statistically significant. From the coefficients

in Model (1), a one-standard deviation increase in *Residual Flows* is associated with a 0.18% reduction in *MES* for large banks, which corresponds to 10.2% of its standard deviation.[12] The impact is of similar magnitude for banks in fragile countries (Model (2)).

In Models (3)-(12) of Panel B of Table 8, we assess the impact of bank flows on banks using additional bank characteristics based on asset quality (*NPL-to-GL*), non-traditional banking activities (*Trading Income*), efficiency (*Cost-to-assets)*, funding (*Short-term funding*), and debt-to-assets (*Leverage*). As before, we report results for the full sample as well as for banks in fragile countries. The results in Panel B show that bank flows reduce systemic risk for banks that have poor asset quality (*High NPL-to-GL*) and those that rely more on volatile sources of funds (*High Short-term funding*); in addition, results in Models (5)-(8) show that the reduction in systemic risk is more pronounced for banks that rely less on non-traditional banking activities (*Trading income*) and for those that are more efficient (*Cost-to-assets*). There is some evidence that the reduction in *MES* is stronger for less efficient banks in fragile countries. We observe no significant reduction in *MES* for banks that are highly leveraged. The magnitudes of the results are similar to the ones associated with bank size. As an example, the coefficients in Model (3) suggest that a one-standard-deviation increase in *Residual Flows* is associated with a 0.18% reduction in *MES* for banks with poor asset quality (*High NPL-to-GL*), which represents 10.36% of its standard deviation.[13]

Overall, our results in this section add further support to the benign view of regulatory arbitrage. The evidence suggests that banks that are more exposed to systemic risk− larger banks, with more volatile funding sources, and higher risk− benefit the most from inflows of capital from

[12] For large banks, the impact of bank flows on *MES* is -0.092 [-0.018+ -0.074]. Thus, a one-standard-deviation increase in *Residual Flows* (1.956) is associated with a -0.180 change in *MES*, or 10.2% of its standard deviation (1.756).
[13] From Model (3), the impact of bank flows on *MES* for *High NPL-to-GL* banks is -0.093 [-0.071+ -0.022]. Thus, a one-standard-deviation increase in *Residual Flows* (1.956) is associated with a -0.182 change in *MES*, or 10.36% of its standard deviation (1.756).

countries with better regulatory quality. The effect is similar and in some cases stronger, in more fragile countries.

3.6. Economic Channels

Next, we estimate a series of tests to investigate the channels by which systemic risk can be reduced as a result of residual cross-border bank flows. Specifically, we examine the impact of bank flows on various measures of bank performance, which we use as our dependent variable: asset quality (*NPL-to-GL*), non-traditional banking activities (*Trading Income*), efficiency (*Cost-to-assets)*, funding (*Short-term funding*), and debt-to-assets (*Leverage*). In Table 9, we estimate the impact of bank flows on these five measures. As before, we include several country- and bank-level variables that have been shown to impact bank performance, although we do not report these, to conserve space. Firm-level controls include: *Size* (log of assets); *Loan-loss provisions-to-assets*; *Non-interest income-to-income*; *Deposits-to-assets*; *Loans-to-assets*, and *Total capital-to-assets*. Country-level controls include: *Log GDP per capita*, *GDP growth*, *Volatility*, *Market return*, *Non-interest income*, and *Bank credit*. Panel A of Table 9 shows results for the full sample of countries, while Panel B shows results for banks in fragile countries.

The results in Panel A of Table 9 reveal that bank flows are associated with a reduction in volatile short-term funding sources (*Short-term funding*) and a reduction in leverage, suggesting that these are viable channels through which bank flows reduce systemic risk (*MES*). The impact is statistically and economically significant. Taking the coefficients in Model (4), a one-standard deviation in *Residual Flows* (2.0 for this subsample) is associated with a 0.40% decline in *Short-term funding*, or 3.6% of its standard deviation. Similarly, from Model (5), a one-standard-deviation in *Residual Flows* (2.03 for this subsample) is associated with a 0.40% decline in *Leverage*, or 4.3% of its standard deviation. We find no evidence that bank flows are associated

with improved asset quality (*NPL-to-GL*), efficiency (*Cost-to-assets*), or with a reduction in non-traditional banking activities (*Trading Income*) for the average bank across our full sample of countries.

In Panel B of Table 9 we show results for banks in fragile countries. As before, we find that bank flows are associated with a reduction in volatile funding sources and leverage for banks in fragile countries. In addition, bank flows are associated with a reduction in trading activities for banks in fragile countries. Trading activities, or non-traditional banking activities have been associated with increased systemic risk. Our results suggest that the reduction in non-traditional bank activities for banks in fragile countries is a channel through which bank flows impact systemic risk in such countries. To assess the economic magnitude of the results, the coefficient in Model (3) in Panel B suggests that a one-standard-deviation increase in *Residual Flows* (2.33 for this subsample) is associated with a -0.058 reduction in *Trading income* for banks in fragile countries, which represents 18.7% of its standard deviation.

Overall, the results in this section suggest that less reliance on volatile funding sources and a decrease in leverage are channels through which bank flows reduce systemic risk in the recipient country. In addition, for banks in fragile countries, a reduction in non-traditional banking activities associated with bank flows appear to be at work in reducing banks' systemic risk in such countries.

4. Robustness Tests

We perform various tests to examine the robustness of our results. First, we examine the robustness of our estimation model for residual flows. It may be that our results are the product of our choice of estimation window. We currently use *all* available data (1983-2013) to estimate

residual flows. This may introduce a look-ahead bias to our results. Accordingly, we test the robustness of our results to the use of alternate estimation windows. In our online appendix, we present regressions of *SRISK* on cross-border flows (similar to Table 3). Rather than using all available data to estimate our residual flows, we use 15- and 10- year rolling windows as well as expanding windows with fixed starting points of 1990 (1983). We do not allow our estimation window for residuals to overlap with our systemic risk measures in any of these tests. We find that our results are robust to the alternative estimation windows proposed, as the coefficient on residual flows is statistically significant across all results, except for regressions in which we use 1983 as our starting point.

We also estimate the effect of lagged cross-border flows to better understand whether the reduction in systemic risk is persistent over time. The results of this test are reported in Table 10. We include, as independent variables, the two, three, four, and five year lagged residual flows. In all regressions, the lagged residual flows are negatively related to systemic risk. Moreover, we find that the two- and four- year lagged residual flows are statistically significant at the 5% level. The coefficients on lagged residual flows are slightly smaller than those found in Table 4, which suggests that the effect may weaken over time.

We conduct several additional robustness tests for our main country-level results and report these in our online appendix. We replicate our main results in Panel A of Table 4 using alternate measures of *Residual Flows*. Specifically, we run regressions in Model (1) of Table 4 using equally-weighted residual flows from the first-stage regressions (Model (9) of Table 3). We also replicate our results using value- and equally-weighted residuals from Models (1)-(8) of Table 3. In all cases, the coefficient on *Residual Flows* remains negative and statistically significant at the 5% level or better. The magnitude of our results is somewhat smaller when aggregating residuals

using equal weights. We also examine whether our results are driven by the financial crisis by running regressions in Panel A of Table 4 excluding the financial crisis period of 2008-2009. We also run regressions separately for the pre-crisis and post-crisis period and find that the results are similar in both periods.

We also conduct robustness tests for our main bank-level results (Panel A of Table 8). First, we use alternate measures of *Residual Flows* from above. Specifically, we estimate Model (1) of Table 8 using equally-weighted residuals from our base model (9) from Table 3, and using equally- and value-weighted residual flows from Models (1)-(8) of Table 3. In all regressions, the coefficient on *Residual Flows* is negative and statistically significant at the 5% level or better. The magnitude of the results is similar to those reported in Table 8 when using value-weighted residuals. We also run regressions excluding the financial crisis of 2008-2009. In addition, given that US banks make up the majority of banks in our sample, we run regressions excluding US banks. Finally, we replicate results in Panel A of Table 8 using bank- and year-fixed effects to better control for non-time varying bank-specific factors that may affect systemic risk. Overall, we find that our main findings are robust to these alternate regression specifications. All results from our robustness tests are reported in our online appendix.

5. Conclusion

We examine the impact of cross-border bank flows on the financial stability of recipient countries by assessing how bank flows affect the country's systemic risk, measured by *SRISK* and *MES*. We shed light on the ongoing debate on whether regulatory arbitrage in international bank flows is detrimental or beneficial to the recipient country.

We find that international bank flows are associated with improved financial stability (i.e. lower systemic risk) in the recipient country. Weak evidence suggests that this impact is stronger when bank flows come from source countries with relatively better regulatory quality and more stable banking sectors. In addition, we document that the impact of bank flows is stronger in recipient countries with weaker regulatory quality and more fragile banking sectors. Overall, our findings suggest that bank flows that are in line with regulatory arbitrage are beneficial to the recipient country, which adds support to the benign view of regulatory arbitrage.

We find, in addition, that the impact of bank flows differs across banks in the recipient country. Specifically, we document that bank flows reduce systemic risk of larger banks, banks that rely more on more volatile sources of funds, and banks with poor asset quality.

Finally, we document that bank flows affect systemic risk in the recipient country by improving the banks' aggregate funding mix (moving banks away from volatile short-term funding sources and high leverage), and by reducing reliance on non-traditional revenue sources for banks domiciled in fragile countries. Overall, our findings provide support for the more benign view of regulatory arbitrage in international bank flows. In sum, this paper provides evidence that is of particular interest to regulators who may be concerned with the impact of cross-border regulatory arbitrage and macroprudential regulation surrounding aligning rules across international financial systems. Moreover, we present the first novel evidence in the finance literature of the effect of cross-border flows on the stability of a country's financial system. In doing so, we open the door to further research questions, which may include studying the effects of cross-border bank flows on the bank-level to a greater extent or examining cross-border systemic risk and financial system linkages.

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Table 1: Summary Statistics – This table presents summary statistics for the variables used in the analysis below. The sample period for our analysis is 2000-2013. Country-level data are reported as of December of each year. Panel A presents summary statistics for all countries in our sample with available data on our systemic risk measure (Marginal Expected Shortfall, *MES*). *SRISK* data is not available for all countries in our sample, and thus restricts our sample size throughout the analysis. Panel B presents summary statistics for the subset of countries for which we have *SRISK* data. All variables are defined in Appendix A.

Panel A – MES sample (60 countries) 2000-2013						
	N	Mean	25th. Pctl.	Median	75th. Pctl.	Std. Dev.
Bank flows	613	0.511	0.009	0.131	0.262	2.093
SRISK-to-GDP	428	5.141	0.286	1.262	6.764	8.236
MES (%)	613	2.696	1.456	2.449	3.514	1.680
Z-score	557	15.567	8.135	13.905	22.482	9.633
Regulatory capital	510	13.701	11.900	13.000	15.300	2.965
Liquid assets to deposits	554	31.806	19.447	28.017	38.912	17.788
Bank assets	537	90.903	45.272	83.206	124.540	53.253
Provisions-to-NPL	457	85.783	52.800	70.900	107.100	49.813
Concentration	540	63.820	47.659	63.174	79.050	19.939
Stability (PCA)	416	-0.400	-0.881	-0.439	-0.028	0.784
Regulation overall (PCA)	610	0.060	-0.700	0.179	0.878	1.046
Restrictions on bank activities	613	7.368	6.000	7.000	9.000	1.953
Official supervisory power	613	11.187	10.000	11.000	13.000	2.441
Stringency of capital regulation	610	6.112	5.000	6.000	8.000	1.892
Private monitoring	613	8.436	7.000	8.000	9.000	1.377
Log GDP per capita	613	8.973	7.883	9.147	10.222	1.437
GDP Growth	613	3.709	1.776	3.687	5.693	3.568
Volatility	613	25.380	16.992	22.549	31.372	13.770
Market return	613	16.049	-13.374	14.594	39.076	40.847
Non-interest income-to-income	613	36.504	27.724	34.331	43.192	13.975
Bank credit	613	76.226	30.581	68.912	105.714	50.862
Panel B – SRISK subsample (56 countries). 2000-2013						
	N	Mean	25th. Pctl.	Median	75th. Pctl.	Std. Dev.
Bank flows	477	0.620	0.018	0.141	0.273	2.358
SRISK-to-GDP	477	5.184	0.240	1.226	7.216	8.143
MES (%)	435	2.998	1.781	2.765	3.840	1.743
Z-score	432	15.256	7.150	14.110	22.849	9.503
Regulatory capital	413	13.689	12.000	13.000	15.000	3.024
Liquid assets to deposits	432	32.769	19.493	29.066	41.816	17.969
Bank assets	426	104.564	62.410	104.098	136.558	54.002
Provisions-to-NPL	361	78.758	49.100	65.500	89.700	47.236
Concentration	421	65.866	48.590	66.192	84.522	20.588
Stability (PCA)	338	-0.459	-0.943	-0.467	-0.128	0.767
Regulation overall (PCA)	476	-0.149	-1.025	-0.340	0.625	1.054
Restrictions on bank activities	477	6.980	5.000	7.000	8.000	1.905
Official supervisory power	477	10.850	9.000	11.000	13.000	2.506
Stringency of capital regulation	476	6.003	4.000	6.000	7.000	1.895
Private monitoring	477	8.499	8.000	8.000	10.000	1.326
Log GDP per capita	477	9.233	8.220	9.607	10.369	1.363
GDP Growth	477	3.157	1.443	3.148	5.044	3.410
Volatility	477	25.862	17.467	22.836	31.797	14.117
Market return	477	13.502	-14.076	11.738	35.201	39.820
Non-interest income-to-income	477	36.932	27.957	34.835	44.120	14.269
Bank credit	477	90.673	50.056	89.555	117.541	52.424

Table 2: Systemic Risk Baseline Regressions - This table presents OLS and 2SLS results of estimating systemic risk using known determinants including volatility and non-traditional income (Engle, et al. (2015), Brunnermeier, et al. (2015)), as well as cross-border banking flows. Models (1)-(6) examine *SRISK* (normalized by the country's GDP) and Models (7)-(12) examine Marginal Expected Shortfall (*MES*). Models (1), (2), (7), and (8) use known determinants of systemic risk. Models (3)-(6) and (9)-(12) include actual cross-border bank flows (log difference in total foreign claims from *t-1* to *t*). Models (5), (6), (11), and (12) are 2SLS regressions which instrument for flows using 1) *Restrictions* – a measure of restrictions to trade from the KOF Index of Globalization, and 2) *Failed deals* − the proportion of failed non-financial mergers in a country. First-stage results are reported in Appendix D. The sample period is 2000-2013, and robust *t*-statistics based on standard errors clustered at the country level are in parentheses. All variables are defined in Appendix A.*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	*SRISK-to-GDP* (%)						Marginal Expected Shortfall (*MES,* %)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					2SLS	2SLS					2SLS	2SLS
Flows t-1 actual			-0.510***	-0.482***	-1.999***	-3.402***			-0.111***	-0.102***	-0.737*	-0.882*
			(-2.87)	(-3.05)	(-3.03)	(-3.67)			(-3.71)	(-3.58)	(-1.93)	(-1.68)
Log GDP per capita t-1	-0.405	-1.040***	-0.359	-0.998***	-0.224	-0.741**	-0.269***	-0.295***	-0.258***	-0.284***	-0.192**	-0.202*
	(-0.58)	(-2.97)	(-0.52)	(-2.92)	(-0.85)	(-2.16)	(-3.03)	(-3.32)	(-3.08)	(-3.38)	(-2.14)	(-1.85)
GDP growth t-1	-0.071	-0.104	-0.012	-0.062	0.160	0.193	-0.006	0.000	0.006	0.010	0.073	0.082
	(-0.53)	(-1.05)	(-0.10)	(-0.66)	(1.28)	(1.26)	(-0.23)	(0.01)	(0.23)	(0.31)	(1.53)	(1.43)
Volatility t-1	4.204	2.674	3.439	1.927	1.207	-2.607	1.207	1.129	1.049	0.985	0.159	-0.124
	(1.18)	(1.04)	(1.23)	(1.09)	(0.56)	(-0.93)	(1.36)	(1.35)	(1.36)	(1.36)	(0.21)	(-0.13)
Market return t-1	-0.474	0.142	-1.173	-0.589	-3.213***	-5.020***	0.295	0.260	0.251	0.225	0.005	-0.046
	(-0.49)	(0.22)	(-1.26)	(-0.96)	(-2.63)	(-2.81)	(1.37)	(1.25)	(1.17)	(1.05)	(0.02)	(-0.15)
Non-interest income t-1	-0.060*	-0.031	-0.069*	-0.038*	-0.096***	-0.081***	-0.002	-0.002	-0.004	-0.003	-0.014	-0.015
	(-1.72)	(-1.39)	(-1.94)	(-1.75)	(-4.02)	(-2.75)	(-0.44)	(-0.33)	(-0.76)	(-0.60)	(-1.64)	(-1.42)
Bank credit t-1	0.090*	0.043*	0.087*	0.039*	0.076***	0.019	0.009*	0.007	0.008*	0.006	0.003	-0.001
	(1.79)	(1.87)	(1.75)	(1.88)	(5.72)	(1.05)	(1.86)	(1.34)	(1.71)	(1.19)	(0.50)	(-0.22)
S-T rate t-1		0.083*		0.065*		-0.046		0.025		0.022		-0.007
		(1.92)		(1.78)		(-0.65)		(1.16)		(1.02)		(-0.26)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	477	441	477	441	477	441	613	574	613	574	613	574
Adjusted R^2	0.765	0.814	0.774	0.822	0.577	0.166	0.605	0.596	0.616	0.606	0.240	0.011
# countries	55	47	55	47	55	47	59	55	59	55	59	55
Partial R^2					0.023	0.023					0.022	0.018
1st stage F-statistic (*p*-					0.010	0.012					0.007	0.028
Hansen *J*-statistic					0.016	0.473					1.490	2.427
χ^2 *p*-value					0.898	0.491					0.475	0.297

Table 3: Baseline Regressions - This table presents results from OLS panel regressions of cross-border bank flows on a country pair-year level, following Houston, et al. (2012). Bank flows are the log difference (difference in log from *t-1* to *t*) of total foreign claims from source country *s* to recipient country *r*. All models use standard variables to estimate the change in cross-border bank flows. We use the results from Model (9) to estimate unexpected bank flows between the country pairs in the following analysis. Panel B presents summary statistics of actual and residual flows. The sample period is 2000-2013 and robust *t*-statistics based on standard errors clustered at the country level are in parentheses. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A – Bilateral Flows Regressions

Dependent variable: Bank Flows$_{s,r,t}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δ Creditor rights	-0.066	0.003	0.026***	-0.068	-0.152	-0.057	-0.043	-0.081	-0.023
	(-1.15)	(0.31)	(7.02)	(-1.18)	(-1.33)	(-0.48)	(-0.40)	(-0.79)	(-0.22)
Δ Credit depth	-0.019***	0.002	-0.010***	-0.019***	-0.019**	-0.015	-0.021***	-0.023***	-0.020**
	(-2.84)	(0.43)	(-6.45)	(-2.84)	(-2.48)	(-1.48)	(-2.63)	(-2.90)	(-2.18)
Δ Property rights	0.002	-0.022***	-0.005	0.002	0.002	0.017	0.014	0.016	0.015
	(0.32)	(-3.17)	(-1.02)	(0.29)	(0.13)	(1.62)	(1.28)	(1.55)	(1.34)
Δ Log GDP per capita	-0.146***	-0.058***	-0.012	-0.146***	-0.164***	-0.196***	-0.197***	-0.200***	-0.201***
	(-5.11)	(-5.92)	(-1.19)	(-5.11)	(-4.01)	(-5.30)	(-5.27)	(-5.80)	(-5.31)
Δ GDP growth	-0.008***	-0.006***	-0.009***	-0.008***	-0.011***	-0.004**	-0.009***	-0.009***	-0.009***
	(-4.85)	(-4.06)	(-5.16)	(-4.88)	(-4.21)	(-2.11)	(-3.65)	(-3.51)	(-3.60)
Δ Population (log)	-0.443***	-0.032***	0.020***	-0.441***	-0.589***	-0.425***	-0.388***	-0.430***	-0.394***
	(-3.65)	(-3.57)	(6.50)	(-3.63)	(-4.00)	(-2.86)	(-3.06)	(-3.39)	(-3.07)
Same language	0.077***	0.080***	0.054***	0.067***	0.064***	0.097***	0.084***	0.085***	0.087***
	(4.38)	(3.47)	(3.58)	(4.22)	(3.35)	(4.39)	(4.36)	(4.50)	(4.54)
Distance	-0.042***	-0.070***	-0.038***	-0.029***	-0.018**	-0.023**	-0.044***	-0.041***	-0.044***
	(-5.86)	(-5.91)	(-6.11)	(-4.10)	(-2.29)	(-2.61)	(-5.78)	(-5.57)	(-5.82)
Contiguous				0.191***	0.212***				
				(7.55)	(8.03)				
Colony				-0.005	0.007				
				(-0.17)	(0.16)				
Δ Financial liberalization					-0.014**				
					(-2.46)				
Δ Restrictions on bank activities						0.029***	0.028***	0.028***	0.031***
						(4.40)	(4.01)	(4.16)	(4.16)
Δ Stringency of capital						0.014**	0.006		
						(2.52)	(0.95)		
Δ Strength of external audit						0.044***			0.036**
						(3.17)			(2.00)
Δ Independence of supervisors						-0.020			
						(-1.17)			
Source country fixed	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Recipient country fixed effects	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44,559	44,559	44,559	44,559	30,528	31,733	36,457	37,937	36,545
Adjusted R^2	0.063	0.052	0.056	0.063	0.083	0.055	0.071	0.070	0.072

Table 3: Baseline Regressions. Continued.

Panel B – Summary Statistics for Residual Cross-Border Flows Using Model (9)						
MES sample (60 countries) 2000-2013						
	N	Mean	25th.	Median	75th. Pctl.	Std. Dev.
Flows	613	0.511	0.009	0.131	0.262	2.093
Residual Flows	613	0.052	-0.285	0.000	0.120	1.091
Residual Inflows	613	0.400	0.000	0.126	0.383	1.393
Residual Outflows	613	-0.702	-0.865	-0.446	-0.007	1.035
SRISK subsample (56 countries), 2000-2013						
	N	Mean	25th.	Median	75th. Pctl.	Std. Dev.
Flows	477	0.620	0.018	0.141	0.273	2.358
Residual Flows	477	0.081	-0.338	-0.001	0.094	1.220
Residual Inflows	477	0.418	-0.047	0.075	0.365	1.540
Residual Outflows	477	-0.716	-0.866	-0.518	0.000	1.070

Table 4: Two-Stage Results – This table presents OLS results and results related to a two-stage estimation process. We use the residual flows between countries as the key independent variable. Residual, or unexpected, flows are the residuals from estimations of equation 3 (Model 9 of Panel A of Table 3), aggregated at the recipient country-year. The dependent variables of interest are *SRISK-to-GDP* and *MES* (%), both of which measure the systemic risk of a country's banking system. We multiply *MES* by negative one to ensure that both measures are increasing in systemic risk. The sample period is 2000-2013 and robust *t*-statistics based on standard errors clustered at the country level are in parentheses. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Using Unexpected Flows to Predict Systemic Risk								
	SRISK-to-GDP (%)				Marginal Expected Shortfall (*MES*, %)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	2SLS	OLS	OLS	OLS	2SLS	OLS	OLS
Residual Flows t-1	-0.731**	-5.236**			-0.135***	-0.894*		
	(-2.45)	(-2.39)			(-3.45)	(-1.83)		
Residual Inflows t-1			-0.517**				-0.079**	
			(-2.40)				(-2.23)	
Residual Outflows t-1				-0.179				0.057
				(-1.03)				(1.39)
Log GDP per capita t-1	-0.440	-0.656*	-0.342	-0.453	-0.275***	-0.308***	-0.260***	-0.252***
	(-0.62)	(-1.85)	(-0.49)	(-0.65)	(-3.12)	(-4.12)	(-2.99)	(-2.91)
GDP growth t-1	-0.029	0.236	-0.034	-0.073	0.001	0.039	-0.000	-0.006
	(-0.22)	(1.29)	(-0.25)	(-0.54)	(0.03)	(1.19)	(-0.01)	(-0.22)
Volatility t-1	3.662	0.315	3.815	4.289	1.111	0.576	1.154	1.188
	(1.22)	(0.11)	(1.23)	(1.20)	(1.38)	(0.97)	(1.37)	(1.33)
Market return t-1	-1.202	-5.693**	-1.082	-0.470	0.246	-0.031	0.257	0.289
	(-1.29)	(-2.34)	(-1.16)	(-0.49)	(1.13)	(-0.12)	(1.17)	(1.35)
Non-interest income t-1	-0.068*	-0.121***	-0.067*	-0.060*	-0.004	-0.011	-0.003	-0.002
	(-1.95)	(-3.25)	(-1.89)	(-1.74)	(-0.68)	(-1.55)	(-0.64)	(-0.42)
Bank credit t-1	0.083	0.039	0.086*	0.091*	0.008	-0.000	0.008	0.009*
	(1.62)	(1.45)	(1.70)	(1.79)	(1.53)	(-0.01)	(1.65)	(1.88)
Constant	2.441	21.761**	1.210	-0.797	3.998***	5.955***	3.776***	3.438***
	(0.28)	(2.02)	(0.14)	(-0.09)	(4.11)	(3.37)	(4.05)	(3.74)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	477	477	477	477	613	613	613	613
Adjusted R^2	0.772	0.471	0.770	0.765	0.611	0.399	0.608	0.606
# countries	55	55	55	55	59	59	59	59
Partial R^2		0.016				0.011		
1st Stage *F*-Statistic *p*-value		0.042				0.012		
Hansen's *J*-statistic		0.240				2.832		
χ^2 *p*-value		0.624				0.243		

Table 5: Sort by Source Country Regulatory Quality and Stability – This table presents ordinary least squares (OLS) regression results. The dependent variable is *SRISK-to-GDP*. We use residual bank flows estimated in Table 3 (Model 9), to predict country level systemic risk. In Panel A we show results from residual bank flows aggregated at the recipient country-year level based on various *de jure* measures of source country regulatory quality from Barth, et al. (2013): 1) *Restrictions on bank activities;* 2) *Official supervisory power;* 3) *Stringency of capital regulation;* 4) *Private monitoring,* and 5) *Regulation-overall (PCA)* that is the first principal component of the four regulatory indices. In Panel B, we report results from residual bank flows based on *de facto* measures of source country banking sector stability obtained from the World Bank's Global Financial Development Database. These are: 1) *Regulatory capital*; 2) *Liquid asset-to-deposits*; 3) *Bank assets*; 4) *Concentration*; 5) *Z-score*; 6) *Provisions-to-NPL*, and 7) *Stability (PCA)* – a composite index of banking sector stability that is the first principal component of the six banking sector indicators. Each year, source countries with values above (below) the cross-country median are classified as high (low) quality. In Models (1)-(3) of Panel A (B) we use the aggregate measure of regulatory quality (stability), while the remainder of the regressions show results using the individual components. The key independent variables are the unexpected flows from source to recipient country. The sample period is 2000-2013 and *t*-statistics based on standard errors clustered at the country level are in parentheses. Detailed definitions of all variables are provided in Appendix A. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A - Source Quality by *De Jure* Measures							
	Dependent Variable: *SRISK-to-GDP (%)*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Flows - High Regulation-Overall	-0.865**		-0.729**				
	(-2.12)		(-2.11)				
Flows - Low Regulation-Overall		-0.590*	-0.166				
		(-1.76)	(-0.82)				
Flows - High Private Monitoring				-1.158**			
				(-2.23)			
Flows - Low Private Monitoring				-0.499			
				(-1.41)			
Flows - High Official Supervisory Power					-0.448		
					(-1.15)		
Flows - Low Official Supervisory Power					-0.438		
					(-1.38)		
Flows - High Stringency of Capital Regulation						-0.414	
						(-1.16)	
Flows - Low Stringency of Capital Regulation						-0.638	
						(-1.64)	
Flows - High Restrictions on Bank Activities							-0.675*
							(-1.84)
Flows - Low Restrictions on Bank Activities							-0.201
							(-1.17)
Country-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	477	477	477	477	477	477	477
Adjusted R^2	0.774	0.770	0.773	0.774	0.773	0.773	0.773
# countries	55	55	55	55	55	55	55
F-test [High=Low] *p*-value			0.132	0.360	0.987	0.703	0.224

Table 5: Sort by Source Country Regulatory Quality and Stability – Continued.

Panel B - Source Quality by *De Facto* Measures									
	Dependent Variable: *SRISK-to-GDP (%)*								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Flows - Stable	-1.171***		-0.720**						
	(-2.95)		(-2.28)						
Flows - Fragile		-0.798*	-0.608						
		(-1.98)	(-1.48)						
Flows - High Regulatory Capital				-0.432*					
				(-1.75)					
Flows - Low Regulatory Capital				-0.430					
				(-1.24)					
Flows - High Liquid Assets-to-Deposits					-0.221				
					(-1.02)				
Flows - Low Liquid Assets-to-Deposits					-0.663				
					(-1.42)				
Flows - High Bank Assets						-0.403			
						(-1.33)			
Flows - Low Bank Assets						-0.461			
						(-1.43)			
Flows - High Concentration							-0.087		
							(-0.45)		
Flows - Low Concentration							-0.789**		
							(-2.05)		
Flows - High Z-score								-0.635**	
								(-2.21)	
Flows - Low Z-score								-0.173	
								(-0.60)	
Flows - High Provisions-to-NPL									-0.457
									(-1.06)
Flows - Low Provisions-to–NPL Loans									-0.438
									(-1.24)
Country-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	477	477	477	477	477	477	477	477	477
Adjusted R^2	0.771	0.773	0.775	0.772	0.773	0.773	0.773	0.773	0.773
# countries	55	55	55	55	55	55	55	55	55
F-test [High=Low] *p*-value			0.852	0.994	0.460	0.905	0.106	0.237	0.977

Table 6: Sort by Recipient Country Regulatory Quality and Stability – This table presents ordinary least squares (OLS) regression results. The dependent variable is *SRISK-to-GDP*. We use residual bank flows estimated in Table 3, (Model 9), to predict country level systemic risk. In Panel A we partition our recipient countries using a *de jure* measure of regulatory quality, *Regulation-overall (PCA)* that is the first principal component of four regulatory indices from Barth, et al. (2013): 1) *Restrictions on bank activities;* 2) *Official supervisory power;* 3) *Stringency of capital regulation;* 4) *Private monitoring*. In Panel B, we partition our recipient countries based on *de facto* measure of banking sector stability, *Stability (PCA)* that is the first principal component of six banking sector indicators obtained from the World Bank's Global Financial Development Database: 1) *Regulatory capital*; 2) *Liquid asset-to-deposits*; 3) *Bank assets*; 4) *Concentration*; 5) *Z-score, and* 6) *Provisions-to-NPL*. Each year, recipient countries with values above (below) the cross-country median are classified as high (low) quality. In Models (1) and (4) of Panel A (B) we use the residual flows, while the remainder of the regressions show results using residual bank flows aggregated at the recipient country-year level based on source country *de jure* (*de facto*) measures. The key independent variables are the unexpected flows from source to recipient country. The sample period is 2000-2013 and *t*-statistics based on standard errors clustered at the country level are in parentheses. Detailed definitions of all variables are provided in Appendix A. The last three rows show *p*-values from χ^2 tests for differences on the impact of residual flows between high and low quality recipients. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A - *De Jure* Measure of Regulatory Quality						
	Dependent Variable: *SRISK-to-GDP (%)*					
	Recipient - **High** Regulation-overall (PCA)			Recipient – **Low** Regulation-overall (PCA)		
	(1)	(2)	(3)	(4)	(5)	(6)
Residual Flows t-1	-1.481			-0.425**		
	(-1.27)			(-2.43)		
Flows - High Regulation-Overall		-1.491			-0.356*	
		(-1.18)			(-1.93)	
Flows - Low Regulation-Overall			-0.875			-0.355
			(-1.21)			(-1.35)
Country-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	174	174	174	286	286	286
Adjusted R^2	0.754	0.755	0.746	0.818	0.817	0.817
Residuals flows [(1)=(4)] *p*-value	0.283					
Flows-high reg. quality [(2)=(5)] *p*-value	0.284					
Flows-low reg. quality [(3)=(6)] *p*-value	0.217					
Panel B - *De Facto* Measure of Stability						
	Dependent Variable: *SRISK-to-GDP*					
	Stable Recipient Countries			Fragile Recipient Countries		
	(1)	(2)	(3)	(4)	(5)	(6)
Residual Flows t-1	-0.230			-0.959**		
	(-0.25)			(-2.28)		
Flows - Stable		-0.138			-1.364**	
		(-0.33)			(-2.62)	
Flows - Fragile			-0.581			-0.931*
			(-0.89)			(-1.94)
Country-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	89	89	89	293	293	293
Adjusted R^2	0.959	0.959	0.959	0.850	0.846	0.851
Residuals flows [(1)=(4)] *p*-value	0.242					
Flows - Stable [(2)=(5)] *p*-value	0.003					
Flows - Fragile [(3)=(6)] *p*-value	0.490					

Table 7: Bank-Level Summary Statistics - This table presents summary statistics for the variables used in the *bank-level* analysis below. The sample period for our analysis is 2000-2013. Bank-level data were obtained from Worldscope and reported as of December of each year. Banks are defined as firms with SIC codes 6000, 6020, 6021, 6022, 6029, 6081 6082, or 6712. Panel A show statistics for the full sample, while Panel B shows results for the subset of *fragile* countries. All variables are defined in Appendix A.

Panel A - Bank Level sample- All countries						
	N	Mean	25th. Pctl.	Median	75th. Pctl.	Std. deviation
Bank level variables:						
MES (%)	12,641	1.441	0.149	1.118	2.332	1.756
NPL-to-GL (%)	11,092	2.580	0.400	1.070	3.100	3.987
Trading Income (%)	9,126	0.076	0.000	0.000	0.035	0.311
Cost-to-assets (%)	12,775	6.408	4.405	5.631	7.132	3.854
Short-term funding (%)	13,633	9.497	1.675	5.789	13.025	11.204
Leverage (%)	12,429	16.389	4.930	11.560	22.710	15.772
Size	12,641	14.988	13.256	14.766	16.546	2.186
Loan loss provisions-to-assets (%)	12,641	0.461	0.106	0.250	0.537	0.711
Non-interest income-to-income (%)	12,641	20.492	11.464	18.068	26.652	12.888
Deposits-to-assets	12,641	69.898	61.249	75.525	83.737	19.104
Total capital-to-assets	12,641	17.070	9.965	14.093	20.302	11.479
Market share	12,641	3.916	0.008	0.197	3.143	8.538
Loans-to-assets t-1	12,641	65.115	57.652	66.513	74.771	14.574
Country-level variables:						
Flows	12,641	1.201	0.089	0.169	0.253	3.675
Residual Flows	12,641	0.190	-0.576	-0.323	-0.011	1.956
Residual Inflows	12,635	0.635	-0.360	-0.076	0.285	2.556
Residual Outflows	12,641	-0.989	-1.158	-0.921	-0.498	0.681
Log GDP per capita t-1	12,641	9.799	9.233	10.470	10.589	1.272
GDP growth t-1	12,641	3.302	1.776	3.235	4.652	2.576
Volatility t-1	12,641	0.217	0.149	0.193	0.253	0.136
Market return t-1	12,641	0.122	-0.112	0.111	0.290	0.321
Non-interest income (%)	12,641	38.473	31.150	41.218	42.434	10.678
Bank credit t-1	12,641	66.363	47.651	53.043	90.175	35.481
Panel B - Bank Level sample- Fragile countries						
	N	Mean	25th. Pctl.	Median	75th. Pctl.	Std. deviation
Bank level variables:						
MES (%)	8,716	1.357	0.116	1.008	2.206	1.729
NPL-to-GL	7,872	2.042	0.310	0.770	2.160	3.535
Trading Income	6,477	0.036	0.000	0.000	0.000	0.208
Cost-to-assets	8,508	5.691	4.405	5.431	6.576	2.601
Short-term funding	8,836	8.028	1.433	5.140	10.941	9.520
Leverage	8,284	14.234	4.500	10.595	19.500	13.554
Size	8,716	14.777	13.043	14.419	16.391	2.212
Loan loss provisions-to-assets	8,716	0.368	0.104	0.220	0.424	0.566
Non-interest income-to-income	8,716	18.951	10.760	16.501	24.451	11.879
Deposits-to-assets	8,716	72.422	65.780	77.412	84.696	17.604
Total capital-to-assets	8,716	16.159	9.612	13.503	19.183	10.808
Market share	8,716	2.679	0.005	0.048	0.969	7.129
Loans-to-assets t-1	8,716	66.172	59.143	66.885	74.818	13.236
Country-level variables:						
Flows	8,716	1.495	0.117	0.172	0.272	4.127
Residual Flows	8,716	0.251	-0.617	-0.481	-0.117	2.189
Residual Inflows	8,710	0.714	-0.514	-0.185	0.151	2.894
Residual Outflows	8,716	-1.117	-1.455	-0.973	-0.664	0.680
Log GDP per capita t-1	8,716	10.052	10.312	10.504	10.589	1.116
GDP growth t-1	8,716	3.138	1.776	2.791	4.091	2.387
Volatility t-1	8,716	0.194	0.145	0.184	0.229	0.080
Market return t-1	8,716	0.119	-0.112	0.130	0.266	0.276
Non-interest income (%)	8,716	39.011	34.622	41.658	42.434	9.005
Bank credit t-1	8,716	66.843	50.056	53.043	86.246	30.563

Table 8– Bank-Level Results: This table presents ordinary least squares (OLS) regression results. The dependent variable is *MES* – the negative of the average bank returns during the worst 5% market return days in a year. Panel A presents results at the bank level for all recipient countries and for the subset of fragile countries – recipient countries with below median *de facto* measure of stability (*Stability-PCA*). Panel B presents results using interactions between residual flows and indicator variables for six bank characteristics. We create the following indicators based on prior year-end values: 1) *Large* – an indicator variable that is equal to one for banks in the top quartile in size (total assets) and zero otherwise; 2) *High NPL−* an indicator variable that is equal to one for banks in the top quartile of non-performing loans-to-gross loans ratio and zero otherwise; 3) *High Trading Income* – an indicator variable that is equal to one for banks in the top quartile of trading income-to-assets ratio and zero otherwise; 4) *High Cost-to-Assets* - an indicator variable that is equal to one for banks in the top quartile of overhead costs-to-assets ratio and zero otherwise; 5) *High S-T Funding* – an indicator variable that is equal to one for banks in the top quartile of non-deposit short-term funding-to liabilities ratio and zero otherwise, and 6) *High Leverage*– an indicator variable that is equal to one for banks in the top quartile of debt-to-assets ratio and zero otherwise. We present results for the full sample of countries as well as for the subset of fragile countries. In all regressions we include a set of firm- and country-level controls (not shown to conserve space). Firm-level controls include: *Size* (log of assets); *Loan-loss provisions-to-assets*; *Non-interest income-to-income*; *Deposits-to-assets*; *Loans-to-assets*, and *Total capital-to-assets*. We also incorporate country-level controls, including: *Log GDP per capita, GDP growth, Volatility, Market return, Non-interest income, and Bank credit*. The key independent variables are the unexpected flows from source to recipient countries. The sample period is 2000-2013 and *t*-statistics based on standard errors clustered at the country level are in parentheses. Country and year fixed effects are included in all regressions. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A - All banks						
	All recipient countries			Fragile recipients		
Dependent Variable:	*MES(%)* - Bank Level					
	(1)	(2)	(3)	(4)	(5)	(6)
Residual Flows t-1	-0.057**			-0.072**		
	(-2.26)			(-2.32)		
Residual Inflows t-1		-0.037**			-0.057**	
		(-2.08)			(-2.14)	
Residual Outflows t-1			-0.002			-0.120
			(-0.04)			(-1.57)
Size	0.350***	0.350***	0.350***	0.355***	0.355***	0.356***
	(17.12)	(17.16)	(17.30)	(16.04)	(16.04)	(16.33)
Loan loss provisions-to-assets	0.139***	0.139***	0.139***	0.143***	0.142***	0.143***
	(3.90)	(3.91)	(3.87)	(3.47)	(3.40)	(3.40)
Non-interest income-to-income	0.006*	0.006*	0.006*	0.005	0.005	0.005
	(1.81)	(1.82)	(1.87)	(1.54)	(1.54)	(1.52)
Deposits-to-assets	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.66)	(-0.62)	(-0.54)	(-0.65)	(-0.61)	(-0.46)
Total capital-to-assets	0.005**	0.005**	0.005**	0.005***	0.006***	0.006***
	(2.03)	(2.05)	(2.07)	(2.94)	(2.99)	(3.04)
Loans-to-assets t-1	-0.007**	-0.007**	-0.007**	-0.005*	-0.005*	-0.005*
	(-2.24)	(-2.23)	(-2.21)	(-1.88)	(-1.87)	(-1.87)
Log GDP per capita t-1	-0.917***	-0.938***	-0.955***	-1.934***	-1.961***	-1.850***
	(-3.97)	(-4.04)	(-4.04)	(-4.19)	(-4.27)	(-3.98)
GDP growth t-1	-0.007	-0.008	-0.014	-0.002	-0.002	-0.019
	(-0.37)	(-0.40)	(-0.77)	(-0.10)	(-0.08)	(-0.84)
Volatility t-1	0.003	0.003	0.004	0.021**	0.021**	0.023**
	(1.21)	(1.20)	(1.16)	(2.09)	(2.11)	(2.30)
Market return t-1	0.003*	0.003	0.003*	0.004*	0.004*	0.004*
	(1.71)	(1.65)	(1.76)	(1.79)	(1.75)	(1.83)
Non-interest income-to-income t-1	-0.006	-0.007	-0.006	-0.006	-0.006	-0.005
	(-1.41)	(-1.42)	(-1.32)	(-0.81)	(-0.82)	(-0.69)
Bank credit t-1	0.004	0.004	0.004	0.005	0.005	0.004
	(1.18)	(1.24)	(1.16)	(0.89)	(0.94)	(0.71)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,641	12,635	12,641	8,716	8,710	8,716
Adjusted R^2	0.539	0.539	0.538	0.609	0.609	0.609
# countries	57	57	57	48	48	48

Table 8– Bank-Level Results- Continued.

Panel B – Bank Level Results by Bank Characteristics												
	MES (%)											
Bank Characteristic:	*Large*		*High NPL*		*High Trading Income*		*High Cost-to-Assets*		*High ST Funding*		*High Leverage*	
	All	Fragile	All	Fragile	All	Fragile	All	Fragile	All	Fragile	All	Fragile
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Flows x Bank Characteristic	-0.074***	-0.071***	-0.022***	-0.021***	-0.013	-0.017	-0.003	-0.005*	-0.019***	-0.013**	-0.009	-0.005
	(-8.45)	(-7.10)	(-3.95)	(-6.24)	(-0.92)	(-0.85)	(-0.72)	(-1.91)	(-2.75)	(-2.48)	(-1.07)	(-1.52)
Bank Characteristic	0.223*	0.342***	0.061	0.054	-0.022	-0.056	0.029	0.014	0.019	0.034	-0.054*	-0.076***
	(1.78)	(5.04)	(1.18)	(1.01)	(-0.48)	(-0.76)	(0.68)	(0.28)	(0.46)	(0.76)	(-1.69)	(-2.74)
Residual Flows t-1	-0.018	-0.022	-0.071**	-0.020	-0.069***	-0.058**	-0.052*	-0.058*	-0.053**	-0.053	-0.044	-0.049*
	(-0.72)	(-0.68)	(-2.28)	(-0.47)	(-3.10)	(-2.06)	(-1.98)	(-1.91)	(-2.13)	(-1.66)	(-1.59)	(-1.84)
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,641	8,174	10,240	7,256	8,371	5,916	11,691	7,785	12,343	8,057	11,368	7,577
Adjusted R^2	0.543	0.613	0.577	0.634	0.579	0.600	0.559	0.622	0.544	0.607	0.559	0.624
# countries	57	42	54	39	54	38	56	41	57	42	56	41

Table 9: Impact on Bank Performance – This table presents ordinary least squares (OLS) regression results in which we examine the channel by which systemic risk may be reduced by cross-border bank flows. We examine the impact of residual flows on various measures of bank performance that capture asset quality, non-traditional banking activities, efficiency, reliance on volatile sources of funding, and leverage. The dependent variables are: 1) *NPL-to-GL−* the ratio of non-performing loans-to-gross loans; 2) *Trading income* – trading income-to-assets ratio; 3) *Cost-to-assets* – the ratio of overhead costs-to-assets; 4) *S-T funding* – the ratio of non-deposit short-term funding-to-liabilities, and 5) *Leverage-* – the debt-to-assets ratio. Panel A shows results for our full sample of countries, while Panel B reports results for the subset of fragile countries – recipient countries with below median *de facto* measure of stability (*Stability-PCA*). The variables are obtained from Worldscope. Bank and country-level controls are included but not reported to conserve space. The sample period is 2000-2013 and robust *t*-statistics based on standard errors clustered at the country level are in parentheses. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A - Full sample					
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	*NPL-to-GL*	*Trading income*	*Cost-to-assets*	*ST funding*	*Leverage*
Residual Flows t-1	0.106	-0.028	-0.086	-0.201**	-0.336***
	(1.42)	(-1.59)	(-1.33)	(-2.47)	(-3.72)
Bank Controls	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	11,092	9,126	12,775	13,633	12,429
# countries	54	54	56	58	57
Adjusted R^2	0.491	0.311	0.763	0.639	0.784
Panel B - Fragile Countries					
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	*NPL-to-GL*	*Trading income*	*Cost-to-assets*	*ST funding*	*Leverage*
Residual Flows t-1	0.103	-0.025**	0.086	-0.470***	-0.342**
	(0.77)	(-1.97)	(1.64)	(-6.07)	(-2.66)
Bank Controls	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	7,872	6,477	8,508	8,836	8,284
# countries	39	39	42	43	42
Adjusted R^2	0.552	0.286	0.720	0.669	0.775

Table 10: Lagged Cross-Border Bank Flows – This table presents OLS results. We use the lagged residual flows between countries as the key independent variable. Residual, or unexpected flows are the residuals from estimations of equation 3 (Model 9 of Panel A of Table 3), aggregated at the recipient country-year. Residual flows are then lagged two to five years. The dependent variable of interest is *SRISK-to-GD*, which measures the systemic risk of a country's banking system. The sample period is 2000-2013 and robust *t*-statistics based on standard errors clustered at the country level are in parentheses. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: *SRISK-to-GDP(%)*			
	(1)	(2)	(3)	(4)
Residual flows t-2	-0.480**			
	(-2.24)			
Residual flows t-3		-0.178		
		(-1.31)		
Residual flows t-4			-0.298**	
			(-2.32)	
Residual flows t-5				-0.228
				(-1.49)
Log GDP per capita t-1	-0.409	-0.386	-0.366	-0.372
	(-0.58)	(-0.55)	(-0.53)	(-0.54)
GDP growth t-1	-0.068	-0.065	-0.063	-0.077
	(-0.50)	(-0.48)	(-0.46)	(-0.55)
Volatility t-1	4.079	4.263	4.284	4.259
	(1.16)	(1.18)	(1.21)	(1.20)
Market return t-1	-0.276	-0.458	-0.457	-0.478
	(-0.27)	(-0.47)	(-0.46)	(-0.51)
Non-interest income-to-income t-1	-0.059*	-0.060*	-0.061*	-0.059*
	(-1.69)	(-1.71)	(-1.77)	(-1.69)
Bank credit t-1	0.086	0.090*	0.090*	0.090*
	(1.66)	(1.78)	(1.78)	(1.77)
Constant	-0.899	-1.315	-1.444	-1.387
	(-0.10)	(-0.15)	(-0.17)	(-0.16)
Year Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Observations	477	477	477	477
Adjusted R^2	0.768	0.765	0.766	0.765
# countries	55	55	55	55

Appendix A: Definitions and Sources

Variable	**Definition**	**Source**
Country-Level:		
SRISK-to-GDP (%)	Year-end value of *SRISK* for the country divided by the annual GDP of the country.	SRISK – NYU V-Lab (http://vlab.stern.nyu.edu/en/)
MES (%)	The negative of the average stock return of the bank when the country's stock market is in the 5% left tail of returns. The country level measure is the annual value-weighted average *MES* of all banks in a country.	Stock return data - DataStream
Bank-Level:		
NPL-to-Gross Loans	Total non-performing loans divided by gross loans.	Worldscope
Trading income-to-assets	Total trading income divided by total assets	Worldscope
Cost-to-assets	Overhead costs divided by total assets	Worldscope
ST funding-to-liabilities	Nondeposit short-term funding divided by total liabilities	Worldscope
Leverage	Total debt divided by total assets	Worldscope
Key Independent Variables:		
Bank Flows$_{s,r,t}$	Aggregate value of cross-border banking flows from source country *s* to recipient country *r* from year *t-1* to year *t*. Following Houston et al. (2012) it is calculated as the log difference (difference in log from *t-1* to *t*) of total foreign claims from source country *s* to recipient country *r*.	Bank for International Settlements (BIS)
Flows	The log difference (difference in log from *t-1* to *t*) of total foreign claims from all source countries to recipient country *r*.	Bank for International Settlements (BIS)
Residual Flows	Residuals from model (7) of Table 3 aggregated at the recipient-country-year, following equation 4.	Estimated following the methodology of Houston, et al. (2012)
Residuals Inflows	Residuals from model (7) of Table 3 aggregated at the recipient-country-year across all source countries that experienced an increase in total foreign claims to recipient country from year *t*-1 to year *t*.	Estimated following the methodology of Houston, et al. (2012)
Residual Outflows	Residuals from model (7) of Table 3 aggregated at the recipient-country-year across all source countries that experienced a decline in total foreign claims to recipient country from year *t*-1 to year *t*.	Estimated following the methodology of Houston, et al. (2012)
Country-Level Variables:		
Restrictions on bank activities	Index measuring regulatory impediments to banks engaging in securities market activities, insurance activities, and real estate activities.	Barth, Caprio, and Levine. (2013)

Appendix A: Definitions and Sources. Continued.

Variable	*Definition*	*Source*
Stringency of capital regulation	Index measuring the stringency of regulations regarding how much capital banks must hold, as well as the sources of funds that count as regulatory capital. The index ranges from 0-10, with higher values indicating greater stringency.	Barth, Caprio, and Levine. (2013)
Official supervisory power	Index measuring whether supervisory entities have authority to take action to prevent and correct problems. The index ranges from 0-14, with higher values indicating greater power.	Barth, Caprio, and Levine (2013)
Private monitoring	Index measuring whether there exist incentives/ability for the private monitoring of banks. The index ranges from 0 to 12, with higher values indicating more private oversight.	Barth, Caprio, and Levine (2013)
Regulation overall (PCA)	Index of overall regulatory quality that is the first principal component of the four Barth, Caprio, and Levine (2013) indices: Restrictions on bank activities, Stringency of capital regulation, Official supervisory power, and Private monitoring.	Barth, Caprio, and Levine (2013)
Z-Score	Annual value for the country's banking system measured as: (ROA+ (equity/assets))/σ(ROA).	Global Financial Development Database
Regulatory capital	Annual value of the capital adequacy of deposit takers. It is a ratio of total regulatory capital to its assets held, weighted according to risk of those assets.	Global Financial Development Database
Liquid assets-to-deposits	The ratio of the value of liquid assets (easily converted to cash) to short-term funding plus total deposits.	Global Financial Development Database
Bank assets	Total assets held by deposit money banks as a share of GDP.	Global Financial Development Database
Provisions-to-NPL	Provisions for loan and lease losses to non-performing loans.	Global Financial Development Database
Concentration	Annual value of the concentration of the country's banking system. Concentration is measured as the assets of the three largest commercial banks as a share of total commercial banking assets.	Global Financial Development Database

Appendix A: Definitions and Sources. Continued.

Variable	Definition	Source
Stability (PCA)	Composite index of banking sector stability that is the first principal component of six banking sector indicators: 1) *Z-score*; 2) *Regulatory capital*; 3) *Liquid assets-to-deposits*; 4) *Bank assets*; 5) *Provisions-to-NPL*, and 6) *Concentration*.	Global Financial Development Database
Log GDP per capita	Annual value of the natural logarithm of the country's gross domestic product (GDP) per capita.	World Development Indicators
GDP growth	Year-over-year change of the country's real GDP.	World Development Indicators
Volatility	Annual stock market volatility for the country.	Stock return data - DataStream
Market return	Annual stock market return for the country.	Stock return data - DataStream
Non-interest income	Annual value for aggregate non-interest income relative to total income for the country's banking system.	Global Financial Development Database
Bank credit	The financial resources provided to the private sector by domestic money banks as a share of GDP.	Global Financial Development Database
Financial liberalization	Index of financial liberalization. Higher values indicate a higher degree of financial liberalization.	Abiad, Detragiache, and Tressel (2010)
Property rights	Index that measures countries' ability to secure property rights, including the existence of legal institutions that are more supportive of the rule of law.	Fraser Institute website
Creditor rights	The index of creditor rights from Djankov et al. (2007).	Djankov et al. (2007)
Credit depth	An index of the depth of credit information in the country.	World Bank's Doing Business Database
Same language	Indicator variable equal to one if the two countries share the same language and zero otherwise.	Mayer and Zignago (2011)
Distance	Log of the circle distance (in km) between the countries' capitals.	Mayer and Zignago (2011)
Colony	Indicator variable equal to one if the two countries have ever had a colonial link and zero otherwise.	Mayer and Zignago (2011)
Contiguous	Indicator variable equal to one if the two countries share a border and zero otherwise.	Mayer and Zignago (2011)

Appendix A: Definitions and Sources. Continued.

Variable	Definition	Source
Strength of external audit	An index measuring the strength of external auditors. Higher values indicate more strength.	Barth, Caprio, and Levine (2013)
Independence of supervisors	An index measuring the degree of the supervisory authority's independence from the government and protection from the banking industry. Higher values of the index indicate more independence.	Barth, Caprio, and Levine (2013)
Failed deals	This variable equals the sum of all failed non-financial M&A deals involving targets in country *i* in year *t* as a proportion of all non-financial deals announced in country *i* in year *t*. Failed deals are those non-financial M&A deals announced in year *t* that are not completed as of the end of our sample period. These include deals that are withdrawn, deals that are still pending years after the announcement, as well as deals with unknown status as of the end of our sample period.	Thomson's SDC Platinum.
Restrictions	An index of restrictions on trade from KOF Index of Globalization. The index is a subcomponent of the Economic Globalization index and measures barriers to trade which include hidden import barriers; tariff rates; taxes on international trade, and capital account restrictions, including limits on foreign ownership of domestic companies. We multiply the index by negative one such that higher values are associated with more restrictive regimes.	Dreher (2006); Dreher, Gaston and Martens (2008).
Bank-Level Variables:		
Size	Log of total assets	Worldscope
LLP-to-assets	Loan loss provisions scaled by total assets	Worldscope
Non-interest income-to-income	Non-interest income divided by the sum of-interest and non-interest income.	Worldscope
Deposits-to-assets	Total deposits divided by total assets	Worldscope
Total capital-to-assets	Total capita divided by total assets	Worldscope
Loans-to-assets	Net loans divided by total assets	Worldscope

Appendix B. Correlations Matrix

This table presents the correlations of the key variables used in the analysis below. The sample period is 2000-2013.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)	1													
(2)	0.9393*	1												
(3)	0.8974*	0.9312*	1											
(4)	-0.3321*	-0.0900*	-0.1828*	1										
(5)	-0.0936*	-0.1570*	-0.1556*	-0.1435*	1									
(6)	-0.0942*	-0.1061*	-0.0934*	-0.0144	0.2125*	1								
(7)	-0.0826*	-0.0298	0.0079	0.1335*	-0.011	-0.0831	1							
(8)	0.0019	0.0598	0.0866*	0.1452*	-0.2002*	-0.039	0.0187	1						
(9)	0.1447*	0.0535	0.0362	-0.2985*	0.4426*	0.1169*	-0.1402*	-0.3759*	1					
(10)	0.012	0.0432	-0.0018	-0.0141	-0.2276*	0.0634	0.0357	0.2042*	-0.3080*	1				
(11)	-0.0873*	-0.0584	-0.0233	0.0925*	-0.1568*	0.1877*	0.1785*	0.1656*	-0.1902*	0.0583	1			
(12)	0.0096	-0.0019	0.0098	-0.0454	-0.0948*	0.0108	0.0876*	0.0376	-0.1605*	0.1382*	0.0568	1		
(13)	0.0141	-0.0343	-0.0286	-0.0911*	0.2353*	-0.008	0.0711	-0.1591*	0.0744*	-0.0226	-0.0536	0.0651*	1	
(14)	0.0710*	-0.0051	-0.0357	-0.2170*	0.5318*	0.0936*	-0.4406*	-0.2998*	0.6594*	-0.2291*	-0.2333*	-0.1622*	0.0206	1

(1) *Flows*
(2) *Residual Flows*
(3) *Residual Inflows*
(4) *Residual Outflows*
(5) *SRISK-to-GDP (%)*
(6) *MES (%)*
(7) *Stability (PCA)*
(8) *Regulation overall (PCA)*
(9) *Log GDP per capita*
(10) *GDP growth*
(11) *Volatility*
(12) *Market return*
(13) *Non-interest income-to-income*
(14) *Bank credit*

Appendix C: Descriptive Statistics by Country – This table provides summary statistics at the country level for the 70 countries in our analysis with available data on either of our two measures of systemic risk: 1) *SRISK* and 2) *MES* – the negative value of the value-weighted *MES* for all banks in a country. We include measures of international bank flows (*Flows*); an aggregate *de jure* measure of regulatory quality, *Regulation-overall (PCA)* that is the first principal component of four regulatory indices from Barth, et al. (2013): *1) Restrictions on bank activities; 2) Official supervisory power; 3) Stringency of capital regulation; 4) Private monitoring,* and an aggregate *de facto* measure of banking sector stability, *Stability (PCA)* that is the first principal component of six banking sector indicators obtained from the World Bank's Global Financial Development Database: 1) *Regulatory capital*; 2) *Liquid asset-to-deposits*; 3) *Bank assets*; 4) *Concentration*; 5) *Z-score, and* 6) *Provisions-to-NPL*. All variable definitions are in Appendix A. We average each measure across the full sample period 2000-2013.

Country	*SRISK*	*MES (%)*	*Flows*	*Regulation overall-PCA*	*Stability PCA*
Argentina	0.20	3.00	0.01	-0.25	-0.18
Australia	.	2.05	0.15	0.71	-0.69
Austria	4.42	3.61	0.09	-1.19	-0.44
Bahrain	0.64	1.62	-0.02	0.38	.
Bangladesh	.	1.08	-0.01	0.76	.
Belgium	13.35	3.55	0.10	-0.80	-0.25
Bosnia	.	-0.34	-0.12	-1.28	-0.09
Brazil	0.59	2.59	0.17	0.47	0.70
Bulgaria	.	1.16	0.35	-0.46	-0.11
Canada	2.14	1.87	0.19	-0.67	-1.27
Chile	0.16	1.10	0.09	0.98	.
China	0.91	2.48	0.20	1.06	-1.35
Colombia	1.22	1.95	0.10	1.26	-0.37
Croatia	0.13	1.35	0.22	-0.51	0.16
Cyprus	16.74	5.01	0.18	-0.26	-1.58
Czech Republic	0.20	.	0.10	-0.09	-0.32
Denmark	6.92	2.06	0.24	-0.28	-0.50
Egypt	.	2.89	0.17	0.85	-0.26
Finland	0.64	1.83	0.21	-0.93	0.76
France	15.72	4.00	0.09	-1.00	-0.20
Germany	7.93	2.52	0.21	-1.35	-0.71
Greece	7.04	4.82	0.10	-0.81	-0.92
Hong Kong	8.83	2.22	0.11	-0.74	-0.40
Hungary	1.12	.	0.24	1.32	-0.64
Iceland	.	1.86	0.39	-1.17	.
India	1.36	3.52	0.21	-0.27	-1.31
Indonesia	0.08	3.30	0.11	2.31	0.23
Ireland	10.35	3.20	0.17	-0.08	-0.74
Israel	4.49	2.66	0.13	0.36	-0.59
Italy	5.21	3.44	0.10	-0.77	-0.63
Japan	6.10	3.12	0.11	0.40	-1.96
Jordan	0.00	1.88	0.00	0.16	0.65
Kazakhstan	0.62	0.48	-0.17	-0.41	-0.02
Kenya	.	0.69	0.02	1.23	0.06
Kuwait	0.07	2.32	0.08	-0.40	0.44
Lithuania	.	1.11	0.27	1.39	-0.46
Luxembourg	10.25	1.07	0.02	0.01	-0.04
Malaysia	0.85	1.90	0.15	1.00	-0.72
Malta	1.58	.	0.10	0.66	-0.31
Mexico	0.06	2.15	0.17	-0.68	1.40
Morocco	0.57	1.77	0.17	0.62	-0.69
Netherlands	14.87	3.60	0.12	-0.98	-0.80
New Zealand	0.05	.	-0.06	-2.60	.
Nigeria	.	2.03	0.19	0.96	-0.78
Norway	1.00	1.72	0.35	-0.89	-0.44
Oman	.	2.61	0.10	0.26	0.25

Appendix C: Descriptive Statistics by Country. Continued.

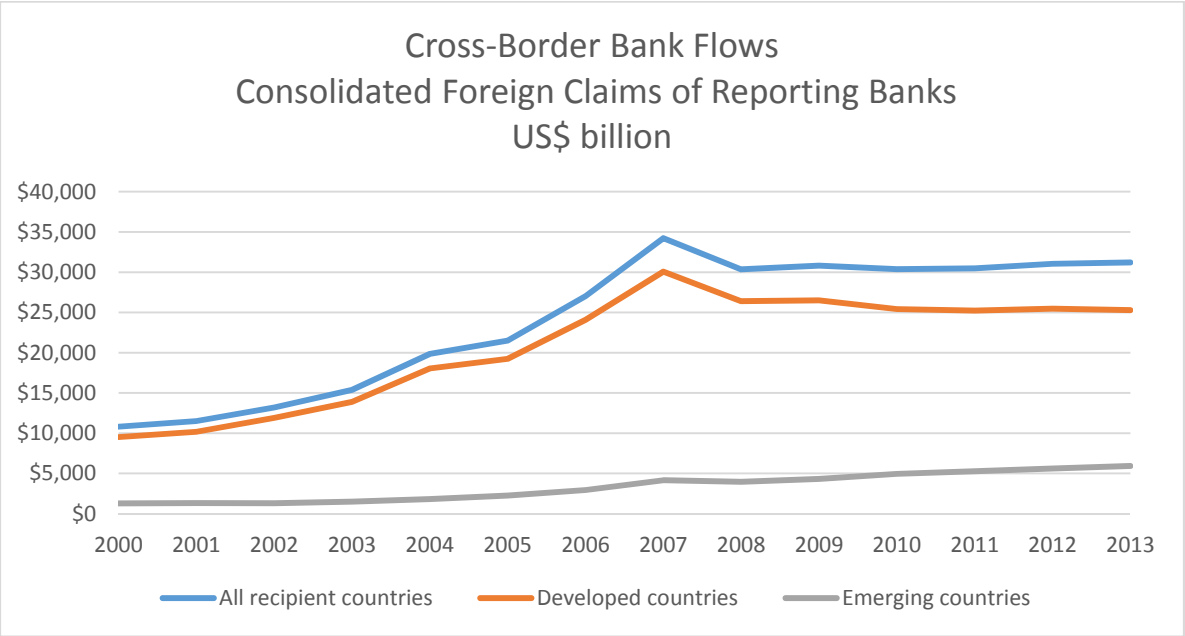
Country	*SRISK*	*MES (%)*	*Flows*	*Regulation overall-PCA*	*Stability PCA*
Pakistan	0.08	3.45	0.11	1.14	-0.86
Peru	0.36	1.26	0.13	0.64	-0.05
Philippines	0.14	2.13	0.11	0.07	0.01
Poland	0.20	2.87	0.30	-0.95	-0.27
Portugal	3.54	2.35	0.14	0.22	-0.85
Qatar	.	3.00	0.28	1.46	.
Romania	0.08	3.91	0.25	-0.38	0.29
Russia	0.55	4.24	0.33	-1.68	0.06
Saudi Arabia	0.05	1.43	0.16	0.99	-0.14
Singapore	1.69	2.57	0.13	0.87	0.26
Slovenia	0.19	.	-0.28	-0.12	.
South Africa	1.94	2.30	0.19	0.05	-0.55
South Korea	0.76	3.96	0.17	0.14	-0.72
Spain	5.04	3.54	0.15	-0.42	-0.87
Sri Lanka	.	2.54	0.10	-0.34	.
Sweden	10.22	3.21	0.17	-1.05	-0.19
Switzerland	28.79	3.43	0.15	0.16	0.28
Thailand	1.23	3.48	0.10	0.09	-1.15
Tunisia	.	0.82	0.05	-0.02	.
Turkey	0.40	4.61	0.26	1.02	0.63
Ukraine	0.19	1.48	0.58	0.28	-0.76
United Kingdom	15.90	2.69	0.13	-1.41	-0.58
United States	2.52	3.75	0.14	1.26	-1.02
Venezuela	.	1.91	0.01	1.49	-0.17

Appendix D: First-Stage of 2SLS Analysis – This table provides results from first-stage regressions associated with 2SLS regressions results in Table 2. The dependent variable is *Flows* −the log difference (difference in log from *t-1* to *t*) of total foreign claims from all source countries to recipient country *r*. We use two instruments: *Restrictions*− an index of restrictions on trade from KOF Index of Globalization, and *Failed deals*− the proportion of failed non-financial M&A deals all failed non-financial M&A deals involving targets in country *i* in year *t*. Controls are the same ones used in our baseline regressions in Table 2 and described in Appendix A. Models (1) and (2) are the first-stage results associated with Models (5) and (6) of Table 2. Models (3) and (4) are the first-stage results associated with Models (11) and (12) of Table 2. Robust *t*-statistics with standard errors clustered at the country level are in parentheses.

First-Stage Regression Results				
	SRISK subsample		*MES* sample	
	Dependent variable: $Flows_{r,t}$			
	(1)	(2)	(3)	(4)
Restrictions$_{t-1}$	-0.036**	-0.042**	-0.920*	-0.767
	(-2.39)	(-2.14)	(-1.76)	(-1.38)
Failed deals$_{t-1}$	0.047	0.039	0.025***	0.023**
	(1.64)	(1.21)	(2.82)	(2.51)
Log GDP per capita t-1	0.015	0.020	0.083	0.088
	(0.16)	(0.20)	(0.86)	(0.87)
GDP growth t-1	0.126***	0.108**	0.109***	0.096***
	(3.35)	(2.60)	(3.75)	(3.04)
Volatility t-1	-1.511	-1.573	-1.418**	-1.405**
	(-0.89)	(-0.85)	(-2.18)	(-2.09)
Market return t-1	-1.408***	-1.499***	-0.402*	-0.373
	(-3.07)	(-2.90)	(-1.68)	(-1.44)
Non-interest income-to-income t-1	-0.014*	-0.014	-0.015**	-0.014*
	(-1.73)	(-1.53)	(-1.99)	(-1.79)
Bank credit t-1	-0.007	-0.006	-0.008*	-0.008*
	(-1.06)	(-0.82)	(-1.80)	(-1.66)
S-T rate t-1		-0.027		-0.030
		(-1.07)		(-1.62)
Year fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Observations	477	441	613	574
Adjusted R^2	0.581	0.625	0.426	0.445
# countries	55	47	59	55

Figure 1: **Consolidated Foreign Claims**

The figure shows the total foreign claims for reporting banks in 26 source countries to 119 recipient countries from 2000 through 2013. The top panel divides the total bank flows by recipient country financial development. The bottom panel shows the total foreign claims by source country/region. Source: Bank for International Settlements Quarterly Review.



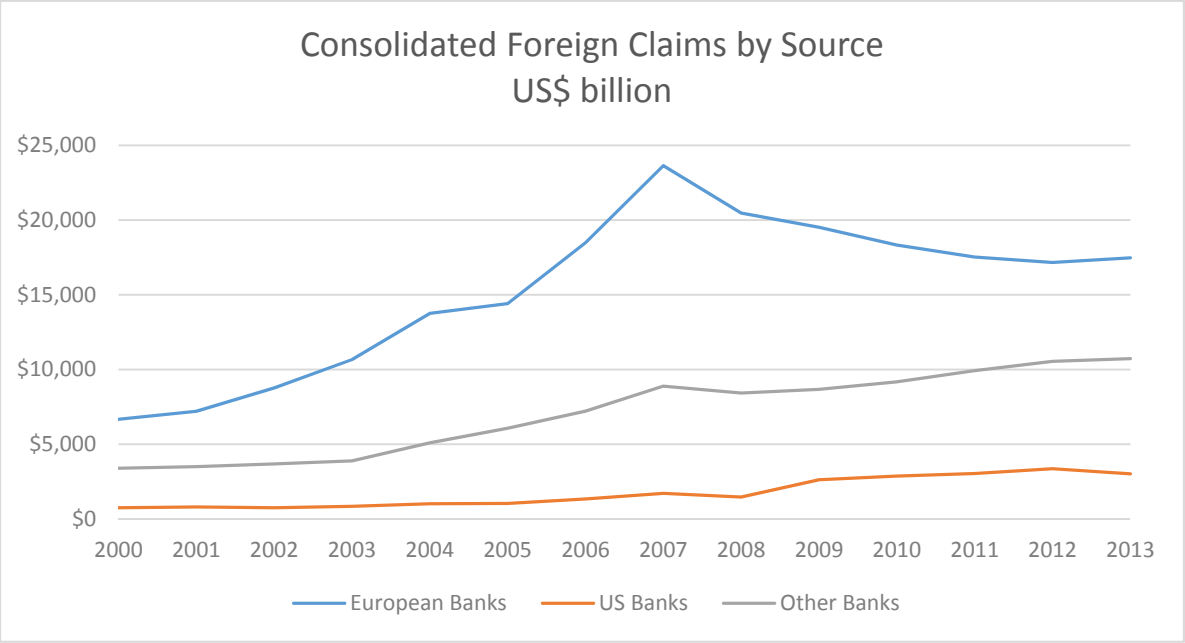


Figure 2: **Systemic Risk Measures by Year.**

The figure shows the evolution of our two measures of systemic risk: 1) *SRISK-to-GDP* -year-end value of *SRISK* for the country divided by the annual GDP of the country, and 2) *MES* - the annual value-weighted average *MES* of all banks in a country. *MES* is the average stock return of the bank when the country's stock market is in the 5% left tail of returns. We take the negative value of *MES* as our measure so that both measures are increasing in systemic risk. The graph shows the cross-country average of each measure.