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Drivers of Financial Integration –

Implications for Asia

Nasha Ananchotikul, Shi Piao and Edda Zoli

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**I N T E R N A T I O N A L M O N E T A R Y F U N D**

## Asia and Pacific

### Drivers of Financial Integration - Implications for Asia

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Authorized for distribution by Rachel van Elkan

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### **Abstract**

Deeper intraregional financial integration is prominent on Asian policymakers' agenda. This paper takes stock of Asia's progress toward that objective, analyzing recent trends in cross-border portfolio investment and bank claims. Then, it investigates the drivers of financial integration by estimating a gravity model of bilateral financial asset holdings on a large sample of source and destination countries worldwide, focusing in particular on the role of regulation and institutions. The paper concludes that financial integration in Asia could be enhanced through policies that lower informational frictions, continue to buttress trade integration and capital market development, remove restrictions to foreign flows and bank penetration, and promote a common regulatory framework.

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## I. INTRODUCTION

Ever since the Asian financial crisis, Asian policymakers have embarked in a number of initiatives to foster regional cooperation and financial integration. This drive has been motivated to a large extent by the desire to enhance resilience against the vagaries of global financial markets by developing a local-currency denominated bond market and beefing up regional reserves. The “Manila Framework” was developed in 1997 as a “new framework for enhanced Asian regional cooperation to promote financial stability”. Other important steps toward regional financial integration include liquidity support arrangements through the Chiang Mai Initiative Multilateralization, the Asian Bond Fund, the Asian Bond Market Initiative, and financial forums such as the Association of Southeast Asian Nations Plus Three and the Executives’ Meeting of East Asia–Pacific Central Banks. The Association of Southeast Asian Nations (ASEAN) has also outlined plans to foster capital market integration, including by building capital market infrastructure and harmonizing regulations.<sup>1</sup>

In spite of these efforts, though, the empirical evidence indicates that regional financial integration lags behind trade integration (IMF, 2014), and that Asian economies maintain stronger financial links with the rest of the world than with other economies in the region (Borensztein and Loungani 2011; Eichengreen and Park 2004; Garcia-Herrero, Yang, and Wooldridge 2008; Pongsaparn and Unterberdoerster 2011).

This paper takes a fresh look at the status of financial integration within Asia and at possible factors hindering progress, focusing on portfolio investment and banking claims. More specifically, it attempts to address the following questions: how financially integrated are Asian economies within the region? Has Asia’s regional financial integration increased? And how does it compare to other regions? What are the drivers of financial integration? And, hence, what are the implications for Asian policymakers pursuing deeper regional financial integration?

To answer these questions we first review recent trends in the share of cross-border holdings of portfolio investment assets and bank claims within Asia compared to outside the region. Next, we estimate the home bias—that is, the tendency to invest more in one’s home country than abroad—in Asia and other regions. Then, through a gravity model, we study the main drivers of financial integration—focusing in particular on the role of regulations—and use the results to draw implications for Asia.

The paper finds that the degree of financial integration within Asia has increased, but remains relatively low, especially when compared with Asia’s high degree of trade integration. Moreover, financial linkages within Asia are less strong than those within the euro area and the European Union, but tighter than those in Latin America. The home bias is

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<sup>1</sup> Indeed, in January 2007, ASEAN leaders affirmed their commitment to the creation of the ASEAN Economic Community (AEC) by 2015 “to transform ASEAN into a region with free movement of goods, services, investment, skilled labor, and freer flow of capital (ASEAN, 2008. p.2).

found to be particularly strong in Asia, limiting cross-border financial transactions within the region.

The gravity model estimates indicate that cross-border portfolio investment assets and bank claims increase with the size and sophistication of financial systems and the extent of trade integration. In addition, restrictions on cross-border capital flows, informational asymmetries, barriers to foreign bank entry, and differences in regulatory and institutional quality create obstacles to financial integration.

Hence, initiatives to advance Asian policymakers' agenda toward deeper regional integration could include steps to further promote financial market development and trade linkages, and reduce informational asymmetries through increased financial disclosure and reporting requirements. Lowering regulatory barriers to capital movements and foreign bank entry, as well as harmonizing regulation, especially for investor protection, contract enforcement, and bankruptcy procedures, appear particularly important.

## **II. REGIONAL FINANCIAL INTEGRATION IN ASIA: RECENT TRENDS**

There is no single and universally accepted definition and measurement of financial integration. The term is sometimes used to indicate financial openness and free cross-border capital movements. In some studies financial integration is intended as equalization of prices among assets with similar risk and return profiles among a group of countries—the so called “law of one price” (e.g., Fukuda, 2011). In others, it is interpreted as reduction in the cost for trading financial assets (Martin, 2011).

This paper uses as indicator of regional financial integration the share of cross-border portfolio investment and bank claims that is intraregional.<sup>2</sup> We prefer to rely on quantity-based measures of integration, instead of price-based indicators—such as yields and returns co-movements—because the latter may be affected by global common factors that are unrelated to regional financial integration.

Unlike foreign direct investment (FDI), most of Asia's portfolio investment is from or directed to outside the region (Figure 1 and 2). About 70 percent of direct investment is originated from within the region, and around 60 percent of Asian FDI is toward the region—with transactions between China and Hong Kong SAR accounting for nearly half of the intraregional total. On the other hand, most portfolio investment to Asia originates from the United States and advanced Europe, although the share of Asian origin increased from about 15 percent in 2001 to about 23 percent in 2013. The share of outward portfolio investment to the rest of the region grew from 10 percent to 24 percent over the same period, but North America and advanced Europe remained the main destinations. However, the shares of intraregional portfolio investment are higher when Japan—the largest portfolio investment

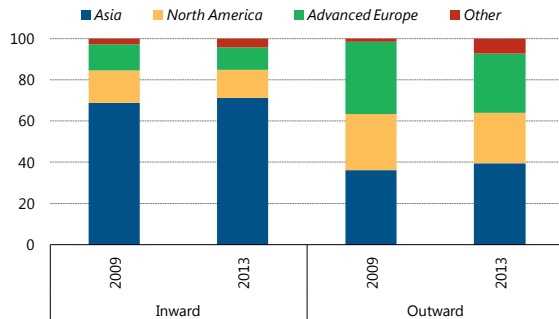
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<sup>2</sup> Data on bilateral cross-border portfolio investment are from the IMF's Coordinated Portfolio Investment Survey. Data on cross-border bank claims are from the Bank for International Settlements (see Appendix III).

source and destination country in Asia—is excluded, reaching 30 percent to 40 percent in 2013.<sup>3</sup>

**Figure 1. Asia: Foreign Direct Investment**

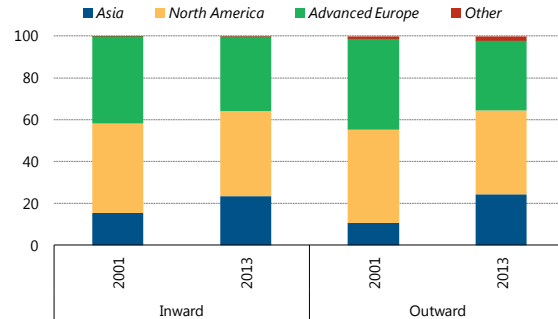
(Percent of total foreign direct investment to and from Asia)



Sources: IMF, Coordinated Direct Investment Survey database; and IMF staff calculations.

**Figure 2. Asia: Foreign Portfolio Investment**

(Percent of total foreign portfolio investment to and from Asia)

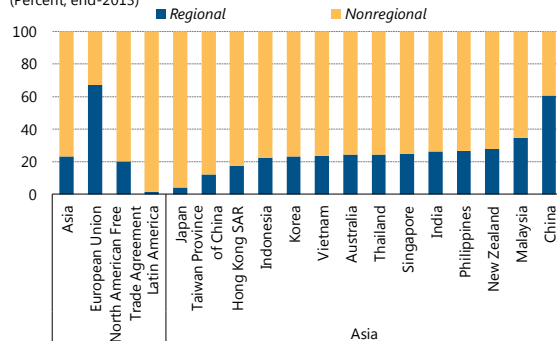


Sources: IMF, Coordinated Portfolio Investment Survey database; and IMF staff calculations.

The share of regional inward portfolio investment is fairly homogeneous across Asian economies, with Japan and China being the main outliers (Figure 3). The high intraregional share in the latter reflects transactions between mainland and Hong Kong SAR. As expected, intraregional portfolio inward investment in Asia is low compared to the EU—only one third. On the other hand, intraregional portfolio inward investment in Asia is significantly higher than in Latin America. The share of Asia's outward portfolio investment directed toward the region is rather heterogeneous across countries (Figure 4). Overall, though, it is smaller than in the EU, and higher than in Latin America.

**Figure 3. Sources of Portfolio Inward Investment**

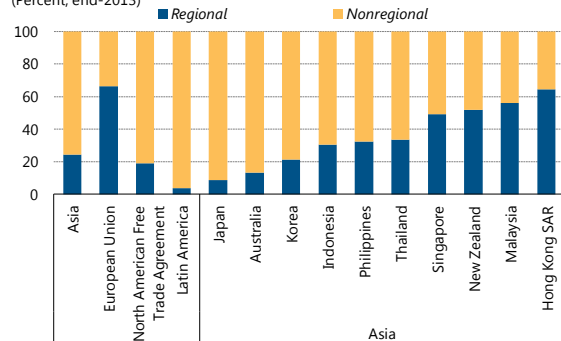
(Percent, end-2013)



Sources: IMF, Coordinated Portfolio Investment Survey database; and IMF staff calculations.

**Figure 4. Destinations of Portfolio Outward Investment**

(Percent, end-2013)



Sources: IMF, Coordinated Portfolio Investment Survey database; and IMF staff calculations.

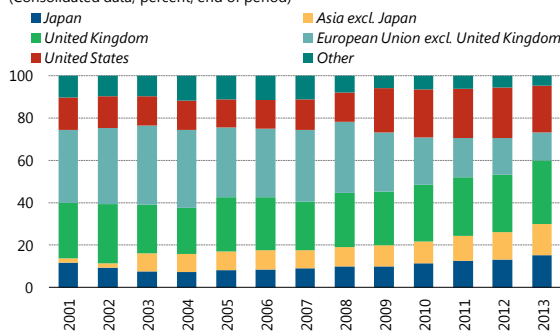
<sup>3</sup> The portfolio asset data set discussed here includes only holdings of the private sector. Foreign portfolio assets in the official sector (central banks, sovereign wealth funds, state-owned entities) in Asia are large, given the size of Asia's official reserves. No information is available on how these assets are allocated, however, although it seems plausible that intraregional allocations have risen over time. Large public sector foreign asset holdings could be seen as a partial substitute for private holdings in terms of risk diversification and therefore may be a factor in Asia's more limited private cross-border portfolio holdings relative to those of other regions.

Hong Kong SAR and Singapore serve as two important financial centers, increasing financial transactions within Asia. Hong Kong SAR is often considered the “gateway” to China, while Singapore is the regional financial center for Southeast Asia (Le Leslé, at al., 2014). The share of Singapore’s foreign portfolio liabilities originating in Asia almost doubled from 13 percent in 2001 to 25 percent in 2013, with the share of portfolio assets in the rest of the region originating from Singapore increasing from 39 percent to 49 percent. For Hong Kong SAR, the rise in inward portfolio investment from Asia (excluding China) has been modest—from 15 percent to 18 percent—while portfolio assets from Hong Kong SAR to Asia (excluding China) have remained roughly stable at around 30 percent.

Asia’s cross-border banking linkages remain stronger between Asian economies and economies outside of Asia than among economies within the region, although intraregional foreign bank claims have increased. The share of foreign bank claims originating from within the region more than doubled, from 13 percent in 2001 to 30 percent in 2013, according to Bank for International Settlements (BIS) consolidated data (Figure 5).<sup>4</sup> This surge reflects the expansion of Japanese and Australian banks in the region, especially since the global financial crisis, when European banks retrenched (IMF, 2015; Lam 2013). BIS locational data point to a similar degree of intraregional banking linkages.<sup>5</sup> According to this metric, about 20 percent of foreign claims originated within the Asian region in 2013, and about 25 percent of Asia’s foreign bank claims were directed to the rest of that region (Figure 6).

**Figure 5. Sources of Foreign Bank Claims on Asia**

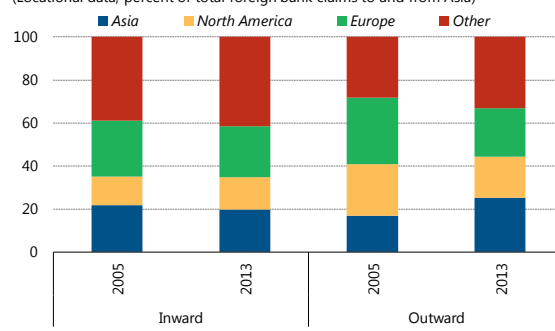
(Consolidated data; percent; end of period)



Sources: Bank for International Settlements; and IMF staff calculations.

**Figure 6. Asia: Foreign Bank Claims**

(Locational data; percent of total foreign bank claims to and from Asia)



Sources: Bank for International Settlements; and IMF staff calculations.

Note: Other includes remaining regions, unallocated locations, and offshore centers.

<sup>4</sup> The BIS data on cross-border bank claims on a consolidated basis categorize banks by nationality, summing up together contractual lending by the head office and all its branches and subsidiaries, net of interoffice transactions. For example, claims of Japanese bank branches and subsidiaries operating, say, in Korea toward local borrowers are counted as Japanese claims on Korea. Publicly available data covers only seven Asian reporting countries and twenty destination countries.

<sup>5</sup> Locational banking statistics categorize banks by location, consistent with the balance-of-payments residency principle. Data on locational cross-border banking claims were obtained from the BIS on a confidential basis.

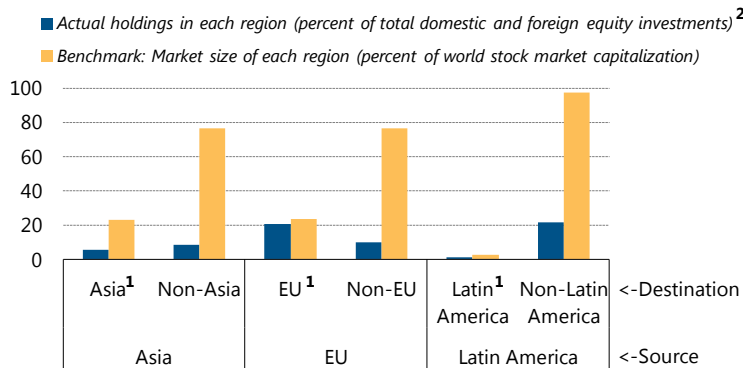


### III. HOME BIAS IN ASIA

What accounts for the rather slow pace of regional financial integration in Asia, in spite of policymakers' initiatives? One explanation is that most of Asia's private financial investment remains within the domestic economy, rather than going abroad; in other words, home bias is strong in Asia. In fact, on average, Asian investors hold only 13 percent of their total equity portfolio in foreign markets (Figure 7). Conversely, the share of cross-border equity investment out of the total equity portfolio is much higher in other regions—31 percent in the EU and 22 percent in Latin America. When compared with the world portfolio allocation benchmarks, the gap between actual investment and the benchmark is lower for Asia's *intra*-regional investments than for the *inter*-regional investment.<sup>6</sup> This suggests that, once controlling for market size, Asian investors are not discriminating against their own region as a destination for investments. Nevertheless, the gap between actual intra-regional investment and the benchmark remains large for Asia, while it is very narrow for EU and Latin America.

**Figure 7. Equity Holdings in Foreign Markets**

(Percent of total equity investments; simple average)



Sources: IMF Coordinated Portfolio Investment Survey database; and IMF staff calculations.

1/ Exclude equity holdings in domestic market.

2/ The sum of the blue bars represents the share of total equity portfolio invested in foreign markets by each source region.

To further assess the size of home bias in Asia, also in comparison with other regions, a home bias index in equity markets is constructed for 50 countries over 2001-12.<sup>7</sup> This measures the extent to which investors allocate a larger share of their portfolio in domestic equities, compared to the benchmark based on the size of the domestic market in the world stock market. The index ranges from 0 to 100, after normalization, with a higher number indicating greater home bias.

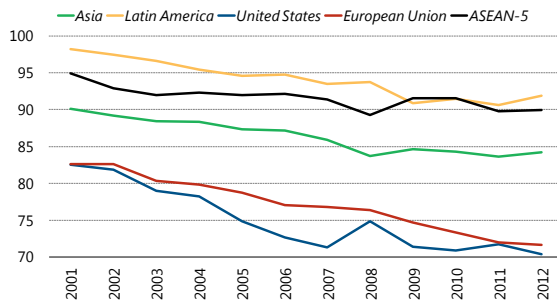
The average home bias in Asia—particularly in the ASEAN-5 economies (Indonesia, Malaysia, the Philippines, Singapore, Thailand)—according to the index is higher than that in the European Union and the United States, though it is lower than that in Latin America (Figure 8). Overall, there has been a clear downward trend in the home bias across all regions

<sup>6</sup> A simple benchmark derived from an international CAPM predicts that portfolio allocation to each country (or region) should be equal to the share of the country's market capitalization in the world market.

<sup>7</sup> Appendix I provides a detailed description of the index construction and country coverage.

for most part of the 2000s, probably driven by increased financial globalization. However, this trend decline seems to have stalled in most regions after the global financial crisis (GFC), when international capital flows retrenched. Only in the European Union members the home bias continued to decline even after the GFC, as domestic investors moved out of their home stock market amidst market corrections and significant uncertainties over the region's economic and financial outlook.

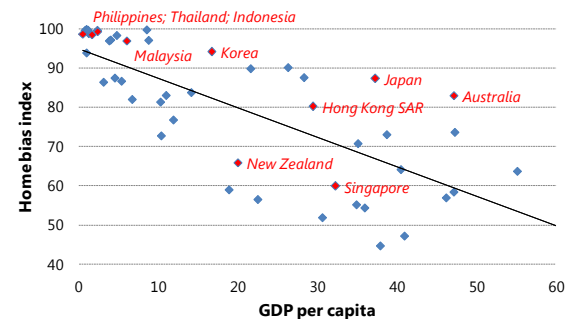
**Figure 8. Home Bias Index across Regions**



Sources: IMF Coordinated Portfolio Investment Survey database; and IMF staff calculations.  
Note: ASEAN-5 = Indonesia, Malaysia, the Philippines, Singapore and Thailand. The index range is from 0 to 100, with a higher number indicating greater home bias.

**Figure 9: Home Bias and Economic Development**

(GDP per capita in thousands of US dollars; average of 2001-2012)



Sources: IMF Coordinated Portfolio Investment Survey database; and IMF staff calculations.

What explains the home bias in equity holdings? The large literature on determinants of financial investment destinations points to three main potentially explanatory factors, namely (i) the level of economic and financial development, (ii) policy restrictions, such as capital control measures, and (iii) implicit transaction costs arising from information frictions, real exchange rate risk, country risk, and corporate governance issues (Chan, Covrig and Ng, 2005; and Bekaert and Wang (2009).

Indeed, there is a negative correlation between the home bias and the level of economic development (Figure 9). A simple panel regression analysis confirms that GDP per capita, financial development (proxied by the share of domestic bank assets to GDP), stock market size, and the degree of capital account liberalization (measured by the Chinn-Ito index of financial openness) are significant determinants of home bias (Table 1).<sup>8</sup> Interestingly, the estimated coefficient on the stock market size variable, which could potentially be a proxy for the level of financial development, has a positive sign. This is perhaps because a larger domestic stock market is more liquid and entails lower transaction costs, thus making domestic equity investment relatively more attractive, after controlling for the level of financial development.<sup>9</sup>

<sup>8</sup> See Chan, Covrig and Ng (2005) and Bekaert and Wang (2009) for a comprehensive investigation of the determinants of home bias in advanced and emerging economies.

<sup>9</sup> Indeed, once GDP per capita and domestic banking sector size are removed from the regressions, the stock market size variable becomes positive. In addition, when the squared stock market size is entered as an additional variable to test for non-linearity, the coefficient on this term has a significantly negative sign, indicating that the positive effect of stock market size on the home bias becomes increasingly smaller as the market becomes larger.

Another noteworthy result from the regressions is that, although the average home bias is lower in Asia than in Latin America (Figure 8), once the level of economic and financial development and capital account openness are controlled for, Asia seems to have much higher residual home bias than Latin America, as captured by the Asia dummy variable (Table 1, Column (2)). The fact that home bias has been particularly strong in Asian economies could be an important factor hindering intraregional financial integration in Asia as most financial investment remains within each country's border instead of being directed toward other countries in the region.

**Table 1: Home Bias Regressions**

Dependent Variable:	(1)	(2)	(3)
Home Bias Index (0-100)			
GDP per Capita	-0.353*** (-4.615)	-0.317*** (-3.965)	0.042 (0.585)
Bank Asset Size / GDP	-0.122*** (-5.976)	-0.140*** (-6.334)	-0.050* (-1.773)
Stock Market Size / GDP	0.057*** (6.014)	0.054*** (4.978)	0.056*** (3.544)
Capital Account Openness	-3.554*** (-4.465)	-4.022*** (-3.975)	-1.968** (-2.374)
Asia Dummy		10.213*** (3.925)	
EU Dummy		6.169** (1.985)	
Latin America Dummy		3.624 (1.406)	
Constant	101.632*** (36.599)	95.944*** (27.105)	97.423*** (38.038)
Time Effects	YES	YES	YES
Country Effects	NO	NO	YES
Observations	538	538	538
R-squared	0.407	0.429	0.937

Source: IMF staff estimates.

Robust t-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### IV. DRIVERS OF FINANCIAL INTEGRATION

What are the main factors driving financial integration between countries? In other words, what are the determinants of cross-border bilateral financial investment? To answer these questions, we estimate a gravity model, based on the theoretical framework developed in Martin and Rey (2004) and Aviat and Coeurdacier (2007).<sup>10</sup> More specifically, the basic estimating equation is as follows:

$$\log(\text{Asset}_{ijt}) = \alpha_1 \log(\text{MktSize}_{it-1}) + \alpha_2 \log(\text{MktSize}_{jt-1}) + \alpha_3 \log(Z_{ijt}) + \alpha_4 \log(R_{jt}) + \text{Constant} + \text{Time dummies} + \varepsilon_{ijt} \quad (2)$$

where  $\text{Asset}_{ijt}$  are the asset holdings of country  $i$  in country  $j$ .  $\text{MktSize}_i$  and  $\text{MktSize}_j$  are the market size of country  $i$  and country  $j$ , respectively.  $Z_{ij}$  are proxies for transaction costs on financial asset trading between the two countries.  $R_j$  is a set of variables affecting the expected return on asset holdings in the destination country.

We run two sets of regressions. In the first, the dependent variable is total portfolio assets (equities and bonds), obtained from the IMF's Coordinated Portfolio Investment Survey (CPIS). In the second, the dependent variable is cross-border bank claims from the Bank of International Settlements.<sup>11</sup>

When the dependent variable is total portfolio holdings, as a measure of market size  $\text{MktSize}_i$  and  $\text{MktSize}_j$  we use the sum of equity market capitalization and the value of the domestic bond market in each country. In regressions where the dependent variable is bilateral bank claims, nominal GDP is the proxy for market size.

Indicators for expected returns  $R_j$  include interest differentials between the source and destination country, past returns of stock indexes in the destination country, change in recipient country's exchange rate vis-à-vis the source country's currency, exchange rate volatility, as well as measures of political, macroeconomic, and financial risks in the destination country. To test whether portfolio diversification is a relevant factor in driving investor decisions, additional explanatory variables are the covariance between real GDP growth of the source and destination country, the covariance of their stock market returns, and the covariance between consumption growth in the source country and stock returns in the destination country, at various time horizons (Appendix III).

Transaction costs on financial asset trading are mainly driven by different types of frictions, which can be grouped into two broad categories, direct and indirect barriers.

Direct barriers are the restrictions imposed on foreign investors in acquiring assets in a particular country, and/or on domestic investors of that country in trading foreign assets.

<sup>10</sup> See Appendix II for the theoretical derivation of a gravity equation for international assets transactions. Empirical studies using gravity models to explain bilateral cross-border financial flows include Eichengreen and Park (2004), Lane (2011), Garcia-Herrero and others (2008).

<sup>11</sup> Appendix III provides a detailed discussion on these data.

These are measured by the capital account openness indexes developed by Chinn and Ito (2006) and Quinn (1997).

Indirect barriers include informational asymmetries, poor financial market infrastructure, and differences in regulatory and institutional quality. As shown in Portes and Rey (2005), informational asymmetries can be well proxied by the distance between the two countries and the lack of a common language because these factors hinder the interaction among economic agents and, hence, the exchange of knowledge about market structures, corporate culture, and other information that may be important for investment decisions. Thus, we use the log of geographical distance between the two capital cities of country pairs as a measure of “informational distance”. A dummy for “common language” is also used to measure whether country pairs share the same language. Furthermore, the size of bilateral trade between two countries is included as an additional explanatory variable, as there can be information spillovers from goods trading into financial assets trading (Aviat and Coeurdacier, 2007; and Lane and Milesi-Ferretti, 2004).<sup>12</sup>

Limited financial market sophistication and infrastructure could also create indirect barriers to financial asset trading. Hence, per capita GDP is added to the explanatory variables set, as a proxy for financial markets sophistication and quality of transaction technology.

Our main hypothesis—and departure from the literature—is that differences in regulatory and institutional quality among countries can be important indirect barriers to financial integration. Indeed, investors may be reluctant to carry out financial transactions with countries whose regulations and institutions are very different from their own. Hence, we include several explanatory variables as proxies of regulatory and institutional quality differences, including indicators of the degree of investor protection, quality of insolvency law and contract enforcement (Appendix III). Also departing from the literature, we test whether a strong foreign bank presence in a country—or regulation favoring foreign bank penetration—support financial integration, by reducing informational asymmetry and transaction costs in cross-border financial transactions. The results are summarized in Table 2.

## **A. Results on the determinants of bilateral portfolio investment**

### **Baseline regressions**

The baseline model specification includes only the main explanatory variables typically featured in gravity-models, namely the market size of the source and destination country, geographic distance, and a common language dummy variable. The dependent variable is asset holdings by the source country in the destination country (Table 3), or the sum of assets

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<sup>12</sup> Two additional arguments justify including bilateral trade as a regressor. First, trade could be the channel for risk sharing, thus reducing the need for financial integration (Cole and Obstfeld, 1991). Second, cross-border financial holdings could reflect trade-related transactions, such as trade finance and export insurance.

and liabilities of the source country toward the destination country (Table 4). All equations include time dummies to control for aggregate shocks that are common across all country-pairs at each point in time. Standard errors are robust to heteroskedasticity, and clustered at the country-pair level. To check for robustness, different econometric estimation techniques are used: the pooled OLS, between effects, random effects, destination-country fixed effects, country-pair fixed effects and the Hausman-Taylor estimator.<sup>13</sup>

All the regressors have the expected signs and are highly significant, regardless of the econometric techniques, although the magnitude of the coefficients vary. This indicates that cross-border investment depends positively on market size of the source and destination country, and negatively on their physical distance, and is larger when the two countries share a common language, consistent with the results in Portes and Rey (2005).

The model including country-pair fixed effects can control for any time invariant omitted explanatory variable which is country-pair specific, but it is not suitable when some of the regressors are completely time invariant (e.g., common language or distance) or have limited variation over time, such as regulatory and institutional factors, which are the main focus of our analysis. The random effects estimator is not appropriate for our data since the null hypothesis of significant random effects is rejected by the Hausman test. In principle, the Hausman-Taylor estimation would be the best approach, since it allows both time-varying and pure cross-sectional regressors in the equation. However, most model specifications do not pass the Hausman's specification test,<sup>14</sup> and those that do tend to produce results that are quite sensitive. Therefore, we will rely mostly on the pooled OLS results for the rest of our empirical analysis, and perform robustness checks using fixed effects or Hausman-Taylor estimation when applicable.

### **Assessing intraregional financial integration**

To investigate regional integration in Asia, and compare it to trends in other regions, intraregional dummy variables are added to the baseline specification. The Asia-intraregional dummy takes on the value of 1 if both source and destination countries are Asian, and 0 otherwise. The estimated coefficient on this variable measures the difference between the level of Asian economies among themselves relative to their level of integration with the rest of the world. Similar intraregional dummies are added for the EU, Latin America, and NAFTA. All intraregional dummies are significant when the market size of the source and destination countries are the only controlling variables (Table 5, column (1)). But when proxies for informational frictions are included, the coefficient of the dummies become

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<sup>13</sup> The Hausman-Taylor estimator, based on an instrumental variable approach, provides consistent estimates of the coefficients on time-invariant variables in panel-data random-effects models where some of the covariates are likely to be correlated with the unobserved individual random effect. Following Serlenga and Shin (2007), the Hausman-Taylor regression in Column (6) of Tables 3 and 4 assumes common language to be the only time-invariant variable that is correlated with individual effects.

<sup>14</sup> The standard Hausman's specification test compares an estimator from the fixed effects model that is known to be consistent with an estimator from the Hausman-Taylor model that is efficient under certain assumptions.

smaller or insignificant, as proximity and common language may explain part of intraregional financial integration.

The positive and significant coefficient of the Asia-intraregional dummy suggests that Asian economies are more integrated among themselves than with the rest of the world. The size of the coefficient indicates that integration is lower than in the EU, while comparable to the degree of integration in Latin America (Table 5, column (2)).<sup>15</sup> However, the apparently higher intraregional integration in Asia is driven by ASEAN. In fact, when the Asia dummy is divided into an ASEAN-intraregional dummy (equal to 1 when both countries belong to ASEAN), and Non-ASEAN Asia intraregional (equal to 1 when both countries belong to Asia, but are outside of ASEAN), only the coefficient on the former is statistically significant (Table 5, column (3)). When Singapore and Hong Kong SAR—the two important financial centers in Asia—are removed from the sample, the coefficient on the ASEAN and Non-ASEAN Asia dummies became smaller, with the non-ASEAN Asia’s coefficient becoming negative and statistically significant (Table 5, Column (4)). These results suggest that most financial integration within Asia occurred among the ASEAN economies, with Singapore and Hong Kong SAR potentially playing an important role in facilitating cross-border financial asset holdings.<sup>16</sup>

When total bilateral portfolio investments are disaggregated by instrument, regression results indicate that ASEAN intraregional integration has been stronger in the equity and short-term debt securities markets (Table 7). Conversely, Latin America’s financial integration seems more prominent in the long-term debt security market, while all portfolio investment markets are highly integrated in the Euro Area.

### **Assessing the determinants of bilateral portfolio investment: the role of regulation**

We now expand the baseline model to include the additional variables discussed above.

The coefficients on GDP per capita of the source and destination countries—the proxy for market sophistication — are always positive and significant, and more so for the source than the destination country (Table 6).<sup>17</sup> As expected, indicators of capital account openness are

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<sup>15</sup> The Wald test confirms that the coefficients on the regional dummies are statistically different from zero and from one another at the 1 percent level.

<sup>16</sup> The CPIS data used here do not allow to trace the ultimate source and destination of financial investments, thus preventing us from investigating the third-country holding issues. The results when Singapore and Hong Kong SAR are included in the sample could overstate the true degree of financial integration within Asia if most cross-border investments in Asia were originated from outside of Asia and channeled through these two Asian financial centers. On the other hand, if most investment were originated from other Asian countries, then the extent of intraregional integration in Asia could be understated by excluding Singapore and Hong Kong SAR.

<sup>17</sup> However, this result does not hold under the fixed effects estimation, possibly due to the high correlation between the level of GDP per capita and the fixed effects, as GDP per capita likely varies very little over the sample period in most cases.

also found to have positive and significant coefficients, and openness in the source country seems to have a bigger impact on financial integration.<sup>18</sup>

The coefficient on the bilateral trade is always positive and significant, suggesting that trade integration buttresses financial integration, possibly because trade in goods and services can help alleviate informational asymmetries and, hence, transaction costs, as argued by Aviat and Coeurdacier (2007).<sup>19</sup>

Departing from the literature, measures of foreign bank presence (number and asset shares in the domestic banking system) are included as additional regressors (Table 7a, columns (1) and (2)). The positive and significant coefficients on these variable suggest that foreign bank participation in the domestic banking system of the destination country supports international financial integration, as foreign banks could be the bridge between foreign funds and domestic investment projects, or because they are likely to be equipped with expertise and technology that help facilitate cross-border financial investments.

Our key departure from existing financial gravity literature is the investigation of the role of regulation and institutions, particularly differences in financial sector regulations between two countries, as implicit barriers to cross-border financial transactions. Hence, several measures of regulatory and institutional quality from various sources are used as additional explanatory variables (Appendix III). The coefficients of the regulation variables of the source and destination country are found to be positive and highly significant in most regressions (Table 7a, columns (3)-(5); Table 7b). Furthermore, differences between country pairs' regulatory quality always have negative and significant coefficients. The estimates indicate that the more similar is the quality of financial and banking regulation, security exchange regulation, investor protection, and contract enforcement between two countries, the larger are their bilateral financial transactions. This is probably because similarities in regulatory frameworks lower information asymmetry and boost investor confidence.

Additional regressions, where these regulatory differences are also interacted with intraregional dummies, suggest that lack of regulatory harmonization has a particularly large negative effects on Asian intraregional investment, suggesting that Asian investments may be more sensitive to these regulatory differences than the sample average.<sup>20</sup>

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<sup>18</sup> When the Quinn (1997)'s financial openness indices are used as a measures of financial openness, we find that capital outflows restrictions matter for source country's outward investments—the more restricted, the lower are cross-border investments—while capital inflow restriction indicators are not significant for either the source or destination country.

<sup>19</sup> There is some collinearity between bilateral trade and gravity-typed variables, such as distance, that are important determinants of trade between countries. However, the fact that both bilateral trade and distance remain significant indicates that the former variable has additional explanatory power for cross-border financial investments.

<sup>20</sup> These results are not reported, but are available from the authors.



**Table 2: Summary of the Results 1/ 2/**

Dependent Variable:	Bilateral portfolio investment	Bilateral bank claims (consolidated)	Bilateral bank claims (locational)
Log (Market Size) - Source	+	+	+
Log (Market Size) - Destination	+	+	+
Log (Distance)	-	-	-
Common Language	+	+	+
GDP per Capita - S	+	+	+
GDP per Capita - D	+	+	+
Bilateral Trade	+	+	+
Capital Account Openness - S	+	+	+
Capital Account Openness - D	+	+	+
Foreign Bank Presence (Asset Share) - D	+		
Foreign Bank Presence (Number Share) - D	+		
Financial and Banking Regulation Index - S	+		
Financial and Banking Regulation Index - D	Non significant		
Financial and Banking Regulation Index - Difference	-		
Regulation of Securities Exchanges - S	+		
Regulation of Securities Exchanges - D	Non significant		
Regulation of Securities Exchanges - Difference	-		
Regulatory Quality - S	+		
Regulatory Quality - D	+		
Regulatory Quality - Difference	-		
Rule of Law - S	+		
Rule of Law - D	+		
Rule of Law - Difference	-		
Protecting Investors Index - S	+		
Protecting Investors Index - D	+		
Protecting Investors Index - Difference	-		
Enforcing Contracts Index - S	Non significant		
Enforcing Contracts Index - D	+		
Enforcing Contracts Index - Difference	-		
Covariance of Real GDP Growth (lagged)	+		
Interest rate differential (lagged)	+		
Stock returns in Destination (lagged)	Non significant		
FX appreciation of D against S (lagged)	-		
Political Risk - D (lagged)	-		
Economic Risk - D (lagged)	Non significant		
Financial Risk - D (lagged)	+		
Bank Branches per Population - D (lagged)	+		
Private Credit to GDP - D (lagged)	+		
Stock Market Cap to GDP - D (lagged)	-		
Mutual Fund Assets to GDP - D	+		
Foreign Bank Entry Application Denied Ratio - D		-	-
Foreign Bank Entry Prohibition Index - D		-	-
Ability of Resolving Insolvency Index - Difference		-	Non significant
Depth of Credit Information Index - Difference		-	Non significant
Auditing Standard - Difference		-	Non significant
Stringency of Minimum Capital Requirements Index - Difference		Non significant	-
Actual Capital Ratio - Difference		Non significant	-
Accounting Standard - Difference		Non significant	-
Auditing Standard - Difference		Non significant	-

Source: IMF staff estimates.

1/ S=Source; D=Destination

2/ Color green indicates that the coefficient of the corresponding variable is statistically significant or highly significant using alternative estimation methods. Color yellow indicates that the coefficient of the corresponding variable is statistically significant or highly significant only with some estimation methods.

### **Additional drivers of bilateral flows**

Diversification does not seem to be a motive for bilateral portfolio investment. In fact, the coefficient on the variable measuring the (lagged) covariance between quarterly GDP growth of the country pair is found to be positive, indicating that countries are more likely to invest in economies with a synchronized business cycle (Table 8). This may be due to informational frictions discouraging transactions between countries located in different geographic regions, whose business cycle is typically less synchronized (Portes and Rey, 2005).

Regression results provide some support to the hypothesis that bilateral investment is driven by the search for yield. Indeed, the coefficient on the (lagged) interest rate differential between the destination and the source country is positive and significant (Table 8, column (4)). However, another indicator of return differential (lagged stock market returns in destination country) is found not to be significant. There is also some indication that a stronger currency in the destination country vis-a-vis the source country deters bilateral flows (Table 8, column (5)). Overall, though, these results are generally not very robust to alternative econometric estimates.

High political risk in the destination country discourages bilateral financial investment (Table 9, column (1)), as indicated by the negative and significant coefficient of the corresponding variable. On the other hand, economic and financial risks do not seem to deter inward foreign portfolio investments. This could be because international investors may be able to hedge against some of such risks, e.g., exchange rate risk.

Indicators of financial development (lagged), e.g., bank branch concentration, private credit to GDP and mutual fund assets to GDP in the destination country seem to have a significant impact on bilateral portfolio asset holdings (Table 9, columns (2)-(6)).

### **B. Results on the determinants of bilateral banking claims**

The financial gravity model is re-estimated, using as dependent variable cross-border bank claims. Both BIS consolidated and locational data are used.

Consistent with the results on bilateral portfolio, market size of the source and destination country (proxied by nominal GDP), geographic distance, and the common language dummy are all found to have significant coefficients with the expected size (Tables 10–13).

As before, intra-regional dummies variables are used to assess integration within Asia, also in comparison to other regions. When proxies for informational frictions are included among the regressors, the coefficient of the Asia-intraregional dummy is insignificant in estimates with consolidated data, suggesting that bilateral banking claims among Asian countries are not higher than those among countries from any part of the world (Table 10). Estimates with locational data, on the other hand, suggest that Asian economies are more integrated among themselves than the average country, if Hong Kong SAR and Singapore are included in the sample (Table 11). In all regressions, and as expected, euro area and EU members are found to be more financially integrated among themselves than the average country outside of these regions.

Given our focus on the role of regulation in driving financial integration, several regulatory and institutional variables are added among the regressors (Tables 12 and 13). The ratio of denied foreign bank applications and an index measuring restrictions to foreign banks entry in the destination country are found to have negative and significant coefficients, suggesting that barriers to foreign bank presence reduce bilateral banking flows. The results also indicate that differences in accounting standards, auditing standards, capital regulation, quality of bankruptcy law, and in strength of credit reporting systems between the source and destination country discourage bilateral banking flows. As in the portfolio gravity models estimated above, indicators of capital account openness and bilateral trade have positive and significant coefficients (Tables 12-13).

## V. IMPLICATIONS FOR ASIA

What do the results from the gravity models on the determinants of financial integrations imply for Asia? How does Asia score with respect to institutional and regulatory variables that were found to have a significant impact on cross-border portfolio and banking transactions? And, hence, what are the policy implications for Asian economies that want to step up regional financial integration?

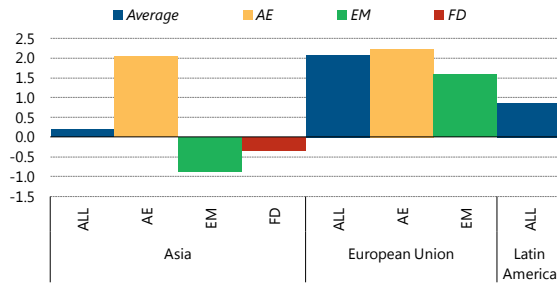
One of the findings from the estimated gravity model is that fewer restrictions on cross-border capital movements support financial integration. In this respect, Asia's relatively more limited capital account openness compared to other regions, especially in emerging economies and Frontier and Developing Countries, could be an obstacle to further integration, including within the region (Figure 10).

In several respects there seem to be fairly marked regulatory differences within Asia, that may hinder further regional financial integration. More specifically, differences in investor protection, in the ability to solve commercial disputes, and in bankruptcies procedures seem more pronounced within Asia than in the EU (Figure 11, 12, 13). Therefore, Asia's policymakers pursuing deeper financial integration may want to consider further harmonization in these areas.

The analysis also suggests that foreign bank penetration could help enhance bilateral financial transactions. From this point of view, statutory restrictions on foreign ownership of equity in the banking sector appear to be particularly prominent in parts of Asia, especially emerging markets (Figure 14). Indeed, foreign bank presence is quite limited in a number of countries—although some exceptions stand out (Figure 15). Hence, easing limits on foreign ownership of equity in banks could support financial integration.

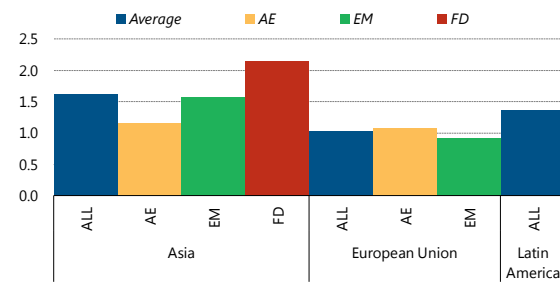
Furthermore, evidence of complementarity between trade and financial integration suggests that advancing further with regional trade integration will also have a positive impact on financial integration. In addition, since financial linkages between countries and the extent of home bias depend on the depth and sophistication of financial markets, initiatives to foster domestic financial deepening would promote further integration.

**Figure 10. Capital Account Openness Index**  
(Average across countries in each region)



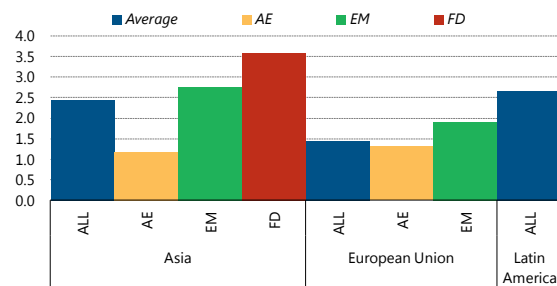
Sources: Chinn and Ito (2006); and IMF staff calculations.  
Note: Data as of 2012. AE = advanced economies; EM = emerging markets; FD = frontier and developing economies.

**Figure 11. Difference in Contract Enforcement Index**  
(Average across countries in each region)



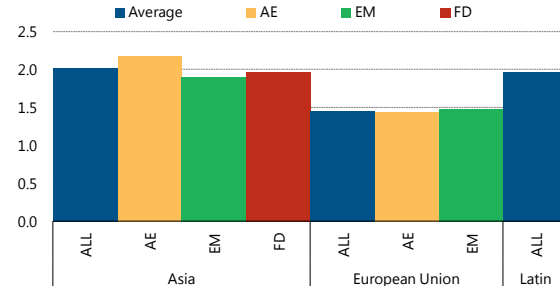
Sources: World Bank, Doing Business database; and IMF staff calculations.  
Note: Data as of 2012. AE = advanced economies; EM = emerging markets; FD = frontier and developing economies.

**Figure 12. Difference in Resolving Insolvency Index**  
(Average across countries in each region)



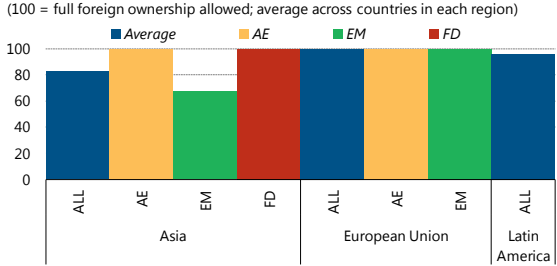
Sources: World Bank, Doing Business database; and IMF staff calculations.  
Note: Data are latest available. AE = advanced economies; EM = emerging markets; FD = frontier and developing economies.

**Figure 13. Difference in Investor Protection Index**  
(Average across countries in each region)



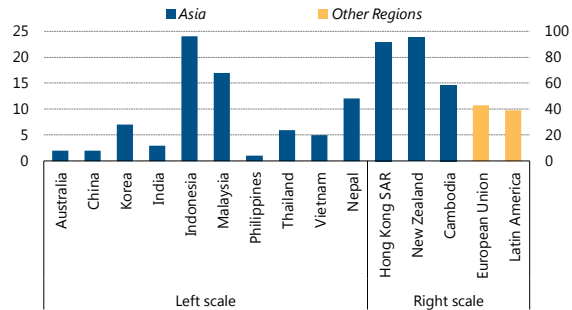
Sources: World Bank, Doing Business database; and IMF staff calculations.  
Note: Data are latest available. AE = advanced economies; EM = emerging markets; FD = frontier and developing economies.

**Figure 14. Allowed Foreign Ownership of Equity in the Banking Sector**  
(100 = full foreign ownership allowed; average across countries in each region)



Sources: World Bank, Investing Across Borders database; and IMF staff calculations.  
Note: Allowed foreign ownership of equity in new investment projects (greenfield foreign direct investment) and on the acquisition of shares in existing companies (mergers and acquisitions). Data as of 2012. AE = advanced economies; EM = emerging markets; FD = frontier and developing economies.

**Figure 15. Foreign Bank Penetration**  
(Foreign bank assets in percent of total bank assets)



Sources: Claessens and van Horen (2014); and IMF staff calculations.  
Note: Data as of 2012.

## VI. CONCLUSIONS

In spite of policymakers' efforts to enhance intraregional financial integration in Asia, the latter lags behind trade integration within the region. While about 60 percent of Asia's exports and imports go to, or originate from, elsewhere within the region, only 20 percent to 30 percent of cross-border portfolio investment and bank claims are intraregional. Asia's strong home bias—i.e., the tendency for private financial savings to remain within the domestic economy—is a partial explanation for limited intraregional financial links.

What else is holding back Asia's intraregional financial integration? Using a gravity model, the paper finds that bilateral financial integration increases with the depth and sophistication of the financial system, the extent of trade integration and greater capital account openness. On the other hand, informational asymmetries, barriers to foreign bank penetration, and differences in regulatory and institutional quality create obstacles to financial integration.

Hence, regional financial integration in Asia could be fostered through steps to buttress trade integration and capital market development, reduce restrictions on cross-border capital flows and foreign bank entry and harmonize regulation. Areas where regulatory differences within Asia remain include investor protection, contract enforcement, and bankruptcy procedures.

On the other hand, developing financial markets and allowing more foreign investor participation in the domestic market would also raise challenges, requiring strong regulatory and supervisory frameworks to minimize financial stability risks. Macroeconomic policies, including monetary, fiscal, and exchange rate management, would need to play a key role in managing the macroeconomic and financial stability risks of volatile capital flows. Appropriate macroprudential policies could also be used to boost resilience. Regional safety nets, including the Chiang Mai Initiative Multilateralization, would help mitigate the impact of capital flow volatility. Stronger international policy cooperation and cross-border supervision would be needed to mitigate stability risks from deeper foreign bank presence.

## References

- ASEAN, 2008, Economic Community Blueprint, Jakarta: ASEAN Secretariat, January.
- Aviat A. and N. Coeurdacier, 2007, The Geography of Trade in Goods and Asset Holdings, *Journal of International Economics* 71 (2007) 22–51.
- Bekaert G. and X. Wang (2009) “Home Bias Revisited”, Columbia Business School.
- Borensztein, E., and P. Loungani. 2011. “Asian Financial Integration: Trends and Interruptions.” Working Paper 11/4, International Monetary Fund, Washington.
- Chan K., V. Covrig and L. Ng, 2005, “What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide”, *The Journal of Finance*, Volume 60, Issue 3, p. 1495–1534.
- Chinn, Menzie D., and Hiro Ito. 2006. “What Matters for Financial Development? Capital Controls, Institutions, and Interactions” *Journal of Development Economics*, 81 (1): 163–192.
- Claessens, S. and N. van Horen, 2014, “Foreign Banks: Trends and Impact,” *Journal of Money Credit and Banking*, 46(1), p. 295–326.
- Cole H. and M. Obstfeld, 1991, “Commodity Trade and International Risk Sharing - How much do financial markets matter?”, *Journal of Monetary Economics*, 28, p. 3–24.
- Eichengreen and Park, 2004, “Why Has There Been Less Financial Integration in Asia than in Europe?” Working Paper 28, Monetary Authority of Singapore.
- Fukuda, Shin-ichi, 2011, “Regional and global short-term financial market integration in Asia: evidence from the interbank markets under the crises”, in Michael B. Devereux, Philip R. Lane, Cyn-Young Park, and Shang-Jin Wei (eds.) *The Dynamics of Asian Financial Integration*, p. 19–51, Routledge.
- Garcia-Herrero, Alicia and Maria Soledad Martinez Peria, 2007, “The Mix of International Banks’ Foreign Claims: Determinants and Implications,” *Journal of Banking and Finance*, 31(6), p. 1613–31.
- Garcia-Herrero, A., D. Yang, and P. Wooldridge. 2008. “Why Is There So Little Regional Financial Integration in Asia?” Working Papers 42, Bank for International Settlements, Basel.
- IMF, 2014, Regional Economic Outlook: Asia and Pacific, April, International Monetary Fund, Washington.

IMF, 2015, *Regional Economic Outlook: Asia and Pacific*, April, International Monetary Fund, Washington.

IMF, 2015, *Global Financial Stability Report*, April, International Monetary Fund, Washington.

Jee-young Jung, 2008, “Regional Financial Cooperation in Asia: Challenges and Path to Development”, BIS Papers No 42, pp. 120–135.

Lam R., 2013, “Cross-border Activity of Japanese Banks”, IMF Working Paper, WP/13/235.

Lane, P. R. and Milesi-Ferretti, G. M., 2004. "Financial Globalization and Exchange Rates," CEPR Discussion Papers 4745, C.E.P.R. Discussion Papers.

Lane, P. 2011. “Regional and Global Drivers of the Portfolio Holdings of Asian Investors.” In *The Dynamics of Asian Financial Integration—Facts and Analytics*, edited by M. Devereux, P. Lane, C.-Y. Park, and S.-J. Wei. Routledge, London and New York.

Le Leslé, F. Ohnsorge, M. Kim, S. Seshadri, 2014, “Why Complementarity Matters for Stability—Hong Kong SAR and Singapore as Asian Financial Centers”, IMF Working Paper, WP/14/119.

Martin Philippe, 2011, “Regional and Global Financial Integration: An Analytical Framework” in M. B. Devereux, P. R. Lane, C.-Y. Park, and S.-J. Wei (eds) *The Dynamics of Asian Financial Integration*, pp. 19-51, Routledge.

Martin P. and H. Rey, 2004, “Financial Super-markets: Size Matters for Asset Trade”, *Journal of International Economics* 64, p. 335–361.

Pongsaparn, R., and O. Unteroberdoerster. 2011. “Financial Integration and Rebalancing in Asia.” Working Paper 11/243, International Monetary Fund, Washington.

Portes, R., and H. Rey. 2005. “The Determinants of Cross-Border Equity Flows.” *Journal of International Economics* 65 (2): 269–96.

Quinn, Dennis, 1997. “The Correlates of Change in International Financial Regulation”, *American Political Science Review* 91 (3), p. 531–551.

Serlenga L. and Y. Shin, 2007, “Gravity models of Intra-EU Trade: Application of the CCEP-HT Estimation in Heterogeneous Panels with Unobserved Common Time-Specific Factors”, *Journal of Applied Economics*, 22, p. 361–381.

**Table 3: Financial Gravity Model - Portfolio Investment;  
Baseline Regressions**

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Log (Portfolio Assets)	OLS	Between Effects	Random Effects	Destination Country-FE	Pair-Fixed Effects	Hausman- Taylor
Log (Stock and Bond Market Size) - Source	1.390*** (39.099)	1.151*** (31.589)	0.962*** (35.911)	1.383*** (41.323)	0.199*** (4.360)	0.224*** (5.251)
Log (Stock and Bond Market Size) - Destination	1.640*** (70.859)	1.367*** (48.602)	1.319*** (60.691)	0.397*** (5.856)	0.476*** (11.611)	0.523*** (13.749)
Log (Distance)	-2.834*** (-35.219)	-2.500*** (-31.039)	-2.781*** (-34.895)	-3.062*** (-34.362)		-2.722*** (-4.381)
Common Language	1.534*** (6.270)	1.697*** (7.693)	1.755*** (7.988)	1.941*** (7.790)		26.327*** (3.257)
Constant	20.473*** (28.914)	14.771*** (3.953)	21.640*** (32.498)	35.817*** (31.417)	5.451*** (22.251)	23.275*** (4.719)
Observations	55,059	55,059	55,059	55,059	55,059	55,059
R-squared	0.465	0.579	0.590	0.519	0.054	
Time Dummies	YES	YES	YES	YES	YES	YES
Number of Pairid	5,900	5,901	5,901	5,902	5,901	5,901
Hausman Test (p-value)			536 (0.00)			10.59 (0.47)

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

**Table 4: Financial Gravity Model - Portfolio Investment;  
Baseline Regressions**

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Log (Portfolio Assets + Liabilities)	OLS	Between Effects	Random Effects	Destination Country-FE	Pair-Fixed Effects	Hausman- Taylor
Log (Stock and Bond Market Size) - Source	1.779*** (54.266)	1.583*** (44.162)	1.519*** (55.896)	-0.056 (-0.592)	0.620*** (11.682)	0.661*** (13.299)
Log (Stock and Bond Market Size) - Destination	1.547*** (52.360)	1.348*** (43.631)	1.279*** (50.977)	0.641*** (7.507)	0.602*** (12.141)	0.635*** (13.767)
Log (Distance)	-2.966*** (-38.002)	-2.790*** (-34.858)	-2.867*** (-36.176)	-2.127*** (-20.926)		-3.461*** (-6.668)
Common Language	1.158*** (4.107)	1.119*** (4.579)	1.253*** (5.138)	2.551*** (10.409)		45.205*** (5.359)
Constant	22.067*** (33.027)	21.767*** (5.958)	22.442*** (34.274)	5.459** (2.279)	6.377*** (21.124)	28.092*** (6.982)
Observations	42,465	42,465	42,465	42,465	42,465	42,465
R-squared	0.515	0.632	0.520	0.678	0.089	
Time Dummies	YES	YES	YES	YES	YES	YES
Number of Pairid	4,731	4,732	4,732	4,733	4,732	4,732
Hausman Test (p-value)			787 (0.00)			11.53 (0.40)

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.



**Table 5: Financial Gravity Model - Portfolio Investment; 1/  
Regional Comparison**

Dependent Variable:	(1)	(2)	(3)	(4)	(5)
Log (Portfolio Assets)	OLS	OLS	OLS	OLS Excl. SGP&HKG	Hausman- Taylor
Log (Stock and Bond Market Size) - Source	1.333*** (36.969)	1.360*** (38.416)	1.380*** (38.782)	1.361*** (37.666)	0.226*** (5.280)
Log (Stock and Bond Market Size) - Destination	1.554*** (62.901)	1.578*** (65.941)	1.611*** (68.783)	1.572*** (65.458)	0.528*** (13.946)
Log (Distance)		-1.932*** (-18.136)	-2.464*** (-27.520)	-2.479*** (-27.244)	-0.820 (-1.254)
Common Language		1.795*** (7.025)	1.615*** (6.370)	1.422*** (5.215)	29.556*** (4.298)
Asia-Intra Dummy	2.261*** (5.449)	0.903** (2.392)			-1.681 (-0.572)
ASEAN-Intra Dummy			2.217*** (3.811)	1.287** (1.977)	
Asia-Intra (excl. ASEAN) Dummy			-0.629 (-0.943)	-1.324* (-1.725)	
European Union-Intra Dummy	7.613*** (38.959)	4.522*** (16.499)			11.055*** (5.676)
Euro area-Intra Dummy			4.355*** (16.578)	4.515*** (17.280)	
European Union-Intra (excl. Euro area) Dummy			2.932*** (6.673)	2.947*** (6.733)	
Latin America-Intra Dummy	3.879*** (5.931)	1.294* (1.926)	0.808 (1.213)	0.961 (1.435)	-17.399*** (-2.924)
NAFTA-Intra Dummy	3.510*** (2.836)	0.655 (0.472)	-0.381 (-0.263)	-0.037 (-0.026)	4.540 (0.317)
Constant	-3.356*** (-17.209)	12.808*** (14.022)	17.360*** (22.322)	17.690*** (22.411)	6.598 (1.213)
Observations	55,134	55,059	55,059	52,010	55,059
R-squared	0.453	0.480	0.472	0.470	
Time Dummies	YES	YES	YES	YES	YES
Hausman Test					15.83
Hausman Test p-value					0.20

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ SGP=Singapore; HKG=Hong Kong SAR

**Table 6: Financial Gravity Model - Portfolio Investment; 1/  
Different Types of Portfolio Assets**

Dependent Variable:	(1) Total Portfolio	(2) Equity	(3) ST Debt	(4) LT Debt
Log (Market Size) - Source	1.380*** (38.782)	1.251*** (33.782)	0.859*** (16.898)	1.526*** (28.801)
Log (Market Size) - Destination	1.611*** (68.783)	1.687*** (63.769)	1.456*** (22.881)	1.513*** (23.500)
Log (Distance)	-2.464*** (-27.520)	-2.096*** (-23.104)	-1.863*** (-14.614)	-2.738*** (-23.192)
Common Language	1.615*** (6.370)	1.665*** (6.365)	3.250*** (7.422)	1.843*** (4.381)
ASEAN-Intra Dummy	2.217*** (3.811)	1.944* (1.912)	3.161** (2.249)	1.024 (0.972)
Asia-Intra (ex. ASEAN) Dummy	-0.629 (-0.943)	0.539 (0.850)	-1.137 (-0.803)	-2.005 (-1.583)
Euro area-Intra Dummy	4.355*** (16.578)	5.126*** (16.672)	5.256*** (10.369)	4.332*** (14.250)
European Union-Intra (excl. Euro area) Dummy	2.932*** (6.673)	2.213*** (4.879)	-0.250 (-0.388)	0.875 (1.360)
Latin America-Intra Dummy	0.808 (1.213)	-1.851*** (-2.898)	-1.927** (-2.561)	2.917*** (2.767)
NAFTA-Intra Dummy	-0.381 (-0.263)	1.727 (0.885)	2.111 (0.928)	-1.022 (-0.654)
Constant	17.360*** (22.322)	13.383*** (17.264)	8.781*** (7.791)	19.376*** (18.250)
Observations	55,059	57,650	26,454	26,454
R-squared	0.472	0.428	0.296	0.370
Time Dummies	YES	YES	YES	YES

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ Market size for:

Column (1) is measured as total size of domestic stock and bond markets in the country;

Column (2) is measured as stock market size only;

Column (3) and (4) is measured as bond market size only.

**Table 7a: Financial Gravity Model - Portfolio Investment; 1/  
Regulatory and Institutional Quality (1)**

Dependent Variable: Log (Portfolio Assets)	(1)	(2)	(3)	(4)	(5)
Log (Market Size) - Source	0.172*** (3.205)	0.235*** (4.954)	0.422*** (5.452)	0.184*** (3.346)	0.269*** (5.745)
Log (Market Size) - Destination	1.036*** (22.852)	1.049*** (27.107)	0.784*** (10.928)	1.011*** (21.823)	0.941*** (24.592)
Log (Distance)	-1.335*** (-13.594)	-1.374*** (-15.693)	-0.839*** (-7.070)	-1.511*** (-15.252)	-1.282*** (-14.720)
Common Language	1.581*** (6.394)	1.341*** (6.001)	1.111*** (3.946)	1.293*** (5.140)	1.421*** (6.382)
GDP per Capita - S	0.106*** (19.962)	0.103*** (20.270)	0.103*** (17.187)	0.087*** (15.535)	0.091*** (16.933)
GDP per Capita - D	0.062*** (10.921)	0.066*** (12.151)	0.052*** (8.074)	0.053*** (8.977)	0.038*** (6.831)
Bilateral Trade	0.798*** (18.048)	0.762*** (19.285)	1.256*** (16.028)	0.751*** (16.658)	0.691*** (17.847)
Capital Account Openness - S	0.972*** (13.294)	1.006*** (15.431)	0.996*** (11.264)	1.006*** (13.715)	0.675*** (9.186)
Capital Account Openness - D	-0.006 (-0.086)	0.014 (0.233)	0.069 (0.847)	0.129** (2.000)	-0.140** (-2.172)
Foreign Bank Presence (Asset Share) - D	0.017*** (6.298)				
Foreign Bank Presence (Number Share) - D		0.031*** (10.379)			
Financial and Banking Regulation Index - S			0.295*** (4.669)		
Financial and Banking Regulation Index - D			-0.078 (-1.238)		
Financial and Banking Regulation Index - Difference			-0.146** (-2.230)		
Regulation of Securities Exchanges - S				0.729*** (6.277)	
Regulation of Securities Exchanges - D				0.003 (0.026)	
Regulation of Securities Exchanges - Difference				-0.675*** (-6.333)	
Regulatory Quality - S					1.059*** (7.587)
Regulatory Quality - D					0.983*** (7.026)
Regulatory Quality - Difference					-0.687*** (-6.519)
Constant	6.444*** (7.743)	6.885*** (9.378)	0.808 (0.714)	6.369*** (6.550)	8.197*** (11.341)
Observations	35,254	51,999	25,231	28,658	52,491
R-squared	0.551	0.563	0.575	0.557	0.566
Time Dummies	YES	YES	YES	YES	YES

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ S=Source; D=Destination

**Table 7b: Financial Gravity Model - Portfolio Investment; 1/  
Regulatory and Institutional Quality (2)**

Dependent Variable:	(1)	(2)
Log (Portfolio Assets)		
Log (Market Size) - Source	0.262*** (5.509)	0.277*** (5.528)
Log (Market Size) - Destination	0.981*** (25.270)	1.019*** (25.471)
Log (Distance)	-1.357*** (-15.462)	-1.406*** (-15.169)
Common Language	1.243*** (5.582)	1.425*** (6.160)
GDP per Capita - S	0.081*** (13.486)	0.099*** (18.304)
GDP per Capita - D	0.046*** (7.094)	0.040*** (7.153)
Bilateral Trade	0.699*** (17.832)	0.686*** (17.189)
Capital Account Openness - S	0.658*** (8.979)	0.970*** (14.312)
Capital Account Openness - D	0.076 (1.276)	0.148** (2.536)
Rule of Law - S	1.119*** (7.912)	
Rule of Law - D	0.376*** (2.785)	
Rule of Law - Difference	-0.389*** (-4.058)	
Protecting Investors Index - S		0.165*** (3.513)
Protecting Investors Index - D		0.148*** (3.144)
Protecting Investors Index - Difference		-0.135*** (-2.579)
Enforcing Contracts Index - S		0.114 (1.520)
Enforcing Contracts Index - D		0.500*** (6.239)
Enforcing Contracts Index - Difference		-0.217*** (-2.613)
Constant	6.981*** (9.495)	2.628** (2.381)
Observations	52,491	44,436
R-squared	0.561	0.564
Time Dummies	YES	YES

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ S=Source; D=Destination

**Table 8: Financial Gravity Model - Portfolio Investment; 1/ 2/  
Drivers of Cross-Border Investments (1)**

Dependent Variable: Log (Portfolio Assets)	(1)	(2)	(3)	(4)	(5)	(6)	(7) FE
Log (Market Size) - Source	0.667*** (16.449)	0.780*** (19.798)	1.126*** (21.643)	0.851*** (15.395)	0.923*** (18.744)	1.375*** (19.033)	0.863*** (7.911)
Log (Market Size) - Destination	1.435*** (48.301)	1.438*** (48.606)	1.449*** (30.719)	1.572*** (43.321)	1.539*** (36.390)	1.489*** (21.215)	0.854*** (8.543)
Log (Distance)	-2.099*** (-23.777)	-2.020*** (-23.134)	-1.970*** (-20.151)	-1.637*** (-15.025)	-1.837*** (-16.791)	-1.380*** (-11.861)	
Common Language	1.482*** (6.213)	1.525*** (6.496)	2.315*** (8.012)	1.723*** (6.344)	2.082*** (7.467)	1.878*** (6.311)	
GDP per Capita - S	0.145*** (30.478)	0.099*** (18.602)	0.103*** (17.397)	0.090*** (14.730)	0.106*** (17.285)	0.091*** (15.856)	-0.029*** (-3.507)
GDP per Capita - D	0.057*** (11.513)	0.051*** (9.130)	0.033*** (5.273)	0.049*** (7.322)	0.042*** (6.739)	0.027*** (3.869)	-0.005 (-0.632)
Bilateral Trade	0.782*** (4.562)	0.779*** (4.650)	0.357*** (3.252)	0.599*** (4.550)	0.467*** (2.981)	0.355*** (2.935)	0.408** (2.015)
Capital Account Openness - S		0.950*** (14.323)	1.268*** (13.370)	1.147*** (12.439)	1.105*** (12.908)	1.335*** (11.728)	0.616*** (6.852)
Capital Account Openness - D		0.120** (2.118)	0.092 (1.113)	0.097 (1.234)	0.106 (1.407)	0.215** (2.105)	0.283*** (2.655)
L.(Covariance of Real GDP Growth)			0.039*** (4.670)			-0.004 (-0.312)	0.004 (0.589)
L.(Interest rate differential)				0.069*** (4.776)		0.012 (0.605)	-0.004 (-0.389)
L.(Stock returns in Destination)					0.001 (0.341)	-0.002 (-0.807)	-0.000 (-0.084)
L.(FX appreciation of D against S)					-0.007*** (-3.288)	-0.009*** (-3.136)	-0.000 (-0.070)
Constant	15.484*** (20.973)	12.964*** (17.437)	11.676*** (13.830)	9.153*** (9.842)	8.579*** (8.869)	3.855*** (3.585)	4.807*** (4.458)
Observations	53,532	53,115	26,742	32,397	32,304	17,728	17,728
R-squared	0.533	0.545	0.552	0.548	0.553	0.544	0.059
Time Dummies	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ S=Source; D=Destination

2/ L. indicates that the variable is lagged.

**Table 9: Financial Gravity Model - Portfolio Investment; 1/ 2/  
Drivers of Cross-Border Investments (2)**

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (Portfolio Assets)							FE
Log (Market Size) - Source	0.234*** (4.746)	0.214*** (3.897)	0.282*** (5.796)	0.263*** (5.499)	0.156** (2.455)	0.091 (1.246)	0.296*** (2.802)
Log (Market Size) - Destination	1.028*** (25.112)	0.985*** (21.517)	0.942*** (22.742)	1.023*** (25.547)	0.846*** (15.271)	0.943*** (12.885)	0.527*** (3.211)
Log (Distance)	-1.252*** (-13.959)	-1.340*** (-13.573)	-1.360*** (-15.122)	-1.358*** (-15.396)	-0.956*** (-9.187)	-0.897*** (-7.502)	
Common Language	1.418*** (6.372)	1.724*** (6.641)	1.448*** (6.387)	1.482*** (6.514)	1.344*** (5.157)	1.555*** (5.066)	
GDP per Capita - S	0.106*** (20.303)	0.106*** (19.106)	0.104*** (19.864)	0.104*** (20.213)	0.115*** (19.689)	0.118*** (18.738)	-0.017 (-1.457)
GDP per Capita - D	0.043*** (7.314)	0.054*** (9.410)	0.051*** (8.176)	0.057*** (10.381)	0.045*** (7.711)	0.049*** (5.227)	0.028** (2.116)
Bilateral Trade	0.775*** (18.562)	0.748*** (16.363)	0.706*** (17.723)	0.722*** (18.328)	1.020*** (16.411)	1.044*** (14.460)	0.219*** (2.941)
Capital Account Openness - S	1.057*** (15.881)	0.978*** (13.027)	0.995*** (15.078)	1.003*** (15.332)	1.178*** (14.710)	1.117*** (11.928)	0.352*** (3.592)
Capital Account Openness - D	-0.016 (-0.266)	0.088 (1.258)	0.113* (1.955)	0.186*** (3.333)	0.225*** (3.129)	-0.087 (-0.889)	-0.074 (-0.747)
L. (Political Risk - D)	-0.059*** (-6.162)					-0.052*** (-3.364)	-0.017 (-1.116)
L. (Economic Risk - D)	0.008 (0.459)					0.081*** (-3.128)	0.014 (0.871)
L.(Financial Risk - D)	0.153*** (10.485)					0.111*** (5.125)	-0.010 (-0.655)
L.(Bank Branches per Population - D)		0.014*** (3.111)				-0.003 (-0.518)	-0.004 (-0.422)
L.(Private Credit to GDP - D)			0.009*** (4.603)			0.001 (0.279)	0.006 (1.597)
L.(Stock Market Cap to GDP - D)				-0.003** (-2.402)		-0.003** (-1.999)	0.003 (1.319)
L.(Mutual Fund Assets to GDP - D)					0.004*** (3.099)	0.005*** (3.763)	0.001 (0.721)
Constant	9.569*** (8.800)	7.370*** (7.191)	8.541*** (11.399)	7.946*** (10.790)	4.823*** (5.551)	6.521*** (3.762)	5.166*** (3.009)
Observations	49,751	35,795	50,336	52,491	33,328	19,895	19,895
R-squared	0.565	0.554	0.555	0.557	0.560	0.563	0.013
Time Dummies	YES	YES	YES	YES	YES	YES	YES
Number of Pairid							3,987

Robust t-statistics in parentheses; Errors clustered at country-pair level

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ S=Source; D=Destination

2/ L. indicates that the variable is lagged.

**Table 10: Financial Gravity Model - Foreign Bank Claims; 1/ 2/  
Regional Comparison - Consolidated**

Dependent Variable:	(1)	(2)	(3)
Log (Foreign Bank Claims)			Excl. SGP&HKG
Log (Market Size) - Source	1.008*** (29.012)	1.136*** (35.604)	1.138*** (35.816)
Log (Market Size) - Destination	1.173*** (53.384)	1.171*** (57.878)	1.158*** (57.057)
Log (Distance)		-1.215*** (-23.758)	-1.249*** (-24.460)
Common Language		1.127*** (9.690)	1.050*** (9.090)
Asia-Intra Dummy	0.719*** (2.786)	0.013 (0.045)	-0.268 (-0.913)
Euro area-Intra Dummy	2.828*** (19.243)	1.137*** (7.855)	1.152*** (7.990)
European Union-Intra (excl. Euro area) Dummy	2.055*** (4.579)	0.404 (1.004)	0.396 (0.989)
Latin America-Intra Dummy	-0.825** (-2.507)	-1.802*** (-5.984)	-1.741*** (-5.810)
NAFTA-Intra Dummy	-0.175 (-0.183)	-2.098*** (-2.978)	-2.023*** (-2.881)
Constant	-6.391*** (-27.372)	2.428*** (5.189)	2.138*** (4.504)
Observations	25,120	22,258	21,789
R-squared	0.561	0.651	0.660
Time Dummies	YES	YES	YES

Robust t-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ SGP=Singapore; HKG=Hong Kong SAR

2/ Market size is measured by country nominal GDP.

**Table 11: Financial Gravity Model - Foreign Bank Claims; 1/ 2/  
Regional Comparison - Locational**

Dependent Variable:	(1)	(2)	(3)
Log (Foreign Bank Claims)			Excl. SGP&HKG
Log (Market Size) - Source	0.767*** (39.672)	0.816*** (43.151)	0.823*** (43.480)
Log (Market Size) - Destination	0.823*** (48.893)	0.874*** (55.070)	0.868*** (55.218)
Log (Distance)		-0.920*** (-22.526)	-0.969*** (-23.690)
Common Language		0.968*** (11.916)	0.829*** (10.312)
Asia-Intra Dummy	1.203*** (7.330)	0.585*** (3.939)	-0.063 (-0.485)
Euro area-Intra Dummy	2.447*** (17.910)	1.137*** (8.083)	1.137*** (8.092)
European Union-Intra (excl. Euro area) Dummy	1.822*** (15.251)	0.454*** (3.689)	0.450*** (3.657)
Latin America-Intra Dummy	0.234 (1.548)	-0.352** (-2.101)	-0.262 (-1.575)
NAFTA-Intra Dummy	0.946 (1.505)	0.085 (0.209)	0.056 (0.140)
Constant	-3.794*** (-24.827)	3.107*** (8.844)	3.535*** (10.047)
Observations	38,998	38,241	36,340
R-squared	0.416	0.482	0.500
Time Dummies	YES	YES	YES

Robust t-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ SGP=Singapore; HKG=Hong Kong SAR

2/ Market size is measured by country nominal GDP.



**Table 12: Financial Gravity Model - Foreign Bank Claims 1/ 2/  
Regulatory Quality - Consolidated**

Dependent Variable: Log (Foreign Bank Claims)	(1)	(2)	(3)	(4)	(5)
Log (Market Size) - Source	0.489*** (9.275)	0.521*** (11.207)	0.563*** (12.902)	0.597*** (13.380)	0.507*** (11.529)
Log (Market Size) - Destination	0.356*** (6.648)	0.420*** (9.196)	0.495*** (11.912)	0.474*** (11.135)	0.447*** (10.352)
Log (Distance)	-0.473*** (-7.453)	-0.528*** (-9.736)	-0.580*** (-11.322)	-0.601*** (-11.700)	-0.508*** (-9.574)
Common Language	0.482*** (3.554)	0.476*** (4.228)	0.555*** (5.313)	0.561*** (5.332)	0.502*** (4.645)
GDP per Capita - S	0.035*** (10.081)	0.037*** (12.495)	0.036*** (13.199)	0.034*** (12.804)	0.036*** (12.219)
GDP per Capita - D	0.015*** (5.476)	0.018*** (7.209)	0.017*** (7.304)	0.019*** (7.784)	0.016*** (6.392)
Bilateral Trade	0.692*** (15.996)	0.628*** (17.747)	0.562*** (16.662)	0.566*** (16.580)	0.617*** (17.930)
Capital Account Openness - S	0.505*** (8.818)	0.400*** (8.079)	0.378*** (8.340)	0.390*** (8.423)	0.407*** (8.580)
Capital Account Openness - D	0.121*** (3.939)	0.130*** (4.702)	0.120*** (4.685)	0.106*** (4.004)	0.137*** (5.238)
Foreign Bank Entry Application Denied Ratio - D	-0.620*** (-3.851)				
Foreign Bank Entry Prohibition Index - D		-0.137*** (-2.671)			
Ability of Resolving Insolvency Index - Difference			-0.073*** (-3.095)		
Depth of Credit Information Index - Difference				-0.094*** (-4.209)	
Auditing Standard - Difference					-0.168*** (-3.604)
Constant	-2.450*** (-5.150)	-2.576*** (-5.911)	-2.797*** (-6.715)	-2.579*** (-6.070)	-2.976*** (-7.101)
Observations	11,151	13,570	16,052	14,139	16,839
R-squared	0.746	0.757	0.761	0.762	0.752
Time Dummies	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ S=Source; D=Destination

2/ Market size is measured by country nominal GDP.

**Table 13: Financial Gravity Model - Foreign Bank Claims 1/ 2/  
Regulatory Quality - Locational**

Dependent Variable: Log (Foreign Bank Claims)	(1)	(2)	(3)	(4)	(5)	(6)
Log (Market Size) - Source	0.169*** (4.337)	0.200*** (5.849)	0.128*** (3.025)	0.184*** (4.106)	0.211*** (6.001)	0.217*** (6.187)
Log (Market Size) - Destination	0.096** (2.554)	0.220*** (6.585)	0.208*** (5.148)	0.257*** (6.006)	0.224*** (6.654)	0.231*** (6.870)
Log (Distance)	-0.437*** (-9.773)	-0.461*** (-11.565)	-0.511*** (-10.589)	-0.504*** (-10.079)	-0.436*** (-10.801)	-0.427*** (-10.581)
Common Language	0.539*** (6.268)	0.555*** (7.313)	0.467*** (5.413)	0.511*** (5.661)	0.556*** (7.377)	0.545*** (7.256)
GDP per Capita - S	0.025*** (9.055)	0.027*** (11.178)	0.026*** (10.161)	0.027*** (9.685)	0.024*** (9.643)	0.024*** (9.583)
GDP per Capita - D	0.030*** (13.010)	0.027*** (13.390)	0.022*** (9.883)	0.021*** (8.826)	0.027*** (12.495)	0.027*** (12.475)
Bilateral Trade	0.635*** (19.560)	0.577*** (20.576)	0.584*** (16.034)	0.551*** (14.033)	0.583*** (20.139)	0.582*** (20.195)
Capital Account Openness - S	0.229*** (7.293)	0.192*** (6.836)	0.210*** (6.560)	0.194*** (5.511)	0.230*** (8.046)	0.226*** (7.934)
Capital Account Openness - D	0.102*** (3.962)	0.156*** (6.548)	0.198*** (7.345)	0.211*** (7.073)	0.162*** (6.966)	0.160*** (6.931)
Foreign Bank Entry Application Denied Ratio - D	-0.359** (-2.529)					
Foreign Bank Entry Prohibition Index - D		-0.093** (-2.332)				
Stringency of Minimum Capital Requirements Index - Difference			-0.102** (-1.993)			
Actual Capital Ratio - Difference				-0.017** (-2.006)		
Accounting Standard - Difference					-0.064* (-1.895)	
Auditing Standard - Difference						-0.208*** (-5.688)
Constant	-7.499*** (-11.467)	-7.255*** (-13.037)	-6.725*** (-9.329)	-6.738*** (-8.797)	-7.115*** (-12.335)	-7.181*** (-12.504)
Observations	20,942	24,798	11,508	7,775	29,428	29,428
R-squared	0.582	0.594	0.578	0.583	0.596	0.597
Time Dummies	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimates.

1/ S=Source; D=Destination

2/ Market size is measured by country nominal GDP.

## Appendix I: Construction of the Home Bias Measures

The home bias index for equity investments is constructed using data on bilateral equity from the IMF's Coordinated Portfolio Investment Survey (CPIS).<sup>21</sup> The data are end-of-year market value of equity holdings of the source country in each country.

Following Bekaert and Wang (2009), a measure of home bias is calculated as follows.

Step 1: Compute an estimate for the size of domestic equity holdings ( $S_{i,i}$ ) by subtracting the sum of foreign holdings of domestic stocks from total stock market capitalization.<sup>22</sup>

$$S_{i,i} = TMS_i - \sum_{k \neq i} S_{i,k}$$

Where

$TMS_i$  = Total market size of country  $i$ , measured by stock market capitalization in US dollars, obtained from Bloomberg.

$S_{i,k}$  = Country  $k$ 's stock holding in country  $i$  (in US dollars).

Step 2: Calculate total stock holdings of country  $i$  in both domestic and foreign markets ( $TSH_i$ ) as:

$$TSH_i = \sum_k S_{i,k}$$

Step 3: Compute the world market size (WMS) by summing TMS over all sample countries:<sup>23</sup>

$$WMS = \sum_j TMS_j$$

Step 4: Construct country  $i$ 's actual portfolio allocation to country  $j$  ( $w_{i,j}^{act}$ ), and the benchmark weight of country  $j$  ( $w_{i,j}^{bm}$ ) as follows:<sup>24</sup>

$$w_{i,j}^{act} = \frac{S_{i,j}}{TSH_i} \quad \text{and} \quad w_{i,j}^{bm} = \frac{TMS_j}{WMS}$$

Step 5: Finally, the raw and normalized home bias indexes are calculated as:

$$HB_i^{raw} = w_{i,i}^{act} - w_{i,i}^{bm}$$

<sup>21</sup> Description of the CPIS data is provided in Appendix III.

<sup>22</sup> This will be a slightly overestimated measure of domestic stock holdings due as some countries do not report to the CPIS.

<sup>23</sup> Another way to calculate the world market size is to sum over the stock holdings of all holding countries ( $TSH_i$ ). However, due to incomplete reporting country coverage, this alternative measure would underestimate the world market size by more than the measure used above.

<sup>24</sup> As noted in Bekaert and Wang (2009), this benchmark weight, which is the relative size of a country's stock market in the world market, would be consistent with that predicted by a world CAPM when the international parity condition holds.

$$HB_i^{norm} = \frac{w_{i,i}^{act} - w_{i,i}^{bm}}{1 - w_{i,i}^{bm}}$$

The normalization is obtained by dividing the raw index by the maximum possible size of the home bias (whereby investors holds exclusively domestic stocks), to take into account the relative size of the home stock market in the world market. The normalized measure ranges from 0 to 1, while the raw measure ranges from 0 and  $(1 - w_{i,i}^{bm})$  for each country. The higher the index, the larger the home bias.

Country coverage is as follows:

Asia: Australia, Hong Kong SAR, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, and Thailand.

ASEAN-5: Indonesia, Malaysia, Philippines, Singapore and Thailand.

European Union: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Malta, Netherlands, Poland, Romania, Slovak Republic, Spain, Sweden and United Kingdom.

Latin America: Argentina, Brazil, Chile, Colombia, Costa Rica, and Venezuela.

## Appendix II. Theoretical model for the empirical specification

The gravity model used for the empirical analysis is based on the theoretical model developed in Martin and Rey (2004) and Aviat and Coeurdacier (2007).

The model is based on the following assumptions: (i) assets are imperfect substitutes, so agents demand different assets to diversify risk; (ii) cross-border asset trade entails transaction costs, possibly driven by informational frictions. There are  $N$  countries populated with  $n_i$  risk averse agents who live for two periods. Each agent is endowed with  $y_i$  units of traded goods and a risky project. The cost of an asset issued by an agent in country  $j$  and bought by an agent in country  $i$  is  $p_j(1 + \tau_{ij})$  where  $p_j$  is the price of the asset and  $\tau_{ij}$  is the bilateral financial transaction cost between the two countries which is paid in units of the asset itself. Each project in country  $j$  pays dividends  $d_j$  in only one state of nature and the number of states,  $L$ , is larger than the number of traded assets so that markets are incomplete.

In the first period, agent  $h$  in country  $i$  consumes part of her endowment, sells shares of her risky project and buys shares of other agents' projects. In the second period consumption is the dividend of shares purchased in the first period. The maximization problem of a representative agent  $h$  in country  $i$  is therefore described as follows:

$$\max_{\left\{ c_{1,h_i}, (x_{k_j}^{h_i})_{1 \leq j \leq N, 1 \leq k_j \leq n_j} \right\}} \left\{ c_{1,h_i} + \beta E \left( \frac{c_{2,h_i}^{1-\frac{1}{\sigma}}}{1 - \frac{1}{\sigma}} \right) \right\}$$

$$\text{s.t.} \quad c_{1,h_i} + \sum_{j=1}^N \sum_{k_j=1}^{n_j} p_j (1 + \tau_{ij}) x_{k_j}^{h_i} = y_i + p_i$$

where  $x_{k_j}^{h_i}$  is the number of shares bought by agent  $h$  in country  $i$  from agent  $k$  in country  $j$ ; and  $\sigma$  can be interpreted as the elasticity of substitution between assets.<sup>25</sup>

Solving this maximization problem gives rise to the following aggregate asset holdings of country  $i$  from country  $j$  (Aviat and Coeurdacier, 2007):

$$\text{Asset}_{ij} = \kappa \frac{n_i n_j}{(1 + \tau_{ij})^{\sigma-1}} \left( \frac{d_j}{L p_j} \right)^{\sigma-1}$$

Let  $R_j = \frac{d_j}{L p_j}$  be the expected gross return on assets in country  $j$ , and  $\kappa = \frac{\beta^\sigma}{L}$  a constant.

A financial gravity equation can be expressed as follows:

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<sup>25</sup> For tractability, asset payoffs are assumed to be uncorrelated so that the elasticity of substitution is only driven by the coefficient of risk aversion and does not depend on the correlation of assets' payoffs.

$$\log(\text{Asset}_{ij}) = \log(n_i n_j) - (\sigma - 1) \log(1 + \tau_{ij}) + (\sigma - 1) \log(R_j) + \log(\kappa) \quad (1)$$

This equation is similar to the standard gravity equations used in the international trade in goods. It states that the log of asset holdings of country  $i$  from country  $j$  ( $\text{Asset}_{ij}$ ) is a function of the log of market sizes of both countries, negatively related to financial transaction costs between the two countries, and positively related to the expected return on assets in country  $j$ .

It should be noted that while Martin and Rey (2004) derive a gravity equation for asset *flows*, following Aviat and Coeurdacier (2007) in our empirical analysis the gravity equation involves asset *holdings*, because CPIS survey data allow to test the model for stock holdings rather than flows. In any case, most likely, transactions and holdings of foreign assets are highly correlated. The empirical results in Portes and Rey (2005) also suggest that the factors shaping the pattern of international asset transactions also affect international asset holdings in a similar way.

### Appendix III: Data Description

The gravity equations for international financial asset trades are estimated using two different sets of data, bilateral portfolio holdings obtained from the IMF's Coordinated Portfolio Investment Survey (CPIS), and bilateral foreign bank claims for the bank for International Settlements (BIS).

#### *Cross-border portfolio investments*

The CPIS provides information on cross-border portfolio investment holdings of up to 78 source countries in over 230 destination countries/territories. The survey was initiated in 1997 and has been conducted annually since 2001 with a substantial increase in coverage and scope. Portfolio investments are disaggregated by the residency of the issuer (which can be identified as the recipient of the investment) and can be broken down by type of security (equity, short-term debt, and long-term debt), though some participating countries may report only total value of portfolio holdings in each country or report the total value of debt security holding without a breakdown by maturity. Securities held as official reserves and those deemed to be foreign direct investments are excluded. All portfolio investment data are valued at market prices (end-December of each year) and expressed in US dollars.

To reduce potential outlier problems in the data, we exclude some very small countries<sup>26</sup> as well as some countries for which data seem distorted (see below). Our final data set contains portfolio investment information for 63 source countries in 140 destinations.

While the CPIS provides the most comprehensive information on bilateral international portfolio asset holdings, it is still subject to a number of important drawbacks and limitations. First, since participation in the CPIS surveys is voluntary, country coverage is incomplete, and varies over time. Moreover, for many countries the only data available is on bilateral foreign *assets*, not *liabilities*. Hence in most of our analysis we use the asset holdings of country  $i$  in country  $j$  as a measure of financial integration between the two countries. For robustness check, we also adopt as an alternative measure of financial integration the *sum* of portfolio investment assets and liabilities between country  $i$  in country  $j$ , which is, however, available only for a sub-sample.<sup>27</sup>

Second, as the survey does not provide information on ultimate investors or ultimate recipients, the data set cannot be used to address the issue of third-country holdings. This can disguise the true underlying investment relationships between the country pairs as well as entail potential data problems. For example, the value of portfolio equity investment by the UK and Germany in Ireland totaled 120 USD billion as reported in the CPIS for the year 2011, while the Irish stock market capitalization was smaller than 100 USD billion.

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<sup>26</sup> Specifically, countries with a population of less than 1 million and/or nominal GDP of less than 5 USD billions are excluded.

<sup>27</sup> In our sample, only 12 participating countries report portfolio liabilities in addition to assets in more recent years. The CPIS also reports portfolio liabilities for non-reporting economies derived from the creditor data.

Third, most participating countries only report the outstanding value of cross-border portfolio asset holdings, not flows. The use of the CPIS data, thus, requires us to replace flows with outstanding stocks in the gravity equations.<sup>28</sup> Finally, since the CPIS data are reported in USD dollar and valued at year-end market prices, the portfolio investment value may be subject to substantial valuation effects due to large exchange rate fluctuations and price movements during the year, and did not necessarily reflect deliberate changes in investment allocations.

### *Cross-border bank foreign claims*

The locational foreign bank claims dataset covers annual data on international financial claims and liabilities of bank offices resident in the BIS reporting countries broken down by country of residence of counterparty, and by nationality of reporting banks. In this dataset, both domestic and foreign-owned banking offices in the reporting countries report their outstanding positions, including those vis-à-vis own affiliates. The locational banking statistics are compiled using principles that are consistent with balance of payments. Specifically, our sample include more than 6000 country pairs over 2001–2013, with 21 Asian economies and 273 intra-Asia pairs.

The consolidated foreign bank claims dataset, however, captures the worldwide consolidated claims of banks headquartered in the BIS reporting countries, including claims of their own foreign affiliates, but excluding positions between related offices. For example, claims of Japanese bank branches and subsidiaries operating, say, in Korea toward local borrowers are counted as Japanese claims on Korea. Our sample cover about 3000 country pairs over 2001–2013. Publicly available data covers only seven Asian reporting countries and twenty destination countries.

### *Other explanatory variables*

The list of the other explanatory variables and their sources is in the table below.

Variable	Source
Foreign Bank Claims (Consolidated; Locational)	Bank for International Settlements (International Banking Statistics)
Stock Market Size Stock Returns	Bloomberg L.P.; CEIC Data Company Ltd.; Haver Analytics; and Thomson Reuters.
Capital Account Openness Index	Chinn and Ito (2006)
Foreign Bank Presence Index (Assets share is measured by foreign bank assets in percent of total bank assets; Number share is measured by number of foreign banks in percent of number of total banks)	Claessen and van Horen(2014)

<sup>28</sup> Ideally, changes in holdings may be used as a proxy for flows. However, due to the time-varying coverage and valuation issues, doing so may be more problematic.



Variable	Source
Distance (Distance between two capital cities of the country pair)	<a href="http://privatewww.essex.ac.uk/~ksg/data-5.html">http://privatewww.essex.ac.uk/~ksg/data-5.html</a>
Common Language Dummy (1 indicates the country pair shares the same language)	<a href="http://users.nber.org/~wei/data.html">http://users.nber.org/~wei/data.html</a>
Financial and Banking Sector Regulation Index	IMD, World Competitiveness Yearbook
Bilateral Foreign Direct Investment Bilateral Portfolio Investment	IMF, CDIS database
Bilateral Trade	IMF, Direction of Trade Statistics
Bank Assets Exchange Rate Money Market Rate	IMF, International Financial Statistics
GDP Deflator GDP per Capita Nominal and Real GDP	IMF, WEO database
Economic Risk Financial Risk Political Risk (Higher values indicate higher risk)	The PRS Group, International Country Risk Guide (ICRG)
Contracts Enforcement Index Credit Information Index Insolvency Resolution Index Investors Protection Index	World Bank, Doing Business database
Accounting Standard Index * Actual Capital Ratio Auditing Standard Index * Bank Branches per Population Bond Market Size Foreign Bank Entry Application Denied Ratio Foreign Bank Entry Prohibition Index * Mutual Fund Assets Stringency of Minimum Capital Requirements Index *	World Bank, Global Financial Development Report, Bank Regulation and Supervision Survey (The indices with * are calculated by the authors)
Foreign Ownership of Equity in Banking Sector Index	World Bank, Investing Across Borders database
Regulatory Quality Rule of Law	World Bank, Worldwide Governance Indicators
Securities Exchanges Regulation Index	World Economic Forum, Global Competitiveness Report