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## ADB Economics Working Paper Series



### Financial Integration in East Asia: An Empirical Investigation

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Hyun-Hoon Lee, Hyeon-seung Huh, and Donghyun Park  
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# **Financial Integration in East Asia: An Empirical Investigation**

**Hyun-Hoon Lee, Hyeon-seung Huh, and Donghyun Park**

May 2011

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## **Abstract**

The central objective of this paper is to empirically evaluate the degree of linkages among East Asian equity and bond markets. The primary contribution of our paper to the empirical literature is that we use a financial gravity model grounded in economic theory. Using data from the International Monetary Fund's Coordinated Portfolio Investment Survey, we find that intra-East Asian financial asset holdings of four East Asian economies—Hong Kong, China; Japan; the Republic of Korea; and Singapore—are larger than the levels predicted by the financial gravity model. However, our analysis suggests that this result is likely to be driven by intraregional trade linkages, and reflects those linkages. Therefore, the salient implication for regional policy makers is that they should continue to promote intraregional financial integration. This paper also aims to analyze the impact of three different types of country-specific risks—political, economic, and financial risks—on investment from the four economies. This analysis yields a clear positive relationship between destination-country risk, particularly political risk and capital inflows.





## I. Introduction

A noticeable feature of East Asian economies' economic success has been the growing integration of their goods markets. Intraregional trade among East Asian economies has grown rapidly in recent years, and the relative importance of trade with countries outside the region has declined correspondingly. More specifically, the share of intra-East Asian trade has increased from 31.7% in 1990 to 42.0% in 2008. To a large extent, the growth of intraregional trade has been driven by regional production networks in which different countries specialize in different stages of the production process. In particular, the PRC has become a key location for assembling parts and components produced in the rest of the region. While this type of intraregional trade promotes the region's productive efficiency and contributes to its role as a global manufacturing hub, it is ultimately driven by final demand from elsewhere, in particular the United States. However, there is also a large and growing trade in final goods among the region's countries. Overall, the evidence strongly indicates that East Asia's goods markets are highly integrated and the degree of integration has been increasing over time.

In conjunction with growing de facto regional economic integration, most evident in the goods markets via the trade channel, East Asia has experienced a sustained surge of official, government-led regionalism since the Asian financial crisis of 1997–1998 (see, for example, Aggarwal et al. 2008, ADB 2008, Dent 2008, Harvie et al. 2005, and Katada 2009). The ASEAN+3 initiative, which brings together the 10 ASEAN members with the three regional giants—the People's Republic of China, Japan, and the Republic of Korea—provides the primary institutional framework for intra-East Asian economic integration. ASEAN+3 started out as a post-Asian crisis forum for fostering financial cooperation in the hopes of preventing future financial crises, and gave rise to a number of new regional financial arrangements. These include the network of bilateral swap agreements under the Chiang Mai Initiative (CMI) to defend against speculative currency attacks, institutionalized and systematic policy dialogue and information exchange, and creation of the Asian Bond Funds as a first step toward a regional bond market. A series of ASEAN+3 finance ministers' meetings in 2008 and 2009 transformed the CMI from a network of bilateral swap agreements into a more institutionalized multilateral framework. More specifically, the finance ministers agreed to speed up the CMI's multilateralization by means of a collectively managed reserve-pooling arrangement governed by a single contract. This transformation would reduce costly and wasteful duplication.

Despite the wide range of official activities and initiatives to promote intra-East Asian financial cooperation, the stylized evidence indicates that de facto integration of the

region's financial markets remains limited. This is especially true in comparison with the integration of the region's real economies via the trade channel. While intraregional trade in goods has grown rapidly and has already reached high levels, intraregional trade in financial assets lags far behind. Put differently, there has been de facto integration of East Asian economies but this integration has largely occurred in the goods markets rather than in the financial markets. To some extent, the lack of regional financial integration mirrors the general underdevelopment of East Asia's financial systems, which are widely perceived as substantially lagging the region's dynamic real economies, especially its world-class, export-oriented manufacturing sector.

Conventional theoretical models predict that foreign capital inflows contribute to the economic growth of the destination countries.<sup>1</sup> While some empirical research indicates a weak relationship between the two variables,<sup>2</sup> it is intuitively plausible that cross-border capital flows benefit the economic growth of both source and destination countries. They finance domestic the investment needs of the destination economies and promote a more efficient allocation of capital in the source economies.<sup>3</sup> In addition to its positive effect on economic growth in general, de facto financial integration in East Asia matters for at least two additional reasons. First, financial integration channels more of the region's savings into the region and thus reduces the extraregional recycling of the region's savings. Second, and more fundamentally, integration of the region's financial markets creates bigger, broader, deeper, more liquid, and more efficient financial systems that can better channel resources to their most productive uses. Financial efficiency is vital to the region's transition from growth based on capital accumulation to growth based on productivity improvements.

The central objective of our paper is to empirically evaluate the degree of bilateral linkages among East Asian financial markets using a financial gravity model grounded in economic theory. To do so, we analyze the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS) data on bilateral holdings of financial assets between East Asian economies. A number of existing empirical studies, including Eichengreen and Park (2005), Kim et al. (2005), Lee (2008), Park and Wyplosz (2008), and Garcia-Herrero et al. (2009) confirm that the level of intra-East Asian financial integration remains low despite the high and growing level of trade integration. Kim et al. (2005), Lee (2008), and Garcia-Herrero et al. (2009) adopt a gravity model of bilateral financial asset holdings and find that the level of financial integration among East Asian economies is low compared to European economies. However, they estimate a gravity model commonly used to estimate trade in goods to estimate trade in assets. The primary contribution of our paper is to more accurately evaluate the degree of intra-East Asian financial integration by

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<sup>1</sup> See Huh et al. (2010) and references therein for theoretical models that explain how foreign capital inflows can have a positive impact on the economic growth of the recipient economy.

<sup>2</sup> See, for example, Prasad et al. (2007), who find no empirical evidence of a direct positive relationship between foreign capital inflows and economic growth.

<sup>3</sup> Of course, capital inflows can also be a major source of financial instability and even financial crisis. For Asian countries, the Asian financial crisis of 1997–1998 was a painful reminder of this serious risk.

estimating theory-based financial gravity equation along the lines suggested by Martin and Rey (2004 and 2006) and Coeurdacier and Martin (2006). Our estimation results indicate that intra-East Asian trade in financial assets is larger than predicted by the theory-based financial gravity model but this result may be driven by the vibrant intra-East Asian trade goods.

In addition to assessing the extent of integration among East Asian financial markets, we seek to evaluate the impact of three different types of destination-country risks (political, economic, and financial risks) on bilateral financial transactions. We find a clear relation between the level of country risk and the level of equity and bond investment flows. In particular, we uncover a close relationship between the political and economic risks of destination economies and inflow of investment. Finally, East Asian economies do not appear to adequately take into account the financial risk of the source economies.

The rest of the paper is organized as follows. Section II describes the magnitude of bilateral holdings of assets among East Asian economies. Section III introduces a simple theoretical framework to generate testable gravity equations for cross-border asset holdings. In this section, we propose three different empirical specifications to test the determinants of bilateral holdings. In Section IV, we report and discuss our main empirical findings. Finally, Section V brings the paper to a close with some concluding observations.

## II. Size of Bilateral Holdings of Financial Assets

In this section we describe the data set used for our empirical analysis, and report the size of cross-border holdings of financial assets (equities and bonds) among East Asian economies.

### A. Data

The data used in this study were collected from the CPIS, which geographically breaks down holdings of equities and bonds.<sup>4</sup> The first CPIS was conducted in 1997 with 29 economies participating. Since 2001, the CPIS has been undertaken on an annual basis and the number of participating economies has expanded to 74, including eight East Asian economies, namely Hong Kong, China; Indonesia; Japan; the Republic of Korea; Malaysia; the Philippines; Singapore; and Thailand. The CPIS collects data on the stock of cross-border holdings of equities and bonds, and breaks down the data by the home country of the issuer. Holdings of securities that constitute direct investment are excluded.

<sup>4</sup> Bond holdings include both long-term and short-term debt securities, but in many cases short-term securities take the value of zero. Therefore, rather than separating bonds into long-term and short-term bonds, we consider only the sum of long-term and short-term bonds.

## B. Absolute Size of Asset Holdings

In 2007, the total value of equity holdings in the world, i.e., the 74 countries that participated in the CPIS survey, was \$17.8 trillion, while the total value of long-term bond holdings in the world was \$19.2 trillion. The data give us some insights about the nature of bilateral holdings of financial assets among East Asian economies.<sup>5</sup> Tables 1 and 2 show the geographic breakdown of equity holdings and bond holdings, respectively, among East Asian economies, as of 2001 and 2007. Table 3 summarizes the share of intraregional securities investment in East Asia, in comparison with exports of goods. Among the eight East Asian economies participating in the CPIS, Japan stands out as the largest investor of equities and bonds, with \$573 billion and \$1.9 trillion in 2007, respectively. However, Japan's intraregional investment share is the smallest among East Asian economies, at only 9.02% for equities and 0.78% for long-term bonds in 2007. In sharp contrast, Japan's intraregional exports share is 46.9 % in 2007.

It is interesting to note that the share of intra-East Asian holdings of long-term bonds is smaller than that of equities for most CPIS-participating East Asian economies. More fundamentally, the shares of both intra-East Asian holdings of equities and intra-East Asian holdings of long-term bonds are far smaller than the share of intra-East Asian exports of goods. Therefore, a first look at the data already indicates that integration among the financial markets of East Asia is much more limited than integration among the region's good markets. Such preliminary evidence is consistent with the conventional wisdom that whereas East Asian economies trade heavily with each other in goods their trade in financial assets is much more limited. In the next section, we describe the theoretical and empirical framework we use to perform a more rigorous in-depth analysis of intra-East Asian financial integration.

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<sup>5</sup> In this study, East Asia includes Brunei Darussalam, Cambodia, the People's Republic of China, Indonesia, Japan, the Republic of Korea, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

**Table 1: Geographic Breakdown of Equity Investment in East Asia**

To \ From	Hong Kong, China	Indonesia	Japan	Korea, Rep. of	Malaysia	Philippines	Singapore	Thailand
<b>Year-end 2001 (million US\$)</b>								
Brunei Darussalam	.	.	.	.	.	.	.	.
Cambodia	.	.	.	.	31.47	.	.	.
China, People's Rep. of	5,449.00	0.03	789.45	15.48	7.97	.	1,035.03	4.00
Hong Kong, China	.	11.22	4,847.86	100.39	47.27	.	3,125.13	6.00
Indonesia	.	.	49.71	12.58	43.69	.	306.86	15.00
Japan	2,145.00	2.21	.	101.49	6.86	0.49	1,536.22	1.00
Korea, Rep. of	1,311.00	0.08	381.31	.	8.41	.	1,034.23	.
Lao People's Dem. Rep.	.	.	.	.	.	.	.	.
Malaysia	604.00	.	338.55	123.82	.	.	5,294.98	.
Myanmar	.	.	.	.	.	.	5.47	.
Philippines	60.00	.	212.82	3.48	60.56	.	420.07	1.00
Singapore	1,403.00	2.20	923.91	0.83	460.93	2.21	.	8.00
Taipei, China	1,486.00	0.03	394.31	.	5.99	.	987.35	1.00
Thailand	488.00	0.01	289.72	20.29	14.71	0.80	1,520.04	.
Viet Nam	.	.	0.76	6.48	10.40	.	25.02	3.00
<b>East Asia</b>	12,946.00	15.77	8,228.39	384.84	698.24	3.50	15,290.41	39.00
<b>World</b>	94,615.00	16.57	227,351.39	1,299.77	1,331.97	110.83	31,318.90	82.00
<b>EASIA/World</b>	13.68%	95.19%	3.62%	29.61%	52.42%	3.16%	48.82%	47.56%
<b>Year-end 2007 (million US\$)</b>								
Brunei Darussalam	.	.	.	.	.	.	.	.
Cambodia	.	.	.	.	.	.	.	.
China, People's Rep. of	152,976.00	0.05	15,042.71	23,066.12	100.41	.	12,806.52	7.72
Hong Kong, China	.	351.08	17,501.33	15,301.59	1,832.15	.	16,205.67	104.44
Indonesia	468.00	.	800.35	560.84	212.31	.	3,555.62	18.28
Japan	8,540.00	3.48	.	4,812.72	200.21	0.22	13,256.35	13.73
Korea, Rep. of	3,574.00	.	5,618.36	.	666.26	.	7,609.17	8.00
Lao People's Dem. Rep.	.	.	.	.	.	.	.	.
Malaysia	1,964.00	1.00	1,158.09	701.12	.	.	8,797.74	3.67
Myanmar	.	.	.	.	.	.	.	.
Philippines	389.00	.	317.76	104.89	37.20	.	800.31	0.96
Singapore	4,285.00	5.74	6,457.25	1,264.16	2,109.78	3.30	.	256.46
Taipei, China	3,603.00	0.07	3,360.24	371.10	317.56	.	3,251.26	4.49
Thailand	1,123.00	23.39	1,443.99	325.17	119.76	1.68	3,524.81	.
Viet Nam	122.00	.	5.95	1,201.01	0.60	.	469.38	3.58
<b>East Asia</b>	177,044.00	384.80	51,706.04	47,708.72	5,596.25	5.20	70,276.84	421.34
<b>World</b>	514,511.00	865.61	573,469.44	104,857.60	9,422.35	185.78	176,802.94	3,300.05
<b>EASIA/World</b>	34.41%	44.45%	9.02%	45.50%	59.39%	2.80%	39.75%	12.77%

Source: Coordinated Portfolio Investment Survey Database (IMF 2010a).

**Table 2: Geographic Breakdown of Long-term Debt Investment in East Asia**

	<b>From:</b>	<b>Hong Kong, Indonesia</b>	<b>Japan</b>	<b>Korea, Rep. of</b>	<b>Malaysia</b>	<b>Philippines</b>	<b>Singapore</b>	<b>Thailand</b>
<b>To</b>	<b>China</b>							
<b>Year-end 2001 (million US\$)</b>								
Brunei Darussalam	.	.	.	.	.	.	.	.
Cambodia	.	.	.	.	.	.	.	.
China, People's Rep. of	1,776.00	.	879.80	117.81	.	.	325.18	.
Hong Kong, China	.	95.41	1,253.57	287.79	27.87	25.03	920.09	47.00
Indonesia	.	.	106.40	40.48	7.65	3.00	260.19	.
Japan	4,980.00	0.96	.	74.84	14.92	4.98	3,606.20	.
Korea, Rep. of	2,680.00	.	5,434.67	.	2.72	6.54	1,670.32	.
Lao People's Dem. Rep.	.	.	.	.	.	.	.	.
Malaysia	1,766.00	.	2,197.36	295.34	.	8.96	1,392.10	.
Myanmar	.	.	.	.	.	.	.	.
Philippines	1,152.00	.	1,347.05	89.48	41.26	.	577.11	.
Singapore	1,225.00	34.92	928.35	141.21	6.57	59.43	.	9.00
Taipei,China	528.00	.	81.94	7.65	13.47	12.94	258.91	.
Thailand	530.00	.	748.20	159.02	21.27	.	499.66	.
Viet Nam	.	.	29.92	15.31	.	.	.	.
<b>East Asia</b>	12,343.00	35.88	9,474.40	638.16	94.38	73.95	6,938.66	9.00
<b>World</b>	85,877.00	687.48	1,004,877.63	5,283.70	550.74	1,641.28	41,960.24	327.00
<b>EASIA/World</b>	14.37%	5.22%	0.94%	12.08%	17.14%	4.51%	16.54%	2.75%
<b>Year-end 2007 (million US\$)</b>								
Brunei Darussalam	.	.	.	.	.	.	.	.
Cambodia	.	.	.	.	.	.	.	.
China, People's Rep. of	5,440.00	.	458.00	201.80	6.05	.	907.13	15.23
Hong Kong, China	.	65.73	849.01	1,768.00	68.35	154.80	3,398.66	42.44
Indonesia	.	.	603.79	190.71	110.99	.	4,047.76	0.64
Japan	2,835.00	.	.	540.43	19.66	11.78	2,421.17	46.71
Korea, Rep. of	13,125.00	8.63	8,117.29	.	294.87	169.19	10,468.36	278.22
Lao People's Dem. Rep.	.	.	.	.	.	.	.	.
Malaysia	3,613.00	3.04	2,031.44	240.25	.	.	4,153.01	39.18
Myanmar	.	.	.	.	.	.	.	0.09
Philippines	592.00	2.05	1,634.73	13.99	43.55	.	874.27	2.48
Singapore	2,834.00	176.82	3,871.57	345.60	89.22	497.49	.	54.16
Taipei,China	1,130.00	.	55.97	116.66	4.84	.	410.67	.
Thailand	442.00	.	289.24	115.45	9.07	33.47	1,118.64	.
Viet Nam	724.00	.	63.51	6.41	.	.	637.62	28.89
<b>East Asia</b>	25,992.00	187.49	15,038.13	1,414.39	573.42	711.93	20,474.96	426.41
<b>World</b>	205,319.00	1,576.34	1,924,828.83	53,255.88	3,404.81	4,792.00	103,119.66	4,367.84
<b>EASIA/World</b>	12.66%	11.89%	0.78%	2.66%	16.84%	14.86%	19.86%	9.76%

Source: Coordinated Portfolio Investment Survey Database (IMF 2010a).

**Table 3: Destination of Investment and Exports**

To \ From:	2001			2007		
	East Asia	World	EASIA/World	East Asia	World	EASIA/World
<b>Equity Investment Outflow (million US\$)</b>						
Hong Kong, China	12,946.0	94,615.0	13.7%	177,044.0	514,511.0	34.4%
Indonesia	15.8	16.6	95.2%	384.8	865.6	44.5%
Japan	8,228.4	227,351.4	3.6%	51,706.0	573,469.4	9.0%
Korea, Rep. of	384.8	1,299.8	29.6%	47,708.7	104,857.6	45.5%
Malaysia	698.2	1,332.0	52.4%	5,596.2	9,422.3	59.4%
Philippines	3.5	110.8	3.2%	5.2	185.8	2.8%
Singapore	15,290.4	31,318.9	48.8%	70,276.8	176,802.9	39.7%
Thailand	39.0	82.0	47.6%	421.3	3,300.0	12.8%
<b>Total</b>	<b>37,606.2</b>	<b>356,126.4</b>	<b>10.6%</b>	<b>353,143.2</b>	<b>1,383,414.8</b>	<b>25.5%</b>
<b>Long-Term Debt Investment Outflow (million US\$)</b>						
Hong Kong, China	12,343.0	85,877.0	14.4%	25,992.0	205,319.0	12.7%
Indonesia	35.9	687.5	5.2%	187.5	1,576.3	11.9%
Japan	9,474.4	1,004,877.6	0.9%	15,038.1	1,924,828.8	0.8%
Korea, Rep. of	638.2	5,283.7	12.1%	1,414.4	53,255.9	2.7%
Malaysia	94.4	550.7	17.1%	573.4	3,404.8	16.8%
Philippines	73.9	1,641.3	4.5%	711.9	4,792.0	14.9%
Singapore	6,938.7	41,960.2	16.5%	20,475.0	103,119.7	19.9%
Thailand	9.0	327.0	2.8%	426.4	4,367.8	9.8%
<b>Total</b>	<b>29,607.4</b>	<b>1,141,205.1</b>	<b>2.6%</b>	<b>64,818.7</b>	<b>2,300,664.4</b>	<b>2.8%</b>
<b>Export of Goods (million US\$)</b>						
Hong Kong, China	99,672.6	190,322.0	52.4%	214,800.4	344,803.0	62.3%
Indonesia	32,308.6	56,336.4	57.3%	70,646.5	114,112.0	61.9%
Japan	159,697.6	403,652.0	39.6%	335,576.0	714,883.0	46.9%
Korea, Rep. of	67,338.8	151,039.0	44.6%	180,916.9	373,737.0	48.4%
Malaysia	48,978.1	88,203.9	55.5%	97,890.1	176,213.0	55.6%
Philippines	16,716.6	32,155.1	52.0%	30,950.5	50,483.1	61.3%
Singapore	66,425.9	121,936.0	54.5%	185,135.2	299,871.0	61.7%
Thailand	32,144.5	65,114.6	49.4%	80,735.7	152,460.0	53.0%
<b>Total</b>	<b>523,282.8</b>	<b>1,108,759.0</b>	<b>47.2%</b>	<b>1,196,651.3</b>	<b>2,226,562.1</b>	<b>53.7%</b>

Note: East Asia includes Brunei Darussalam, Cambodia, the People's Republic of China, Indonesia, Japan, the Republic of Korea, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

Sources: Coordinated Portfolio Investment Survey Database (IMF 2010a), Direction of Trade Statistics Database (IMF 2010b).



### III. Theoretical Framework and Empirical Specification

Our paper builds on recent papers that have analyzed the financial gravity equation, such as Martin and Rey (2004 and 2006), Portes and Rey (2005), Aviat and Coeurdacier (2005), and Coeurdacier and Martin (2006). Specifically, we derive a testable financial gravity equation from the model of Martin and Rey (2004 and 2006) and Coeurdacier and Martin (2006) for bilateral cross-border trade in financial assets.

#### A. Theoretical Framework

Coeurdacier and Martin use a simplified version of Martin and Rey (2004 and 2006) to derive a gravity equation for trade in assets with financial transaction costs.<sup>6</sup> Coeurdacier and Martin derive the value of aggregate demand from country  $i$  agents for assets issued in country  $j$  as in equation (1) below. The derivation of equation (1) is based on microeconomic foundation of utility-maximizing behavior by risk-averse individuals who live for two periods. Agents are endowed with risky projects and assets are claims on those projects. The number of traded assets is exogenous. As in the trade literature, the bilateral financial transaction cost is paid in units of the asset itself. The technology implies that each project pays dividends in only one state of nature and the dividend is zero in all other states of nature. A representative individual in country  $i$  maximizes utility subject to the first period budget constraint. In the second period, consumption is the dividend paid out by shares purchased in the first period (Coeurdacier and Martin provide the complete derivation of equation (1)).

$$Asset_{ij} = \frac{\beta L_i y_i n_j}{(1 + \beta)} \left( \frac{r_j Q_i}{\tau_{ij}} \right)^{\varepsilon - 1} \quad (1)$$

where  $L_i$  = population of country  $i$

$y_i$  = per capita income of country  $i$

$L_i y_i$  = size (gross domestic product or market capitalization of country  $i$ )

$n_j$  = number of assets in country  $j$  (financial sophistication of country  $j$ )

$\tau_{ij}$  = transaction costs between the two countries

$r_j$  = expected return in country  $j$

$Q_i$  = financial price index specific to country  $i$ <sup>7</sup>

<sup>6</sup> Aviat and Coeurdacier (2005) also derive the financial gravity equation in a related framework.

<sup>7</sup>  $Q_i$  measures the country's financial remoteness. A country with a low  $Q_i$  is a country to which it is difficult to sell financial assets. The analogy in the trade literature can be found in Anderson and van Wincoop (2003) and Head

$\beta/(1+\beta)$  is the elasticity of the size factor and the number of assets, while  $\varepsilon$  can be interpreted as the elasticity of substitution between assets. Thus, the value of aggregate demand from country  $i$  agents for assets issued in country  $j$  will increase as the economic size of country  $i$  increases, the number of financial assets in country  $j$  increases, the expected return of country  $j$  increases, and transaction costs between the two countries decrease. We can interpret the number of financial assets as a proxy for financial sophistication.

By taking logs and adding subscript  $t$  for time, we arrive at the financial version of the gravity equation for total holdings of assets between countries  $i$  and  $j$  at time  $t$ :

$$\log \text{Asset}_{ijt} = \log(\beta/(1+\beta)) + \log L_{y_{it}} + \log n_{jt} + (\varepsilon - 1) \log r_{jt} - (\varepsilon - 1) \log \tau_{ijt} + (\varepsilon - 1) \log Q_{it} \quad (2)$$

It is noted that, unlike the standard gravity equation, equation (2) includes the market size, financial openness, and expected returns of only one country. However, it is reasonable to assume that aggregate demand from country  $i$  agents for assets issued in country  $j$  also increases as the economic size of country  $j$  increases.<sup>8</sup> Aggregate demand may also increase as the financial sophistication of country  $i$  increases. For example, financial sophistication can mean greater freedom to purchase foreign financial assets. Furthermore, low rates of return on domestic investment will cause domestic residents to invest more in foreign financial assets. Similarly, financial price index specific to partner country  $j$  is expected to matter as well. Therefore, our study extends equation (2) and utilizes the following gravity equation:

$$\log \text{Asset}_{ijt} = \log(\beta/(1+\beta)) + \log L_{y_{it}} + \log L_{y_{jt}} + \log n_{it} + \log n_{jt} + (\varepsilon - 1) \log r_{it} + (\varepsilon - 1) \log r_{jt} - (\varepsilon - 1) \log \tau_{ijt} + (\varepsilon - 1) \log Q_{it} + (\varepsilon - 1) \log Q_{jt} \quad (3)$$

## B. Baseline Empirical Specification

We analyze a panel data set for the period 2001–2007 on bilateral cross-border equity holdings between four East Asian source economies—Hong Kong, China; Japan; the Republic of Korea; and Singapore—and 50 partner countries for which the data are available. Among the eight East Asian economies participating in CPIS, four countries namely, Indonesia, Malaysia, the Philippines, and Thailand, are not included as source countries in the empirical analysis because their data are incomplete for too many partner economies, as seen in Tables 2a and 2b. On the other hand, all East Asian economies, except for Brunei Darussalam, Lao People's Democratic Republic, and Myanmar are included as partner countries.

and Mayer (2004) where the price index measures a country's remoteness in the gravity equation for goods trade.

<sup>8</sup> For example, economic size can be a proxy for financial depth.

In Martin and Rey (2006), the number of assets issued by a country is shown to increase with financial openness. We therefore proxy the financial sophistication ( $n_j$ ) of market ( $j$ ) by the capital control intensity index in Column 4E of the *Economic Freedom of the World Index* published by the Fraser Institute. This index measures restrictions on foreign investment and capital controls, and takes a value between 0 and 1. The higher the value, the lower the restrictions on foreign investment and capital controls, and hence the more liberalized is the capital market. We define this as  $Caplib_{jt}$ . To analyze whether the four source economies are major investors in assets issued by the other East Asian economies, we add a dummy variable,  $EASIA$ , which takes the value of 1 if the issuing economy is an East Asian economy. We include dummies for the source and partner countries to account for the financial price indices,  $Q_{it}$  and  $Q_{jt}$ , specific to the source and partner countries, respectively. We also include year dummies to take account of factors such as world business cycle, global capital market shocks, and so forth. Therefore, our baseline empirical specification takes the following form:

$$\begin{aligned} \log Asset_{ijt} = & \alpha + \beta_1 \log GDP_{it} + \beta_2 \log GDP_{jt} + \beta_3 \log Caplib_{it} + \beta_4 \log Caplib_{jt} + \beta_5 \log Retrun_{it} \\ & + \beta_6 \log Return_{jt} + \beta_7 \log \tau_{ijt} + \beta_8 EASIA + u_i + u_j + u_t + \varepsilon_{ijt} \end{aligned} \quad (4)$$

where  $\log Asset_{ij}$  is the natural logarithm of the value of the holdings of foreign equities or long-term bonds issued in economy  $j$  by residents of an East Asian economy  $i$ ,  $u_i$  is the dummy for the source economies,  $u_j$  is the dummy for the partner economies, and  $u_t$  is the year dummy.

Therefore, we control for fixed effects in both source and partner country dimensions. Please note that we do not explicitly include the financial price indices,  $Q_{it}$  and  $Q_{jt}$ , which can be considered as the “multilateral resistance term” in Anderson and van Wincoop (2003), because the use of fixed effects in both dimensions allows us to control for this.

Among the explanatory variables, gross domestic product (GDP) in 2000 US dollars is taken from the World Development Indicators (WDI) Online data (World Bank 2011), except for Taipei, China.<sup>9</sup> The expected return,  $Return_j$  is the annualized average monthly return adjusted for exchange rate movement that takes into account the influence of exchange rate changes, i.e.,  $Return_j = [(1 + R_j)(1 + e_j)] - 1$ , where  $R_j$  is the 1-year nominal rate of return of an asset in its own currency, taken from the WDI Online data, and  $e_j$  is the rate of appreciation of the home currency relative to the US dollar.<sup>10</sup>

In equation (4),  $\tau_{ij}$  is transaction costs between the two countries, which takes the following specific functional form:

<sup>9</sup> GDP for Taipei, China, is obtained from Council for Economic Planning and Development (2010).

<sup>10</sup> The average gross equity return and gross bond return are used for the equity and bond equation, respectively. Following Faruqee et al. (2004), we also adjusted the rate of return using the inflation rate in the destination economy, and found similar results.

$$\tau_{ijt} = Dist_{ij}^{\delta_1} \times \exp(\delta_2 Tax_{ijt} + \delta_3 Comlang_{ij} + \delta_4 Contig_{ij} + \delta_5 Colony_{ij} + \delta_6 OFC_j)$$

where *Dist* is the bilateral distance, and *Comlang*, *Contig*, *Colony*, and *OFC* are dummies that indicate which partner countries share a common language, share a common border, have former colonial ties, and are offshore financial centers. We include *OFC* to control for partner countries that are offshore financial centers offering very favorable fiscal treatment.<sup>11</sup>

Geographical distance is taken from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). The distances are weighted distances, which use city-level data to assess the geographic distribution of population inside each nation. The variables indicating whether the countries share a geographic border and a common language and are former colonies of another country are also taken from CEPII's website. Tax rate is drawn from the International Bureau of Fiscal Documentation (IBFD) Tax Treaties Database, and is the current highest marginal rate applied on dividends when the dependent variable is equity holdings, or on interest when the dependent variable is long-term bond holdings.

### C. First Alternative Empirical Specification

Lee (2008), Lane and Milesi-Ferretti (2008), and Garcia-Herrero et al. (2009) suggest that the volume of trade in goods between countries has a positive impact on cross-border financial asset trade and add the 1-year lagged volume of trade in goods as an explanatory variable in their gravity equations, but this is subject to endogeneity bias because trade in goods itself is affected by other gravity variables such as market size and geographic distance. Therefore, we instead include the residuals of the dependent variable obtained from running the following equation:

$$\begin{aligned} \log Trade\_goods_{ijt} = & \alpha + \beta_1 \log GDP_{it} + \beta_2 \log GDP_{jt} + \beta_3 Tradelib_{it} + \beta_4 Tradelib_{jt} \\ & + \beta_5 \log Distance_{ij} + \beta_6 Contig_{ij} + \beta_7 Comlang_{ij} + \beta_8 Colony_{ij} + u_i + u_t + \varepsilon_{ijt} \end{aligned} \quad (5)$$

where the dependent variable is the log of bilateral trade in goods and *Tradelib* measures the degree of freedom to trade internationally (Column 4 of the *Economic Freedom of the World* index). The residual (*r-Trade*) from this regression measures bilateral trade intensity between two economies. Specifically, positive values imply that the pair enjoys greater bilateral trade than expected by gravity, while negative values imply that the bilateral trade between the pair is smaller than expected by gravity. Therefore, we estimate the following equation:

<sup>11</sup> Following the *Economist* magazine, offshore financial centers in our sample are Bahrain; Barbados; Bermuda; Costa Rica; Cyprus; Hong Kong, China; Ireland; Luxembourg; Malta; and Panama.

$$\begin{aligned} \log \text{Asset}_{ijt} = & \alpha + \beta_1 \log \text{GDP}_{it} + \beta_2 \log \text{GDP}_{jt} + \beta_3 \log \text{Caplib}_{it} + \beta_4 \log \text{Caplib}_{jt} + \beta_5 \log r_{it} + \\ & \beta_6 \log r_{jt} \\ & + \beta_7 \log \tau_{ijt} + \beta_8 r\text{-Trade}_{ijt} + \beta_9 \text{EASIA} + u_i + u_j + u_t + \varepsilon_{ijt} \end{aligned} \quad (6)$$

## D. Second Alternative Empirical Specification—Equation (3)

In another alternative empirical specification, we examine whether the four East Asian economies have similar or different degree of financial integration with other East Asian economies, i.e., whether our estimates for the EASIA dummy from the baseline specification are dominated by any particular source economy. Thus, we will replace the EASIA dummy in equation (4) with four interaction dummies capturing the pairs where both country  $i$  and country  $j$  are East Asian economies:

$$\begin{aligned} \log \text{Asset}_{ijt} = & \alpha + \beta_1 \log \text{GDP}_{it} + \beta_2 \log \text{GDP}_{jt} + \beta_3 \log \text{Caplib}_{it} + \beta_4 \log \text{Caplib}_{jt} + \beta_5 \log r_{it} + \\ & \beta_6 \log r_{jt} \\ & + \beta_7 \log \tau_{ijt} + \beta_8 \text{HKG\_ASIA} + \beta_9 \text{JPN\_ASIA} + \beta_{10} \text{KOR\_ASIA} + \beta_{11} \text{SGP\_ASIA} \\ & + u_i + u_j + u_t + \varepsilon_{ijt} \end{aligned} \quad (7)$$

where

$\text{HKG\_ASIA}_{jt} = 1$  if country  $i$  is Hong Kong, China and country  $j$  is an East Asian economy at time  $t$ ;  $= 0$  otherwise

$\text{JPN\_ASIA}_{jt} = 1$  if country  $i$  is Japan and country  $j$  is an East Asian economy at time  $t$ ;  $= 0$  otherwise

$\text{KOR\_ASIA}_{jt} = 1$  if country  $i$  is the Republic of Korea and country  $j$  is an East Asian economy at time  $t$ ;  $= 0$  otherwise

$\text{SGP\_ASIA}_{jt} = 1$  if country  $i$  is Singapore and country  $j$  is an East Asian economy at time  $t$ ;  $= 0$  otherwise

Similar to equation (4), equation (7) was estimated using the value of the holdings of foreign equities and long-term bonds as two alternative dependent variables.

## IV. Empirical Results

In this section, we report and discuss the main findings that emerge from the empirical analysis described in the preceding section.

### A. Empirical Results from Baseline Specification—Equation (4)

Table 4 shows our baseline regression results for both cross-border equity and bond holdings. Columns 1 and 4 present the estimates for equities and bonds, respectively, when we control for fixed effects only in the source country, while in columns 2 and 5 we control for fixed effects in both source and partner countries. When we control for fixed effects in both countries, the EASIA dummy cannot be estimated since partner country dummies ( $u_j$ ) and the time-invariant variables are perfectly collinear. Therefore, we also present the results estimated by the random-effects GLS regression procedure, in columns 3 and 6.<sup>12</sup>

The results for trade in equities and bonds compare favorably with those for trade in goods, both in terms of the precision of estimates and explanatory power. Our financial gravity equation captures about 65% of the variance for equities and about 70% of the variance for bonds. Both market size and financial market liberalization of partner countries have the expected signs and coefficients that are comparable to those found in other studies. That is, the four East Asian economies' bilateral holdings of equities and bonds are largest in countries with large market size and a high degree of financial liberalization. However, the coefficients of GDP of the four economies are statistically insignificant. This result is not unexpected since Hong Kong, China and Singapore invest more abroad than the Republic of Korea but have a much smaller GDP than the Republic of Korea.

In the equity equations, the rate of return in the source economies is negative and statistically significant while the rate of return in the destination economies is positive and statistically significant in column 2. On the other hand, the rate of return is not statistically significant in the bond equations. Turning to the variables related with transaction costs, we find that distance is significant and negative, suggesting that the four East Asian economies tend to purchase more equities from geographically closer economies. Distance is a proxy not only for transaction costs but to a greater extent for information asymmetries because transaction fees are typically small for financial asset trade. The common language and contiguity variables are significant and positive in the equity equation. In the bond equations, however, the contiguity variable is significant and

<sup>12</sup> The random effects procedure can be inconsistent because random effects impose the assumption of strict exogeneity and orthogonality between explanatory variables and the error term, but unobserved local factors could be captured by the error term and correlated with an explanatory variable. Therefore, we ran a Hausman test and found that in the equity equation, coefficients estimated by the efficient random effects procedure are the same as the ones estimated by the consistent fixed effects estimator, but in the bond equation it is rejected at the 5% level.

negative, as seen in columns 5 and 6. We also find that the tax variable is significant and negative, implying that a high tax rate on dividend or interest income discourages foreign investment. Our results also suggest that the four source economies invest more in offshore financial centers, which are usually lightly regulated low-tax jurisdictions. Finally, the four East Asian economies do not invest more in countries with colonial ties.

**Table 4: Determinants of Cross-border Holdings of Securities**

	Equities			Bonds		
	(1) OLS	(2) OLS	(3) GLS	(4) OLS	(5) OLS	(6) GLS
GDP_i	0.61 (1.03)	-0.30 (0.76)	-0.01 (0.79)	0.30 (1.13)	0.23 (0.82)	0.32 (0.87)
GDP_j	1.30*** (0.04)	1.48*** (0.44)	1.50*** (0.11)	1.17*** (0.05)	0.27 (0.53)	1.28*** (0.11)
Caplib_i	0.18 (0.16)	0.34*** (0.11)	0.30** (0.12)	0.11 (0.15)	0.13 (0.11)	0.13 (0.11)
Caplib_j	0.30*** (0.04)	0.02 (0.07)	0.21*** (0.06)	0.42*** (0.04)	0.03 (0.08)	0.16** (0.07)
Return_i	-1.36*** (0.49)	-1.23*** (0.36)	-1.25*** (0.39)	0.29 (0.72)	0.23 (0.58)	0.28 (0.55)
Return_j	-0.35 (0.36)	0.62** (0.25)	0.51 (0.32)	-0.13 (0.64)	-0.58 (0.51)	-0.35 (0.53)
Tax_j	-0.03*** (0.01)	-0.02 (0.01)	-0.03** (0.01)	-0.03*** (0.01)	-0.05*** (0.01)	-0.04*** (0.01)
Dist	-1.09*** (0.17)	-0.99*** (0.17)	-1.01*** (0.16)	-0.51*** (0.20)	-1.22*** (0.21)	-1.02*** (0.18)
OFC	3.80*** (0.32)		4.37*** (0.59)	1.06*** (0.27)		1.60*** (0.55)
Comlang	1.16*** (0.15)	1.35*** (0.18)	1.31*** (0.16)	1.23*** (0.22)	1.21*** (0.25)	1.12*** (0.20)
Contig	1.04*** (0.32)	1.23*** (0.46)	1.14*** (0.30)	1.28*** (0.44)	-2.12*** (0.78)	-1.39** (0.57)
Colony	-0.66** (0.30)	-1.31*** (0.30)	-1.21*** (0.27)	-1.79*** (0.33)	-2.62*** (0.42)	-2.35*** (0.32)
EASIA	0.73*** (0.24)		1.05*** (0.37)	0.74** (0.33)		-0.15 (0.53)
Constant	-39.83 (28.68)	-18.29 (24.33)		-32.01 (27.59)	2.27 (24.77)	-27.56 (24.38)
<b>Source</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Destination</b>	No	Yes	Yes	No	Yes	Yes
<b>Year</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	1,048	1,048	1,048	707	707	707
<b>R2</b>	0.66	0.64	0.65	0.71	0.75	0.68

\*\*\*, \*\*, and \* denote 1%, 5%, and 10% level of significance, respectively.

GLS = generalized least squares, OLS = ordinary least squares.

Note: Shown in parentheses are standard errors.

Source: Authors' estimates.

Above and beyond these effects, do the four East Asian economies hold more equities and bonds issued by other East Asian economies than predicted by the theory-based financial gravity model? This pertains to the central objective of our empirical analysis, which is to evaluate the degree of financial integration among East Asian economies. In the equity equations, the EASIA dummy is positive and significant for both one-way fixed effects and random effects. More specifically, the estimated coefficients of 0.727 and 1.049 imply that the four East Asian economies hold 107% and 185% more equities from East Asia than from elsewhere.<sup>13</sup> On the other hand, in the bond equations, the EASIA dummy is positive and significant for one-way fixed effects but not for random effects. The estimated one-way fixed effects coefficient of 0.738 implies that the four economies hold 109% more bonds from East Asia than from elsewhere.<sup>14</sup> To sum up the baseline results, while the four East Asian economies invest more within the region than outside the region, this differential effect is clearer for equities than for bonds.

For comparative purposes, Table 5 shows the estimates from a comparable regression for goods trade. It is interesting to note that the EASIA dummy in the goods export equation yields far larger estimates than in the equity equation of Table 3. Specifically, the four East Asian economies export 312% more goods to East Asia than to rest of the world.<sup>15</sup> Thus, East Asian financial markets are less integrated with each other than East Asian goods markets. More specifically, while our evidence suggests that Hong Kong, China; Japan; the Republic of Korea; and Singapore trade disproportionately more with other East Asian economies in both financial assets and goods, the disproportionate effect is greater for goods than for financial assets. Nevertheless, our results imply that although intra-East Asian financial integration is weaker than intra-East Asian trade integration, it is still strong enough so that the four East Asian economies buy more financial assets from East Asia than the rest of the world even after we control for the other determinants of international trade in financial assets.

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<sup>13</sup>  $\exp(0.727)-1 = 1.07$  and  $\exp(1.049)-1 = 1.85$

<sup>14</sup>  $\exp(0.738)-1 = 1.09$

<sup>15</sup>  $\exp(1.417)-1 = 3.12$



**Table 5: Determinants of Goods Exports**

	(1) OLS	(2) OLS	(3) GLS
GDP_i	0.68** (0.26)	0.70*** (0.17)	0.69*** (0.18)
GDP_j	0.79*** (0.02)	1.14*** (0.12)	0.86*** (0.05)
Tradelib_i	-0.13 (0.15)	-0.14 (0.11)	-0.14 (0.10)
Tradelib_j	0.33*** (0.02)	0.05 (0.04)	0.10** (0.05)
Dist	-0.27*** (0.06)	-0.54*** (0.07)	-0.51*** (0.08)
Comlang	1.00*** (0.07)	0.50*** (0.06)	0.53*** (0.06)
Contig	1.21*** (0.15)	1.45*** (0.21)	1.46*** (0.11)
Colony	-0.29*** (0.09)	-0.20 (0.13)	-0.21** (0.09)
EASIA	1.62*** (0.08)		1.42*** (0.17)
Constant	-31.38*** (6.79)	-36.33*** (5.46)	-29.82*** (4.96)
<b>Source</b>	Yes	Yes	Yes
<b>Destination</b>	No	Yes	Yes
<b>Year</b>	Yes	Yes	Yes
<b>Observations</b>	2,092	2,092	2,092
<b>R2</b>	0.80	0.55	0.79

\*\*\*, \*\*, and \* denote 1%, 5%, and 10% level of significance, respectively.

GLS = generalized least squares, OLS = ordinary least squares.

Note: Shown in parentheses are standard errors.

Source: Authors' estimates.

## B. Empirical Results for First Alternative Specification—Equation (6)

As noted earlier, bilateral trade linkage might influence bilateral investment linkage, and hence Table 6 reports the results when we include the residuals of the dependent variable obtained from running the gravity equation for goods trade (equation (5)). The estimated coefficients for *r-Trade* is around 0.5 in cross-border equity holdings and around 0.3 in bond holdings, which are both significant at the 1% level. This indicates that countries that trade more with each other invest more in each other. Including the bilateral trade intensity variable does not appear to substantially affect the estimates of most explanatory variables. One very significant exception is the EASIA dummy. The estimated coefficient for the EASIA dummy is no longer significant in any equity or bond equation. That is, once we control for the strong trade linkages among East Asian economies, we no longer uncover evidence of financial integration. The evidence of intra-East Asian financial integration we found in our baseline regressions may thus be largely driven by trade integration. Our finding is similar and consistent with the results of Lee (2008)

and Garcia-Herrero et al. (2009), who find that estimates for the intra-East Asia dummy become smaller when bilateral trade volume is included in the gravity equation.

**Table 6: Determinants of Cross-border Securities (with trade intensity)**

	Equities			Bonds		
	(1) OLS	(2) OLS	(3) GLS	(4) OLS	(5) OLS	(6) GLS
GDP_i	0.54 (1.01)	-0.21 (0.76)	0.04 (0.77)	0.40 (1.11)	0.33 (0.82)	0.44 (0.87)
GDP_j	1.28*** (0.04)	1.57*** (0.44)	1.48*** (0.12)	1.17*** (0.05)	0.24 (0.53)	1.28*** (0.11)
Caplib_i	0.18 (0.16)	0.32*** (0.11)	0.28** (0.12)	0.10 (0.15)	0.11 (0.11)	0.11 (0.11)
Caplib_j	0.31*** (0.04)	0.05 (0.07)	0.21*** (0.06)	0.41*** (0.04)	0.04 (0.08)	0.17** (0.07)
Return_i	-1.20** (0.49)	-1.12*** (0.36)	-1.15*** (0.38)	0.21 (0.70)	0.22 (0.58)	0.27 (0.54)
Return_j	-0.25 (0.36)	0.61** (0.25)	0.55* (0.32)	-0.13 (0.66)	-0.52 (0.51)	-0.28 (0.52)
Tax_j	-0.03*** (0.01)	-0.02 (0.01)	-0.03** (0.01)	-0.03*** (0.01)	-0.05*** (0.01)	-0.04*** (0.01)
Dist	-1.43*** (0.17)	-1.22*** (0.18)	-1.27*** (0.16)	-0.92*** (0.19)	-1.39*** (0.23)	-1.24*** (0.18)
OFC	3.75*** (0.34)		4.48*** (0.70)	0.72** (0.32)		1.13* (0.60)
Comlang	1.33*** (0.15)	1.74*** (0.20)	1.68*** (0.18)	1.28*** (0.19)	1.38*** (0.26)	1.33*** (0.22)
Contig	1.05*** (0.30)	1.13** (0.46)	1.05*** (0.31)	0.82** (0.40)	-2.19*** (0.78)	-1.53*** (0.54)
Colony	-0.59** (0.29)	-1.38*** (0.30)	-1.28*** (0.24)	-1.71*** (0.31)	-2.60*** (0.42)	-2.33*** (0.29)
r_Trade	0.55*** (0.10)	0.50*** (0.11)	0.51*** (0.12)	0.44*** (0.08)	0.28** (0.14)	0.34*** (0.12)
EASIA_d	-0.09 (0.27)		0.33 (0.42)	-0.16 (0.34)		-0.71 (0.52)
Constant	-34.95 (24.70)	-21.15 (24.17)	-27.04 (22.03)	-30.83 (27.13)	1.98 (24.71)	
<b>Source</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Destination</b>	No	Yes	Yes	No	Yes	Yes
<b>Year</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	1,040	1,040	1,040	707	707	707
<b>R2</b>	0.68	0.65	0.67	0.72	0.75	0.70

\*\*\*, \*\*, and \* denote 1%, 5%, and 10% level of significance, respectively.

GLS = generalized least squares, OLS = ordinary least squares.

Note: Shown in parentheses are standard errors.

Source: Authors' estimates.

## C. Empirical Results for Second Alternative Specification— Equation (7)

Having estimated the aggregated tendency of the four East Asian economies' cross-border holdings of equities and long-term bonds, we examine whether our aggregated estimates for the EASIA dummy in the baseline specification are dominated by any particular source economy. To do so, we include country-pair dummies, e.g., Japan–East Asia, Korea–East Asia, and so forth—for equities and bonds as in equation (7). Table 7 reports the results of estimating equation (7).<sup>16</sup> For comparative purposes, we also report the corresponding results for goods exports from a comparable regression. We do not show the estimates of the other control variables in order to highlight the most relevant results.<sup>17</sup>

**Table 7: Country-pair Effects**

	Equities			Bonds			Goods		
	(1) OLS	(2) OLS	(3) GLS	(4) OLS	(5) OLS	(6) GLS	(7) OLS	(8) GLS	(9) OLS
HKG_ASIA	1.48*** (0.34)	1.19*** (0.31)	2.12*** (0.39)	0.83** (0.38)	-0.23 (0.27)	1.34*** (0.39)	0.79*** (0.10)	-0.01 (0.11)	-0.03 (0.08)
JPN_ASIAa	0.01 (0.29)	-1.12*** (0.28)	0.12 (0.33)	-0.75** (0.33)	-3.00*** (0.24)	-1.31*** (0.36)	1.51*** (0.09)	0.48*** (0.11)	0.50*** (0.08)
KOR_ASIA	0.36 (0.39)		1.07** (0.46)	1.32*** (0.36)		1.62*** (0.42)	0.84*** (0.10)		-0.13 (0.09)
SGP_ASIA	1.89*** (0.34)	1.68*** (0.29)	2.69*** (0.37)	1.00** (0.44)	0.05 (0.27)	1.59*** (0.40)	1.73*** (0.12)	0.98*** (0.11)	0.98*** (0.09)
<b>Source</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Destination</b>	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
<b>Year</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	1,048	1,048	1,048	921	921	921	2,092	2,092	2,092
<b>R2</b>	0.67	0.67	0.66	0.71	0.76	0.66	0.80	0.57	0.76

\*\*\*, \*\*, and \* denote 1%, 5%, and 10% level of significance, respectively.

GLS = generalized least squares, OLS = ordinary least squares.

Note: Estimates for the control variables are not reported for brevity. Shown in parentheses are standard errors.

Source: Authors' estimates.

In terms of equities, Hong Kong, China; the Republic of Korea; and Singapore appear to hold more equities issued in other East Asian economies, as indicated by their positive and significant East Asia dummies. On the other hand, Japan does not invest disproportionately more in East Asian equity markets. In fact, for Japan, the East Asia dummy is negative and significant for the two-way fixed effects estimation. This tendency becomes even clearer in the case of bonds. Japan holds smaller amounts of long-term bonds issued by other East Asian economies. In contrast, the other three countries hold greater amount of intraregional long-term bonds than predicted by the gravity model.

<sup>16</sup> Note that in the two-way fixed effects model, country-pair dummies are also estimated, except for one country-pair.

<sup>17</sup> Those results are available from authors upon request.

For goods exports, the estimated coefficient for the Japan–East Asia dummy variable is consistently positive and significant across all specifications. Thus, Japan is unique in that it trades heavily within East Asia but invests heavily outside the region.

#### **D. Role of Country Risks in Intra-East Asian Financial Integration—Equation (8)**

Many studies attribute the fact of East Asia's financial integration substantially lagging behind its trade integration to the underdevelopment of its financial systems. However, few studies examine the role of country-specific risk in cross-border investment. It is intuitively plausible to assume that the quality of the host country's institutions has a major effect on capital inflows. Countries with stronger overall governance and institutions entail lower political, economic, and financial risks from the viewpoint of foreign investors. Conversely, a high degree of risk aversion among foreign investors goes a long way toward explaining the failure of countries with weak governance and institutions to attract foreign investment. The economic risk rating is used to assess a country's current strengths and weaknesses, while the financial risk rating aims to measure a country's ability to repay its foreign liabilities. What is especially relevant for developing countries and hence most of East Asia is political risk, which refers to the risk that the returns to investment may suffer as a result of political changes or political instability.<sup>18</sup> The three types of risk are interrelated and all have potentially large impact on international capital flows. Therefore, we extend our baseline model by adding the three different categories of country risks to the financial gravity equation as follows:

$$\begin{aligned} \log \text{Asset}_{ijt} = & \alpha + \beta_1 \log \text{GDP}_{it} + \beta_2 \log \text{GDP}_{jt} + \beta_3 \log \text{Caplib}_{it} + \beta_4 \log \text{Caplib}_{jt} + \beta_5 \log \text{Retrun}_{it} \\ & + \beta_6 \log \text{Return}_{jt} + \beta_7 \log \tau_{ijt} + \beta_8 \text{Pol\_Risk}_{ijt} + \beta_9 \text{Econ\_Risk}_{ijt} + \beta_{10} \text{Finy\_Risk}_{ijt} \\ & + \beta_{11} \text{EASIA} + u_i + u_j + u_t + \varepsilon_{ijt} \end{aligned} \quad (8)$$

where  $\text{Pol\_Risk}_{jt}$ ,  $\text{Econ\_Risk}_{jt}$ , and  $\text{Fin\_Risk}_{jt}$  denote the political, economic, and financial risks of economy  $j$ .

The country risk variables are constructed by Political Risk Services (PRS) and published as the International Country Risk Guide (ICRG) rating, which comprises 22 variables in three categories of risk: political risk ( $\text{Pol\_Risk}$ ), economic risk ( $\text{Econ\_Risk}$ ), and financial risk ( $\text{Fin\_Risk}$ ). Originally, the political risk index is based on 100 points, financial risk on 50 points, and economic risk on 50 points. For the sake of comparability, the original indices of economic risk and financial risk are multiplied by 2, so that each of these three measures ranges from 0 indicating minimum risk, to 100 indicating maximum risk. We include political, economic, and financial risk in our regressions. Please refer to the Appendix for further details on these three categories of risk.

<sup>18</sup> Please refer to the Appendix for full definitions of economic, financial, and political risk.

**Table 8: Determinants of Cross-border Securities (with country risk)**

	Equities			Bonds		
	(1) OLS	(2) OLS	(3) GLS	(4) OLS	(5) OLS	(6) GLS
GDP_i	0.24 (0.93)	-0.35 (0.76)	-0.19 (0.76)	0.28 (1.03)	0.22 (0.82)	0.34 (0.88)
GDP_j	1.28*** (0.04)	1.39*** (0.48)	1.37*** (0.10)	1.16*** (0.04)	0.47 (0.60)	1.21*** (0.09)
Caplib_i	0.23* (0.14)	0.35*** (0.11)	0.32*** (0.12)	0.12 (0.13)	0.13 (0.11)	0.12 (0.11)
Caplib_j	0.01 (0.04)	-0.02 (0.07)	0.02 (0.06)	0.14*** (0.05)	0.04 (0.08)	0.12 (0.07)
Return_i	-1.23*** (0.45)	-1.20*** (0.36)	-1.18*** (0.38)	0.29 (0.67)	0.23 (0.58)	0.27 (0.55)
Return_j	0.43 (0.34)	0.64*** (0.25)	0.67** (0.30)	-0.09 (0.56)	-0.59 (0.51)	-0.29 (0.52)
Tax_j	-0.04*** (0.01)	-0.02 (0.01)	-0.03** (0.01)	-0.03*** (0.01)	-0.05*** (0.01)	-0.03*** (0.01)
Dist	-1.00*** (0.17)	-0.99*** (0.17)	-1.01*** (0.16)	-0.28 (0.19)	-1.22*** (0.21)	-0.86*** (0.18)
OFC	3.40*** (0.28)		3.56*** (0.56)	1.36*** (0.22)		1.41*** (0.43)
Comlang	1.40*** (0.15)	1.35*** (0.18)	1.39*** (0.16)	1.00*** (0.20)	1.20*** (0.25)	1.05*** (0.19)
Contig	0.72** (0.29)	1.22*** (0.46)	1.11*** (0.32)	1.66*** (0.43)	-2.12*** (0.78)	-0.81 (0.55)
Colony	-0.73** (0.33)	-1.32*** (0.30)	-1.26*** (0.27)	-1.38*** (0.29)	-2.62*** (0.42)	-2.17*** (0.32)
Pol_risk	0.07*** (0.01)	0.03* (0.02)	0.07*** (0.02)	0.04*** (0.01)	-0.01 (0.02)	0.03** (0.01)
Econ_risk	0.05*** (0.01)	0.03 (0.02)	0.04** (0.02)	0.07*** (0.01)	-0.01 (0.02)	0.03* (0.02)
Fin_risk	-0.02*** (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.05*** (0.01)	-0.00 (0.01)	-0.03*** (0.01)
EASIA	1.10*** (0.24)		1.32*** (0.39)	1.20*** (0.30)		0.38 (0.45)
Constant	-35.83 (25.92)	-18.09 (24.71)		-36.30 (25.05)	-0.89 (25.61)	-30.55 (24.81)
<b>Source</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Destination</b>	No	Yes	Yes	No	Yes	Yes
<b>Year</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	1,048	1,048	1,048	707	707	707
<b>R2</b>	0.72	0.64	0.72	0.76	0.75	0.74

\*\*\*, \*\*, and \* denote 1%, 5%, and 10% level of significance, respectively.

GLS = generalized least squares, OLS = ordinary least squares.

Note: Shown in parentheses are standard errors.

Source: Authors' estimates.

Table 8 reports the results obtained from running equation (8) to assess how different categories of country risk are associated with cross-border capital flows. Inclusion of the country risk variable does not appear to substantially affect the estimates of the explanatory variables. In terms of the equity equations reported in columns 1–3, political

risk is positive and significant in all cases and its estimated coefficient ranges from 0.031 to 0.072. The estimates imply that a 10-point reduction in the political risk index is associated with a 3%–7% increase in equity investment. Economic risk also appears to be positively associated with equity investment. Somewhat puzzlingly, financial risk is negative and significant for one-way fixed effects although not for the other two estimations. In terms of the long-term bond equations reported in columns 4–6, political risk is still positive and significant for one-way fixed effects and random effects but no longer significant for two-way fixed effects. Our estimates for economic risk show a similar pattern. Financial risk is negative and insignificant for one-way fixed effects and random effects although it is insignificant for two-way fixed effects. This implies that East Asian economies do not adequately take into account the financial risk of the economies in which they invest.

## V. Concluding Observations

The central objective of this paper was to empirically evaluate the degree of bilateral linkages among East Asian financial markets. To do so, we apply a financial gravity model to the IMF's Coordinated Portfolio Investment Survey data on bilateral holdings of financial assets between East Asian economies. According to conventional wisdom, East Asian has already reached an advanced level of trade integration, or integration of goods markets, but lags far behind in terms of financial integration, or integration of financial markets. A number of existing empirical studies, including Eichengreen and Park (2005), Park and Wyplosz (2008), Kim et al. (2005), and Lee (2008), confirms the asymmetry between trade integration and financial integration in East Asia. The primary contribution of our study to this empirical literature is to measure the degree of intra-East Asian financial integration more accurately and rigorously by using a gravity model grounded in economic theory. That is, we use a gravity model that is more appropriate for trade in financial assets than the standard gravity model used for trade in goods. More specifically, we estimate a theory-based financial gravity model along the lines suggested by Martin and Rey (2004 and 2006) and Coeurdacier and Martin (2006).

The primary finding that emerges from our empirical analysis is that trade in financial assets (equities and bonds) among East Asian economies is larger than predicted by the theory-based financial gravity model. A preliminary look at the data, in particular the low share of intra-East Asian equity and bond holdings relative to the share of intra-East goods trade, supports the conventional wisdom that intra-East Asian financial integration remains limited. However, our evidence from more rigorous in-depth empirical analysis indicates that East Asian economies trade more assets with each other than with the rest of the world when we control for the standard determinants of cross-border capital flows such as market size, rate of return, financial openness, tax rate, geographical distance,

and other relevant source and investor country characteristics. The tendency for East Asian economies to trade more financial assets with each other is more pronounced for equities than for bonds. At a broader level, we find that the propensity of East Asian economies to trade more with each other is much more pronounced for goods than for financial assets, which lends support to the conventional wisdom that the region's financial integration lags behind its high level of trade integration.

While it is tempting to interpret our finding that East Asian economies' trade in financial assets is larger than the levels predicted by the financial gravity model as evidence of intraregional financial integration, we must interpret this finding with a great deal of caution. In this connection, it should be emphasized that when we include intra-East Asian goods trade intensity as an additional explanatory variable, we no longer find that intra-East Asian assets trade is bigger than assets trade between East Asia and the rest of the world. Therefore, it is possible that our finding of disproportionately large intra-East Asian trade in assets is driven by and reflects the region's high level of trade integration. Furthermore, our country-specific results suggest that Japan, the largest investor in the region, invests more outside East Asia even though it trades a lot with East Asia. Therefore, the salient implication of our findings for East Asian policy makers is that they should continue to promote the integration of the region's financial markets, in particular bond markets for which we find weaker evidence of integration than equity markets. Deeper financial integration will contribute to the formation of bigger, broader, deeper, more liquid, and more efficient financial systems that will safeguard the region from external financial shocks and pave the way for a growth that relies more on higher productivity.

Our results suggest that fundamental determinants of cross-border investment such as market size, financial openness, rate of return, and a number of other source and destination country characteristics go a long way toward explaining purchases of foreign equities and bonds by the four East Asian economies. The broader implication for policy makers from this broader finding is that to the extent that they can influence those fundamentals, they can play a significant role in promoting intra-East Asian financial integration. Therefore, the high collective power of the explanatory variables in our financial gravity equation estimations is promising for the ability of policy makers to foster integration. Specific policy options to speed up financial integration among Asian countries include removing remaining obstacles to cross-border investment; creating regional financial products such as regional index funds; addressing differences in credit rating, accounting, and auditing standards as well as legal and regulatory frameworks; and setting up a regional credit rating agency to improve credit risk assessment.

Finally, while explanations of East Asia's lower level of intraregional financial integration relative to its advanced trade integration have centered on the underdevelopment of the region's financial systems relative to its dynamic real economies, country-specific risk is another potential impediment to closer intraregional financial linkages. Our empirical

analysis yields a clear positive relationship between cross-border investment and political risk. More specifically, the lower the level of a country's political risk, the more capital inflows it attracts. This finding is stronger for equities than bonds. Therefore, a reduction in political risk across the region will be conducive for an expansion of intraregional trade in financial assets. This is plausible since one major reason why East Asian economies continue to invest heavily in the advanced economies despite low returns is their political stability. While more research needs to be done on the role of country-specific risks, reduction of those risks, in conjunction with financial development, will give a big push to the process of financial integration in East Asia.

## Appendix: Data Sources

**Bilateral distance** (weighted distances in kilometers, which use city-level data to assess the geographic distribution of population inside each nation): Centre d'Etudes Prospectives et d'Informations Internationales ([www.cepii.fr/anglaisgraph/bdd/distances.htm](http://www.cepii.fr/anglaisgraph/bdd/distances.htm))

**Bilateral exports and imports** (in millions of US dollars): International Monetary Fund, Direction of Trade ([www.imfstatistics.org/DOT/](http://www.imfstatistics.org/DOT/)); Taipei, China Bureau of Foreign Trade (<http://cus93.trade.gov.tw/ENGLISH/FSCE/>)

**Bilateral securities holdings** (in millions of US dollars): International Monetary Fund, Coordinated Portfolio Investment Survey ([www.imf.org/external/np/sta/pi/cpis.htm](http://www.imf.org/external/np/sta/pi/cpis.htm))

**Bond return rate:** Authors' calculation with data from DataStream on indices compiled by JPMorgan. Specifically, US dollar denominated Emerging Market Bond Index (EMBI) is applied for emerging markets and US dollar denominated Government Bond Index (GBI) is applied for developed markets. If one market is available at both EMBI and GBI, the index at EMBI is applied as EMBI covers a longer time frame. Return is annualized 1 year monthly return.

**Country risk variables:** Constructed by Political Risk Services (PRS), and published as the International Country Risk Guide (ICRG) rating, which comprises 22 variables in three subcategories of risk: political risk (*Pol\_Risk*), economic risk (*Econ\_Risk*), and financial risk (*Fin\_Risk*) ([www.prsgroup.com/](http://www.prsgroup.com/))

**Economic risk (*Econ\_Risk*)** rating assesses a country's current economic strengths and weakness. It is comprised of the following five components: per capita GDP, real GDP growth, annual inflation rate, budget balance as a percentage of GDP, and current account as a percentage of GDP.

**Equity return rate:** Authors' calculation with data from DataStream on local stock market benchmark indices. Return is annualized 1 year monthly return with adjustment to exchange rate fluctuation. Exchange rate of return is annualized 1 year monthly return against the US dollar, calculated with data from Thomson Reuters



**Financial risk** (*Fin\_Risk*) rating aims to measure a country's ability to repay its foreign liabilities. It consists of the following five components: foreign debt as a percentage of GDP, foreign debt services as a percentage of exports and goods and services, current account as a percentage of exports of goods and services, net international liquidity as months of import cover, and exchange rate stability.

**Geography variables** (Comlang, Contig, Colony): Centre d'Etudes Prospectives et d'Informations Internationales ([www.cepii.fr/anglaisgraph/bdd/distances.htm](http://www.cepii.fr/anglaisgraph/bdd/distances.htm))

**Gross domestic product** (GDP, in millions of US dollars): World Bank, *World Development Indicators* ([publications.worldbank.org/WDI](http://publications.worldbank.org/WDI)); Council for Economic Planning and Development.

**Political risk** (*Pol\_Risk*) rating aims to assess the political stability of the countries. It is comprised of the following 12 components: government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic tensions, democratic accountability, and bureaucracy quality.

**Tax rate on dividend income and interest income:** International Bureau of Fiscal Documentation Tax Treaties Database ([www.ibfd.org/portal/Product\\_treaties.html](http://www.ibfd.org/portal/Product_treaties.html))

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### **About the Paper**

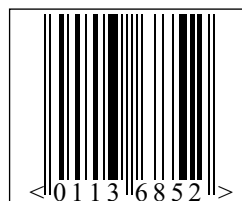
Hyun-Hoon Lee, Hyeon-seung Huh, and Donghyun Park empirically examine the degree of linkage among the equity and bond markets of Hong Kong, China; Japan; the Republic of Korea; and Singapore using a financial gravity model. They find that financial linkages among the four economies are higher than predicted by the financial gravity model, driven by trade linkages.

### **About the Asian Development Bank**

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