International Capital Mobility of East Asian Countries: Is Domestic Investment Financed by Regional or Global Savings?

Soyoung Kim	Sunghyun H. Kim	Cyn Young Park
Department of Economics	Department of Economics	ADB
Seoul National University	Suffolk University	

Abstract

Following capital account liberalization and financial market deregulation in the early 1990s, many East Asian economies experienced a surge in international capital flows. In addition, these East Asian economies have taken various steps to improve regional financial cooperation and integration since the 1997/98 Asian financial crisis. Theoretically, freely mobile international capital flows can benefit countries by efficiently matching worldwide savings and investment opportunities. This paper investigates the extent to which the domestic investment of East Asian economies is financed by domestic and foreign savings, based on the framework extended from Feldstein and Horioka (1980). In particular, this paper focuses on the role of (East Asian) regional versus global saving in financing domestic investment in order to infer the relative importance of regional versus global capital markets in East Asia. The results show that Japanese saving has played an important role in financing domestic investment of emerging East Asian economies, while savings from G6 economies (G7 excluding Japan) have not been a significant factor.

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1. Introduction

While the degree of international capital mobility in East Asia has increased significantly in recent decades, it is not yet clear whether this trend has been attained at the regional level. With the removal of legal and other barriers to capital flows and with improved access to global information, financial liberalization of domestic capital markets has substantially raised the degree of capital mobility in East Asian economies since the 1990s.[1] However, it is hard to find evidence that the recent financial market liberalization increased the degree of capital mobility within East Asia.

Various signs suggest that capital mobility within East Asia may not be as high as the degree of capital mobility between East Asian economies and developed economies. Earlier studies show that East Asia's financial markets are more integrated with global financial markets than among themselves despite impressive progress in the region's economic integration.[2] The recent buildup of global imbalances may also reflect the tendency of East Asia's capital for "international" mobility. For example, while many developing economies in East Asia continue to face significant infrastructure and investment deficits, they also accumulate large current account surpluses, which have been used to finance the current account deficit of the United States (US) for a very low return.

In theory, freely mobile international capital flows can enhance economic welfare in various ways. High capital mobility allows economies to smooth their consumption when faced with temporary declines in income and/or to finance productive investment at home without being constrained by the amount of domestic saving. Economic theories aside, however, experience shows that high international capital mobility in an inadequately developed domestic financial system may incur substantial economic and social costs. Massive capital inflows and outflows often associated with capital account liberalization tend to increase the risk of financial/currency crises and destabilize

[1] For example, see Kim, Kim, and Wang (2007).

[2] Eichengreen and Park (2004) and Kim, Lee, and Shin (2007) documented that financial market integration within East Asian economies has been far slower than that between East Asia and advanced countries.

financial markets and the real economy by, for example, contributing to boom–bust cycles.[3]

Likewise, net welfare effects of increased capital mobility and financial integration within a region remain uncertain for the region's individual economies. That is, an increase in the degree of regional capital mobility may not improve welfare for certain economies in the region. Economies do not need regional capital markets once they are fully integrated with global capital markets. Moreover, increased funding through regional capital markets may decrease potential gains from external capital flows into the region. Nevertheless, increased capital mobility within a region may provide additional benefits to the economies in the region. For example, it may help reduce the region's reliance on external funding, thus decreasing the region’s vulnerability to the vagaries of international investors and their funding conditions.

This paper documents the evolution of saving and investment relations for East Asian economies; such relations are considered to be an important macroeconomic consequence of internationally mobile capital flows. In particular, the paper examines the role of regional versus global capital markets by measuring the extent to which domestic investment is financed by domestic saving, regional saving, and global saving. Based on such relations, the paper will address how regional or global savings have contributed to financing domestic investment of East Asian economies as international capital mobility of East Asian economies increased in recent years.

Since the seminal contribution of Feldstein and Horioka (1980), numerous studies have investigated the degree of international capital mobility based on the relation between domestic investment and domestic saving.[4] Intuitively, under financial autarky, domestic investment and domestic saving should be perfectly correlated as domestic investment is fully constrained by domestic saving. However, if capital is perfectly mobile internationally, domestic investment and domestic saving do not have to be correlated because capital can move freely to any place with a high return.

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[3] See Rodrik and Subramanian (2009) for a survey of the costs and benefits of capital account liberalization.
[4] For example, Murphy (1984), Obstfeld (1986, 1995), Bayoumi (1989), and Kim (2001).

Subsequent studies have questioned whether a simple saving–investment relation truly represents the degree of capital mobility. Therefore, it may be difficult to argue that international capital mobility has increased or decreased based on the saving–investment relation. However, the methodology can still be extended to understand the role of regional and global capital markets in financing domestic investment by examining the relationship between domestic investment and domestic, regional, and global saving. In this paper, the extended methodology (developed by Kim and Kim, 2010) is applied to investigate the role of regional and global capital markets in financing domestic investment of East Asian economies.[5]

This paper adds value to the previous literature on East Asia's experience of capital account liberalization and financial integration in two aspects. First, while past studies have used various measures to document different degrees of regional versus global capital mobility and financial market integration in East Asia, no studies have focused on the saving and investment relation.[6] Second, although some studies (i.e., Kim, Kim, and Wang 2007; Kim, Oh, and Jeong 2005; Sinha, 2002) investigated the saving and investment relation in East Asia, no studies have examined the issue from the comparative perspective of regional versus global capital markets of East Asia.

The rest of the paper comprises the following sections. Section 2 briefly reviews the progress of financial integration in East Asia since the 1990s. Section 3 explains the empirical methodology. Section 4 presents the empirical results. Section 5 concludes.

2. Financial Integration and Capital Flows in East Asia

Since the early 1990s, financial integration in East Asia has gathered pace along with financial deregulation and capital account liberalization. Although there is no undisputed and universal definition of financial integration, it is often closely associated with financial openness and the free movement of capital. In East Asia, where financial markets are rapidly developing and integrating both regionally and globally, the evolution of the degree of capital mobility is likely to be multidimensional. With financial

[5] See Kim and Kim (2010) for more detailed discussion of methodology and applications to more general samples.

[6] For example, see Eichengreen and Park (2004); Kim, Lee, and Shin (2007); Kim and Lee (2008); Kim, Kim, and Wang (2004).

globalization, international capital mobility is rising. In recent years, however, the region's authorities have been making conscious efforts to promote financial market integration within East Asia.

In the aftermath of the 1997/98 financial crisis, East Asian economies took various steps to improve domestic financial systems and promote capital account liberalization. Indeed, the 1997/98 crisis played a catalytic role in accelerating regional financial cooperation and integration—in part to safeguard the region's financial markets against the spillover of global market instability, but also to promote financial market development in the region. There have been several important regional initiatives, such as the ASEAN Surveillance Process, Chiang Mai Initiative, Asian Bond Markets Initiative, and Asian Bond Fund (ADB 2008). Despite these efforts, however, regional financial integration seems to be lagging behind the region's trade and economic integration. Several studies also find that the financial markets in East Asia are more integrated with the global market than with each other.

Capital inflows and outflows in East Asia have risen sharply since the 1990s (Figure 1). Reflecting the recent trend of financial globalization, international capital mobility accelerated in the few years prior to the 2008/09 crisis. With the volume of cross-border capital flows on the rise, cross-border holdings of financial assets also have increased sharply. The region’s gross external assets and liabilities as a share of gross domestic product (GDP) reached 215% in 2006, up from 152% in 1990, according to Lane and Milesi-Ferretti (2007).

While still slow in its integration with global markets, East Asia's regional financial integration appears to be making steady progress. An interesting question to ask is whether an increase in regional financial integration complements or substitutes for global integration. For example, with increased regional financial integration, East Asian economies may finance their investment from regional, rather than from global, sources. Although data on cross-border capital flows remain limited, data from the Coordinated Portfolio Investment Survey by the International Monetary Fund (IMF) reveals an interesting trend (Figure 2) in this regard. The region’s portfolio investment in regional assets rose from 14.8% of total assets in 2001 to about 27.9% in 2007, while G3

economies (European Union 15,[7] Japan, and the US) account for about 70.5% of the region's liabilities in 2007, down from 77.5% in 2001.

3. Empirical Method

3.1. Basic Empirical Model

While the original Feldstein-Horioka saving investment correlation puzzle is based on cross-sectional regression analysis, we start from the following saving-investment regression that is widely used by studies in a time-series or panel regression setup:

$$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \varepsilon_{it} \quad (1)$$

where I is domestic investment, S is domestic saving, Y is domestic income, the subscript i indicates economy i, and the subscript t indicates time t. The coefficient β represents how savings rate is related to investment rate, called the "saving retention coefficient" in the previous studies. Under perfect international capital mobility, a simple theoretical model suggests that investment decision is independent of saving decision, so β should be close to zero under perfect capital mobility. On the other hand, investment should be equal to saving in a closed economy, so saving and investment should be perfectly correlated and β should be close to 1. Therefore, some studies interpret that a low value of β implies a high degree of capital mobility.

The regression may also be interpreted as showing how investment is financed by domestic saving. A small (or large) β suggests that only a small (or large) fraction of domestic investment is financed by domestic saving. If domestic investment is not fully financed by domestic saving, a fraction of domestic investment is likely to be financed by foreign saving, which implies a non-zero degree of international capital mobility. In the

[7] The original 15 members of the European Union were Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

following, this interpretation is explicitly extended in order to evaluate the relative role of regional versus global capital markets (or saving) in financing domestic investment.

From equation (1), regional and global savings rates are added as explanatory variables.

$$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_t^G}{Y_t^G} + \varepsilon_{it} \qquad (2)$$

where I^R, S^R, and Y^R, are Asian regional aggregate (excluding own economy) investment, savings, and income, and I^G, S^G, and Y^G, are global aggregate (excluding Asian economies) investment, savings, and income. The regression shows how the domestic investment rate is related to domestic, Asian aggregate, and global savings rates. β can be interpreted as the usual savings retention coefficient. Further, γ and δ may be interpreted as how domestic investment is financed by Asian aggregate and global savings, which implies the relative role of regional and global capital markets that contribute to financing domestic investment, respectively. Further, if the interpretation that a low β implies a high degree of international capital mobility is extended, a high γ (a high δ) can be interpreted as a high degree of regional (global) international capital mobility, because domestic investment is likely to be less related to domestic savings but more related to foreign savings when the degree of international capital mobility is high.

Another type of regression is considered—one that highlights the relative role of regional versus global capital markets. Suppose that domestic investment is fully financed by domestic savings, Asian aggregate savings, and global savings. Then, $\beta + \gamma + \delta$ should equal 1.[8] By subtracting $\frac{S_{it}}{Y_{it}}$ from both sides of equation (2), the following equation is obtained:

[8] The list of possible sources that may make the sum be not equal to 1 follows: First, regional or global investment may affect domestic investment. For example, a drop in regional or global investment may contribute to an increase in domestic saving. However, investments were not included in the regression because it is hard to interpret the coefficients of investments, especially in relation to the role of regional and global financial markets. Second, if the per capita income is different across economies, the sum may not be equal to 1. Third, the paper uses investment and savings rate data on country, regional aggregate, and global aggregate levels, and these scales may not be the same, especially when global savings rates affect investment rates of East Asian economies differently from those of the world's other economies. Fourth,

$$\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S_{it}^R}{Y_{it}^R} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S_t^G}{Y_t^G} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it} \quad (3)$$

Equation (3) may have a practical advantage over equation (2) because the degree of freedom and the multicollinearity problems are less likely to be present.

One potential problem in interpreting the estimated β as the (inverse of the) degree of international capital mobility is that changes in savings are not exogenous to changes in investment. That is, changes in investment may affect changes in savings. Furthermore, a structural shock may affect savings and investment simultaneously. For example, studies have suggested that savings and investment can be positively correlated even under perfect capital mobility in the presence of some structural shocks such as technology shocks (for example, Baxter and Crucini 1995). In such a case, β in equation (1) may not reflect the degree of international capital mobility because β can be close to 1 even under perfect international capital mobility. This presents a similar problem to that in interpreting γ and δ in equations (2) and (3) as a measure of relative regional versus global capital mobility.

However, one can still interpret the coefficients β, γ, and δ as a simple relationship between savings and investment. The estimated β shows how domestic savings and investment are correlated and can provide some information on the low bound of the degree of international capital mobility. Further, the paper employs two methods to obtain a measure that closely estimates the degree of international capital mobility. First, in order to control for the effects of productivity shocks that may concurrently affect savings and investment, the paper uses the method developed by Kim (2001) and Kim, Kim, and Wang (2007). First, the residuals from the regressions of savings and investment on productivity shocks are derived; the residuals are then used to reestimate equations (1), (2), and (3). Second, the instrumental variable regression is run. By using the instruments, the potential endogeneity problem can be reduced. Kim

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the foreign data may not include all the economies in the world. Fifth, there can be some measurement errors.

and Kim and Kim (2010) provide more detailed explanations of the empirical methodology.

3.2. Data and Estimation

The paper analyzes 11 Asian economies: the People's Republic of China (PRC); Hong Kong, China; Indonesia; Japan; the Republic of Korea; Malaysia; the Philippines; Singapore; Thailand; Taipei,China; and Viet Nam. Data are from 1980 to 2007. Savings is defined as GDP minus government consumption and private consumption. Investment is gross fixed capital formation plus changes in stocks. Both nominal savings and investment rates are calculated by dividing them by nominal GDP. Most of the national income account data are taken from the International Financial Statistics of the International Monetary Fund (IMF). Additional sources of data are from the Asian Development Bank; Ministry of Finance in Japan; and Taipei,China.

To compute Asian regional aggregate data, first, the local currency data of savings, investment, and GDP of each economy are converted into the US dollar amount using period average exchange rates. Then, the sum of these values, excluding own economy, is used to calculate the total Asian aggregate savings, investment, and GDP data for each sample economy. Taking the ratio of Asian aggregate GDP, Asian regional aggregate savings and investment rates is calculated:

$$\frac{S_t^R}{Y_t^R} = \frac{\sum_j E_t^j S_t^j}{\sum_j E_t^j Y_t^j}$$, where j = 1, …, N, excluding own economy,

where E is the exchange rate against the US dollar. The same method is used to calculate global savings and investment rates. In fact, G7 or G6 (excluding Japan) economies' aggregates are used for global data.[9]

Productivity shocks are defined as annual percentage changes in productivity. Solow residuals are used for the productivity measure. The share of labor in manufacturing output is assumed to be 0.6. Real GDP data are used for output and

employment data for labor input. Asian aggregate and G7 productivity shocks are the weighted averages of the individual economies' productivity shocks. Nominal GDP is used to calculate relative weights.

The ordinarly least-squares (OLS) estimation method is used in cross-section and time-series regressions, and fixed effects panel regressions are used for panel regressions. Standard errors are corrected for heteroscedasticity. Instrumental variable regressions include one period lagged values of all variables in the estimated equation because lagged values of domestic investment rate and domestic, regional, and global savings rates can help predict savings rates.

4. Empirical Results

4.1. Basic Statistical Properties of Savings and Investment

Table 1 reports main statistical properties of savings and investment (as a ratio of GDP) in East Asia. The first column reports the statistics of the whole period (1980–2007). Average savings and investment rates of the 11 East Asian economies are 31.3% and 28.7%, respectively. Singapore shows the highest savings rate (about 45%) among the 11 economies, while the PRC shows the highest investment rate of 37.7%. The Philippines and Viet Nam have the lowest savings and investment rates: 15.4% and 20.8%, respectively. The average savings rate is higher than the average investment rate in all economies except for the Philippines and Viet Nam.

The whole sample period is divided into 1980–1989, 1990–1999, and 2000–2007. In three economies—the PRC, Malaysia, and Viet Nam—both savings and investment rates increase significantly over time. Conversely, both savings and investment rates decrease over time in Japan and Taipei,China. Average statistics are also reported for subgroups of economies: emerging Asia—the 10 East Asian economies, excluding Japan; big three—the PRC, Japan, and the Republic of Korea; Association of Southeast Asian Nations (ASEAN)—Indonesia, Thailand, the Philippines, Malaysia, and Singapore; and "Greater China"—the PRC; Hong Kong, China; and Taipei,China. Both savings and investment rates of the big three, Greater China, and emerging Asia are larger than the average of all 11 economies. The average savings rate of all 11 economies tends to

increase over time. The average investment rate of all 11 economies increases from the 1980s to the 1990s but decreases from the 1990s to the 2000s.

Some studies examined the cross-sectional savings and investment relationship to infer the degree of long-run capital mobility. The present study also reports the estimation results of cross-sectional regressions of the savings–investment (S-I) correlation, using the OLS estimation method in Table 2, for the 11 East Asian economies and 10 emerging East Asian economies, to infer the degree of long-run capital mobility. Cross-sectional data are constructed by taking averages of savings and investment rates over different periods. Table 2 provides the regression coefficients of investment (the ratio of GDP) on savings (the ratio of GDP). That is, the coefficient β is from the regression:

$$\frac{I_i}{Y_i} = \alpha + \beta \frac{S_i}{Y_i} + \varepsilon_i \quad . \tag{7}$$

From the regression of the whole data period, the S–I correlation is 0.50, while in the 1980s it is 0.63, it decreases to 0.51 in the 1990s, and it decreases further to 0.35 in the 2000s. The rolling S–I correlation is calculated with a 15-year window. The results show that the S–I correlation consistently decreases over time: from 0.63 in the 1980–1994 period to 0.39 or 0.38 in 1993–2007. All these results confirm that the S–I correlation decreases significantly over time in East Asia, which may indicate that long-run capital mobility has increased over time in the region.

Before running the panel regression, panel unit root and panel cointegration tests were used to find the appropriate data form for regressions. Table 3 reports the results. The panel unit root test results, based on Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003), show that the null hypothesis of unit root can be rejected for the first differenced data of savings and investment rates, but not for the level data. Panel cointegration test based on Pedroni (1999) show that the null hypothesis of no cointegration cannot be rejected. This implies that the first differenced data should be used, and a cointegrating relation does not need to be considered.[10]

[10] This result may imply that current account is non-stationary. Although many past studies assumed that the current account is stationary, but it is unclear whether current account is stationary from the data.

4.2. Investment and Foreign Savings

Table 4 reports the panel regression results for the regression of domestic investment on domestic, regional, and global savings rates (in equation [2]). The results of the regression with fixed effect and the instrumental variable regression are reported. Four types of regressions are used over the whole sample period: (1) only domestic savings rate as a regressor; (2) domestic and East Asian aggregate savings rates as regressors; (3) domestic and G6 savings rates as regressors; and (4) domestic, East Asian aggregate, and G6 savings rates as regressors. The regression coefficients of the Asian aggregate and G6 savings rates are also reported, using subperiod analysis with regression (4). Japan is treated as one of the East Asian economies and is excluded from the global aggregate.

First, the estimated coefficient of the domestic savings rate, β, ranging from 0.35 to 0.41, is significant in all panel regressions. If β is interpreted as the (inverse of the) degree of international capital mobility, the estimated coefficient implies that the degree of international capital mobility of East Asia is far from perfect, which is consistent with the findings in past studies, e.g., Kim, Kim, and Wang (2007).

Most interestingly, the coefficient of the Asian aggregate savings rate is significant in all regressions but the coefficient of the G6 savings rate is not significant in any panel regressions. The estimated coefficient of the Asian aggregate savings rate is 0.48 (fixed effect) and 0.71 (instrumental variable) in the regression, including all three regressors. The estimated coefficient is significant at the 5% and 1% levels, respectively. This result suggests that a large fraction of domestic investment of individual East Asian economies has been financed by Asian regional savings but not by global savings, which implies a strong role of the Asian regional capital market.

Faruqee and Lee (2009) run three types of unit root tests for 101 countries, and found that unit root is not rejected in about a half of the cases. Faruqee and Lee (2009) interpreted this result as follows. (1) unit root and stationarity tests tend to have lowe power in finite sample (2) the current account is generally a very persistent series, making it difficult to distinguish between nonstationary and stationary alternatives over limited time spans.

It is also interesting to compare the size of estimated coefficients of the Asian aggregate savings rate and that of estimated coefficients of the domestic savings rate. The coefficient of the Asian aggregate savings rate is as large as the coefficient of domestic savings rates in all types of regressions, which indicates a strong role of Asian regional savings in financing domestic investment. However, this does not necessarily imply that changes in East Asian regional savings rates explain the variations of changes in investment rates of individual East Asian economies more than changes in domestic savings rates of individual economies. In the panel regression, the standard deviation of the East Asian aggregate savings rate is 0.87 while that of the individual savings rate is 2.07. Changes in the East Asian aggregate savings rate are less volatile than changes in individual savings rates of individual East Asian economies. Therefore, the role of changes in the individual savings rate in explaining the actual changes in the individual investment rate is still larger than the role of changes in the regional aggregate savings rate.[11]

The subperiod panel regressions show that the estimated coefficients of the Asian aggregate savings increased substantially in the later period. For earlier subperiods (from 1980–1994 to 1984–1998), the estimated coefficients are negative and not significant, but for later subperiods (from 1985–1999 to 1993–2007), the estimated coefficients are positive and significant.

Table 5 reports the results for the modified regression (equation [3]). The results in general support the main findings in the original regression. The estimated coefficient of the Asian aggregate savings rate (minus the domestic savings rate) is positive (0.54–0.74) and significant, which supports the strong role of the Asian regional capital market in financing the investment of East Asian economies. On the other hand, the estimated coefficient of the G6 savings rate (minus the domestic savings rate) is positive and significant in the regression including only the G6 savings rate as a regressor, but it is close to zero and not significant when the Asian aggregate savings rate is added as a regressor, which implies a small role of global financial markets in financing domestic investment.

[11] For a rough comparison, if the standard deviation of each variable is multiplied by the coefficient of the variable, (2.07)(0.38) = 0.787 is obtained for the individual savings rate, and (0.87)(0.48) = 0.418 for the Asian aggregate savings rate.

Table 6 shows the results for the 10 emerging East Asian economies. In the regression, Japan is not included in the aggregate East Asian savings rate, but is included in the G7 savings rate. Interestingly, now the role of G7 savings tends to be more important than the East Asian aggregate savings. The coefficients of the G7 and the Asian aggregate savings rates are not estimated to be significant in most cases, but the point estimate of the G7 savings rate is larger than that of the East Asian aggregate savings rate (which is close to zero). In addition, the estimated coefficient of the G7 savings rate in the instrument variable regression that includes all three regressors is 0.80 and significant at the 5% level. The subperiod estimation results show that the coefficients of the regional aggregate savings rate are small and not significant at all, but the coefficients of the global aggregate savings rate are positive in the later period and estimated to be significant for the subperiods from 1985–1999 to 1988–2002.

The results show that East Asian aggregate savings play a more important role than global aggregate savings when Japan is included in East Asia (Table 5), but global aggregate savings play a more important role than East Asian aggregate savings when Japan is included in the global aggregate. Therefore, Japan is likely to be the key economy that helps to finance investment in emerging East Asian economies. To confirm this conjecture, one may run a regression that includes the Japanese savings rate as a separate regressor as follows:

$$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_t^G}{Y_t^G} + \rho \frac{S_t^J}{Y_t^J} + \varepsilon_{it},$$

where S^j and Y^j are Japanese savings and output, respectively. East Asia includes the 10 emerging East Asian economies (excluding Japan) and the global aggregate includes the G6 economies, excluding Japan. Table 7 confirms the conjecture. The coefficient of Japanese savings is positive and significant at the 1% level, but the coefficient of the global savings rate is not estimated to be significant. The subperiod estimation shows that the coefficients of the Japanese savings rate are positive and significant in the later subperiods (from 1985–1999 to 1993–2007).

Table 8 (1) shows the estimation results for the modified regression that includes only two regressors. As in Table 6, East Asia includes 10 emerging East Asian economies, excluding Japan but the global aggregate includes G7 economies, including Japan. The coefficient of the G7 savings rate (minus the own savings rate) is positive and estimated to be significant, but the coefficient of the regional aggregate savings rate (minus own savings rate) is close to zero and insignificant. Table 8 (2) shows the estimation results for the modified regression that includes the Japanese savings rate separately but uses only three regressors. Again, only the coefficient of the Japanese savings rate (minus the own savings rate) is positive and significant.

4.3. Controlling Structural Shocks

Table 9 shows the coefficients estimated from the regressions of savings and investment rates on productivity shocks, without lag and with one lag. The signs of the coefficients are as expected in most cases: an increase in productivity has positive effects on investment and savings. Coefficients of lag variables are in general smaller than the coefficients of contemporaneous variables. Therefore, the regression without lags is used for the following regressions. In fact, the results with and without lags are similar. The new savings and investment rate data are constructed by taking the residuals of these regressions of savings and investment rates on productivity shocks.

Table 10 (1) reports the results for the regression of the investment rate on the domestic, Asian aggregate (including Japan), and G6 (excluding Japan) savings rates, after controlling for productivity shocks. As in the case without controlling for productivity shocks, the coefficient of the Asian aggregate savings rate is larger than the coefficient of the G6 savings rate. However, the coefficient of the Asian aggregate savings rate is not estimated to be significant. Table 10 (2) reports the results for the modified regression with only two regressors. Now the coefficient of the Asian aggregate savings rate (minus the domestic savings rate) is positive and significant at the 1% level.

Table 11 reports the results for the case in which the global aggregate includes Japan but East Asia excludes Japan, after controlling for productivity shocks. In the regression that includes three regressors (Table 11 [1]), coefficients of the Asian and global aggregate savings rates are not estimated to be significant. In the regression that

includes only two regressors (Table 11 [2]), coefficients of the Asian and global aggregate savings rates are positive and estimated to be significant.

Table 12 reports the results that include Japanese savings rate separately. In the regression that includes four regressors (Table 12 [1]), the coefficient of the Japanese savings rate is positive but the coefficients of the regional aggregate and global savings rates are either non positive or insignificant. In the regression that includes three regressors (Table 12 [2]), the coefficient of the Japanese savings rate is positive and significant but the other coefficients are not estimated to be significant.

Overall, although less clear-cut than the results from basic regressions, these regression results, after controlling for productivity shocks, confirm that the Japanese savings rate played the most important role in financing investment in emerging East Asian economies and that global savings, excluding Japan, did not help finance East Asian investment at all.

5. Conclusion

Following capital account liberalization and financial market deregulation in the early 1990s, East Asian economies experienced a surge in international capital flows. Theoretically, improved international capital mobility can provide a benefit by efficiently allocating worldwide savings to the place with appropriate investment opportunities. This paper investigates the extent to which the domestic investment of East Asian economies is financed by domestic, regional, and global savings, in order to infer the role of regional and global capital markets in funding domestic investment.

The empirical results are as follows. First, global savings (as proxied by G6 savings, excluding Japan) has not played a role in financing domestic investment of emerging East Asian economies. Since the 1990s, capital flows between East Asian economies and industrial economies have been large. These large capital flows have often been considered to be a source of currency crisis and instability of asset prices and financial systems in East Asian economies. Despite the drawbacks of high international capital mobility, theories suggest that global capital markets can also provide a benefit. However, our empirical results shows that huge international capital flows between major

industrial economies and East Asian economies have not really been a meaningful source of domestic investment in East Asia.

Second, the East Asian capital market including Japan has been successful in financing domestic investment. Japanese savings appear to have played the most important role in financing the domestic investment of emerging East Asian economies. This result is interesting, as past studies often suggested that East Asian regional capital markets are not very integrated. However, when the coverage of the regional capital market is exended to include Japan, the regional market is found to be rather well integrated and effective in funding the investment of individual economies in the region.

Third, the role of Japanese savings (or East Asian aggregate savings including Japan) in financing East Asian investment has increased from the 1980s to the 2000s. East Asian economies have taken steps to improve regional financial cooperation and integration since the Asian Financial crisis. Improved regional financial cooperation, together with various measures to facilitate the market liberalization and deregulation process, has likely contributed to this increased role of the regional financial markets.

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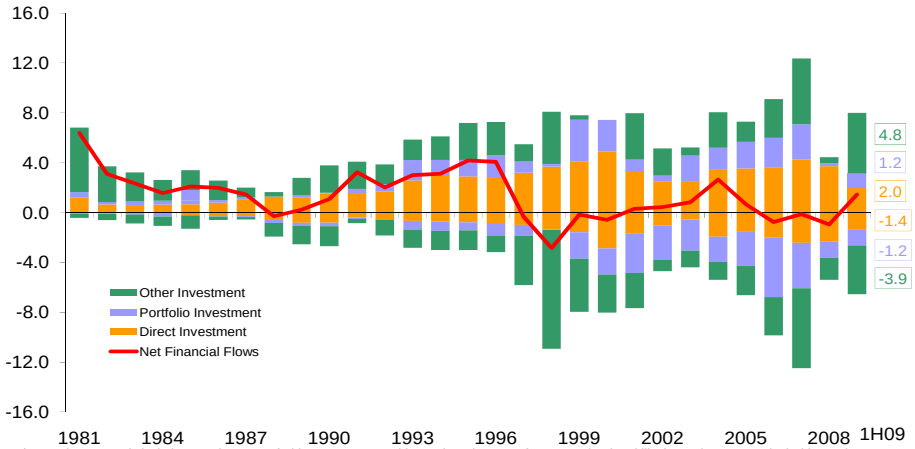
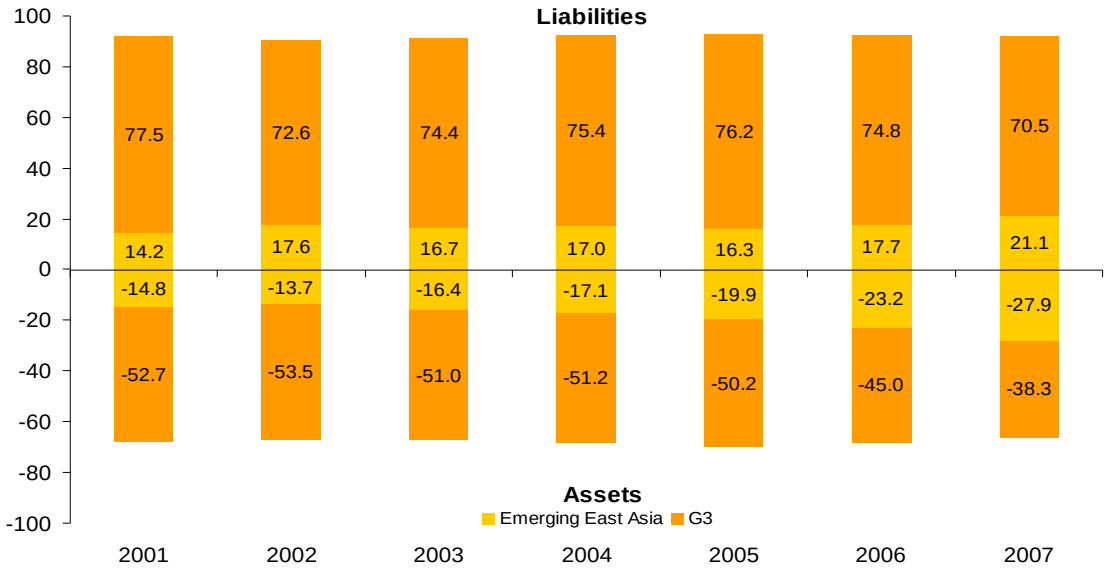
Figure 1: Financial Account Flows—Emerging East Asia[1]
(% of GDP)



[1] Emerging East Asia includes People's Rep. of China, Hong Kong, China, Indonesia, Rep. of Korea, Malaysia, Philippines, Singapore, Taipei,China and Thailand. Other investments include derivatives. Data for People's Rep. of China begins 1982; Hong Kong, China 1998.
Source: Authors' calculations using data from *International Financial Statisitics*, International Monetary Fund and national sources.

Figure 2: Emerging Asia's portfolio investment (% of total)



[1]Emerging East Asia includes Brunei Darussalam, Cambodia, People's Rep. of China, Hong Kong, China, Indonesia, Rep. of Korea, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Taipei,China, Thailand, and Viet Nam. G3 economies include European Union 15, Japan and United States. Data for Assets include Hong Kong, China; Indonesia; Rep. of Korea; Malaysia; Philippines; Singapore; and Thailand only.
Source: *Coordinated Portfolio Investment Survery*, International Monetary Fund.

Table 1. Properties of Saving and Investment (Percentage, Period Average)

	1980-07		1980-89		1990-99		2000-07	
	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y	S/Y	I/Y
China	39.1	37.7	34.6	35.2	39.7	37.8	43.8	40.6
Hong Kong	32.4	27.1	33.5	28.2	31.8	29.5	31.6	22.8
Indonesia	30.1	27.5	31.0	28.8	31.4	29.1	27.5	23.9
Korea	33.2	32.0	31.0	30.3	36.5	35.4	32.0	29.7
Malaysia	38.7	30.5	33.3	30.7	40.7	36.3	43.0	23.1
Philippines	19.1	20.8	23.0	22.2	14.9	22.4	19.6	17.0
Singapore	45.0	34.1	41.6	42.4	47.6	34.9	46.1	22.8
Taiwan	28.6	22.9	32.9	24.1	26.9	24.1	25.2	19.8
Thailand	31.1	31.0	26.0	29.4	35.2	36.3	32.2	26.1
Vietnam	15.4	23.6	3.3	14.5	16.2	23.7	29.7	34.7
Japan	29.5	27.8	31.7	29.8	30.6	29.1	25.2	23.8
Average	31.1	28.6	29.3	28.7	32.0	30.8	32.3	25.8
Big 3	33.9	32.5	32.4	31.8	35.6	34.1	33.7	31.4
ASEAN	32.8	28.8	31.0	30.7	33.9	31.8	33.7	22.6
Greater China	38.8	33.0	36.6	35.2	39.7	34.1	40.5	28.7
Emerging Asia	31.3	28.7	29.0	28.6	32.1	30.9	33.1	26.0

Note: Big 3 (Korea, Japan, China), ASEAN (Indonesia, Thailand, Malaysia, Singapore and the Philippines), Greater China (Hong Kong, Singapore, China), Emerging Asia (10 countries excluding Japan).

Table 2. Saving-Investment Correlation (Cross-Section)

Asian 10 countries				**Asian 11 countries (including Japan)**		
$(I/Y)_i = \alpha + \beta(S/Y)_i$				$(I/Y)_i = \alpha + \beta(S/Y)_i$		
whole period	0.50	*(0.12)*		whole period	0.50	*(0.11)*
1980-89	0.63	*(0.13)*		1980-89	0.63	*(0.12)*
1990-99	0.51	*(0.09)*		1990-99	0.51	*(0.09)*
2000-07	0.35	*(0.26)*		2000-07	0.35	*(0.24)*
1980-94	0.63	*(0.11)*		1980-94	0.63	*(0.10)*
1981-95	0.63	*(0.11)*		1981-95	0.63	*(0.11)*
1982-96	0.62	*(0.12)*		1982-96	0.62	*(0.11)*
1983-97	0.61	*(0.11)*		1983-97	0.60	*(0.11)*
1984-98	0.58	*(0.11)*		1984-98	0.58	*(0.10)*
1985-99	0.55	*(0.10)*		1985-99	0.55	*(0.09)*
1986-2000	0.53	*(0.09)*		1986-2000	0.53	*(0.09)*
1987-2001	0.50	*(0.09)*		1987-2001	0.50	*(0.09)*
1988-2002	0.49	*(0.10)*		1988-2002	0.49	*(0.09)*
1989-2003	0.46	*(0.11)*		1989-2003	0.46	*(0.10)*
1990-2004	0.44	*(0.12)*		1990-2004	0.44	*(0.11)*
1991-2005	0.43	*(0.13)*		1991-2005	0.43	*(0.12)*
1992-2006	0.40	*(0.15)*		1992-2006	0.40	*(0.14)*
1993-2007	0.38	*(0.16)*		1993-2007	0.39	*(0.15)*
Numbers in the parentheses are standard errors.						
All Coefficients are signifiacnt with a 1% level.						

Table 3. Unit Root and Cointegration Tests

Panel unit root test (Levin, Lin, Chu test)					Panel unit root test (Im, Pesaran, Shin test)				
S/Y	0.17	Δ(S/Y)	-9.58**		S/Y	0.30	Δ(S/Y)	-9.05**	
I/Y	0.27	Δ(I/Y)	-11.19**		I/Y	-0.32	Δ(I/Y)	-10.39**	
Panel Cointegration Test (Pedroni residual cointegration test with max lag length 2)									
(S/Y, I/Y)	0.75	v-Statistics							
	-0.56	rho-Statistics							
	-0.88	PP-Statistics							
	0.33	ADF-Statistics							
Asian aggregate data exludes Japan.									
Cointegration test statistics for four variable cases are for the null hypothesis that none of the variables are cointegrated.									
Panel unit root and cointegration test results used the data of 10 emerging Asian countries.									
** Reject the null hypothesis with 1% level. * Reject the null hypothesis with 5% level.									

Table 4. The Role of Domestic, Regional, and Global Saving

East Asia includes 11 East Asian countries, including Japan.

Global aggregate includes G6 countries, excluding Japan.

$$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_{it}^G}{Y_{it}^G} + \varepsilon_{it}$$

(1) Full Period Estimation

		Fixed Effect	Instrumental Variable
Reg1	β	0.41**	0.40**
		(0.08)	*(0.09)*
Reg2	β	0.38**	0.35**
		(0.09)	*(0.09)*
	γ	0.43*	0.66*
		(0.20)	*(0.22)*
Reg3	β	0.41**	0.38**
		(0.09)	*(0.09)*
	δ	0.04	0.14
		(0.32)	*(0.34)*
Reg 4	β	0.38**	0.35**
		(0.09)	*(0.09)*
	γ	0.48*	0.71**
		(0.21)	*(0.24)*
	δ	-0.21	-0.26
		(0.34)	*(0.36)*

(2) Sub-Period Estimation (Fixed Effect)

	β	γ	δ
1980-94	0.36**	-0.29	0.32
1981-95	0.33**	-0.17	0.20
1982-96	0.29**	-0.36	0.03
1983-97	0.28*	-0.35	-0.05
1984-98	0.33**	-0.02	0.57
1985-99	0.22	1.15**	0.36
1986-2000	0.18	1.03**	-0.11
1987-2001	0.34*	1.19**	-0.49
1988-2002	0.39**	1.21**	-0.28
1989-2003	0.37*	1.10**	-0.31
1990-2004	0.38**	0.75**	-0.16
1991-2005	0.44**	0.70*	-0.17
1992-2006	0.43**	0.69*	-0.14
1993-2007	0.33*	0.79*	-0.11

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 5. The Role of Regional and Global Saving

East Asia includes 11 East Asian countries, including Japan.
Global aggregate includes G6 countries, excluding Japan.

$$\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S_{it}^R}{Y_{it}^R} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S_{it}^G}{Y_{it}^G} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it}$$

		Fixed Effect	Instrumental Variable
Reg1	γ	0.60**	0.61**
		(0.08)	*(0.08)*
Reg2	δ	0.58**	0.59**
		(0.09)	*(0.09)*
Reg3	γ	0.54**	0.74**
		(0.20)	*(0.23)*
	δ	0.07	-0.13
		(0.21)	*(0.23)*

The numbers in parenthesis are standard errors.
**: significant at 1% level, *: significant with 5% level

Table 6. The Role of Domestic, Regional, and Global Saving

East Asia includes 10 East Asian countries, excluding Japan.

Global aggregate includes G7 countries, including Japan.

$$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_{it}^G}{Y_{it}^G} + \varepsilon_{it}$$

(1) Full Period Regression

		Fixed Effect	Instrumental Variable
Reg1	β	0.40**	0.40**
		(0.09)	*(0.09)*
Reg2	β	0.39**	0.39**
		(0.09)	*(0.09)*
	γ	0.11	0.19
		(0.19)	*(0.20)*
Reg3	β	0.37**	0.35**
		(0.09)	*(0.09)*
	δ	0.55	0.59
		(0.35)	*(0.36)*
Reg 4	β	0.37**	0.35**
		(0.09)	*(0.09)*
	γ	-0.01	0.02
		(0.21)	*(0.23)*
	δ	0.55	0.80*
		(0.38)	*(0.41)*

(2) Sub-Period Regression (Fixed Effect)

	β	γ	δ
1980-94	0.38**	-0.22	0.08
1981-95	0.33**	-0.11	0.06
1982-96	0.31**	-0.17	-0.42
1983-97	0.29*	-0.07	-0.39
1984-98	0.32**	-0.12	0.61
1985-99	0.17	-0.32	2.56**
1986-200	0.14	-0.22	2.87**
1987-200	0.31*	-0.29	2.40**
1988-200	0.33*	-0.26	2.06*
1989-200	0.33*	-0.03	1.54
1990-200	0.35*	0.03	1.39
1991-200	0.41**	0.09	1.32
1992-200	0.41**	0.10	1.32
1993-200	0.32*	0.08	1.35

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 7. The Role of Japanese Saving

East Asia includes 10 East Asian countries, excluding Japan.

Global aggregate includes G6 countries, excluding Japan.

$$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_{it}^G}{Y_{it}^G} + \rho \frac{S_{it}^J}{Y_{it}^J} + \varepsilon_{it}$$

(1) Full Period Regression

	Fixed Effect	Instrumental Variable
β	0.38**	0.32**
	(0.09)	*(0.09)*
γ	-0.05	-0.27
	(0.20)	*(0.24)*
δ	-0.37	-0.48
	(0.38)	*(0.47)*
ρ	0.70**	1.11**
	(0.25)	*(0.29)*

(2) Sub-Period Regression (Fixed Effect)

	β	γ	δ	ρ
1980-94	0.36**	-0.27	0.41	-0.26
1981-95	0.32**	-0.12	0.22	-0.16
1982-96	0.29**	-0.24	-0.01	-0.32
1983-97	0.27*	-0.13	-0.09	-0.33
1984-98	0.32**	-0.02	0.58	-0.02
1985-99	0.21	-0.05	0.25	1.23**
1986-2000	0.17	-0.05	-0.14	1.24**
1987-2001	0.31*	-0.18	-0.34	1.34**
1988-2002	0.34*	-0.21	-0.26	1.46**
1989-2003	0.32*	-0.14	-0.36	1.41**
1990-2004	0.32*	-0.25	-0.26	1.32**
1991-2005	0.37*	-0.33	-0.45	1.54**
1992-2006	0.36*	-0.31	-0.40	1.52**
1993-2007	0.19	-0.97*	-0.43	2.59**

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 8. The Role of Regional, Global, and Japanese Saving

(1)

East Asia includes 10 East Asian countries, excluding Japan.

Global aggregate includes G7 countries, including Japan.

$$\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S_{it}^R}{Y_{it}^R} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S_{it}^G}{Y_{it}^G} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it}$$

		Fixed Effect	Instrumental Variable
Reg1	γ	0.54**	0.56**
		(0.09)	*(0.09)*
Reg2	δ	0.63**	0.64**
		(0.09)	*(0.09)*
Reg3	γ	0.00	0.07
		(0.20)	*(0.21)*
	δ	0.63**	0.57**
		(0.22)	*(0.23)*

(2)

East Asia includes 10 East Asian countries, excluding Japan.

Global aggregate includes G7 countries, excluding Japan.

$$\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S_{it}^R}{Y_{it}^R} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S_{it}^G}{Y_{it}^G} - \frac{S_{it}}{Y_{it}}\right) + \rho\left(\frac{S_{it}^J}{Y_{it}^J} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it}$$

	Fixed Effect	Instrumental Variable
γ	-0.01	0.07
	(0.19)	*(0.21)*
δ	-0.12	-0.29
	(0.26)	*(0.29)*
ρ	0.75**	0.85**
	(0.25)	*(0.28)*

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 9. Effects of Productivity Shocks on Saving and Investment

$\Delta(I/Y)_t=\alpha I+\beta I\Delta(prod\ sh)_t$														
$\Delta(S/Y)_t=\alpha S+\beta S\Delta(prod\ sh)_t$														
(No lag)														
Country	China	HK	Ind	Kor	Mal	Phi	Sing	Taw	Thai	Viet	Jap	Asian agg	G6 agg	G7 agg
βI_t	0.02	0.06	0.23*	0.21*	0.45**	0.48**	0.17	0.21*	0.54**	0.2*	0.18**	0.20**	0.22	0.22*
	(0.03)	*(0.06)*	*(0.11)*	*(0.08)*	*(0.13)*	*(0.11)*	*(0.10)*	*(0.10)*	*(0.10)*	*(0.09)*	*(0.04)*	*(0.07)*	*(0.11)*	*(0.11)*
βS_t	0.01	0.04	0.09	0.06	0.07	0.28**	0.12*	0.28**	0.05	0.12	0.16**	0.13*	0.18*	0.20*
	(0.02)	*(0.05)*	*(0.10)*	*(0.06)*	*(0.08)*	*(0.07)*	*(0.06)*	*(0.06)*	*(0.05)*	*(0.10)*	*(0.03)*	*(0.06)*	*(0.09)*	*(0.09)*
(One lag)														
Country	China	HK	Ind	Kor	Mal	Phi	Sing	Taw	Thai	Viet	Jap	Asian agg	G6 agg	G7 agg
βI_t	0.03	0.16	0.23*	0.26**	0.51**	0.49**	0.17	0.21*	0.5**	0.17	0.16**	0.20**	0.22	0.25*
	(0.03)	*(0.08)*	*(0.11)*	*(0.08)*	*(0.13)*	*(0.14)*	*(0.10)*	*(0.09)*	*(0.10)*	*(0.13)*	*(0.03)*	*(0.08)*	*(0.12)*	*(0.11)*
βI_t-1	0.04	-0.15	0.05	0.06	-0.01	-0.02	-0.04	0.11	0.16	0.04	0.11**	-0.01	-0.06	-0.05
	(0.03)	*(0.08)*	*(0.11)*	*(0.08)*	*(0.13)*	*(0.14)*	*(0.10)*	*(0.10)*	*(0.10)*	*(0.13)*	*(0.03)*	*(0.07)*	*(0.12)*	*(0.11)*
βS_t	0.00	0.06	0.09	0.06	0.04	0.26**	0.12*	0.27**	0.02	0.20	0.15**	0.12	0.18	0.20
	(0.02)	*(0.07)*	*(0.11)*	*(0.06)*	*(0.08)*	*(0.09)*	*(0.06)*	*(0.06)*	*(0.06)*	*(0.15)*	*(0.02)*	*(0.06)*	*(0.09)*	*(0.10)*
βS_t-1	-0.01	-0.01	0.03	-0.01	0.00	0.04	0.00	-0.02	0.06	-0.12	0.1**	0.03	0.00	0.04
	(0.02)	*(0.06)*	*(0.11)*	*(0.06)*	*(0.08)*	*(0.09)*	*(0.06)*	*(0.06)*	*(0.06)*	*(0.14)*	*(0.02)*	*(0.06)*	*(0.09)*	*(0.10)*

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 10. The Role of Domestic, Regional, and Global Saving (Controlling for Shocks)

East Asia includes 11 East Asian countries, including Japan.

Global aggregate includes G6 countries, excluding Japan.

(1) $\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_{it}^G}{Y_{it}^G} + \varepsilon_{it}$

		Fixed Effect	Instrumental Variable
Reg1	β	0.20**	0.21**
		(0.07)	*(0.07)*
Reg2	β	0.19**	0.19**
		(0.07)	*(0.07)*
	γ	0.20	0.22
		(0.21)	*(0.21)*
Reg3	β	0.22**	0.23**
		(0.07)	*(0.07)*
	δ	-0.43	-0.41
		(0.28)	*(0.28)*
Reg 4	β	0.21**	0.22**
		(0.07)	*(0.07)*
	γ	0.39	0.39
		(0.22)	*(0.23)*
	δ	-0.62*	-0.63*
		(0.30)	*(0.30)*

(2) $\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S_{it}^R}{Y_{it}^R} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S_{it}^G}{Y_{it}^G} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it}$

		Fixed Effect	Instrumental Variable
Reg1	γ	0.72**	0.71**
		(0.07)	*(0.07)*
Reg2	δ	0.66**	0.64**
		(0.07)	*(0.07)*
Reg3	γ	0.69**	0.73**
		(0.15)	*(0.15)*
	δ	0.04	-0.04
		(0.15)	*(0.15)*

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 11. The Role of Domestic, Regional, and Global Saving (Controlling for Shocks)

East Asia includes 10 East Asian countries, excluding Japan.

Global aggregate includes G7 countries, including Japan.

(1) $\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S_{it}^R}{Y_{it}^R} + \delta \frac{S_{it}^G}{Y_{it}^G} + \varepsilon_{it}$

		Fixed Effect	Instrumental Variable
Reg1	β	0.20**	0.20**
		(0.08)	*(0.07)*
Reg2	β	0.19**	0.20**
		(0.08)	*(0.07)*
	γ	0.08	0.12
		(0.16)	*(0.16)*
Reg3	β	0.21**	0.22**
		(0.08)	*(0.08)*
	δ	-0.34	-0.32
		(0.30)	*(0.29)*
Reg 4	β	0.21**	0.21**
		(0.08)	*(0.08)*
	γ	0.14	0.17
		(0.17)	*(0.17)*
	δ	-0.41	-0.28
		(0.31)	*(0.31)*

(2) $\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S_{it}^R}{Y_{it}^R} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S_{it}^G}{Y_{it}^G} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it}$

		Fixed Effect	Instrumental Variable
Reg1	γ	0.63**	0.64**
		(0.07)	*(0.07)*
Reg2	δ	0.72**	0.70**
		(0.08)	*(0.08)*
Reg3	γ	0.29*	0.41**
		(0.14)	*(0.14)*
	δ	0.44**	0.31*
		(0.15)	*(0.15)*

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level

Table 12. The Role of Japanese Saving (Controlling for Shocks)

East Asia includes 10 East Asian countries, excluding Japan.

Global aggregate includes G6 countries, excluding Japan.

(1) $$\frac{I_{it}}{Y_{it}} = \alpha_i + \beta \frac{S_{it}}{Y_{it}} + \gamma \frac{S^R_{it}}{Y^R_{it}} + \delta \frac{S^G_{it}}{Y^G_{it}} + \rho \frac{S^J_{it}}{Y^J_{it}} + \varepsilon_{it}$$

	Fixed Effect	Instrumental Variable
β	0.20**	0.21**
	(0.08)	*(0.08)*
γ	-0.02	0.09
	(0.17)	*(0.18)*
δ	-0.91*	-0.83*
	(0.38)	*(0.41)*
ρ	0.59	0.45
	(0.35)	*(0.37)*

(2) $$\frac{I_{it}}{Y_{it}} - \frac{S_{it}}{Y_{it}} = \alpha_i + \gamma\left(\frac{S^R_{it}}{Y^R_{it}} - \frac{S_{it}}{Y_{it}}\right) + \delta\left(\frac{S^G_{it}}{Y^G_{it}} - \frac{S_{it}}{Y_{it}}\right) + \rho\left(\frac{S^J_{it}}{Y^J_{it}} - \frac{S_{it}}{Y_{it}}\right) + \varepsilon_{it}$$

	Fixed Effect	Instrumental Variable
γ	0.21	0.33*
	(0.14)	*(0.15)*
δ	-0.12	-0.12
	(0.20)	*(0.20)*
ρ	0.67**	0.52**
	(0.19)	*(0.21)*

The numbers in parenthesis are standard errors.

**: significant at 1% level, *: significant with 5% level