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Does international reserve accumulation crowd out domestic private investment?

Wishnu Mahraddika*

Abstract: Foreign exchange reserve accumulation is one of the preferred strategies to protect against susceptibility to financial crises. At the same time, maintaining a healthy international reserve position has the potential to promote domestic investment by reducing the cost of foreign borrowing through improving international creditworthiness. However, contractionary monetary policy in the form of sterilization operations implemented as part of reserve accumulation strategy could crowd out financing for domestic investment. This study examines the relationship between foreign reserve accumulation and domestic private investment by undertaking a dynamic panel data econometric analysis covering 58 countries over the period 2000–2014. The findings suggest that reserve accumulation is positively associated with domestic private investment in the long run.

Keywords: Reserves; Investment; Panel ARDL estimator

JEL: E2; E5; F30; F4; G15

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1. Introduction

After a series of economic crisis in various parts of the world during the 1990s, there has been a significant increase in the world international reserves. The stock of international reserves (excluding gold) in 2016 was more than US$9 trillion, up from around US$0.5 trillion in the early 1980s. While China, Japan, and Saudi Arabia account for the lion's share of world reserves, reserve holdings of countries directly affected by financial crises, in particular, those in East Asia, have increased at a faster rate over the past two decades [1].

Reserve accumulation is a strategy to cushion the domestic economy in the face of significant capital reversals or a sudden stop of capital inflows due to abrupt changes in the assessment of global market risk. Another benefit of having an adequate amount of reserves is the capability to intervene in the domestic foreign exchange market to manage the exchange rate in order to maintain international competitiveness of the economy (Bird and Mandilaras, 2005, Aizenman and Lee, 2007, Obstfeld et al., 2010, Aizenman et al., 2015).

Aside from these benefits, there are both positive and negative economic implications associated with reserve accumulation. The most obvious negative implication is the 'carrying cost' due to the positive spread between the nation's external borrowing rate and the return from the investment of the foreign asset (Rodrik, 2006). Another possible implication, which remains relatively understudied, is the impact on domestic investment. Fukuda and Kon (2012)

* Arndt Corden Department of Economics, Crawford School of Public Policy. I would like to bestow my appreciation to Professor Prema-chandra Athukorala for guidance, Dr. Megan Poore for editorial help and the two anonymous referees of *International Economics* for valuable comments.

[1] Based on the statistics from 113 countries with complete series of international reserves position for 1980 – 2016 period from International Monetary Fund, *International Financial Statistics* database (http://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B).

find a positive relationship between foreign reserves and domestic gross fixed capital formation. The authors interpreted this finding as an outcome of the ability to draw on foreign financing under favourable terms thanks to macroeconomic resilience assured by a healthy reserve position. However, studies by Cook and yetman (2012), Lee and Choi (2010), and Reinhart et al. (2016) indicate a negative relationship between reserves accumulation and domestic investment. The authors infer this result as evidence of funnelling domestic savings that could have been used to finance domestic investments into international reserves.

The purpose of this paper is to contribute to the fledgling literature on the implications of international reserves accumulation for domestic investment. Compared to prior studies, the paper offers significant improvements in three dimensions. First is the specific focus on private investment. Previous analyses have focussed on total investment that includes both private and public investment. However, the implicit homogeneity assumption of combining private and public investment is debatable because the latter is determined by different factors, including some non-economic considerations. Second, the association between the reserve accumulation and domestic private investment is examined using an investment function, which incorporates fundamental determinants of investment such as output and the cost of capital. Third, the dynamic panel data estimator (ARDL) used in the paper enables to distinguish between the long-run (steady state) and short-run relationship between reserve accumulation and investment, while controlling for country-specific heterogeneity.

The results suggest that, overall, reserve accumulation is positively associated with private investment: a mild negative short-run relationship, which is marginally statistically significant, is more than counterbalanced by a stronger long-run (steady-state) relationship. This result is robust to the use of alternative specifications of the investment function and its estimation for different subsamples of the countries.

The rest of the paper is organised as follows: The next section undertakes an interpretative survey of the literature on the determinants of reserve accumulation with emphasis on the postulated impact on domestic investment to provide the context for the ensuing empirical analysis. The specification of the estimating equation is discussed in Section 3. Section 4 discusses data sources and variable construction followed by the estimation method in Section 5. Results are discussed in the context of the existing literature in Section 6. The final section summarizes the findings.

2. Reserves accumulation and domestic investment

There is a sizeable literature on the underlying economic motives for reserve accumulation by individual countries. One reason behind reserve accumulation is providing insurance against temporary external shocks. In this case, the monetary authority chooses to hold reserves to meet an unanticipated increase in demand for foreign exchange to avert a domestic financial crisis (Heller, 1966). Flood et al. (2001) find that, aside from the variability in the balance of payments, there is a significant role for exchange rates volatility and openness to trade and capital flows in explaining the behaviour of reserves accumulation. Maintaining international competitiveness through undervalued real exchange rate is another possible motive for countries to accumulate international reserves (Bird and Mandilaras, 2005; Aizenman and Lee, 2007; Obstfeld et al., 2010; Aizenman et al., 2015).

Side by side with the sizeable literature on the motives for reserve accumulation, some studies have focused on its economic costs. Rodrik (2006) asserts that the cost of holding international reserves amounts have been increased to about 1% of GDP per annum for developing countries from 1990 to 2004. This cost is estimated based on the disparity between the return of liquid foreign assets and the nation's external borrowing rate. Also, the authority

that chooses to hold a certain amount of foreign reserves must be willing to bear the opportunity cost of not investing in assets with a better return. Other studies postulate that international reserve accumulation could lead to distortions in the banking sector, asset price bubbles and welfare losses due to forced saving and reduced consumption under limited capital account openness (Mohanty and Turner, 2006; Filardo and Yetman, 2012; and Jeanne, 2012).

The impact of the accumulation of foreign exchange reserves on domestic investment can occur through various channels. First, the domestic liquidity management of the central bank to limit the inflationary and exchange rate appreciation pressure resulting from the accumulation of reserves[2] can negatively affect private domestic investment through the lower availability of liquidity or higher cost of fund. To offset the excess liquidity caused by the intervention, the central bank can sell some of its stock of government bonds or issuing central bank certificates (sterilized intervention). In a thin and imperfect financial market, this strategy often increases the interest rates on securities used for intervention (Turner, 1991; and Frankel, 1994). Another less costly way for the central bank to reduce the liquidity is by increasing the required reserves of the banking sector. Observations by Garton (2004) and Filardo and Grenville (2012) show the increase of international reserves in the asset side of the central bank's balance sheet does not always correspond to an equivalent increase of the base money. Therefore, the domestic liquidity management necessitated by the accumulation of foreign reserves could lower the liquidity or push-up the cost of fund, both of which can adversely impact the domestic private investment.

The second possible effect is through the fiscal balance. In a situation where the return on domestic bonds is higher than the return from the investment of foreign reserves, an increase

[2] The central bank can accumulate foreign exchange reserves in two ways: by borrowing foreign foreign exchange by directly issuing securities or through swap arrangements with the domestic banks and buying from the domestic foreign exchange market. The latter approach has the consequence of increasing domestic money supply resulting in inflationary pressure and hence real exchange rate appreciation.

in reserve holdings by the central bank reduces the amount of profits going to the treasury.[3] This, in turn, could reduce government expenditure or increase taxes, both of which could impair domestic private investments.

Third, foreign reserves level can have a positive impact on investment through lowering the cost of foreign borrowing or through real exchange rate undervaluation. Fukuda and Kon (2012) develop a framework that shows that as the economy build-up its reserves, the ratio between foreign liabilities of the country and reserves decreases, which lowers the cost of foreign borrowing by improving market confidence of the external financial position of the country.

On the empirical side, Fukuda and Kon (2012) provide evidence based on cross-section regression of 134 countries and period of 1980-2004 that confirms the positive relationship between the level of reserves and domestic investment. By contrast, Reinhart et al. (2016), by applying VAR approach to data for eight Asian countries (India, Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Singapore, Thailand) over the period 1980 - 2014, find that increase in reserves reduces domestic investment. They attributed the negative impact to the channelling of domestic savings from domestic investment to acquiring foreign reserves. The authors note that this finding is consistent with the failure of investment rate in Asian countries during the post the 1997 crisis years to recover to the pre-crisis levels. This inference is consistent with the discussion reported in Cook and yetman (2012) and Lee and Choi (2010). Cook and yetman (2012) depict a negative relationship between the central bank's balance sheet expansion and domestic investment in Asian countries. The results reported in Lee and Choi (2010) for a sample of advanced and emerging-developing Asian economies for the

[3] This forgone income does not enter the central bank's balance sheet as a loss since it is only an imputed opportunity cost.

period of 1980-2008 indicate a negative association between domestic investment and excess accumulation of international reserves accompanied by sterilization.

3. The model

To test the relation between foreign reserves accumulation and domestic private investments, this paper estimates an investment function that includes foreign reserves as one of its explanatory variables. There is a large volume of literature on the determinants of investment in the economy. The empirical strand of the literature has explored a range of approaches such as the accelerator, neoclassical, Tobin's Q models and Euler equations (Chirinko, 1993 and Caballero, 1999). Regarding prediction performance and data availability, models based on the accelerator and neoclassical models are preferable compared to Tobin's Q and Euler equations-based models (Oliner et al., 1995), which emphasize the financial market's ability to assign prices for investment opportunities properly. Dixit and Pindyck (1994), Bloom et al. (2007), Bloom (2009), and Baum et al. (2010) provide another extension of the investment literature by investigating the effect of uncertainty on investment.

The investment function used in this paper is a modified version of the neoclassical approach pioneered by Jorgenson (1967). The original version of the function is derived for the profit-maximising representative firms using a Cobb Douglas production function, which assumes that the firm is a price taker in the factor market. According to this approach, the two main determinants of private investment are output (Y)[4] and the cost of capital (CoC). The

[4] The output variable should be the expected output of the representative firm. To adopt the model in the aggregate setting, it is assumed that the representative firm's output is proportional to the total output of the economy.

desired capital stock (K^*) has a negative relationship with *CoC* and a positive association with *Y* (equation 1).

$$K_t^* = \frac{\rho Y_t}{CoC_t} \tag{1}$$

Three key factors determine the cost of capital[5]: the interest rate i_t, which is a measure of the opportunity cost of investing in other assets; the depreciation rate of the capital goods (δ_t); and capital gain/loss due to changes in the price of capital goods (P_t^k). To express the cost in real terms, the interest rate is adjusted by the expected inflation of capital goods π_t^k and other terms normalized by the general deflator (P_t).

$$CoC_t = \frac{P_t^k}{P_t}(i_t - \pi_t^k + \delta_t) \tag{2}$$

Changes in the capital stock is the adjustment of the previous capital stock with the desired capital stock

$$\Delta K_t = \beta(K_t^* - K_{t-1}) \tag{3}$$

or

$$K_t = \beta K_t^* + (1-\beta)K_{t-1} \tag{3a}$$

where K_t is the actual capital stock, hence ΔK_t is the net investment. β is the coefficient of adjustment that accommodates the partial adjustment mechanism, which could be related to changing economic conditions (Blejer and Khan, 1984).

The investment data recorded on the national accounts refer to the gross investment that consists of net investment and the replacement investment. Assuming the replacement

[5] In general, the calculation of the cost of capital follows the work of Athukorala (1998) and Terrones and Cardarelli (2005)

investment follows a linear function of the lagged capital stock, the representation of the gross investment (I_t) is as follows

$$I_t = \Delta K_t + cK_{t-1} \tag{4}$$

alternatively, by using lag operator L, we have

$$I_t = (1 - (1 - c)L)K_t \tag{5}$$

Based on equation (3a), (5) and (1), we can re-express the basic investment equation as follows[6]

$$I_t = \beta\rho(1 - (1 - c)L)\frac{Y_t}{CoC_t} + (1 - \beta)I_{t-1} \tag{6}$$

Based on equation (6), investment is not only determined by the output (Y_t) and the cost of capital (CoC_t), but also by the adjustment coefficient β. This study hypothesizes β varies with the economic factors namely government investment, institutional quality, and the international reserves, which is the focus of this study. Under constrained financial and physical resources, government investment can negatively affect private investment. On the other hand, government investments in the form of provision of physical infrastructures, and essential health and education services can support private investment (Devarajan 1996, and Khan 2014). Supportive institutional quality is also important for investment (Svensson 1998, and Buchanan et al. 2012). As for the international reserves, following the discussion in the previous section, the direction of the relationship with the domestic investment is debatable.

For the empirical analysis, the estimation equation applied is:

$$PI = f\{Y, CoC, IR, GI, IQ\} \tag{7}$$

where PI is private investment, and the explanatory variables, with the expected sign of the coefficients given in parentheses, are listed below:

[6] For details on the derivation procedure refer to Blejer and Khan (1984)

$Y(+)$	output
$CoC(-)$	cost of capital
$IR(+/-)$	international reserves
$GI(+/-)$	government investment
$IQ(+)$	institutional quality

4. Data

4.1 Sources

Most of the data are compiled from the World Bank and the International Monetary Fund (IMF) databases[7]. Considering the data availability, the balanced panel data set used for the regression analysis consists of 58 countries[8], which covers the recent period of 2000 – 2014. These countries accounted for more than 70% of the total reserves in the world during this period and are representative of global trends in reserve accumulation during this period. For private investment, these countries cover 67% of total private investment recorded in the database during this period.

Data on private and government investment are from the IMF Investment and Capital Stock Dataset (2017)[9]. Data on international reserves (total reserves net of monetary gold) is obtained from the International Financial Statistics (IFS) database. Gold is excluded because it is less liquid compared to other assets that are classified as reserves. The institutional quality variable is represented by the control of corruption index obtained from the Worldwide

[7] World Bank database: https://datacatalog.worldbank.org/dataset/world-development-indicators; IMF database: http://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B

[8] **Advanced economies:** Australia, Czech Republic, Israel, Japan, South Korea, Singapore, Switzerland, United Kingdom, United States; **Emerging markets:** Albania, Algeria, Argentina, Armenia, Azerbaijan, Belarus, Botswana, Brazil, Bulgaria, Chile, China, Costa Rica, Dominican Republic, Egypt, Arab Rep., Guatemala, Hungary, India, Indonesia, Lebanon, Macedonia - FYR, Malaysia, Mauritius, Mexico, Namibia, Panama, Paraguay, Peru, Philippines, South Africa, Swaziland, Thailand, Ukraine, Uruguay; **Developing countries:** Bangladesh, Bolivia, Gambia, Haiti, Honduras, Kenya, Republic of Kyrgyz, Moldova, Mozambique, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Vietnam. The country grouping is based on the IMF classification.

[9] The investment and capital stock dataset (https://www.imf.org/external/np/fad/publicinvestment/#5) provides the nominal GDP in local currency unit and GDP in constant 2011 international dollars, which is used to derive the implicit conversion factor.

Governance Indicators (World Bank)[10]. Data for other variables are extracted from the World Development Indicators (WDI) (World Bank) and the World Economic Outlook (WEO) (International Monetary Fund).

Cost of capital is calculated using the deflator of gross fixed capital formation and GDP, and the bank lending interest rate from WDI. The depreciation rate is estimated from the IMF investment and capital stock dataset. For the expected inflation of capital goods, one period lag of gross fixed capital formation deflator is utilised.

As discussed in the previous section, the investment function was derived for a representative profit-maximizing firm which may not be perfectly suitable to estimate the country level aggregate investment since in the national account, GDP which is the proxy used for output, include domestic investment. Therefore, the output variable used here is constructed by deducting domestic investment from GDP to better reflect the domestic demand that is more relevant for the determination of investment.

In estimating the model, GDP (net of investment), private investment, and international reserves are converted to constant 2011 international dollars and then transformed into natural logarithms. The logarithms transformation also applied to the cost of capital. The government investment enters the estimation as a ratio to GDP, while the corruption index enters the estimation without any transformation.

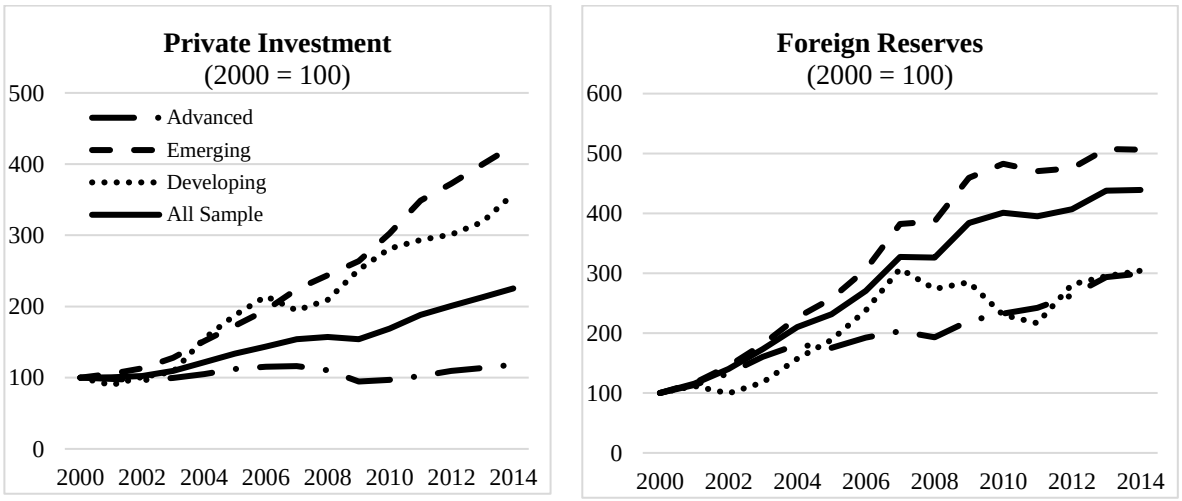
4.2 A first look at the data

In general, the level of private investment in the countries covered in this study during the sample period (2000-2014) shows an increasing trend. When countries are grouped by income levels, the increasing trend of domestic private investment is much faster in emerging

[10] The missing observation for year 2001 is approximated by the average of observation in year 2000 and 2002.

and developing economies compared to the high-income countries. Between 2000 and 2014 the amount of investment in the two former groups of countries has increased by about fourfold. Meanwhile, for high-income countries, there was a modest increasing trend in the period 2000-2007 followed by a sharp decline during the global financial crisis, and the returning to pre-crisis levels by 2014 (Figure 1, left panel).

As for the foreign reserves, the largest increase occurred in emerging economies. The increase was mainly driven by China. China's foreign reserves holding represents almost 50% of the sample's foreign reserves position or equivalent to almost 60% of emerging economies' foreign reserves. Other Asian countries, especially those affected by the 1997-98 financial crisis have generally indicated faster reserve accumulation, though from low initial bases. Meanwhile, foreign reserves for other countries have also increased, but at a lower rate (Figure 1, right panel).



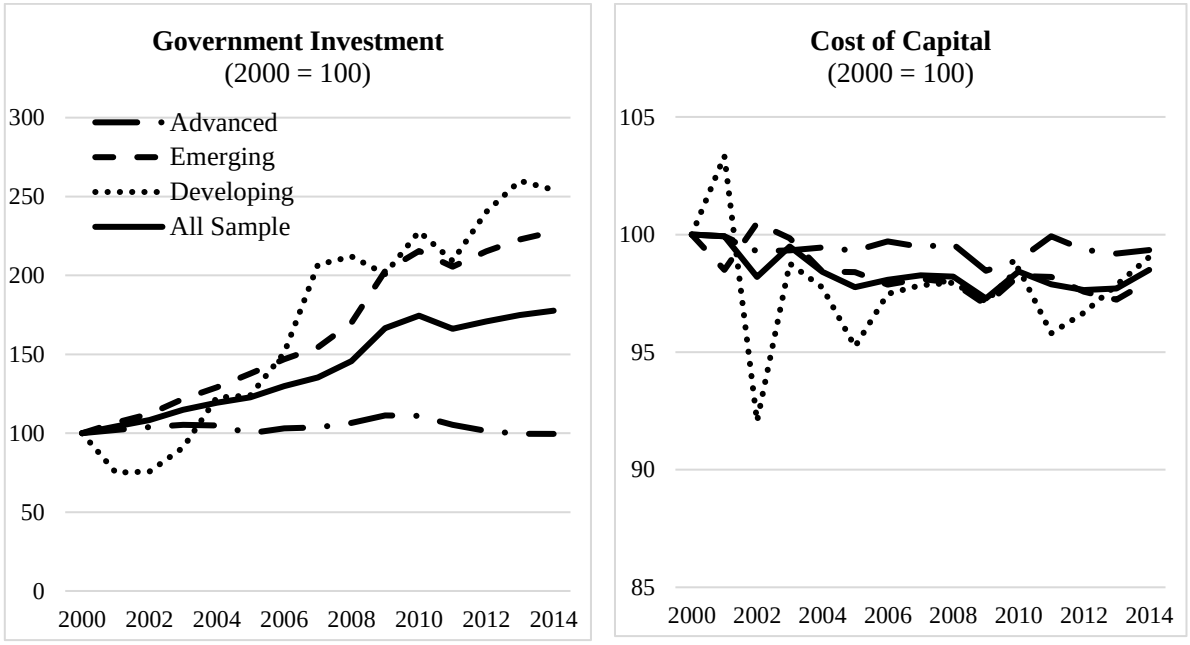
Source: Data compiled from the IMF and World Bank

Figure 1. Private investment and foreign reserves 2000 – 2014

Government investment also shows an increasing trend in emerging and developing economies (Figure 2 – left panel). For advanced economies, the level of government investment is relatively stable and showed a positive trend in the period of the global financial crisis in

2008 - 2010. The slight increase in the level of government investment during this period could be related to the initiative to withstand the economic slowdown by increasing public spending.

The cost of capital index moved relatively steady over the sample period showing, on average, a gradually declining trend. From the aspect of volatility, the movement of the cost of capital in developing countries is more dynamic compared to other groups of countries (Figure 2 – right panel).



Source: Data compiled from the IMF and World Bank

Figure 2. Government investment and cost of capital 2000 – 2014

5 Estimation method

The model is estimated using the dynamic panel time-series approach (Pesaran, 2015). This approach is suitable for capturing cross-sectional feature among countries and the dynamic interaction between investment and international reserves in an autoregressive distributed lag (ARDL) model setting. Other than the possibility to accommodate variables in the form of level and differences with different lags, as explained in Pesaran (2015), the models have *' the advantage that they are robust to integration and cointegration properties of the*

regressors, and for sufficiently high lag-orders could be immune to the endogeneity problem, at least as far as the long-run properties of the model are concerned'.

Three are three alternative ARDL estimator suitable for datasets with a relatively large observation of *N* groups and *T* periods[11]. The mean group (MG) estimator estimates individual regressions for each group and therefore allows for coefficient heterogeneity both in the long and short run part of the ARDL model. The dynamic fixed effect (DFE) estimator pools data from different panels into one panel, resulting in homogenous slope coefficients and error variances while only allowing heterogeneity in the intercept term. The pooled mean group (PMG) estimator forms the middle ground of MG and DFE. It presumes homogeneity for the long-run coefficients while allowing for heterogeneity in the short-run coefficients (including the error correction term coefficient) (Pesaran et al., 1999).

The autoregressive distributed version with one period lag[12] of Equation (7) takes the following form,

$$\begin{aligned} PI_{it} = \ & \mu_i + \delta'_{Y,0} Y_{i,t} + \delta'_{Y,1} Y_{i,t-1} + \delta'_{CoC,0} CoC_{i,t} + \delta'_{CoC,1} CoC_{i,t-1} + \delta'_{IR,0} IR_{i,t} \\ & + \delta'_{IR,1} IR_{i,t-1} + \delta'_{GI,0} GI_{i,t} + \delta'_{GI,1} GI_{i,t-1} + \delta'_{IQ,0} IQ_{i,t} \\ & + \delta'_{IQ,1} IQ_{i,t-1} + \gamma_i PI_{i,t-1} + \ \varepsilon_{it} \end{aligned} \tag{8}$$

where μ_i denotes the country fixed effects. By gathering the control variables in matrix X, the dynamic panel model with the long-run and short-run relation can be expressed as follows

$$\Delta PI_{it} = \vartheta_i \left(PI_{i,t-1} - \beta_i' X_{i,t-1} \right) + \delta_{1i}' \Delta X_{i,t} \ + \ \mu_i + \ \varepsilon_{it} \tag{9}$$

where $\Delta PI_{it} = PI_{it} - PI_{i,t-1}$, $\vartheta_i = -(1 - \gamma_i)$, and β_i' is the sum of $\delta_{p,q}'$ in equation (8) normalized by $1 - \gamma_i$. β_i' and δ_{1i}' is the the explanatory variables' long-run and short-run

[11] Relatively large N groups compared to time series standard and relatively large T periods compared to panel standard.

[12] It is standard practice to use one period lag when working with annual data. As stated below, in this study an optimal lag length of one is also consistent the Schwarz criterion

parameter respectively. The coefficient ϑ_i represents the error correction term, which implies the existence of cointegration if it is negative and significant.

Before estimating the model, it is important to check the time-series properties of the data. The panel data set used in this study has a larger number of countries compared to the period (N>T). A panel unit root testing method that is suitable for this data characteristic is the Harris – Tzavalis (1999) procedure. Based on the test result (Table 1), most of the variables (private investment, international reserves, and GDP) are non-stationary. In the model, investment is determined by the combination of output, cost of capital, and other factors. Therefore, the combination of variables with different unit root properties could form a cointegration relation. Given the mixed unit root characteristic of the data series, the panel ARDL is applicable with both the level and differenced variables in the estimation.

Table 1. Unit root property test using Harris – Tzavalis method

Variable	Test Statistics			
	Level		First Difference	
	Constant	Constant & Trend	Constant	Constant & Trend
Private investment	0.836	0.513	-0.044***	0.000***
International reserves	0.844	0.557	-0.106***	-0.067***
GDP	0.959	0.615	0.177***	0.259***
Cost of capital	-0.122***	-0.244***	-0.525***	-0.525***
Government investment / GDP	0.723***	0.496**	0.058***	0.082***
Institutional quality	0.763*	0.461**	-0.161***	-0.105***

Note: ***, **, * respectively denotes rejection of the null hypothesis of panels contain unit root at 10%, 5%, and 1% significance level. The test employs the small sample adjustment option.

6. Results and discussion

Bivariate relationship between domestic investment and foreign exchange reserve is first estimated as a benchmark. The control variables are then added successively. All equations are estimated using the three dynamic panel estimators. An optimal lag length of one is selected based on the Schwarz criterion. The results based on the three estimators are broadly similar, but the estimates based on PMG are preferred in terms of the consistency with the analytical

priors and the statistical properties. The Hausman test results confirm that the homogeneity assumption in the long-run element of the PMG estimator is acceptable. This implies that PMG estimators are consistent and more efficient compared to MG estimator. Compared to the DFE estimator, PMG is preferred in terms of better performance in capturing the data variability.

The PMG estimates are reported in Table 4. The alternative estimates of PMG and DFE are given in the Appendix for comparison. The descriptive statistics and the correlation matrix of the variables are provided in Table 2 and Table 3 in order to facilitate interpretation of the results.

Table 2. Descriptive statistics

Variables	Unit	Mean	Standard Deviation	Min	Max
Private investment	2011 PPP international $, billions	160.99	469.77	0.05	4,662.31
International reserves		152.62	592.44	0.00	6,447.58
GDP		704.15	1,851.60	1.62	13,273.40
Cost of capital	Index	280.84	16.99	0.00	496.38
Government investment / GDP	Ratio	0.06	0.05	0.00	0.33
Institutional quality	Index	-0.12	0.91	-1.72	2.33

Number of observations: 870 (58 countries)

Table 3. Correlation between variables

Variables	PI	IR	GDP	CoC	GI	IQ
Log of private investment (PI)	1					
Log of international reserves (IR)	0.74	1				
Log of GDP	0.97	0.75	1			
Log of cost of capital index (CoC)	0.05	0.06	0.04	1		
Government investment / GDP (GI)	0.06	0.22	0.03	0.02	1	
Institutional quality index (IQ)	0.39	0.28	0.32	0.02	0.03	1

According to the base-line regression (Equation 1 in Table 4), one percent increase in reserve levels is associated with a 0.16 percent contraction in private investment in the short-run, but 0.92 percent increase in the long-run. Both coefficients are statistically significant at the 1% level. When control variables are successively added, the magnitude of the coefficients reduce as expected, but the signs remain unchanged, and the significance of the short-term coefficients diminishes. According to the full model (Equation 5 in Table 4), the long run

coefficient estimated is positive and statically significant at the 1% level, suggesting that one percentage change in reserves is associated with 0.1 percent increase in domestic private investment. By contrast, the short run coefficient, which is significant only at the 10% level, suggest a milder negative association of reserve accumulation on investment (- 0.06). All the average error correction terms are negative and significant across all specifications with a range of -0.3 to -0.2. Thus, the results suggest that the overall (steady-state) relationship between reserve accumulation and private investment is positive: a mild negative short-run relationship is counterbalanced by a stronger positive relationship in the long-run with the adjustment period of 3 to 5 years.

The long-run coefficients of all control variables have the expected signs, and most of them are statistically significant. The output is positively and significantly associated with domestic private investment. As for the cost of capital variable, the coefficients across all specifications are statistically significant with the expected negative sign. The ratio of government investment to output has a positive association in the long-run. This is consistent with the nature of government investments that have a relatively long gestation period such as infrastructure, education, and health facilities where the benefits are not realized instantly. Finally, the results suggest a positive long-run association between improvement in institutional quality and private investment.

For the short-run coefficients, some coefficient signs are not in-line with the analytical framework. The inconsistencies may be related to the feature of PMG estimation where the short-run dynamics are determined by the estimated lag structure together with the error-correction parameter for a specific country (Gemmel et al., 2016). Also, Pesaran et al. (1999) caution that, unlike the long-run PMG parameters which are consistent and converge to their asymptotic value in a relatively short time, the time needed for the short-run parameters to

converge is longer. Therefore, given these possible noises, it is not possible to interpret these coefficients with confidence.

The results run counter to the previous studies that have reported a negative association between domestic investment and the accumulation of international reserves. This divergence could be owing to different sample coverage, both in terms of country and period, methodology, variable measurement, and control variables included in the estimation. However, the results are consistent with that of Fukuda and Kon (2012) who find a positive relationship between reserves accumulation and domestic investment through lower cost of investment finance. As discussed (Section 2), there are also other possible channels that could be related to this phenomenon. For instance, a high level of reserves enables countries to intervene in the foreign exchange market and maintain the competitiveness of its tradable sector, which in turn deliver a higher demand for investments. Another possible channel is with adequate reserves, firms could allocate less precautionary savings and able to distribute more expenditure for investments. Moreover, the accumulation of international reserves will be more likely to have a negative effect on investment through domestic liquidity contraction only if it is fully sterilized.

Table 4. Determinants of private investment: PMG estimation

Variable	Pooled Mean Group Estimation				
	1	**2**	**3**	**4**	**5**
Dependent variable: Δ Log of private investment					
Long run coefficients					
Log of reserves	0.923***	0.274***	0.253***	0.156***	0.101***
	(0.019)	(0.027)	(0.026)	(0.02)	(0.024)
Log of GDP		0.999***	1.038***	1.299***	0.707***
		(0.058)	(0.054)	(0.04)	(0.053)
Log of cost of capital			-0.486*	-0.525**	-1.065***
			(0.255)	(0.21)	(0.163)
Govt. investment / GDP				2.635***	1.103**
				(0.381)	(0.429)
Institutional Quality					0.49***
					(0.033)
Short run coefficients (average)					
Δ Log of reserves	-0.166***	-0.083**	-0.065*	-0.056	-0.064*
	(0.04)	(0.036)	(0.037)	(0.034)	(0.035)
Δ Log of GDP		-0.707*	-0.741*	-0.862**	-0.483
		(0.428)	(0.421)	(0.336)	(0.345)
Δ Log of cost of capital			-0.05	-0.186	-0.251
			(0.276)	(0.261)	(0.343)
Δ Log of Govt. investment / GDP				-3.142***	-2.681***
				(1.02)	(1.009)
Δ Institutional Quality					-0.07
					(0.087)
Dummy GFC (2007-2009)	-0.077***	-0.049*	-0.053*	-0.025	-0.014
	(0.029)	(0.028)	(0.029)	(0.028)	(0.034)
Constant	-0.002	-0.703***	0.081**	-0.186***	1.195***
	(0.028)	(0.119)	(0.039)	(0.069)	(0.255)
Error correction term	-0.236***	-0.297***	-0.297***	-0.261***	-0.216***
	(0.037)	(0.045)	(0.047)	(0.052)	(0.049)
Observation	754	754	754	754	754
Countries	58	58	58	58	58
R square	0.70	0.70	0.72	0.78	0.83
Adjusted R square	0.57	0.51	0.48	0.53	0.55
F Statistic	5.23	3.70	3.00	3.04	2.98
Prob > F	0.00	0.00	0.00	0.00	0.00
Hausman Test MG vs PMG (Chi^2 p-value)	0.43	0.86	0.83	1.00	1.00

Note: ***, **, * respectively denotes 1%, 5%, and 10% level of significance. Standard error in parentheses. The long-run coefficients have already adjusted by the error correction term. The GDP variable does not include private and public investments. The cost of capital included is lagged by one period with the assumption of investment decision is based on the cost reflected in the previous year. The Hausman test uses the covariance matrix based on the estimated disturbance variance from the efficient estimator (PMG). Using the covariance matrix based on the consistent estimator (MG) does not change the conclusion.

Robustness check

A series of diagnostic post-estimation test was conducted on the full model (Equation 5 in Table 4) to evaluate the misspecification of the functional form, residual heteroscedasticity, non-normality and the serial correlation of the residual. The Ramsey specification test shows that out of 58 countries, only eight do not pass the critical value for the functional form. Two countries do not pass the heteroscedasticity test that is conducted using the Breusch-Pagan (BP) approach. All countries pass the non-normality test of the residual (Jarque-Berra test) and the Lagrange Multiplier (LM) test for the serial correlation. Considering the heterogeneity of the countries in the sample and the assumptions placed by the estimator, based on this result, the author considers the neoclassical model specification augmented with all the control variables estimated using PMG approach is acceptable.

To evaluate the robustness of the estimates, a sensitivity test is done by estimating the full model using PMG estimator by dividing the 58 countries into two groups. The results are reported in Table 5. Compared to the estimation result using the full sample, changing the sample does not alter the direction of the international reserves coefficient in the long and short-run. The sensitivity test starts by only using emerging and developing countries as the sample. In the next estimation, exclusion of China (the country with the largest stock of international reserves) from the emerging and developing countries sample does not have a significant impact on the coefficients of interest.

The variables used to estimate the regressions in this paper has already been carefully constructed to minimize susceptibility to endogeneity. As explained in the data section, the output variable used in the estimation does not include domestic investment. The possibility of collinearity between output and government investment is also addressed by using the ratio of government investment to GDP instead of its level. The cost of capital variable entered

estimation with one lag, assuming that private investors make their decision based on last year's cost of capital. The key explanatory variable of interest, reserves accumulation, is considered to be exogenous since the monetary authority does not consider investment as a factor in determining the level of reserves required. The exogeneity of reserves accumulation with respect to investment is confirmed by the empirical finding in Reinhart et al. (2016).

Another way to check whether the PMG estimation is affected by endogeneity is by augmenting the lags of regressors and dependent variables to make sure the residuals are serially uncorrelated and reduce the bias. Pesaran et al. (1999) assert that for the long-run parameters inference, an augmentation of the order of ARDL model can correct both for the endogenous regressors and residual serial correlation. However, considering the data availability, it is not possible to apply this to all the specifications. The comparison between coefficients estimated using the recommended lag and the augmented lag does not show a significant difference for most cases.

Finally, alternative estimation of the investment equation was undertaken using the system-generalized method of moments (GMM) estimator to check the consistency of the result. This approach aims to overcome the problem of endogeneity by using internal instrumental variables to replace potentially endogenous regressors[13]. The results reported in Appendix (Table A-3) to support the inference of positive long-run association between the reserves and domestic private investment. The *p*-value of the second order autocorrelation test and the Hansen overidentifying restriction test confirm the internal instruments used for all the regression are statistically acceptable.

[13] The system GMM estimated for this paper follows the DFE specification due to the assumption of slope homogeneity both in the long-run and short-run.

Table 5. Determinants of private investment: Sensitivity test

Variable	Pooled Mean Group Estimation		
	All Sample	**Emerging & Developing**	**Emerging & Developing excl. China**
Dependent variable: Δ Log of private investment			
Long run coefficients			
Log of reserves	0.101***	0.122***	0.112***
	(0.024)	(0.028)	(0.027)
Log of GDP	0.707***	0.666***	0.689***
	(0.053)	(0.063)	(0.061)
Log of cost of capital	-1.065***	-1.003***	-1.023***
	(0.163)	(0.17)	(0.167)
Govt. investment / GDP	1.103**	1.695***	1.456***
	(0.429)	(0.524)	(0.494)
Institutional Quality	0.49***	0.461***	0.463***
	(0.033)	(0.036)	(0.035)
Short run coefficients (average)			
Δ Log of reserves	-0.064*	-0.069*	-0.072*
	(0.035)	(0.04)	(0.041)
Δ Log of GDP	-0.483	-0.8**	-0.823**
	(0.345)	(0.356)	(0.362)
Δ Log of cost of capital	-0.251	-0.401	-0.417
	(0.343)	(0.364)	(0.372)
Δ Log of Govt. investment / GDP	-2.681***	-2.328**	-2.358**
	(1.009)	(1.117)	(1.14)
Δ Institutional Quality	-0.07	-0.098	-0.104
	(0.087)	(0.102)	(0.104)
Dummy GFC (2007-2009)	-0.014	-0.014	-0.014
	(0.034)	(0.04)	(0.041)
Constant	1.195***	1.268***	1.311***
	(0.255)	(0.264)	(0.272)
Error correction term	-0.216***	-0.241***	-0.248***
	(0.049)	(0.054)	(0.055)
Observation	754	637	624
Countries	58	49	48
R square	0.83	0.83	0.83
Adjusted R square	0.55	0.64	0.65
F Statistic	2.98	4.42	4.58
Prob > F	0.00	0.00	0.00

Note: ***, **, * respectively denotes 1%, 5%, and 10% level of significance. Standard error in parentheses. The long-run coefficients have already adjusted by the error correction term. The GDP variable does not include private and public investments. The cost of capital included is lagged by one period with the assumption of investment decision is based on the cost reflected in the previous year.

7. Conclusion

This paper has examined the association of international reserve accumulation with domestic private investment while controlling for the fundamental drivers of investment. The econometric analysis involved estimating an investment equation based on a panel data set covering 58 countries over the period 2000–2014, using an estimation method that helps to delineate short-run and long-run associations while allowing for country-specific heterogeneity.

The findings suggest that one percentage point change in reserves is associated with a 0.1 percent increase in private domestic investment, which more than counterbraced a mild negative association in the short-run. The findings are robust to the estimation of investment function with various combinations of explanatory variables and different sample compositions.

Overall, the results provide support for the policy of relying on reserve accumulation for a cushion against external shock as benefits gained from having a healthy reserve position seems to promote investment in the long run. The mild negative short-run association could represent a cost worth incurring given the favourable long-term relationship and, more importantly, given the individual country's vulnerability financial crises in this era of financial globalisation.

Appendix

Table A-1: Mean Group Estimation

Variable	Mean Group Estimation				
	1	2	3	4	5
Dependent variable: Δ Log of private investment					
Long run coefficients (average)					
Log of reserves	-2.676	-19.293	0.222	0.805	-0.966
	(3.166)	(19.773)	(0.134)	(1.342)	(1.32)
Log of GDP		40.405	0.608*	1.956	0.604
		(40.017)	(0.271)	(1.148)	(1.683)
Log of cost of capital			-4.577**	4.769	-4.191
			(1.761)	(4.65)	(6.984)
Govt. investment / GDP				-11.458	51.981
				(18.261)	(27.877)
Institutional Quality					-4.857
					(3.731)
Short run coefficients (average)					
Δ Log of reserves	-0.174***	-0.125	-0.142*	-0.09	-0.521
	(0.047)	(0.065)	(0.061)	(0.11)	(0.287)
Δ Log of GDP		-0.933	-0.868	-1.554	1.936
		(0.48)	(0.507)	(0.838)	(2.382)
Δ Log of cost of capital			0.416	1.179	-0.473
			(0.434)	(0.708)	(1.441)
Δ Log of Govt. investment / GDP				3.351	8.596
				(5.456)	(11.942)
Δ Institutional Quality					0.317
					(0.327)
Dummy GFC (2007-2009)	-0.065**	-0.039	-0.049	-0.092	0.416
	(0.033)	(0.03)	(0.032)	(0.113)	(0.225)
Constant	0.421***	-1.183*	3.18	13.665	-6.077
	(0.155)	(0.486)	(4.249)	(7.195)	(17.716)
Error correction term	-0.439***	-0.545***	-0.604***	-0.769	-0.805
	(0.05)	(0.056)	(0.062)	(0.44)	(0.844)
Observation	754	754	754	754	754
Countries	58	58	58	58	58
R square	0.71	0.87	0.97	1.00	1.00
Adjusted R square	0.53	0.71	0.82	1.00	1.00
F Statistic	3.97	5.61	6.28	n/a	n/a
Prob > F	0.00	0.00	0.00	n/a	n/a

Note: ***, **, * respectively denotes 1%, 5%, and 10% level of significance. Standard error in parentheses. The long-run coefficients have already adjusted by the error correction term. The GDP variable does not include private and public investments. The cost of capital included is lagged by one period with the assumption of investment decision is based on the cost reflected in the previous year.

Table A-2: Dynamic Fixed Effect Estimation

Variable	Dynamic Fixed Effect Estimation				
	1	2	3	4	5
Dependent variable: Δ Log of private investment					
Long run coefficients					
Log of reserves	0.462***	0.555**	0.547**	0.633*	0.609*
	(0.105)	(0.198)	(0.193)	(0.294)	(0.273)
Log of GDP		-0.408	-0.398	-0.526	-0.491
		(0.534)	(0.529)	(0.63)	(0.593)
Log of cost of capital			0.134**	0.144**	0.150**
			(0.042)	(0.051)	(0.054)
Govt. investment / GDP				-3.239	-3.9
				(8.133)	(8.37)
Institutional Quality					0.499
					(0.449)
Short run coefficients					
Δ Log of reserves	-0.055	-0.058	-0.055	-0.06	-0.061
	(0.035)	(0.036)	(0.036)	(0.038)	(0.039)
Δ Log of GDP		-0.812*	-0.814*	-0.922*	-0.923*
		(0.363)	(0.364)	(0.416)	(0.415)
Δ Log of cost of capital			-0.020***	-0.020***	-0.021***
			(0.004)	(0.004)	(0.004)
Δ Log of Govt. investment / GDP				-0.889	-0.825
				(1.161)	(1.199)
Δ Institutional Quality					-0.034
					(0.066)
Dummy GFC (2007-2009)	-0.053*	-0.064*	-0.064*	-0.060*	-0.060*
	(0.026)	(0.029)	(0.029)	(0.028)	(0.028)
Constant	0.432***	0.738*	0.589	0.661	0.666
	(0.07)	(0.336)	(0.329)	(0.347)	(0.344)
Error correction term	-0.227***	-0.193***	-0.193***	-0.184***	-0.187***
	(0.028)	(0.041)	(0.041)	(0.048)	(0.048)
Observation	754	754	754	754	754
Countries	58	58	58	58	58
R square	0.26	0.20	0.30	0.31	0.32
Adjusted R square	0.19	0.13	0.24	0.25	0.25
F Statistic	39.24	25.06	26.46	22.59	19.12
Prob > F	0.00	0.00	0.00	0.00	0.00

Note: ***, **, * respectively denotes 1%, 5%, and 10% level of significance. Standard error in parentheses. The long-run coefficients have already adjusted by the error correction term. The GDP variable does not include private and public investments. The cost of capital included is lagged by one period with the assumption of investment decision is based on the cost reflected in the previous year.

Table A-3: Dynamic Fixed Effect Estimation – System GMM Estimation

Variable	Dynamic Fixed Effect – System GMM Estimation				
	1	2	3	4	5
Dependent variable: Δ Log of private investment					
Long run coefficients					
Log of reserves	0.64	0.096	0.104	0.119	0.122
	(2.841)	(0.09)	(0.096)	(0.119)	(0.129)
Log of GDP		0.973***	0.972**	0.96*	0.955
		(0.372)	(0.42)	(0.5)	(0.718)
Log of cost of capital			-0.306	-0.3	-0.384
			(0.618)	(0.63)	(0.784)
Govt. investment / GDP				-1.587	-1.769
				(4.28)	(5.064)
Institutional Quality					-0.037
					(0.194)
Short run coefficients					
Δ Log of reserves	-0.24**	-0.182*	-0.175*	-0.185	-0.184
	(0.099)	(0.097)	(0.092)	(0.119)	(0.122)
Δ Log of GDP		0.3	0.276	0.311	0.318
		(0.823)	(0.738)	(0.805)	(0.802)
Δ Log of cost of capital			0.05	0.05	0.054
			(0.078)	(0.079)	(0.087)
Δ Log of Govt. investment / GDP				0.431	-0.237
				(4.183)	(4.567)
Δ Institutional Quality					0.032
					(0.388)
Dummy GFC (2007-2009)	-0.015	-0.023	-0.023	-0.024	-0.022
	(0.015)	(0.02)	(0.019)	(0.026)	(0.024)
Constant	0.097*	-0.207*	0.0403	0.051	0.116
	(0.057)	(0.106)	-0.588	(0.596)	(0.683)
Error correction term	-0.015	-0.145***	-0.145**	-0.145**	-0.129
	(0.062)	(0.053)	(0.059)	(0.072)	(0.095)
Observation	754	754	754	754	754
Countries	58	58	58	58	58
Arrelano-Bond 2nd order autocorrelation (p-value)	0.53	0.64	0.54	0.56	0.57
Hansen overidentification restriction (p-value)	0.40	0.23	0.20	0.14	0.10

Note: ***, **, * respectively denotes 1%, 5%, and 10% level of significance. Standard error in parentheses. The long-run coefficients have already adjusted by the error correction term. The GDP variable does not include private and public investments. The cost of capital included is lagged by one period with the assumption of investment decision is based on the cost reflected in the previous year. Instrumented variables: private investment and GDP. Orthogonal deviations and Windmeijer's sample correction options are applied in the estimation.

References

Aizenman, J. and Lee, J., 2007. International reserves: precautionary versus mercantilist views, theory and evidence. *Open Economies Review*, *18*(2), pp.191-214.

Aizenman, J., Cheung, Y.W. and Ito, H., 2015. International reserves before and after the global crisis: Is there no end to hoarding? *Journal of International Money and Finance*, *52*, pp.102-126.

Athukorala, P.C., 1998. Interest rates, saving and investment: Evidence from India. *Oxford Development Studies*, *26*(2), pp.153-169.

Baum, C.F., Caglayan, M. and Talavera, O., 2010. On the investment sensitivity of debt under uncertainty. *Economics Letters*, *106*(1), pp.25-27.

Blejer, M.I. and Khan, M.S., 1984. Government policy and private investment in developing countries. *Staff Papers*, *31*(2), pp.379-403.

Bird, G. and Mandilaras, A., 2005. Reserve accumulation in Asia. *World Economics*, *6*(1), pp.85-99.

Bloom, N., 2009. The impact of uncertainty shocks. *econometrica*, *77*(3), pp.623-685.

Bloom, N., Bond, S. and Van Reenen, J., 2007. Uncertainty and investment dynamics. *The review of economic studies*, *74*(2), pp.391-415.

Buchanan, B.G., Le, Q.V. and Rishi, M., 2012. Foreign direct investment and institutional quality: Some empirical evidence. *International Review of financial analysis*, *21*, pp.81-89.

Caballero, R.J., 1999. Aggregate investment. *Handbook of macroeconomics*, *1*, pp.813-862.

Chirinko, R.S., 1993. Business fixed investment spending: Modeling strategies, empirical results, and policy implications. *Journal of Economic literature*, *31*(4), pp.1875-1911.

Cook, D. and Yetman, J., 2012. Expanding central bank balance sheets in emerging Asia: a compendium of risks and some evidence. *BIS Paper No.66d*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2185323

Devarajan, S., Swaroop, V. and Zou, H.F., 1996. The composition of public expenditure and economic growth. *Journal of monetary economics*, *37*(2), pp.313-344.

Dixit, A.K. and Pindyck, R.S., 1994. *Investment under uncertainty*. Princeton university press.

Filardo, A. and Grenville, S., 2012. Central bank balance sheets and foreign exchange rate regimes: understanding the nexus in Asia. https://www.bis.org/publ/bppdf/bispap66e_rh.pdf

Filardo, A.J. and Yetman, J., 2012. The expansion of central bank balance sheets in emerging Asia: what are the risks? *BIS Quarterly Review*, *July*, pp.47-63

Flood, R., Marion, N., Agénor, P.R. and Eichengreen, B., 2001, January. Holding International Reserves in an Era of High Capital Mobility [with Comments and Discussion]. In *Brookings trade forum* (pp. 1-68). Brookings Institution Press.

Frankel, M.J.A., 1994. *Sterilization of money inflows: difficult (Calvo) or easy (Reisen)?* (No. 94-159). International Monetary Fund.

Fukuda, S.I. and Kon, Y., 2012. 'Macroeconomic impacts of foreign exchange reserve accumulation: theory and international evidence', in Kawai, M., Morgan, P.J., and Takagi, S. *Monetary and Currency Policy Management in Asia*. Edward Elgar Publishing, pp.120.

Garton, P., 2004. Foreign reserve accumulation in Asia: Can it be sustained? *Economic Round-up*, (Spring 2004), p.1.

Gemmell, N., Kneller, R. and Sanz, I., 2016. Does the Composition of Government Expenditure Matter for Long-Run GDP Levels? *Oxford Bulletin of Economics and Statistics*, *78*(4), pp.522-547.

Harris, R.D. and Tzavalis, E., 1999. Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of econometrics*, *91*(2), pp.201-226.

Heller, H.R., 1966. Optimal international reserves. *The Economic Journal*, *76*(302), pp.296-311.

International Financial Statistics. International Monetary Fund. http://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B

International Monetary Fund, 2015. Making public investment more efficient. Policy Paper http://www.imf.org/en/Publications/Policy-Papers/Issues/2016/12/31/Making-Public-Investment-More-Efficient-PP4959

Jeanne, O., 2012. Capital account policies and the real exchange rate (No. w18404). *National Bureau of Economic Research*. https://www.nber.org/papers/w18404

Jorgenson, D., 1967. The theory of investment behavior. In *Determinants of investment behavior* (pp. 129-175). NBER.

Khan, F.H., 2014, Three essays on determinants and impact of institutional quality, *PhD thesis*, The Australian National University, viewed 15 October 2018, https://openresearch-repository.anu.edu.au/handle/1885/12089

Lee, M.I.H. and Choi, W.G., 2010. *Monetary transmission of global imbalances in Asian countries* (No. 10-214). International Monetary Fund.

Mohanty, M.S. and Turner, P., 2006. Foreign exchange reserve accumulation in emerging markets: what are the domestic implications? *BIS Quarterly Review, September*, pp.39-52

Obstfeld, M., Shambaugh, J.C. and Taylor, A.M., 2010. Financial stability, the trilemma, and international reserves. *American Economic Journal: Macroeconomics*, *2*(2), pp.57-94.

Oliner, S., Rudebusch, G. and Sichel, D., 1995. New and old models of business investment: a comparison of forecasting performance. *Journal of Money, Credit and Banking*, *27*(3), pp.806-826.

Pesaran, M.H., 2015. *Time series and panel data econometrics*. Oxford University Press.

Pesaran, M.H., Shin, Y. and Smith, R.P., 1999. Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, *94*(446), pp.621-634.

Reinhart, C.M., Reinhart, V. and Tashiro, T., 2016. Does reserve accumulation crowd out investment?. *Journal of International Money and Finance*, *63*, pp.89-111.

Rodrik, D., 2006. The social cost of foreign exchange reserves. *International Economic Journal*, *20*(3), pp.253-266.

Svensson, J., 1998. Investment, property rights and political instability: Theory and evidence. *European economic review*, *42*(7), pp.1317-1341.

Terrones, M. and Cardarelli, R., 2005. Global imbalances: A saving and investment perspective. *World economic outlook*, pp.91-124.

Turner, P., 1991. *Capital flows in the 1980s: a survey of major trends* (No. 30). Basle: Bank for International Settlements, Monetary and Economic Department.

World Development Indicators. World Bank. https://datacatalog.worldbank.org/dataset/world-development-indicators