

# **Dynamic Relationship Between Foreign Capital Inflows and Inflation: Evidence From Small Open Asian Economies**

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## **Abstract**

This paper investigates the effects of capital inflows by type on inflation in eight small open economies in Asia using a panel VAR from 2000 to 2018. The estimation results overall indicate that the expansionary effects from aggregate demand are larger than any contractionary effects caused by the appreciation of the local currencies, and, subsequently, capital inflows have an overall positive effect on inflation. Meanwhile, the influence of capital inflows by type on inflation varies, depending on the degree of financial market development and the adoption of inflation targeting (IT) in the economy's implementation of monetary policy.

JEL Classification Number: E31, F21, F32

Key Words: Capital Inflows, Inflation, Panel VAR, Aggregate Demand, Foreign Exchange Rate

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## **I. Introduction**

As capital inflows across countries have been increasing in size and frequency since the 1980s, there have been theoretical and empirical studies of the impact of capital inflows on the real economy and financial markets. Theoretically, the seminal Mundell-Fleming model has been at the heart of the discussion. The model predicts that the expansion of capital inflows have contractionary effects on the domestic economy through the appreciation of the local currency, leading to a decrease in net exports (Fleming 1962; Mundell 1963; Dornbusch 1976).

Contrary to the prediction of the Mundell-Fleming model, empirically it is still unclear whether capital inflows actually cause a diminishing effect on small open economies when considering the cases of active local policies to attract foreign capital investment for economic development in emerging markets. Also, there have been sizable crises accompanied by economic recessions when sudden capital outflows occurred in emerging markets. This is usually called a sudden stop, and is discussed in many previous studies (Calvo 1998; Calvo et al. 2004, 2008; Reinhart and Reinhart 2009; Forbes and Warnock 2012).

Meanwhile, more recent studies show that capital inflows can have an expansionary effect on small open economies (Blanchard et al. 2016, 2017; Ghosh and Qureshi 2016). Moreover, these studies indicate that their transmission effects on the domestic economy might vary depending on the type of capital inflows. For example, as discussed in Blanchard et al. (2017), the effects of capital inflows by foreign bond investments can be limited since central banks tend to control interest rates through open market operations. On the other hand, capital inflows of non-bond investments, such as foreign equity and other investments, can have more expansionary effects.

While numerous studies analyze the impact of capital inflows on economic growth, there is still empirically limited discussion as to the effects of capital inflows on inflation in an

economy-wide framework involving both dynamic features of the expansionary and contractionary sides of the capital inflows. Instead, the existing studies have been heavily focused on exchange rate pass-through effects, whereby capital inflows can lead to local currency appreciation, and in turn, it decreases import prices which put downward pressure on domestic prices (Dornbusch 1987; Krugman 1987; Campa and Goldberg 2005, 2010; Forbes et al. 2018; Ha et al. 2019). At the same time, capital inflows can increase inflationary pressure by augmenting aggregate demand through extended foreign investment into equity, bonds and other assets, as recently discussed by Blanchard et al. (2016, 2017) and Ghosh and Qureshi (2016). Accordingly, the final effects of capital inflows on inflation can be determined by the magnitudes of both paths, the negative effects of the exchange rate and the positive effects of aggregate demand on inflation.

In sum, the dynamic relationship between capital inflows and inflation, considering both the contractionary and expansionary effects, is still less discussed, and features many uncharted questions. For example, can the relationship between capital inflows and inflation differ by the type of inflow, like the relationship with economic growth? Can the relationship be differentiated according to monetary policy behavior related to the adoption of an inflation targeting framework? Finally, does it depend on the degree of development of local financial markets?

Against this background, this empirical study fills the gap in the literature in that, first, it analyzes the impact of disaggregated capital inflows on inflation, which is little discussed and which is absent in the context of small open Asian economies. Second, this study further analyzes whether the impact of capital inflows on inflation can be differentiated according to each economy's monetary policy behavior and the degree of financial market development.

For the empirical analysis, this study constructs a country panel using quarterly frequency

datasets from 2000 to 2018 for eight Asian economies: Hong Kong, India, the Philippines, Singapore, South Korea, Sri Lanka, Taiwan, and Thailand. The six-variable panel VAR model is constructed to investigate the transmission channels of capital inflows and their effects on inflation, such as foreign equity investment, foreign bond investments, and other types of foreign investments.

The overall estimation results indicate that the aggregate demand channel of capital inflows dominates the exchange rate channel, showing that capital inflows have positive effects on inflation. In addition, we verify that the influence of capital inflows by type on inflation varies depending on the degree of financial market development and the adoption of inflation targeting (IT) in the implementation of monetary policy.

More specific estimation results can be summarized as follows. First, the shock to foreign equity investments and other investments have statistically significant positive effects on domestic inflation after the second quarter. In contrast, the shock to foreign bond investments has a weak negative effect on inflation. Second, economies that do not use inflation targeting (Hong Kong, India, Sri Lanka, and Taiwan) see more significant effects on inflation by all capital inflow shocks, i.e., foreign equity, bonds, and other investments when compared to economies that have adopted inflation targeting, such as Korea, the Philippines, Singapore, and Thailand. That is, central banks that have adopted inflation targeting tend to have a more active response to inflationary pressure from capital inflows. This is also in-line with findings in Cabral et al. (2016) who document inflation stabilization in emerging economies that have adopted IT. Third, the effects of a shock to other investments concerning inflation are greater in countries with less developed financial markets, such as India, the Philippines, Sri Lanka, and Thailand, when compared to others in the group. This indicates that conventional banks in less developed financial markets can play an important role until a certain degree of capital

market development, which needs challenging prerequisites, such as macroeconomic stability, high institutional quality, etc., as discussed in Rojas-Suarez (2014).

This study is organized as follows. Section II introduces the existing literature on the impact of capital inflows on the real economy, financial markets, and inflation. Section III discusses the definition, composition, and transmission channels of capital inflows. Section IV explains the panel VAR models and the estimation results of the impulse response functions. Finally, section V summarizes the major findings and discusses policy implications.

## **II. Literature Review**

The standard conventional Mundell-Fleming models predict that the effects of capital inflows on an economy are contractionary (Mundell 1963; Fleming 1962; Dornbusch 1976). That is, capital inflows lead to a local currency appreciation and, accordingly, a decrease in net exports, and subsequently a contraction in output given other variables being equal. As discussed in Reinhart and Reinhart (2009), however, in reality, emerging market capital inflows are found to be more associated with appreciations, credit booms, and output increases through a boom-bust cycle driven by capital movements. Blanchard et al.(2017) try to fill this gap between the conventional models and the emerging market reality by exploring two types of capital inflows, bonds and non-bonds, in their theoretical and empirical analyses. They argue that bond flows lead to an appreciation and are contractionary for a given monetary policy rate, while the non-bond flows lead to an appreciation but can be expansionary if the expansionary effects of the flows dominate the contractionary effects of the appreciation.

Existing empirical studies into the effects of capital inflows are heavily focused on economic growth. Relatively recent studies such as Ghosh and Qureshi (2016) and Blanchard

et al. (2016, 2017) demonstrate that large capital inflows can lead to economic overheating and domestic credit expansion in emerging markets. In contrast, empirical studies reporting contractionary effects of capital inflows in line with Mundell-Fleming models are rare for emerging economies. Instead, numerous empirical works have explored the long-term negative consequences caused by capital inflow surges and sudden outflows. These episodes, i.e., sudden stops, often lead to economic and financial crises, as seen in the 1997 Asian case. On the occasion of the crisis, many empirical studies investigated the positive and negative effects of capital inflow surges and steep capital outflows on emerging economies (Quinn 1997; Fisher 1998, 2003; Rogoff 1999; Klein and Olivei 1999; Edwards 2001). Several studies, such as Bhagwati (1998) and Rodrik (1998), also discuss the costs and benefits of financial liberalization.

From the perspective of capital inflows by type, they matter to the relationship with domestic credit growth. Calderon and Kubota (2012) mention that two types of capital, private investment driven by bank inflows and portfolio equity investments, are more likely to create bad credit booms and end up with a financial crisis. Igan and Tan (2015) also show that net inflows of other types of assets are associated with rapid domestic credit growth. Additionally, Furceri et al. (2012) and Ghosh and Qureshi (2016) argue that debt-driven capital inflows have more of an effect on domestic credit creation than on portfolio equity or FDI. As discussed earlier, Blanchard et al. (2016, 2017) also show that the expansionary or contractionary characteristics would differ depending on monetary policy in response to bond and non-bond capital inflows.

In contrast to the ample literature exploring the relationship between capital inflows and economic growth, including macroeconomic and financial imbalances, existing studies that directly target the dynamic relationship between capital inflows and inflation in an economy-

wide framework are still quite limited, except for several papers analyzing country-specific relationships, such as Muinhos (2000) for Brazil and Choi and Son (2018) for Korea. In a sense, this lack of discussion is understandable, in that if capital inflows are associated with contractionary (or expansionary) macroeconomic consequences in theoretical or empirical studies, they can naturally be translated into a decrease (or increase) of inflation without explicit arguments for inflation.

In addition, existing studies investigating the effects of capital inflows on inflation have focused on the exchange rate pass-through effect, whereby capital inflows lead to local currency appreciation, and dollar-denominated import prices can decrease, and, finally, can negatively affect inflation. This linkage from exchange rate movements to consumer prices has long been explored on the strands of theoretical grounds (Dornbusch 1987; Krugman 1987) and empirically, too (Campa and Goldberg 2005, 2010; Forbes et al. 2018; Ha et al. 2019). Despite their successful evaluation of the magnitudes and state-dependent characteristics of the exchange rate pass-through effect, these studies do not explicitly accommodate the dynamic effects of capital inflows on inflation via a demand-driven transmission mechanism.

### **III. Definition, Composition and Transmission Channels of Capital Inflows**

#### **3.1 Definition and Composition of Capital Inflows**

Capital inflows can be identified as changes over time in the liabilities of the balance sheet for foreign financial investments on the international investment position (IIP). In other words, foreign capital inflows are calculated by changes in the balances of inbound foreign investments in the liability account at the end of the quarter on the IIP. That is, capital inflows in this paper are gross variables, not net capital inflows (inbound investment by foreigners minus outbound investment by local residents), which had often been used until the early 1990s.

After Forbes and Warnock (2012) noted that inbound foreign investment (capital inflows) and outbound investment (capital outflows) can be determined by different factors, along with growing capital movements since the mid-1990s, capital flows need to be recognized as gross variables.

The IIP is a set of balance statistics that involves transaction and non-transaction factors for increasing or decreasing balances. The transaction factors are aggregated in the balance of payments. The non-transaction factors involve exchange rate fluctuations, price fluctuations, and other adjustments, which are all related to the valuation adjustment. The IIP includes direct investments, portfolio investments, including equity and debt securities, financial derivatives, other investments, and reserve assets. Meanwhile, it is known that stock-based statistics representing trends such as the IIP are more appropriate than using flow-based statistics, like the balance of payments, to analyze correlations among macroeconomic variables such as capital inflows and growth (Bonfiglioli 2008; Joice 2011; Friedrich and Guérin 2019).

The capital inflows in this paper are composed of foreign equity investments, foreign bond investments, and other investments. These three account for a considerable portion of capital inflows. In the meanwhile, FDI is excluded from the capital inflows in this study in that we focus on the inflation pressure of aggregate demand driven by relatively short-run capital inflows based on foreign financial investments through bonds, equity and bank borrowing. This is also a reason for adopting the vector autoregression technique, which has superior power in detecting short-run dynamic correlations. The empirical studies exploring the effects of FDI on inflation present equivocal results, such that Elijah (2006) and Narayanamurthy et al. (2010) illustrate a significant relationship between the two variables, while it is not found in Moosa and Cardak (2006) or in Wijeweera and Mounter (2008). Overall, the effects of FDI capital inflows on inflation should be explored as a future study with a more suitable framework



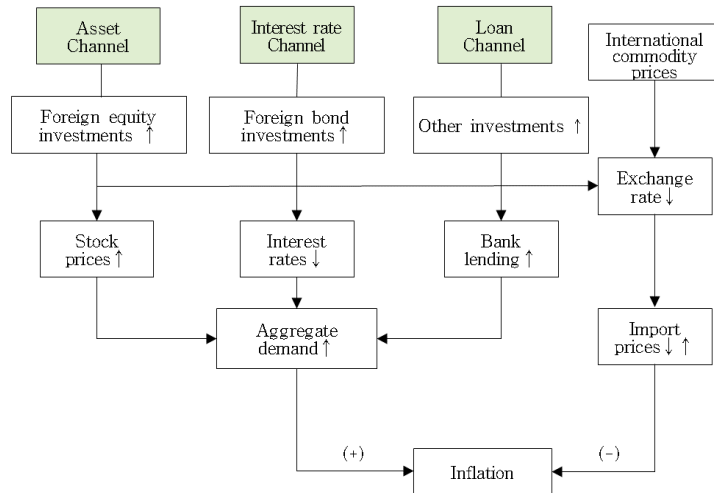
reflecting both the short-run and long-horizon interactions.

### **3.2 Transmission Mechanism of Capital Inflows to Inflation**

Foreign capital inflows are converted into local currency and then invested in stocks, bonds, and resources for bank lending. As capital inflows increase liquidity in the domestic market, stock prices can increase, interest rates can fall, and bank lending can increase, which can stimulate consumption and investment, and subsequently can lead to an increase in aggregate demand. This extended aggregate demand would be related to increased inflationary pressure, which is denoted by the aggregate demand path.

More specifically, the aggregate demand path can have three subordinate transmission channels, depending on the type of capital inflows as illustrated in figure 1. Through the asset channel, if capital inflows in the form of equity investments increase, stock prices can appreciate, and consumption and investment can increase due to the wealth effect. The interest rate channel refers to a case where consumption and investment increase as ample foreign bond investment brings down market interest rates. Lastly, consumption and investment can increase due to the loan channel, as overseas borrowing by financial institutions increases. That is, capital inflows by overall type can have close correlations with their associated channel variables, such as equity prices, return on debt securities, and domestic lending. These channel variables can, in turn, spur aggregate demand, as discussed in Calderon and Kubota (2012), Igan and Tan (2015), Ghosh and Qureshi (2016), and Blanchard et al. (2016, 2017). Finally, this expanded aggregate demand would positively affect inflation.

Figure 1. Transmission Channels & Effects of Foreign Capital Inflows on Inflation



Sources: Choi and Son (2018).

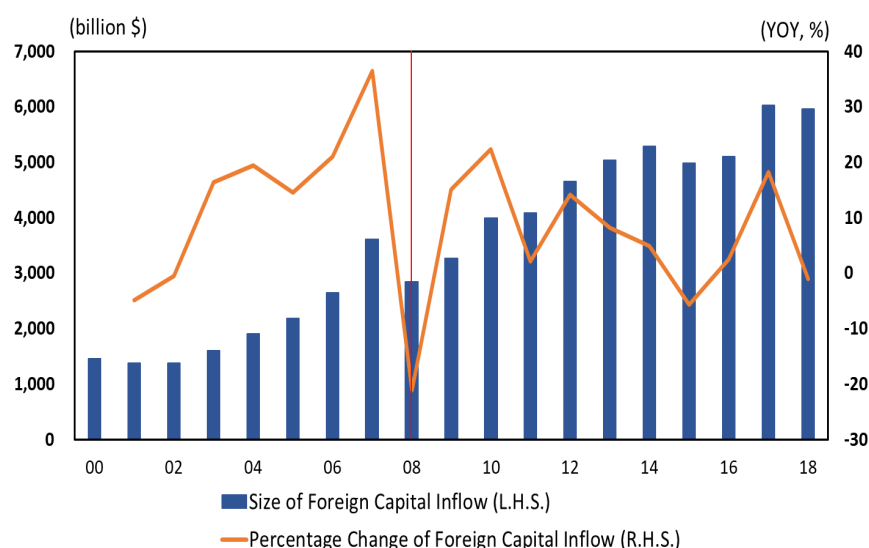
Domestic currency appreciation along with capital inflows can also have a negative effect on consumer prices via the exchange rate pass-through effect, as discussed in theoretical studies (Dornbusch 1987; Krugman 1987) and in numerous related empirical studies (Campa and Goldberg 2005, 2010; Forbes et al. 2018; Ha et al. 2019). Import prices, however, can be affected not only by changes in the nominal exchange rate, but also by changes in international commodity prices, such as crude oil prices. In short, capital inflows can be connected to domestic inflation through two paths, both negatively in the exchange rate and positively in terms of aggregate demand, both at the same time. Accordingly, the final impact of capital inflows on inflation can be determined by the relative magnitude of the two effects.

### 3.2.1. Capital Inflow Trends

Capital inflows in figure 2 is the sum of yearly changes in foreign portfolio equity investments, foreign portfolio bond investments, and other types of foreign investments in the liabilities column on the IIP, as defined in the previous section. In the 2000s, the capital inflows for eight Asian economies steadily expanded at an annual average rate of 14.6% until 2007, just before the 2008 global financial crisis, as shown in figure 2. In 2008, capital inflows fell

by 21.2% year-on-year as the bankruptcy of Lehman Brothers sharply shrank global financial markets. In response to such a financial breakdown and economic recession, advanced countries continued to carry out large-scale quantitative easing policies. This led to a continuous expansion of global investments into emerging markets, supporting robust growth between 2009 and 2013, with annual growth of 12.6%. As capital inflows contracted starting in 2014, however, mainly with bank loans, average annual growth stood at only 8.0% between 2009 and 2018, as illustrated in table 1. Meanwhile, the trend of year-on-year growth shows that capital inflows have slowed since the crisis.

Figure 2. Foreign Capital inflows<sup>1)</sup>



Note: 1) The size of foreign capital inflows indicates the sum of yearly changes for portfolio equity investments, portfolio bond investments, and other investments in the liabilities column on the international investment position (IIP) statistics for eight Asian economies. Percentage changes in foreign capital inflows indicate the yearly growth rates of the size of foreign capital inflows.

Sources: Authors' own calculations using data from Haver Analytics.

Table 1. Growth Rates of Foreign Capital Inflows by Type<sup>1)</sup>

	(yearly avg., USD billion, %)			
	Equity	Bonds	Other	Total
2001–2007	26.9 (633.7)	14.7 (138.6)	10.3 (1,324.6)	14.6 (2,096.8)
2008	-52.6 (621.7)	-16.1 (210.3)	-1.5 (2,006.9)	-21.2 (2,838.9)
2009–2018	13.2 (1,481.1)	10.8 (413.2)	6.4 (2,940.8)	8.0 (4,835.2)

Full Period	14.9 (1,103.8)	10.8 (295.2)	7.4 (2,260.4)	9.0 (3,659.3)
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Note: 1) The definitions of foreign capital inflows by type are the same as in note 1 in figure 2. The numbers in the parentheses are outstanding amounts for each type of capital inflow.

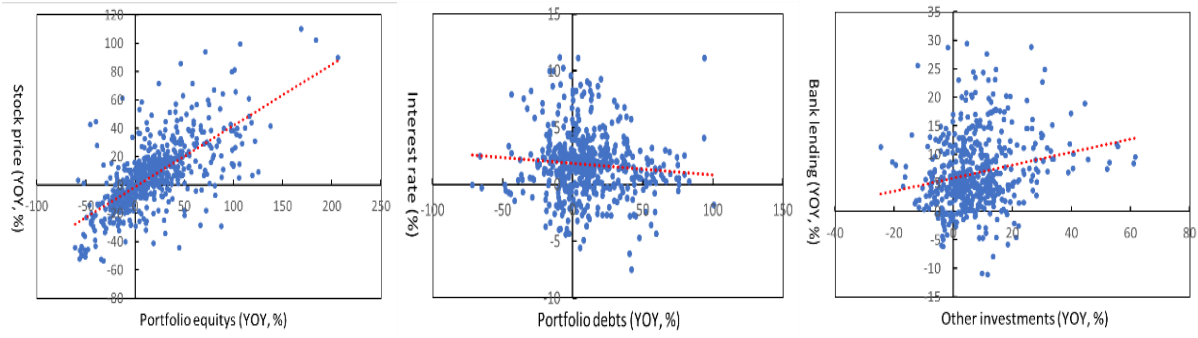
Sources: Authors' own calculations using data from Haver Analytics.

### 3.2.2. Capital Inflow Channels

Before the empirical analysis using the model, a preliminary review of the relationship between capital inflow by type and inflation for eight Asian economies is conducted. The capital inflows by type are used on a local currency basis, in that foreign capital is converted into the local currency and then invested in the domestic financial market.

Figure 3 shows a series of scatter plots showing the yearly growth rates of capital inflows by type and the corresponding movements of the channel variables. The left and right panels indicate the yearly growth rates of portfolio equity and other investments on the x-axis, respectively, and the yearly growth rates of stock prices and bank lending on the y-axis, respectively, for the eight Asian economies. Two panels illustrate the overall positive correlation, which is in line with our intuition and also consistent with findings in Reinhart and Reinhart (2009). In contrast, the middle panel in figure 3 shows weak negative correlation, in which the yearly growth rates of portfolio bond investments is on the x-axis and real interest rates on 10-year government bonds less inflation is on the y-axis. This is also told to us by our intuition, in that more bond investments by foreigners are likely to be associated with a decrease in the real returns on the assets. However, the relationship appears to be weak, which reminds us of the argument discussed in Blanchard et al. (2017) in which bond-type capital inflows would be less expansionary given little change in the monetary policy stance holding policy rate and related market interest rates.

Figure 3. Growth Rates of Foreign Capital Inflows by Type and Corresponding Channel Variables<sup>1)</sup>



Note: 1) The left panel shows the yearly growth rates of portfolio equity investments on the x-axis and the yearly growth rates of stock prices on the y-axis. The middle panel shows the yearly growth rates of portfolio bond investments on the x-axis and the annual real interest rates, the 10-year government bond rate less inflation, on the y-axis. The right panel shows the yearly growth rates of other investments on the x-axis and the yearly growth rates of bank lending on the y-axis. The three dotted lines are fitted lines based on the standard least square method. All data are on a quarterly basis.

Sources: All data except real interest rates are from Haver Analytics. Real interest rates are from IMF International Financial Statistics.

## IV. Panel VAR Estimation

### 4.1. Panel VAR Model

This study adopts panel vector autoregression (VAR) models rather than existing country panel regressions in the sense that the VAR technique can provide a comprehensive and simultaneous impulse-response analysis reflecting both positive and negative channels of capital inflows on inflation. A panel VAR model as proposed by Abrigo and Love (2015) is constructed to examine the dynamic correlation of capital inflows on inflation. The specification can be expressed by equation 1. Here,  $i$  is the country,  $t$  is the time in the quarter, and the matrix  $A$  is a coefficient vector to be estimated. In addition,  $u$  and  $e$  refer to the fixed effects and the specific error terms.

The panel VAR system is established by accumulating observations by country in row. A Cholesky decomposition is applied to identify the model, and based on the transmission effect in figure 1, the ordering of exogenous variables is set as follows: CP (commodity prices; international commodity prices), CI (capital inflows), FX (foreign exchange rate; exchange rate), CV (channel variables; capital inflow path variables), AD (aggregate demand), and P

(prices; inflation), respectively. Higher exogenous rankings are given to the variables of international commodity prices, capital inflows, and exchange rate variables, because they are determined not only by domestic economic conditions, but also by international demand and supply, and by the strategic choices of foreign investors. Given the fact that the domestic aggregate demand and the inflation are, lastly, affected by the variables in the transmission channel of capital inflows, the two variables are regarded as the least exogenous ones. Meanwhile, the import price index is excluded because the dataset is not available in some countries, which is different from the flowchart in figure 1.

$$[CP \ CI \ FX \ CV \ AD \ P]_{it} = [CP \ CI \ FX \ CV \ AD \ P]_{it-1} + u_i + \epsilon_{it}. \quad (1)$$

Meanwhile, CI (capital inflow) variables are classified into Equity (foreign equity investments), Bonds (foreign bond investments), and Other (other investments). In addition, channel variables (CV) are set as stock prices (SP), real interest rates (Rate), and bank lending (Lending), according to the channels of capital inflow by type.

Overall, the selection of each individual variable in the regression is based on previous theoretical and empirical discussions. First, empirical studies (Furlong and Ingenito 1996; Browne and Cronin 2010) find that commodity prices have an influence on consumer prices. In addition, the commodity prices have been included as the most exogenous variable in the conventional macroeconomic VAR setup as a proxy representing a supply-side inflation channel or an unobserved inflation expectation to cure a price puzzle, which is interpreted as inflation's expansionary response to the contractionary shock of monetary policy (Sims and Zha 2006). The selection of the variables for capital inflows by type and their corresponding channel variables are largely based on the empirical findings in Ghosh and Qureshi (2016) and Blanchard et al. (2017) in that equity, bond, and bank lending through foreign investments have

significant effects on asset prices, credit growth and GDP. Finally the demand effects of capital inflows would be accumulated in a variable of aggregate demand (AD), just ahead of inflation (P), and the exchange effects would also be accounted for through the appreciation of the foreign exchange rate (FX) compared to inflation (P). The overall summarization of these discussions is illustrated in figure 1.

The order of lagged variables in the panel VAR is selected for one quarter according to the general selection criteria, and the model is estimated using the generalized method of moments (GMM). The lagged variables from the first to fourth quarter are involved as the instrumental variables. Meanwhile, the lagged variables included in the instrumental variables in the form of differences can be significantly omitted. Therefore, the missing values are replaced with zero values following Holtz-Eakin (1988) to minimize missing observations. All panel VAR models satisfy the stability condition in that an eigenvalue is located within a unit circle of Lutkepohl (2005). Finally, the orthogonalized impulse response functions and the 95% confidence intervals are estimated through 200 Monte Carlo simulations. Given the satisfaction of the stability condition with an eigenvalue being located within a unit circle, the number of Monte Carlo simulations does not matter with respect to forming the overall impulse-response functions. For example, the functions and 95% confidence intervals using 1,000 simulations little change from those using only 200 simulations.

## **4.2 Data**

Explanations and sources of data used for the panel VAR model are summarized in table 2. The candidate countries for the analysis include 12 out of Haver's 21 emerging market countries in the Asia Pacific region, since the capital inflow data are available only for Bangladesh, Hong Kong, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Singapore, Sri Lanka, Taiwan, and Thailand. Among them, the data from four countries (Bangladesh, Indonesia,

Malaysia, and Pakistan) are relatively short compared to other countries, or their growth rates of capital inflows show too much volatility, which leads us to exclude them from the analysis.

Table 2. Endogenous Variables in Panel VAR

Variables		Explanations	Sources <sup>4)</sup>
International commodity prices (CP)		Yearly growth rates of all commodity index	IMF IFS
Capital inflow by type (CI) <sup>1) 2)</sup>	Foreign equity investments (Equity)	Yearly growth rates of foreign equity investments; USD basis	HAVER
	Foreign bond investments (Bond)	Yearly growth rates of foreign bond investments; USD basis	HAVER
	Other investments (Other)	Yearly growth rates of other investments; USD basis	HAVER
Channel variables (CV)	Stock prices (SP) <sup>3)</sup>	Yearly real growth rates of stock prices	HAVER
	Real interest rates (Rate)	Yearly differences in 10-year government bond minus yearly CPI growth	IMF IFS
	Bank lending (Lending) <sup>3)</sup>	Yearly real growth rates of bank lending	HAVER
Foreign exchange rates (FX)		Yearly growth rates of foreign exchange rates against USD (domestic currency/USD, i.e., increase of the value implies depreciation of domestic currency)	IMF IFS
Aggregate demand (AD)		Yearly real growth rates of household consumption plus yearly growth rates of private fixed investments	HAVER, WDI
Inflation (P)		Yearly growth rates in CPI	CEIC

Notes : 1) For the countries with insufficient observations of capital inflows, Lane and Milesi-Ferretti (2017) data were used. 2) For the yearly frequency dataset, interpolation is applied to generate a quarterly frequency dataset. 3) Stock prices and bank lending are converted into real variables using the CPI. 4) Aggregate demand for Singapore is obtained from the Singapore Department of Statistics.

The sample period is set from the first quarter of 2000 to the fourth quarter of 2018, in that around 2,000 normal economic activity began after the 1997 Asian Crisis and the most recent point for data availability is 2018 at the time of drafting this manuscript. Additionally, the starting point of available data for each country is different, so it is an unbalanced panel.

Concerning the channel effect of capital inflows by type on inflation, it can be difficult to precisely identify the transmission, and, accordingly, it would be appropriate to analyze it with a nested model including all capital inflow types. However, due to limited data availability, we



estimate each capital inflow impact separately, following Blanchard et al. (2017) and Ghosh and Qureshi (2016).

The first variable is capital inflows, which is based on Haver data, but for countries with insufficient observations it is supplemented by external assets and liabilities data from Lane and Milesi-Ferretti (2017). Capital inflow variables (in USD terms) are all converted to yearly growth rates. In the case of existing papers that analyze the transmission effects of capital inflows, the empirical models simplify economic variables into three categories: impact variables, response variables, and channel variables. For example, Song and Kim (2009) who analyzed capital inflows and economic fluctuations, set the VAR variables as foreign capital, real GDP, and channel variables. This paper also adopts this basic framework on the effects of capital effects.

In the case of stock prices (SP), interest rates (Rate), and lending (Lending), which are set as the channel variables, they are transformed into real terms using price indices. The growth rates in stock prices and bank lending are constructed on a year-on-year basis. For the exchange rate (FX), nominal yearly growth rates are used since the effect of the fluctuation of imported prices on inflation can be immediately transferred through the nominal exchange rate.

Total demand is set as the sum of real private consumption and real private fixed investment, and the growth rates are also on a yearly basis. In the case of Taiwan, the use of real private fixed investment data is limited, so only the real private consumption growth rates are involved. In short, all endogenous variables are converted to stable time series in the form of yearly growth rates or differences in order to satisfy the stability condition of the panel VAR system.

Lastly, some countries only have data about aggregate demand and about capital inflow by type on a yearly basis. The quarterly series of aggregate demand for Hong Kong, India, the

Philippines, Sri Lanka, and Taiwan are constructed from the corresponding yearly datasets using an interpolation allowing cubic function. Also, capital inflows by type in Taiwan from 2000 to 2018, Sri Lanka from 2000 to 2010, and in the Philippines and Singapore for 2000, have only yearly frequency datasets. Subsequently, the same interpolation is applied to obtain quarterly datasets. The descriptive statistics on the endogenous variables are displayed in appendix A.

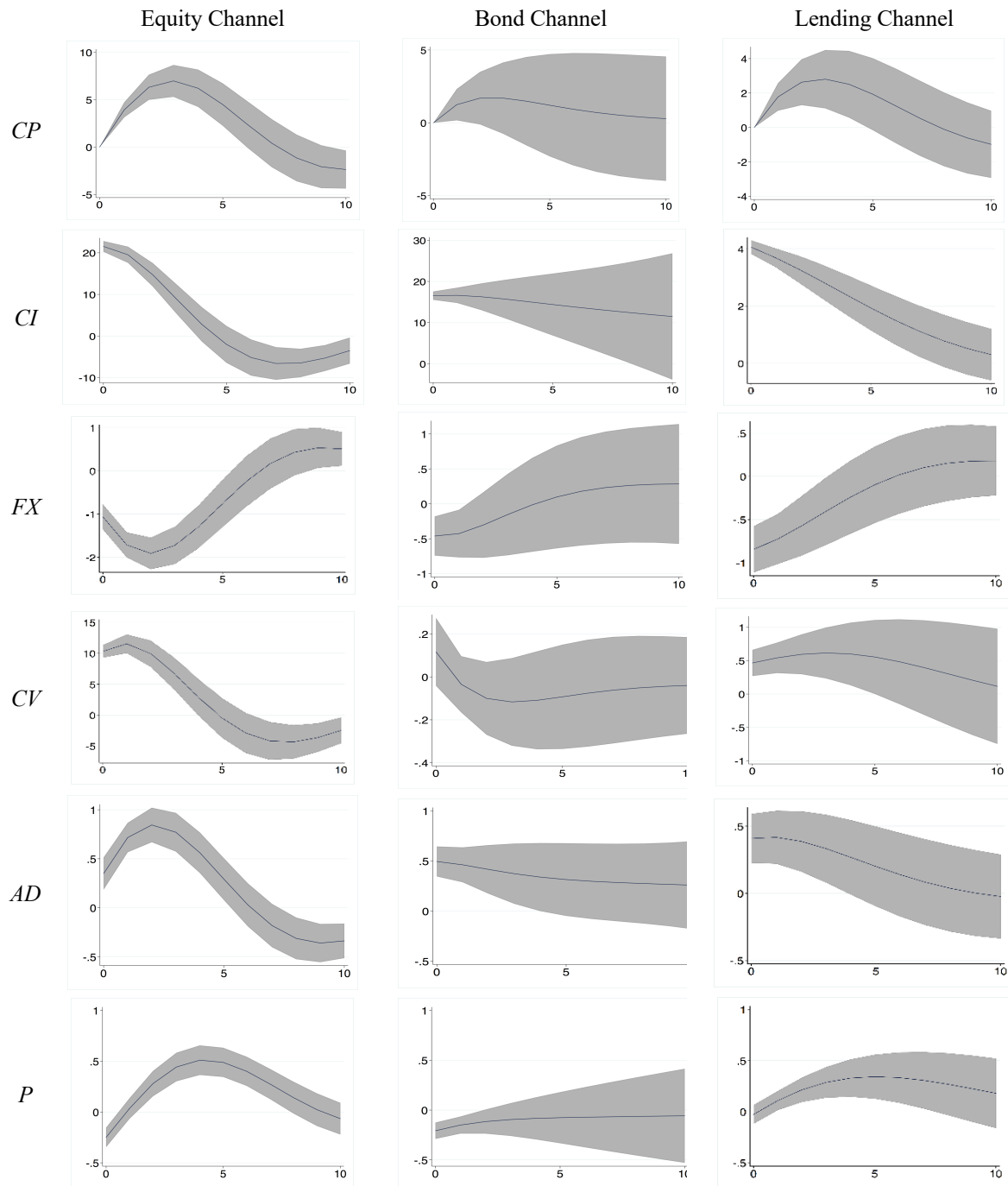
### **4.3. Impulse-Response Functions**

#### **4.3.1. Baseline Model**

Figure 4 shows the impulse response functions over 10 quarters of the endogenous variable with respect to a one standard deviation shock to the error terms for each capital inflow by type. The impulse response functions of the exchange rate (FX) responding to each capital inflow shock show that all of the capital inflows for each channel, such as equity investments, bond investments, and other investments, decrease the exchange rate until the third and fifth quarters. In other words, the value of each country's currency increases as foreign capital inflows are added into the foreign exchange markets. However, in the case of bond investment inflows, the appreciation responses disappear after the second and third quarters. Also, the appreciation responses become insignificant after the fifth quarter in the case of bank lending. This can be understood in terms of there being an accumulation of foreign reserves in small open economies. They have a tendency to alleviate excessive exchange rate appreciation because small open economies seek current account surpluses to steadily secure foreign reserves as a safety net against external shocks.

Figure 4. Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by

Type: Baseline Model Over all Eight Countries



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.

Second, the impulse response functions of the channel variables, the growth rate of stock prices (SP) and bank lending (Lending), show significant positive effects in responding to

shocks of capital inflows by foreign equity investment (Equity) and other investments (Other), respectively. However, in the case of foreign bond investments (Bond), the effects of foreign bond investments on inflation are relatively limited, as the real interest rate (Rate), the corresponding channel variable, does not decrease significantly in response to foreign bond investments. This may be due to there being less developed financial markets, such as capital markets in some countries, or because the interest rate channel from foreign bond investments may not work efficiently. Also, as discussed in Won and Joo (2009) and Blanchard et al. (2017), if the central banks try to maintain the policy interest rate at the target level through open market operations, the impact of foreign bond investments on interest rates can be limited, even in countries with a developed financial market. Blanchard et al. (2017) found that when the central bank responds to a decline in the market interest rate caused by the inflow of foreign bond investments through open market operations, foreign bond investments can only cause a domestic currency appreciation and do not affect interest rates, which can be translated as having a contractionary effect on an economy.

As a result, each capital inflow by type can have channel effects on domestic inflation as a combination of increased private aggregate demand (AD), lower import prices due to the appreciation of the domestic currency, and pressure to lower net exports due to higher export prices. More specifically, it is found that foreign equity investments and other investments, which see a relatively long-lasting increase in the growth rate of private aggregate demand, have a significant positive effect on domestic inflation from the second quarter onward. In particular, foreign equity investments have a greater and persistent impact on inflation.

However, in the case of foreign bond investments, unlike in the previous two cases, the persistence of the increase in private aggregate demand is relatively weak, and it is found to have a weak negative effect on domestic inflation in the short term. This can be attributed to

the fact that, as discussed above, the real interest rate, the channel variable for capital inflows, does not change significantly, implying that the decreasing effect of imported prices on inflation caused by a domestic currency appreciation would be greater than the inflation pressure caused by an increase in aggregate demand from the capital inflows.

Meanwhile, using quarterly data, the aggregate demand almost immediately responds to foreign investment capital inflows as a result of the impulse response functions. This finding is consistent with the discussion in previous studies, such as Montiel (2013), Blanchard et al. (2016), and Choi and Son (2018), which demonstrate that the relationship between foreign investment and aggregate demand in small open economies has become more closely related as capital flows across countries increase.

#### **4.3.2. Monetary Policy Framework and the Degree of Financial Market Development**

This section analyzes whether the impact of each capital inflow channel on inflation can be differentiated according to the monetary policy framework and to the degree of financial market development across countries. To this end, the eight Asian countries are classified into those that have adopted inflation targeting (IT) and those that have not (Non-IT), as illustrated in table 3. IT countries include Korea, the Philippines, Singapore, and Thailand. All of them adopted IT operating systems in the early 2000s. Meanwhile, Singapore does not announce an explicit IT goal, but it is included in the IT country group as it maintains an indirect price stabilization priority. In the case of India, IT was adopted in August 2016, but it is included in the non-IT country group because it maintained its monetary aggregate target system for most of the analysis period. In addition, the exchange rate is mainly determined by a managed floating foreign exchange system or a floating exchange system in inflation targeting countries.

In contrast, the monetary policy in Non-IT countries tends to be more or less an exchange rate targeting regime, such as a fixed exchange rate system.<sup>1</sup>

Table 3. Classification of Economies by Monetary Policy Framework and the Degree of Financial Market Development

Economies	Inflation targeting (IT)	Non-inflation targeting (Non-IT)	Developed financial markets <sup>1)</sup>	Less developed financial markets <sup>1)</sup>
Hong Kong		√	√	
India		√ <sup>2)</sup>		√
Korea	√		√	
Philippines	√			√
Singapore	√ <sup>3)</sup>		√	
Sri Lanka		√		√
Taiwan		√	√	
Thailand	√			√

Notes: 1) The degree of financial market development is based on GDP per capita. 2) India adopted IT in August 2016, but it maintained a monetary aggregate targeting system for most of the estimation period. 3) Singapore maintains a monetary policy framework with an implicit inflation stabilization system.

Next, the degree of financial market development is classified based on GDP per capita, following Čihák et al. (2012). The degree of development of a financial market can be assessed from various aspects, such as the depth, access, efficiency, and stability of the financial market. Čihák et al. (2012) note that most financial market development indicators are analyzed to be proportional to the income level. Accordingly, the countries are classified as “developed” and as “less developed” countries with their financial markets based on GDP per capita. According to the IMF (2019b), GDP per capita in Singapore, Hong Kong, Korea, and Taiwan (based on 2018 USD) was \$64,579, \$48,451, \$33,320, and \$25,008, respectively. In Thailand, Sri Lanka, the Philippines, and India it was \$7,448, \$4,099, \$3,104, and \$2,038, respectively. So among

<sup>1</sup> A panel VAR analysis was conducted on country groups by the exchange rate system, either a floating or a fixed exchange rate system. Overall, the estimation results saw no significant difference from the country groups of the IT and Non-IT countries. This indicates that the monetary policy framework is closely related to the exchange rate system.

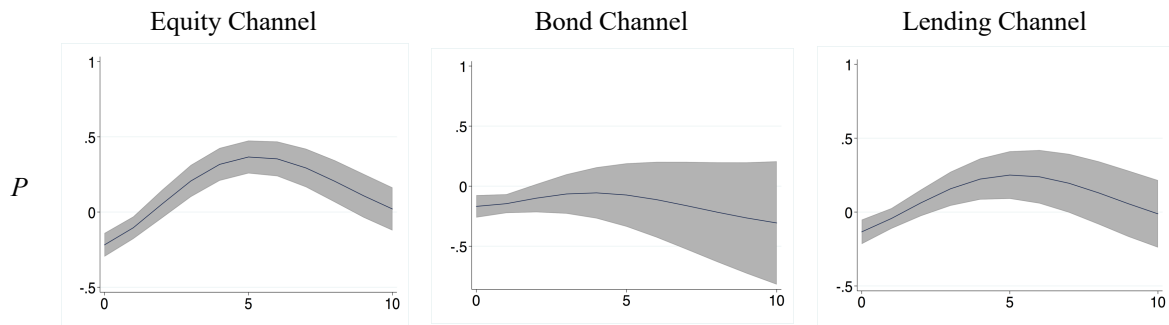
the eight countries, Hong Kong, Korea, Singapore, and Taiwan, whose GDP per capita (based on 2018 USD) exceeds \$25,000, are classified as countries with relatively developed financial markets, whereas India, the Philippines, Sri Lanka, and Thailand, whose per capita GDP (based on 2018 USD) is less than \$10,000, are regarded as having relatively less-developed financial markets.

It is worth noting that a time-varying Bayesian panel VAR as proposed by Wieladek (2014) would be an effective method in that the transmission effects of capital inflows by type would differ depending on monetary policy regimes or the degree of financial markets across countries and time. This method, however, is only applicable to balanced panel data, which is not the case in this paper that deals with unbalanced panel data.

The impulse response functions of inflation responding to capital inflow shocks for the four IT countries are displayed in figure 5. The full impulse response functions are presented in appendix B.1. Overall, the estimation results are similar to those for all countries in figure 4. However, contrary to expectations, the impulse response function of domestic interest rates responding to foreign bond investments declines until the fourth quarter after a shock. In general, in the IT adopting countries, even if domestic interest rates are under pressure due to an increased capital inflow, central banks tend to minimize short- and long-term fluctuations in interest rates to maintain the policy rate level (Blanchard et al. 2017). This result might be attributable to the use of long-term government bond rates in this paper to examine the long-term effects of capital inflows, while the central bank's policy rates are mainly reflected in short-term bonds. On the other hand, it was found that a decline in interest rates did not act as pressure to expand aggregate demand and inflation.

Figure 5. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow

by Type for the Four IT Adopting Countries



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.1 for the full impulse response functions.

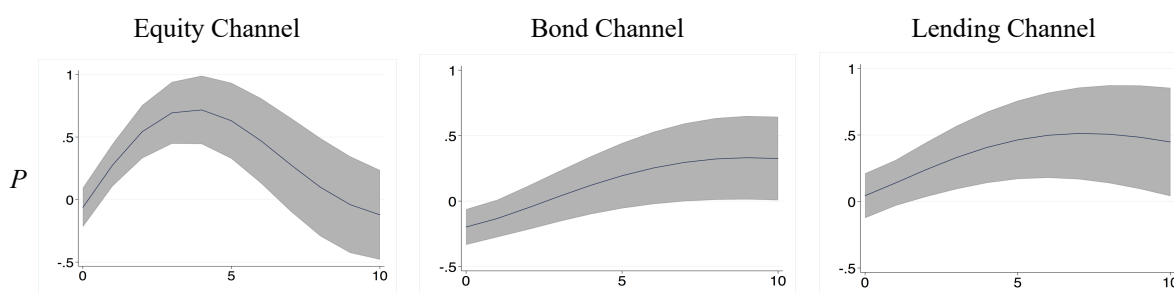
Figure 6 shows the impulse response functions of inflation for the four non-IT countries with the full impulse response functions being illustrated in appendix B.2. Comparing it with figure 5, there is overall no significant difference in qualitative aspects in terms of the impact of capital inflow by type on domestic financial markets and on the real economy. However, when comparing the quantitative effects of these capital inflow shocks on inflation, the magnitudes are smaller than in the IT countries. This can be attributable to the fact that in the case of the IT adopting countries, the exchange rate appreciation effect, due to the floating exchange rate system, is relatively larger than that in the non-IT countries, and the central banks in IT countries have a tendency to respond actively to the impact of capital inflows on inflation. The inflation stabilization of IT-adopted emerging economies is well documented in Cabral et al. (2016).

On the other hand, non-IT countries have a relatively large impact on prices compared to those that adopt IT. This seems to be related to the fact that these non-IT countries are mainly adopting an exchange rate targeting system that limits excessive fluctuations in their exchange rates. This means that in the case of non-IT countries, the downward pressure on inflation from decreased import prices caused by an appreciation is likely to be smaller, and also that the mid-



to long-term slowdown effects on inflation from a decline in net exports would be weaker than in the IT countries.

Figure 6. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four Non-IT Adopting Countries



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.2 for the full impulse response functions.

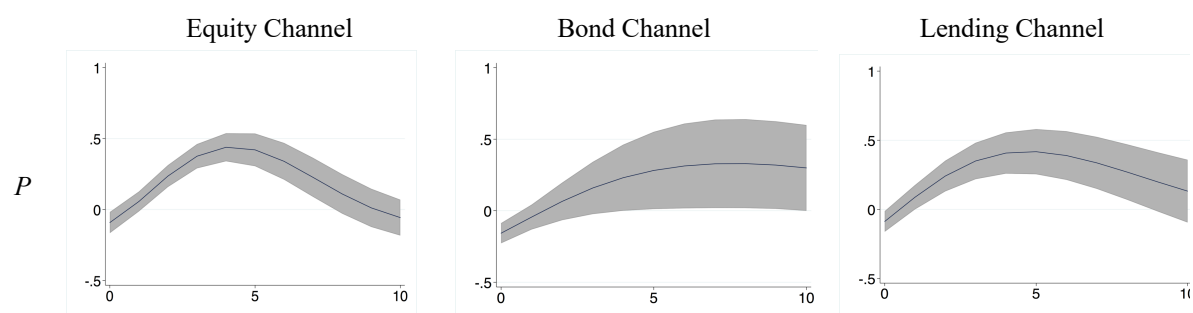
Next, as shown in table 3, the same impulse response functions are estimated for two country groups according to the degree of development of their financial markets. The results of the estimates on the country group with developed financial markets are shown in figure 7. Overall, the estimation results do not show much difference from those for all countries in figure 4. Meanwhile, the estimation results for the group of countries with less developed financial markets are shown in figure 8. The full impulse response functions are displayed in appendix B.3 and B.4, respectively.

Comparing the results of figure 8 with those in figure 7, there is no significant difference in qualitative aspects, such as directions of impulse response functions. The significant differences, however, are found in the quantitative aspects, such as the magnitude of the impulse response functions. First of all, the effects of the shock of foreign equity investment on inflation do not show much difference between the two country groups. However, in the case of the lending channel, the impact is found to be greater in countries with less developed

financial markets. This implies that other investments could have a greater impact on the real economy of the country through the bank lending channel, given that direct financial markets, such as capital markets, are not yet sufficiently developed.

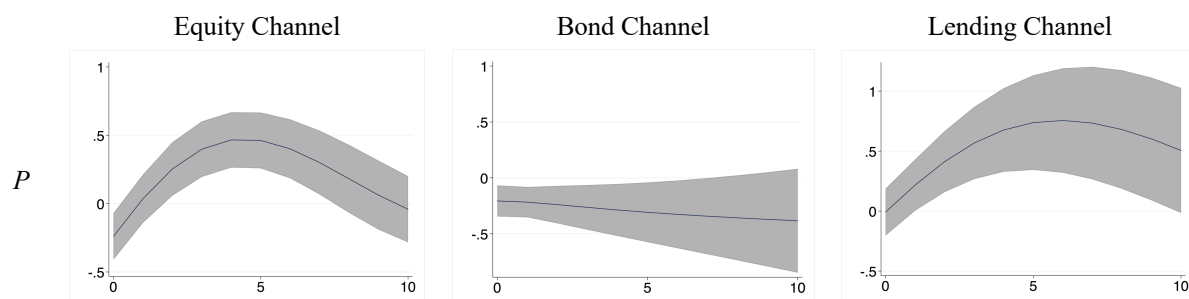
Foreign bond investments have a weak positive effect on inflation in the medium- to long-term for countries with developed financial markets, but insignificant results in countries with less developed financial markets. This can be interpreted in that the impact of foreign bond investments (Bond) on the real economy and inflation through interest rate changes is limited due to less developed bond markets in countries with less developed financial markets.

Figure 7. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four Countries with Developed Financial Markets



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.3 for the full impulse response functions.

Figure 8. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four Countries with Less Developed Financial Markets



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.4 for the full impulse response functions.

#### 4.4. Robustness Analyses

In this section, three robustness analyses are performed. First, the same impulse response functions are estimated using a capital inflow dataset based on the balance of payments (BOP). This is because the IIP dataset used in this paper includes not only actual capital inflows, but also changes due to valuation adjustments of stocks and exchange rates. Accordingly, it can cause a problem in that the correlation between capital inflows of equity and bonds based on IIP and fluctuations in stock prices and interest rates may be excessively higher than they actually are.

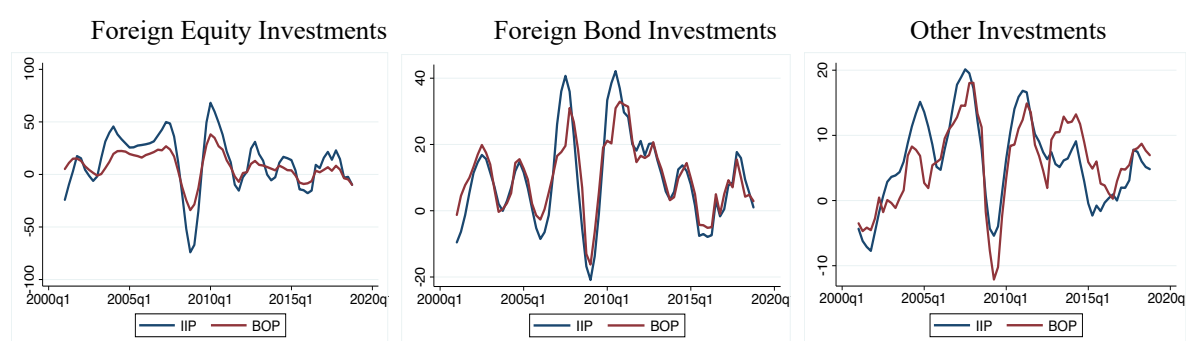
Second, the similar impulse response functions are estimated by changing the order of exogeneity in the endogenous variables. That is, it is examined whether there is a difference in the estimation results of the impulse response functions even if the order is slightly changed. Third, the impulse response functions on all economies, except Hong Kong and Singapore, are estimated. This is because, as pointed out by the IMF (2019a), there may be differences in the form of foreign transactions taking place there from other countries in the sense that the two economies operate as international financial centers.

For the first robustness check, the stock statistics on capital inflows based on the BOP are compiled using the flow statistics of the BOP. The reason for applying this methodology is that capital inflows on the balance of payments are the flow statistics involving positive and negative flow statistics. However, we need a positive time series like the IIP stock statistics to calculate consistent yearly growth rates of capital inflows. To this end, the IIP stock statistics at the end of the first quarter of 2000 are set as an initial stock observation, and the flow statistics on capital inflows from the BOP are sequentially added or subtracted to the compiled previous stock statistics. In cases where the statistics on the BOP are not available for capital

inflow by type, the existing IIP statistics are used instead. More specifically, the IIP statistics are used for the capital inflows from the first quarter of 2000 to the fourth quarter of 2008 for India. For Sri Lanka, the IIP statistics are also used from foreign equity and bond investments in the first quarter of 2000 to the first quarter of 2011. Lastly, in the case of Singapore, capital inflows on foreign equity and bond investments are calculated using IIP statistics for the entire period.

Before estimating the impulse response functions, we review whether there is a difference in the trends of growth rates of capital inflows for each channel between the IIP and the BOP. As can be seen in figure 9, overall, there is no significant difference in the trend of the growth rate of the two series. In the case of foreign equity investments, however, the volatility of the IIP statistics reflecting the market valuation adjustment is found to be greater. Foreign bond investments also show greater volatility in IIP statistics, but less than that of equity investments. Finally, in the case of other investments with bank lending being a considerable share, the BOP statistics show slightly more variations, but no significant difference. In sum, the two statistics have a slight difference in volatility, particularly in equity investments, but there is generally no significant difference in the overall trend during the period.

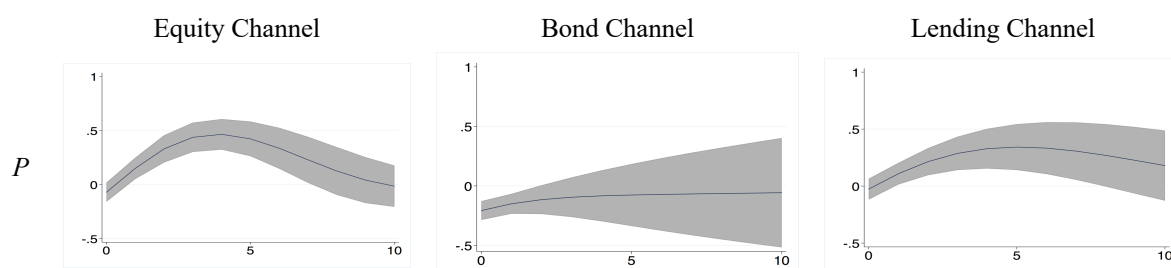
Figure 9. Comparisons of Growth Rates of Capital Inflows by Type Between IIP and BOP Statistics



Note: All time series are averages on the yearly growth rates in the eight countries.

Meanwhile, the impulse response functions of inflation responding to capital inflow by each channel using the BOP statistics are shown in figure 10. As can be seen from the fact that the trends from both the IIP and the BOP are similar, the impulse response functions of inflation using the BOP statistics are quite similar to those using the IIP statistics in figure 4. It can be understood that the primary effects of actual capital inflow by type play a major role in generating similar trends from both the IIP and BOP statistics. Accordingly, the exchange rate and market price valuation adjustments have a secondary effect on the degree of volatility between the two variables.

Figure 10. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow by Type Using BOP Statistics

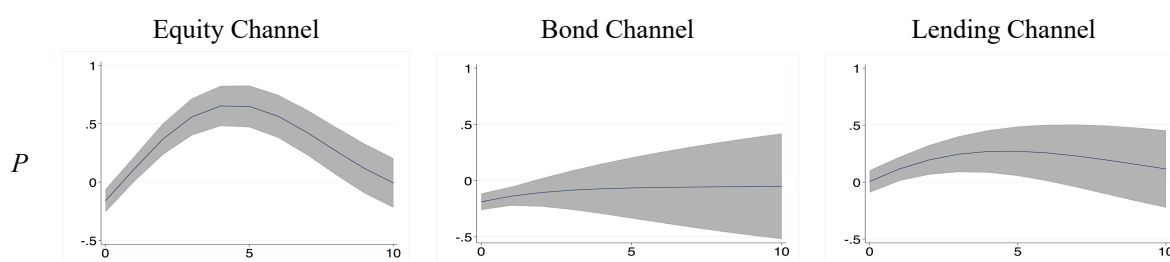


Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.5 for the full impulse response functions.

Next, we conduct a second robustness check to see whether the estimation results of the baseline model in figure 4 are robust to changes in the order of exogeneity for the endogenous variables. In the baseline model and further estimations, the order is assumed to be a causal flow from an external variable block to a domestic variable block. In other words, it is assumed that external variables composed of [CP CI FX] are hardly affected by domestic variables composed of [CV AD P] for the contemporary quarter. This causal flow is overall consistent with our intuition, as well as being related to previous research into small open economies. In

this section, we slightly swap the order of the capital inflow (CI) and the exchange rate (FX) in the external variable block, and also swap the order of the channel variable (CV) and domestic aggregate demand variable (AD) in the domestic variable block. In other words, we keep the following assumptions regarding the order: international commodity prices (CP), such as oil prices, are the most exogenous, and domestic prices (P) are the most endogenous variables. The estimated results in figure 11 and appendix B.6 show that the confidence intervals of the endogenous variables are somewhat wider and a certain difference is found in the quantitative sense when compared to the baseline estimations in figure 7. However, we can verify that there is no striking difference in the impact of each capital inflow channel on domestic inflation.

Figure 11. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow by Type Considering the Changes of the Order of Exogeneity



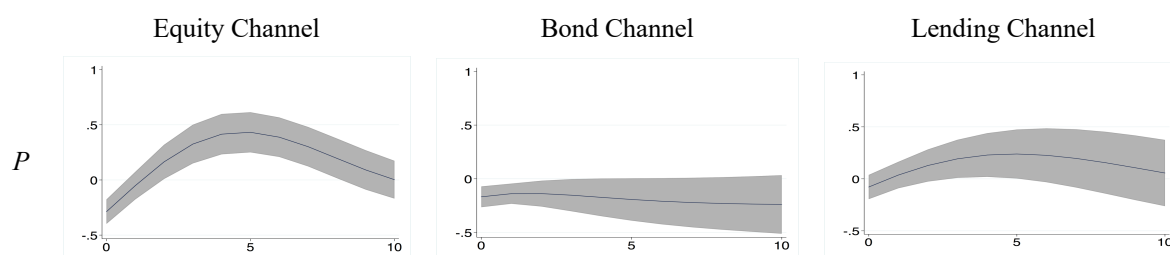
Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.6 for the full impulse response functions.

Finally, the impulse response functions are estimated for six economies other than Hong Kong and Singapore. Figure 12 shows that the impulse response functions using country panels from the six countries are overall similar to the results in figure 4. However, when the two economies are excluded, the inflation decline due to an appreciation of the domestic currency is more sustained in the case of foreign bond investments. In the case of the two economies functioning as international financial centers, Hong Kong maintains a fixed exchange rate

system, and Singapore also controls fluctuations in exchange rates through a managed floating system. Accordingly, we conjecture that the pass-through effects from the exchange rate to inflation would be weak, and, in turn, the increasing effects of capital inflows through elevated imported prices on inflation would be limited.

In sum, the robustness check indicates that the main estimation results of the baseline model are overall robust to the above three variations in the specification. As can be seen in figures 10 to 12, the impact of capital inflows through foreign equity and other investments act as inflationary pressure through the expansionary effects in aggregate demand. On the other hand, in the case of foreign bond investments, their effects on inflation are found to be limited, which is related to the central bank's monetary policy stance holding interest rates.

Figure 12. Impulse Response Functions of Inflation Responding to a One Standard Deviation Shock to Capital Inflow by Type for Six Economies, not Hong Kong and Singapore



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively. Please refer to appendix B.7 for the full impulse response functions.

## V. Conclusion

As capital flows across countries have been expanded and liberalized since the 1980s, empirical studies have been growing on the effects of capital inflows on the real economy and financial markets in a small open economy. Existing studies have been mainly focused on the relationship between capital flows and economic growth or on financial stability concerns, particularly related to a sharp capital outflow, i.e., a sudden stop.

Contributing to the literature, this paper attempts an empirical analysis of the relationship between disaggregated capital inflows and inflation for eight small open economies in Asia. Capital inflows can play a role as disinflation pressure due to the exchange rate pass-through effect, while they can also act as inflationary pressure through the expansionary aggregate demand effect.

Against this background, this study constructs a six-variable panel VAR model using quarterly data from 2000 to 2018 for eight small open economies in Asia, covering Hong Kong, India, Korea, the Philippines, Singapore, Sri Lanka, Taiwan, and Thailand. Using the model, the dynamic transmission effects of each channel of capital inflow (foreign equity, bonds, and other investments) on inflation are examined separately. In addition, this study further investigates whether the influence of capital inflows on inflation is differentiated according to the monetary policy framework and to the degree of financial market development.

The overall estimation results indicate that capital inflows have positive effects on inflation, implying that the effects of expansionary aggregate demand surpass the contractionary effects of local currency appreciation on inflation. More specifically, foreign equity investments and other investments have statistically significant positive effects on domestic inflation while foreign bond investments have overall insignificant effects on inflation. Additionally, the impacts of each capital inflow channel on inflation in non-IT economies (Hong Kong, India, Sri Lanka, and Taiwan) have greater upward pressure on inflation than in IT economies (Korea, the Philippines, Singapore, and Thailand) in a quantitative sense. Finally, the impulse response functions indicate that the effects of foreign equity investments on inflation are overall similar between the two groups, that is, countries with developed financial markets (Hong Kong, Korea, Singapore, and Taiwan) and countries with less developed financial markets (India, the Philippines, Sri Lanka, and Thailand). The effects of other investments, however, are found to



be greater in countries with less developed financial markets. This implies that bank borrowing from abroad can have a relatively large impact on the real economy and inflation through the lending channel, given immature capital markets, for the countries with less developed financial markets.

The analysis results of this paper suggest the following policy implications for a small open economy facing frequent capital inflows and outflows. It is necessary to pay more attention to not only the aggregate amount of capital inflow, but also to the fluctuations within each type of capital inflow, in that the impacts differ of each channel of capital inflow on the domestic real economy and on inflation. In addition, strengthening the inflation targeting framework and developing stronger financial markets can be effective measures for central banks in emerging markets to cope better with the inflation pressures from capital inflows.

## References

- Abrigo, M. R., and I. Love (2015), "Estimation of Panel Vector Autoregression in Stata: A Package of Programs," available on <http://paneldataconference2015.ceu.hu/Program.Michael-Abrigo.pdf>.
- Bhagwati, J. (1998), "The Capital Myth: The Difference between Trade in Widgets and Dollars," *Foreign Affairs*, Vol. 77, pp. 7-12.
- Blanchard, O., J. D. Ostry, A. R. Ghosh, and M. Chamon (2016), "Capital flows: Expansionary or Contractionary?" *American Economic Review*, Vol. 106 (5), pp. 565-569.
- Blanchard, O., J. D. Ostry, A. R. Ghosh, and M. Chamon (2017), "Are Capital Inflows Expansionary or Contractionary? Theory, Policy Implications, and Some Evidence," *IMF Economic Review*, Vol. 65 (3), pp. 563-585.
- Bonfiglioli, A. (2008), "Financial Integration, Productivity and Capital Accumulation," *Journal of International Economics*, Vol. 76 (2), pp. 337-355.
- Browne, F. and D. Cronin (2007), "Commodity Prices, Money and Inflation," *Journal of Economics and Business*, Vol. 62, No. 4, pp. 331-345.
- Cabral, R. F. Carneiro, and A. Mollick (2016), "Inflation Targeting and Exchange Rate Volatility in Emerging Markets," *Policy Research Working Paper*, 7712, World Bank.
- Calderón, C., and M. Kubota (2012), "Gross Inflows Gone Wild: Gross Capital Inflows, Credit Booms, and Crises," *Policy Research Working Paper*, 6270, World Bank.
- Calvo, G. A (1998), "Capital Flows and Capital-market Crises: the Simple Economics of Sudden Stops," *Journal of Applied Economics*, pp. 35-54.
- Calvo, G. A., A. Izquierdo, and Luis-Fernando Mejía (2004), "On the Empirics of Sudden Stops: the Relevance of Balance-sheet Effects," *NBER Working Paper* 10520.
- Calvo, G., A. Izquierdo, and Luis-Fernando Mejía (2008), "Systemic Sudden Stops: the Relevance of Balance-sheet Effects and Financial Integration," *NBER Working Paper* 14026.
- Campa, J. and L. Goldberg, (2005), "Exchange Rate Pass-Through into Import Prices," *Review of Economics and Statistics*, Vol. 87, No. 4, pp. 679-690.
- Campa, J. and L. Goldberg, (2010), "The Sensitivity of the CPI to Exchange Rates: Distribution Margins, Imported Inputs, and Trade Exposure," *Review of Economics and Statistics*, Vol. 92, No. 2, pp. 392-407.
- Choi, Y. J., and J. C. Son (2018), "The Effect of Foreign Capital Inflow on Inflation," *Journal of Money & Finance*, Vol. 32 (1). (in Korean)
- Čihák, M., A. Demirgüç-Kunt, E. Feyen, R. Levine (2012), "Benchmarking Financial Systems around the World," *Policy Research Working Paper* 6175, World Bank.
- Cowan, K., and José De Gregorio (2007), "International Borrowing, Capital Controls and the Exchange Rate: Lessons from Chile," NBER Chapters in: Capital Controls and Capital Flows in *Emerging Economies: Policies, Practices, and Consequences*, National Bureau of Economic Research, pp. 241-296.
- Cowan, K., José De Gregorio, A. Micco, and C. Neilson (2008), "Financial Diversification, Sudden Stops, and Sudden Starts," in: Cowan, Kevin, Edwards, Sebastian, Valdés, Rodrigo (Eds.), *Current Account and External Finance*, Central Bank of Chile.
- Dornbusch, R. (1976), "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, Vol. 84, No. 6, pp. 1161-1176.
- Dornbusch, R. (1987), "Expectations and Prices," *American Economic Review*, Vol. 77, No. 1, pp. 93-106.
- Edwards, S. (2001), "Capital Mobility and Economic Performance: Are Emerging Economies Different?", *NBER Working Paper*, No. 8076.
- Elijah, O. k. (2006), *Determinants of Foreign Direct Investment in Kenya*, Institute African de Development Economiqueet de Planification Publication: Dakar, Senegal.
- Faucette, J. E., A. D. Rothenberg, and F. E. Warnock (2005), "Outflows-induced Sudden Stops," *Journal of Policy Reform*, Vol. 8, pp. 119-130.
- Fisher, S. (1998), "Capital Account Liberalization and the Role of the IMF" in *Essays in International Finance*, No. 207, Princeton University.
- Fisher, S. (2003), "Globalization and its Challenges," *American Economic Review*, Vol. 93 (2), pp. 1-30.
- Fleming, J. M. (1962), "Domestic Financial Policies Under Fixed and Floating Exchange Rates," *IMF Staff Papers*, Vol. 9, pp. 369-379.
- Forbes, K. J., and F. E. Warnock (2012), "Capital Flow Waves: Surges, Stops, Flight, and Retrenchment," *Journal of International Economics*, Vol. 88(2), pp. 235-251.
- Forbes, K., I. Hjortsoe, and T. Nenova (2017), "The Shocks Matter: Improving Our Estimates of Exchange Rate

- Pass-Through," *Journal of International Economics*, Vol. 114 (September), pp. 255-275.
- Friedrich, C., and P. Guérin (2019), "The Dynamics of Capital Flow Episodes," *Journal of Money, Credit and Banking*, Vol. 52 (5), pp. 969-1003.
- Furceri, D., S. Guichard, and E. Rusticelli (2012), "The Effect of Episodes of Large Capital Inflows on Domestic Credit," *The North American Journal of Economics and Finance*, Vol. 23 (3), pp. 325-344.
- Furlong, F. and R. Ingenito (1996), "Commodity Prices and Inflation," *Economic Review*, Federal Reserve Bank of San Francisco, 2, pp. 27-47.
- Ghosh, A. R., and M. S. Qureshi (2016), "Capital Inflow Surges and Consequences," *ADB Working Paper Series*, 585.
- Ha, J., M. Stocker, and H. Yilmazkuday, "Inflation and Exchange Rate Pass-Through," *Policy Research Working Paper 8780*, World Bank, Washington D.C.
- Holtz-Eakin, D., W. Newey, and H. S. Rosen (1988), "Estimating Vector Autoregressions with Panel Data," *Econometrica*, pp. 1371-1395.
- IMF, (2019a), "The External Balance Assessment Methodology: 2018 Update," *IMF Working Paper*, WP/19/65.
- IMF, (2019b), *World Economic Outlook, October 2019: Global Manufacturing Downturn, Rising Trade Barriers*, IMF.
- Igan, D., and Z. Tan (2015), "Capital Inflows, Credit Growth, and Financial Systems," *IMF Working Paper*, WP/15/193.
- Joice, J. (2011), "Financial Globalization and Banking Crises in Emerging Markets," *Open Economies Review*, Vol. 22 (5), pp. 875-895.
- Klein, M. W., and G. Olivei (1999), "Capital Account Liberalization, Financial Depth and Economic Growth," *NBER Working Paper*, No. 7384.
- Krugman, P. (1987), "Pricing to Market When the Exchange Rate Changes," *NBER Working Paper 1926*, National Bureau of Economic Research, Cambridge, MA.
- Lane, P. R., and G. M. Milesi-Ferretti (2017), "International Financial Integration in the Aftermath of the Global Financial Crisis," *IMF Working Paper*, WP/17/115.
- Lütkepohl, H. (1993), "Testing for Causation Between Two Variables in Higher-dimensional VAR Models," in *Studies in Applied Econometrics* (pp. 75-91). Physica-Verlag HD.
- Montiel, P. J. (2013), "Capital Flows: Issues and Policies," *IDB Working Paper Series*, No. IDB-WP-411, Inter-American Development Bank.
- Moosa, I. A., and B. A. Cardak (2006), "The Determinants of Foreign Direct Investment: An Extreme Bounds Analysis," *Journal of Multinational Financial Management*, Vol. 16 (2), pp. 199-211.
- Muinhos, M. K. (2000), "From Capital Inflow to Inflation: the Role of Exchange Rate and Government Debt," *Revista Brasileira de Economia*, Vol. 45, N0. 1, pp. 57-84.
- Mundell, R. (1963), "Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates," *Canadian Journal of Economics and Political Sciences*, Vol. 29, pp. 475-85.
- Narayanamurthy, V., S. Perumal, and C. S. Kode (2010), "Determinants of FDI in BRICS Countries: A Panel Analysis," *International Journal of Business Science and Applied Management*, Vol. 5 (3), pp. 1-13.
- Quinn, D. (1997), "The Correlates of Changes in International Financial Regulation", *American Political Science Review*, Vol. 91, pp. 531-551.
- Reinhart, C. M., and V. R. Reinhart (2009), "Capital Flow Bonanzas: an Encompassing View of the Past and Present," in: Frankel, Jeffrey and C. Pissarides (Eds.), *NBER International Seminar on Macroeconomics 2008*.
- Rodrik, D. (1998), "Who Needs Capital-Account Convertibility" in *Essays in International Finance*, Vol. 207, Princeton University.
- Rogoff, K. (1999), "International Institutions for Reducing Global Financial Instability", *Journal of Economic Perspectives*, Vol. 13 (4), pp. 21-42.
- Rojas-Suarez, L. (2014), "Towards Strong and Stable Capital Markets in Emerging Market Economies," *BIS Papers* No. 75.
- Rothenberg, A. D., and F. E. Warnock (2011), "Sudden Flight and True Sudden Stops," *Review of International Economics*, Vol. 19 (3), pp. 509-524.
- Sims, C. and Zha (2006), "Does Monetary Policy Generate Recessions?," *Macroeconomic Dynamics*, Vol. 10, No. 2, pp. 231-272.
- Wieladek, T. (2016), "The Varying Coefficient Bayesian Panel VAR Model," *Bank of England Working Paper* No. 578.
- Wijeweera, A., and S. Mounter (2008), "A VAR Analysis on the Determinants of FDI Inflows: The Case of Sri Lanka," *Applied Econometrics and International Development*, Vol. 8 (1).

## Appendix A

Descriptive Statistics for the Endogenous Variables<sup>1)</sup> in the Panel VAR

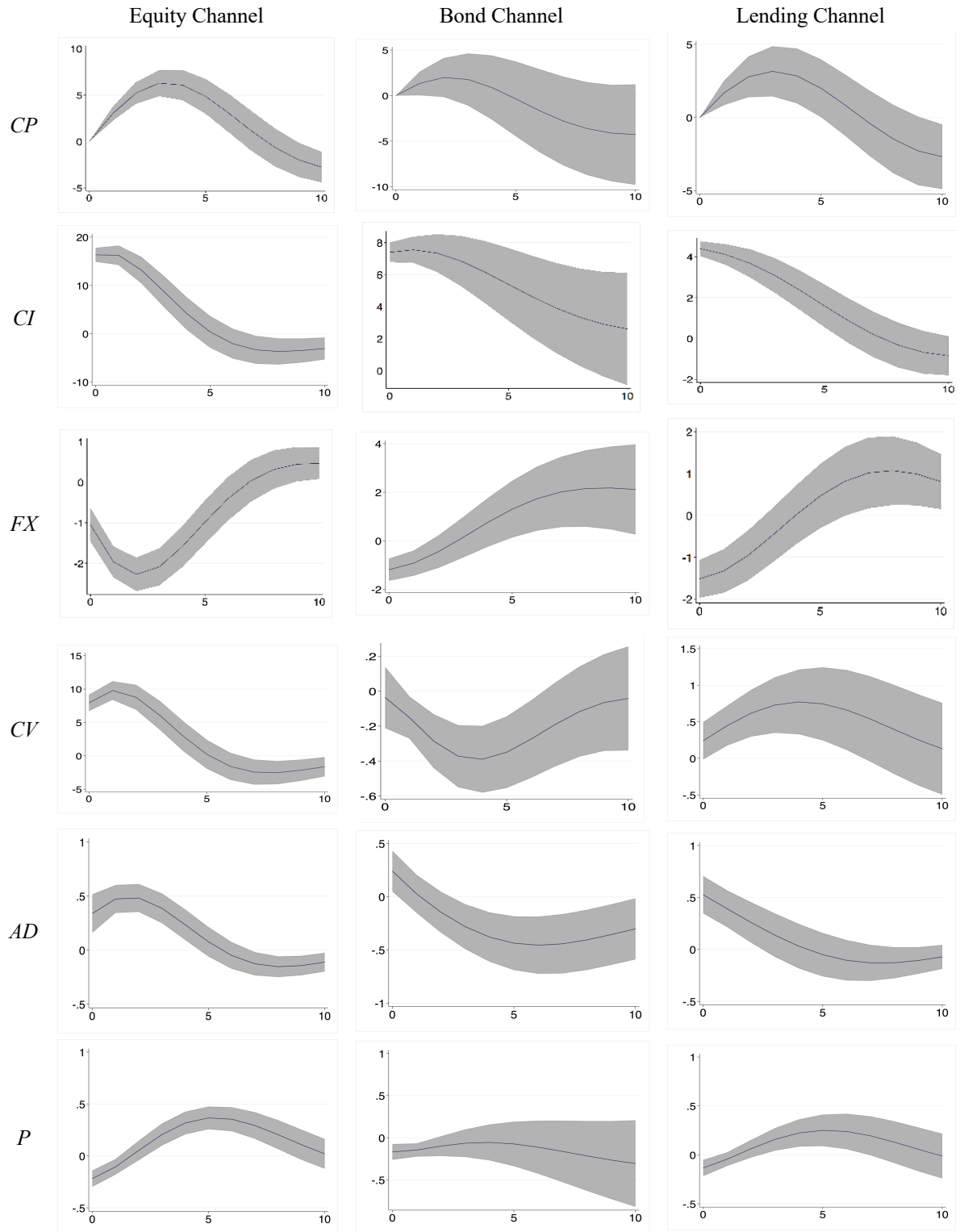
Variables		Obs.	Mean	S.D.	Min	Max
International commodity prices (CP, %)		608	5.18	20.83	-51.83	40.00
Capital inflow by type (CI)	Equity investment (Equity, %)	576	11.90	32.71	-94.31	111.86
	Bond investment (Bond, %)	576	9.60	28.00	-126.23	165.34
	Other investments (Other, %)	576	6.02	10.65	-28.13	48.00
Channel variables (CV)	Stock prices (SP, %)	608	3.36	23.81	-76.54	74.26
	Real interest rates (Rate, %p)	538	-0.29	2.44	-7.46	9.09
	Bank lending <sup>2)</sup> (Lending, %)	560	9.53	7.04	-5.98	30.70
Foreign exchange rates (FX, %)		608	0.70	6.63	-21.34	39.36
Aggregate demand (AD, %)		608	5.34	4.89	-5.91	38.57
Inflation (P, %)		608	3.40	3.64	-4.94	26.54

Notes: 1) All variables except bank lending are on a quarterly average basis. Bank lending is on a quarterly-end value basis. All variables except the real interest rates are the yearly growth rates. The real interest rates are the yearly differences in the levels.

2) Stock prices (SP) and bank lending (Lending) are converted into real variables using the CPI.

## Appendix B.1

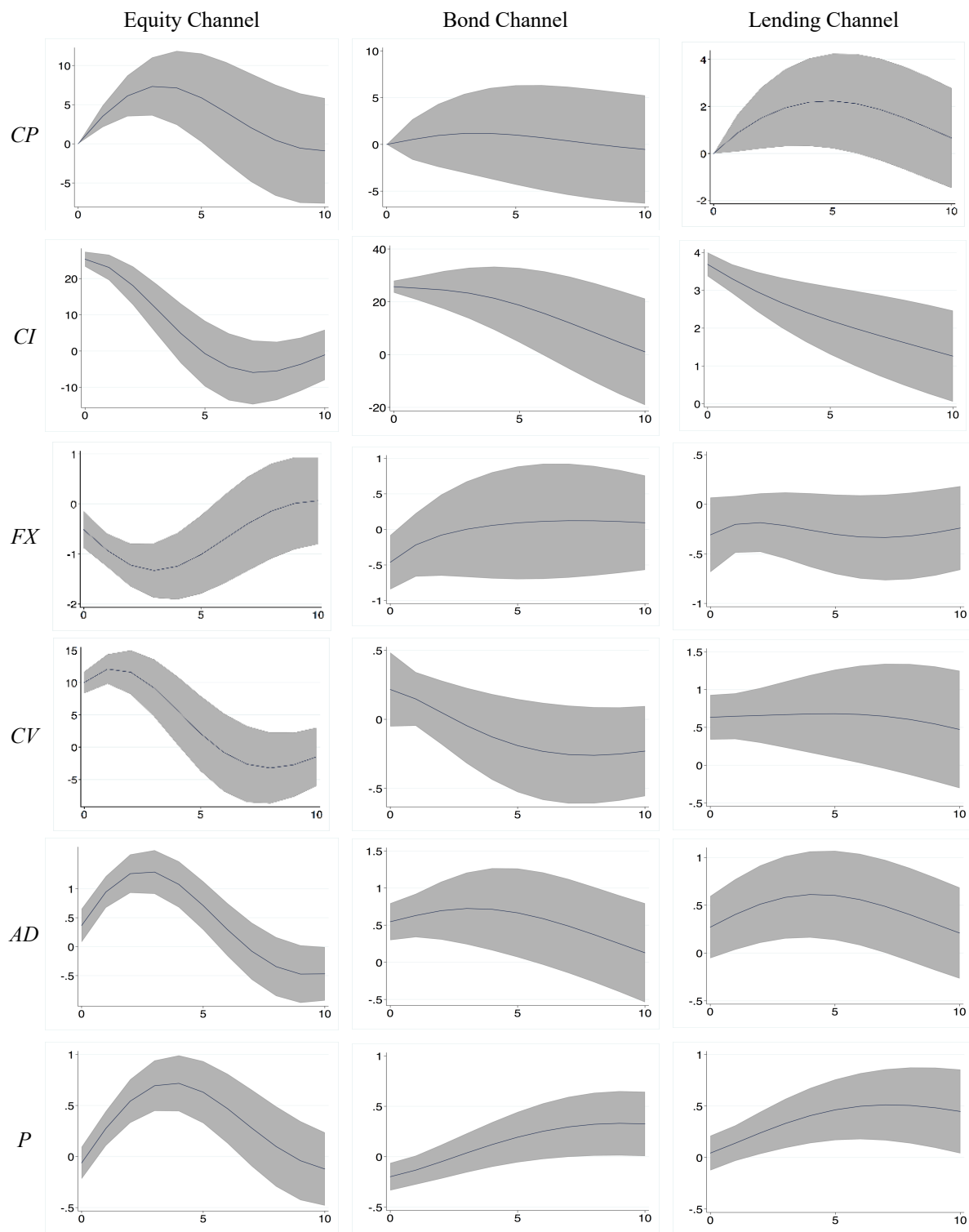
Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four IT Adopting Countries



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.

## Appendix B.2

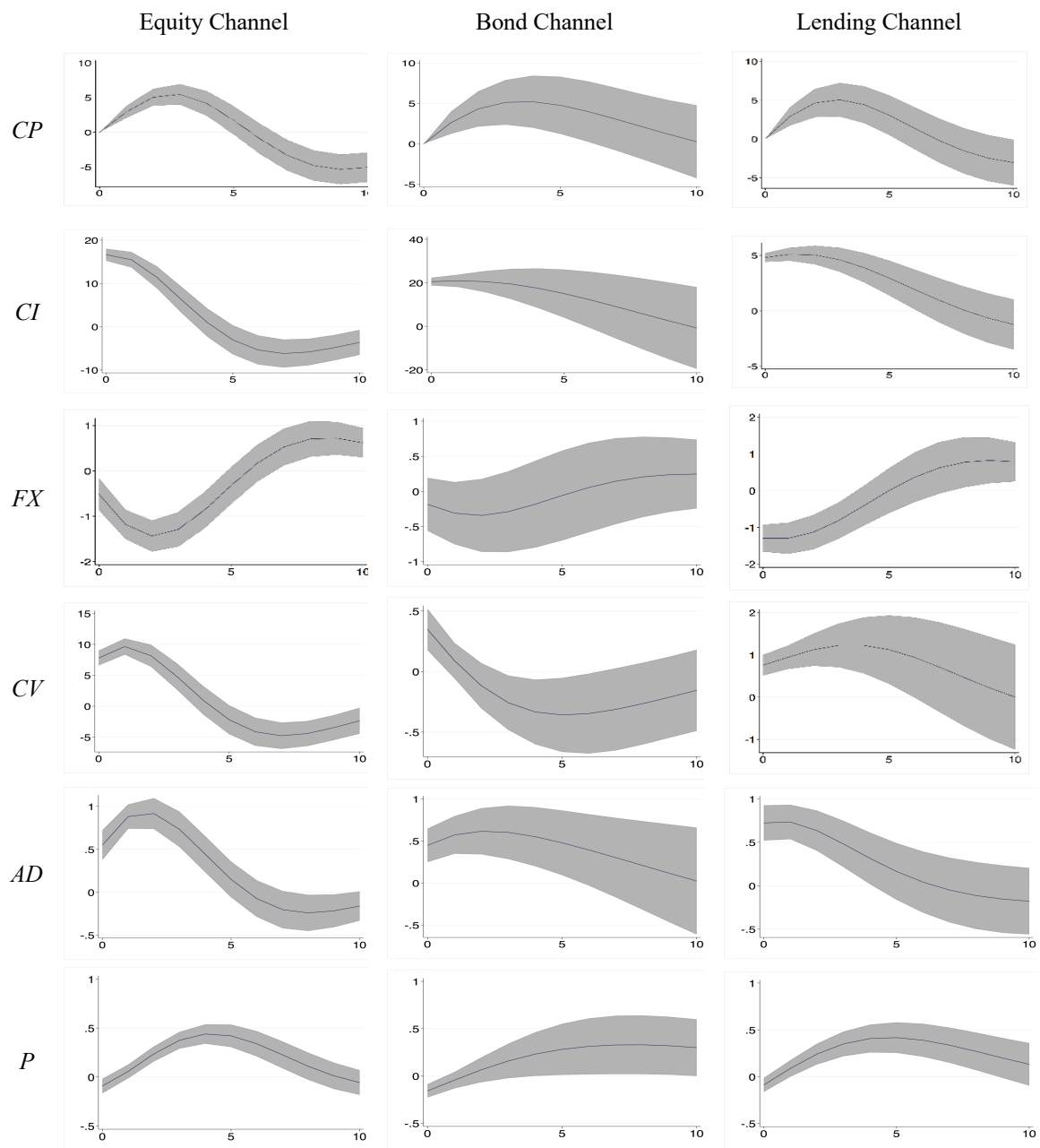
Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four Non-IT Adopting Countries



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.

## Appendix B.3

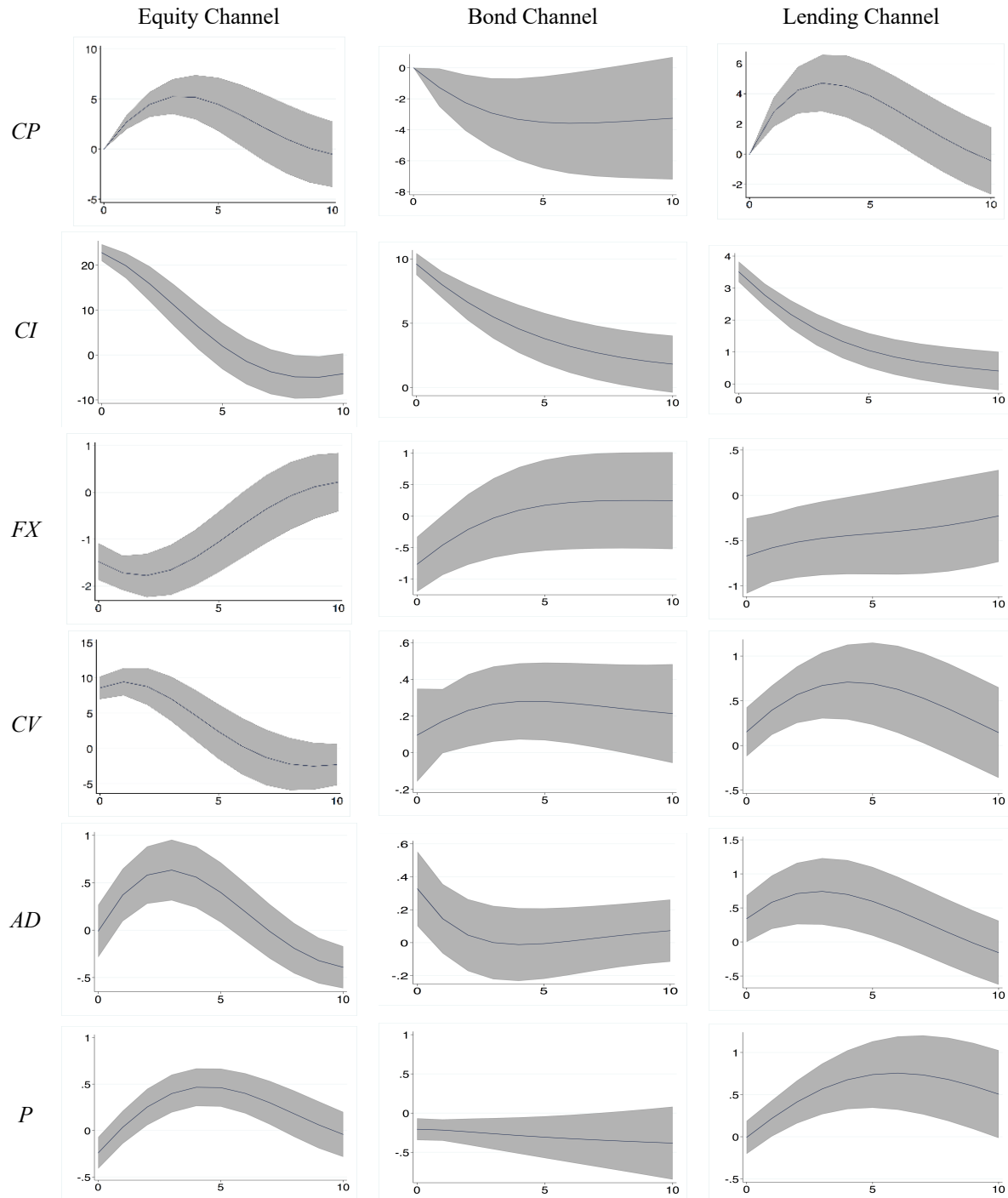
Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four Countries with Developed Financial Markets



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.

## Appendix B.4

Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type for the Four Countries with Less Developed Financial Markets

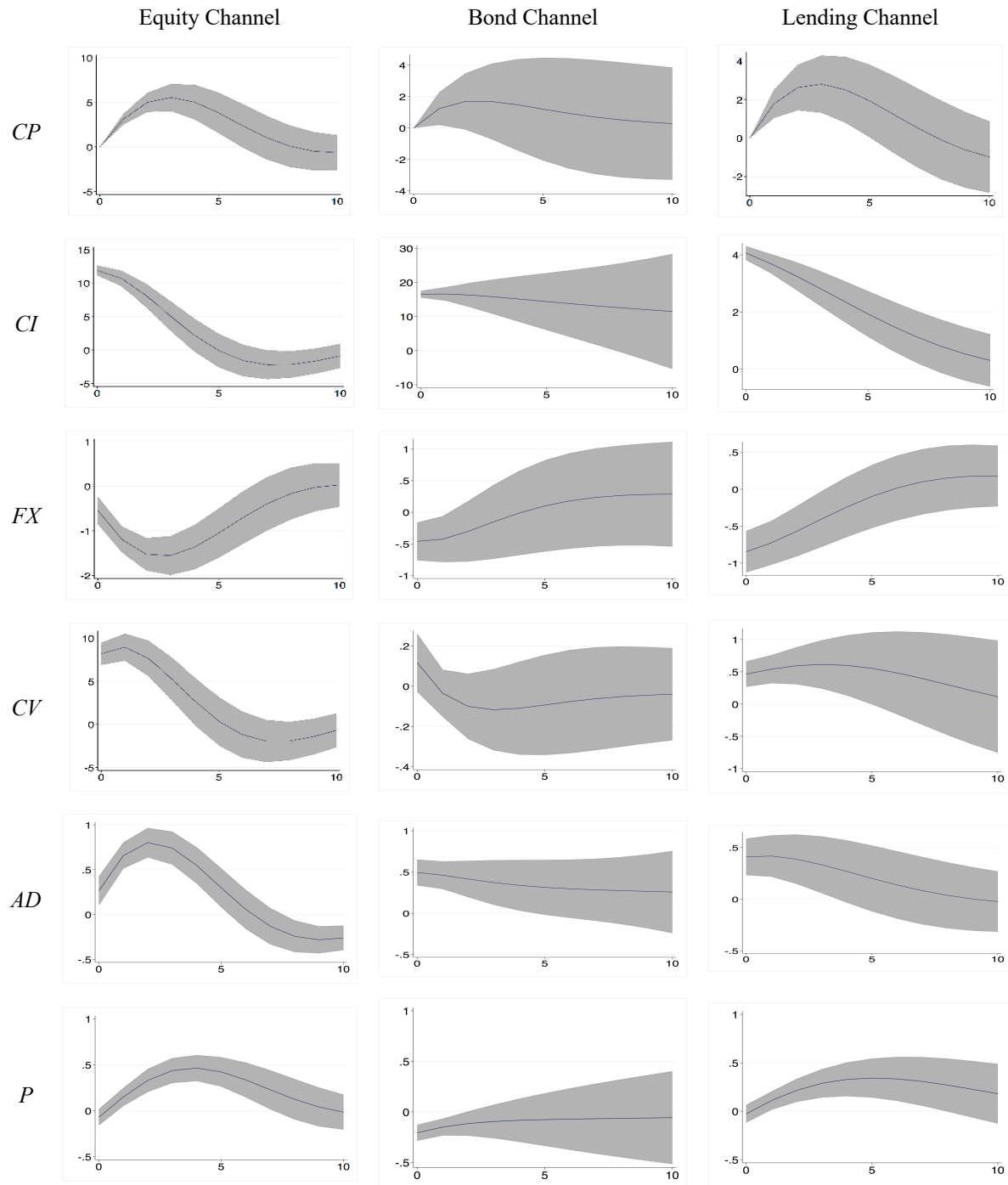


Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.



## Appendix B.5

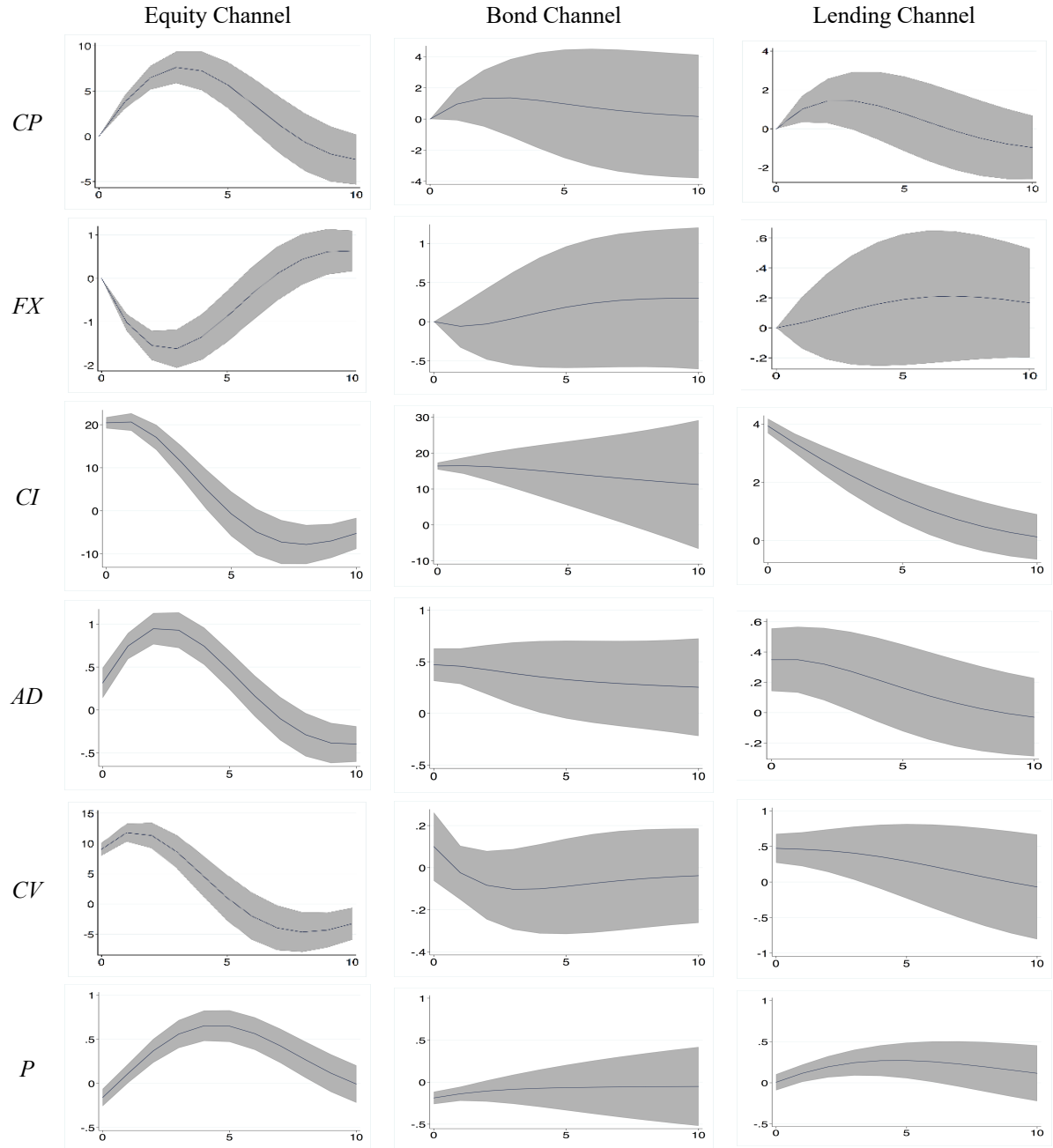
Figure 10. Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type Using BOP Statistics



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.

## Appendix B.6

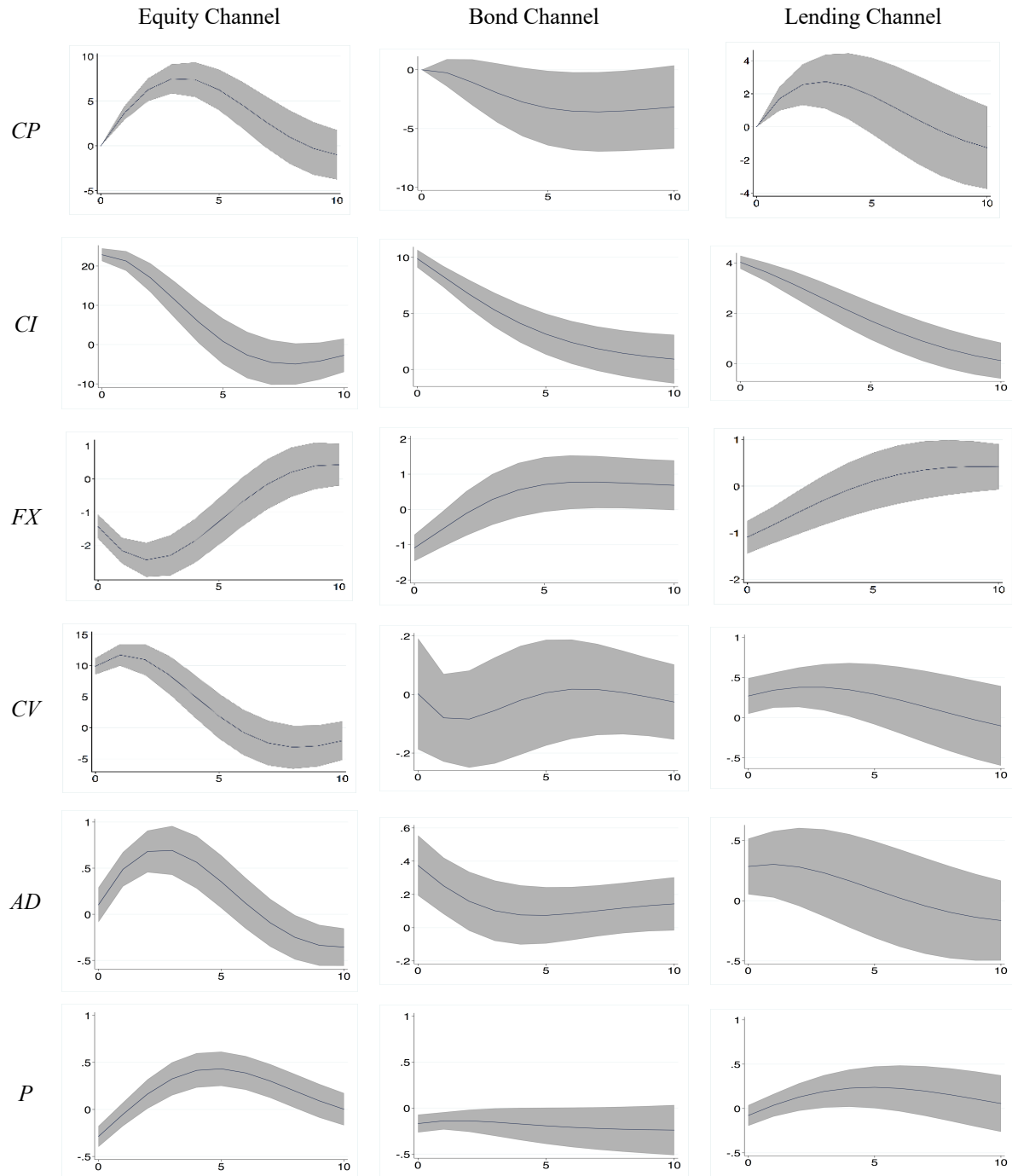
Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type Considering the Changes of the Order of Exogeneity



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.

## Appendix B.7

Impulse Response Functions Responding to a One Standard Deviation Shock to Capital Inflow by Type for Six Economies, not Hong Kong and Singapore



Note: The solid lines and the shaded areas indicate the impulse response results and the 95% confidence intervals, respectively.