Effectiveness of Capital Controls: Gates versus Walls

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Abstract

This study analyzes the effectiveness of capital controls on international debt flows using data of 81 economies, including both advanced and emerging economies, over the period from 1995 to 2019. The analysis using the total sample shows that, although they are in the expected directions, the impulse responses of capital controls are statistically insignificant. Making various distinctions among samples (such as advanced and emerging economies and pre- and post-crisis periods), we still find that most results are statistically insignificant. However, the canonical distinction between the "gate" and "wall" economies indicates that the effectiveness of capital controls is relevant for the "wall" emerging economies.

Keywords: Capital flows; Capital controls; Local projection
JEL Classification: E69, F32, F38, F41.

1

1 Introduction

Large and volatile capital flows are of great concern to policymakers in emerging economies. The COVID-19 pandemic has resulted in historic portfolio outflows from emerging economies (IMF, 2020, ch.3). The International Monetary Fund (IMF) previously opposed policies that impeded the free flow of capital. However, the IMF admits that capital control policies can be a valid alternative policy tool for emerging economies to manage excessive capital flows under certain circumstances (IMF, 2022).[1] The IMF changed its view on capital controls when many emerging economies had been contending with the sudden influx of capital owing to the unprecedented quantitative easing measures in developed countries after the global financial crisis. Macroeconomic instability in the form of asset bubbles, high inflation, declining international competitiveness owing to domestic currency appreciation, and sudden reversal of capital flows, has been observed on a number of occasions in the past. Therefore, many policymakers and researchers consider some kind of policy intervention, such as capital controls, necessary for macroeconomic stability.

Accordingly, capital controls have been among the most important topics in international finance, and have been examined increasingly. However, the empirical literature on the effectiveness of capital controls yields mixed results.[2] Some empirical studies suggest that capital controls are effective (e.g., Ostry et al., 2012; Ahmed and Zlate, 2014; Chantapacdepong and Shim, 2015; Bruno et al., 2017), while others suggest that capital controls are ineffective (e.g., Forbes and Warnock, 2012; Forbes et al., 2015; Frost et al., 2020). Notably, quite a few empirical studies show that the effectiveness of capital controls depends on many different factors, such as asset categories, countries' income levels, financial development levels, regulatory quality levels, the structure of the banking sector, the direction of flows, the type of capital controls, the difference between advanced and emerging economies (e.g., Binici et al., 2010; Baba and Kokenyne, 2011; Dell'Erba and Reinhardt, 2015; Beirne and Friedrich, 2017; Nispi Landi and Schiavone, 2021; Kitano and Zhou, 2022). We

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[1] For more details, see Ostry et al. (2010), Ostry et al. (2012), and IMF (2012).

[2] Many theoretical studies suggest that overall, capital controls are a potentially useful policy tool. See, for example, the literature review in Kitano and Takaku (2018), Kitano and Takaku (2020), and Yin et al. (2022).

can say that the empirical literature is inconclusive on whether capital controls are effective or not.

We analyze the effectiveness of capital controls on international debt flows using data of 81 economies, including both advanced and emerging economies, over the period from 1995 to 2019. We use the local projection (LP) estimation methodology proposed by Jordà (2005).[3] We first use total samples, including both advanced and emerging economies, to examine the effectiveness of imposing capital controls on international debt flows. We further make various distinctions between the samples. Considering the inconclusive empirical literature on whether capital controls are effective or not, we expect that we may find positive results about the effectiveness of capital controls in some cases, but negative results in other cases.

The analysis using the total sample shows that, although they are in the expected directions, the impulse responses of imposing capital controls are statistically insignificant. We find that distinguishing between the pre- and post-crisis periods does not change the result in the total sample case. We further distinguish between the two groups of advanced and emerging economies. We find that the result in advanced economies is almost similar to the whole sample case, whereas the result in emerging economies is less relevant compared with the whole sample case. However, the results are statistically insignificant. Further, by distinguishing between the pre- and post-crisis periods for the two groups of advanced and emerging economies, respectively, we find that some impulse responses are in the opposite direction to the expected, and that most results are statistically insignificant.

Following the canonical distinction by Klein (2012), we finally distinguish between the "gate" and "wall" countries. Klein (2012) makes a key distinction between episodic controls that cover a narrow set of asset categories ("gate") and long-standing controls that cover a broad set of asset categories ("wall"). Our results show that compared with the "gate" economies, the effectiveness of capital controls is relevant for the "wall" economies.

Our study deviates from the existing literature in that we examine the effectiveness of capital controls using the canonical distinction, "gate" and "wall," originally

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[3]More recent studies employ this method (e.g., Gupta et al., 2021).

proposed by Klein (2012).[4] To the best of our knowledge, this study is the first to follow the canonical distinction between "gate" and "wall" economies, and examine how the effectiveness of capital controls differs between the two groups.

2   Data and Methodology

2.1   Data

We use annual data of 81 economies:31 advanced economies and 50 emerging economies over the period from 1995 to 2019, owing to data availability constraints.[5] Following Forbes and Warnock (2012), Broner et al. (2013), and Nispi Landi and Schiavone (2021), we use gross (rather than net) inflows as our measure of capital inflows. Gross inflows are defined as the *net* purchases and sales of domestic assets by foreign agents.[6] We obtain gross inflow data from the balance of payments in the CEIC database.[7] In Section 2.2, we use capital-inflow-to-GDP ratio, which is defined as the ratio of gross inflows to nominal gross domestic product(GDP). Nominal GDP data are also obtained from the CEIC database.

We use the dataset of capital control indices compiled by Fernández et al. (2016). The dataset contains the annual 0-1 dummy variables; 1 indicates if such a policy is in place, and 0 indicates for the absence in specific asset categories. We choose capital controls for debt transactions. In the dataset by Fernández et al. (2016), we specifically use the "bo_plbn" and "bo_siln" indices in the asset category of "bonds or other debt securities with an original maturity of more than one year." When "bo_plbn" is 1 (0), it indicates that capital controls on the *purchase* of domestic debt by foreign agents are in place (absent). The imposition of capital controls on the *purchase* of domestic debt by foreign agents discourages foreign agents from

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[4]Klein (2012)'s estimates show significant differences in the partial correlations of "gate" and "wall" types of capital controls with the growth of certain financial variables and with GDP growth. However, the estimate controlling GDP per capita finds little evidence on the differences between them.

[5]Table 1 shows the 31 advanced economies. Table 2 shows the 50 emerging economies.

[6]The *gross* inflows refer to the *net* of purchases and sales. Accordingly, the terminology of "gross inflows" may be confusing (Forbes and Warnock, 2012).

[7]The gross inflow data specifically correspond to the term "foreign portfolio investment: debt securities" in the CEIC database.

purchasing domestic debt. Therefore, if "bo_plbn" is 1, it is expected to *decrease* the gross inflows. When "bo_siln" is 1 (0), it indicates that capital controls on the *sale* of domestic debt by foreign agents are in place (absent). The imposition of capital controls on the *sale* of domestic debt by foreign agents discourages foreign agents from *selling* domestic debt. As argued above, gross inflows are defined as the *net purchases and sales* (i.e., purchases minus sales) of domestic assets by foreign agents. Therefore, if "bo_siln" is 1, it is expected to *increase* the gross inflows.

We include each country's real GDP growth rates, consumer price index (CPI) inflation rates, financial development indices, nominal exchange rates (depreciation rates against the US dollar), nominal interest rates, total exports and imports to GDP ratios, external debt-to-GDP ratios, and the Volatility Index (VIX) computed by the Chicago Board Options as control variables in the regressions in Section 2.2. Real GDP growth and CPI inflation rates are obtained from the Penn World Table (Feenstra et al., 2015). The financial development indices are obtained from the IMF Financial Development (FD) Index database. Volatility Index (VIX) data are obtained from "FRED" of the Federal Reserve Bank of St. Louis. The other four datasets (each country's nominal exchange rates, nominal interest rates, total exports and imports to GDP ratios, and external debt-to-GDP ratios) are obtained from the CEIC database.

Following Klein (2012) and Fernández et al. (2016), we classify the sample economies into three groups: "open," "gate," and "wall." In Section 3, we examine how they differ in the effectiveness of capital controls. Using data on inflow controls over the period from 1995 to 2010 for various asset categories, Klein (2012) divided 44 countries into three groups: "open" countries (persistently open to inflows), "wall" countries (persistently closed), and "gate" countries (i.e., episodic controls). Using data on inflow controls over the period of 1995 to 2019, we classify 31 advanced and 50 emerging countries into three categories, as shown in Tables 1 and 2. We further follow Fernández et al. (2016, p.558)'s criteria: "*"Open" ("Walls") countries have, on average, capital controls on less than 15 percent (more than 70 percent) of their transactions subcategories over the sample period and do not have any*

Table 1: Classification of advanced economies into "open", "gate", and "wall" groups

Open		Gate	
Country	Mean	Country	Mean
Austria	0.146	Australia	0.267
Belgium	0.067	Cyprus	0.450
Canada	0.056	Czech	0.291
Denmark	0.057	Finland*	0.153
France	0.071	Germany	0.193
Hong Kong	0.021	Greece*	0.175
Ireland	0.048	Iceland	0.465
Italy	0.025	Israel	0.126
Japan	0.002	Korea	0.349
Latvia	0.064	Malta	0.322
Netherlands	0	Portugal	0.173
New Zealand	0.101	Slovenia	0.372
Norway	0.052	Switzerland	0.192
Singapore	0.140		
Spain	0.028		
Sweden	0.086		
United Kindom	0.02		
United States	0.134		
(18)		(13)	

Notes: There is no sample advanced economy classified as "wall." The countries with * are classified as "open" in Fernández et al. (2016) (from 1995 to 2013), but "gate" in our analysis (from 1995 to 2019).

years in which controls are on more than 25 percent (less than 60 percent) of their transaction subcategories. "Gate" countries are neither Walls nor Open." In Table 1, there is no "wall" country, as no sample advanced economies are classified as the "wall" economies. In Table 1, 18 countries are classified as "open" countries, while 13 countries are classified as "gate" countries. The countries with * (Finland and Greece) are classified as "open" countries in Fernández et al. (2016) (from 1995 to 2013), but classified as "gate" countries in our analysis (from 1995 to 2019). In Table 2, we classify 8, 31 and 11 countries as "open," "gate," and "wall" respectively. The countries with * are classified as "open" in Fernández et al. (2016) (from 1995 to 2013), but classified as "gate" in our analysis (from 1995 to 2019). Although their average capital-control indices are larger than 70%, the countries with ** are classified as "gate" rather than as "wall." This is because they have at least one year, which is less than 60%.

Table 2: Classification of emerging economies into "open", "gate", and "wall" groups

Open		Gate				Wall	
Country	Mean	Country	Mean	Country	Mean	Country	Mean
Georgia	0.063	Argentina	0.509	Kyrgyz	0.266	China	0.957
Mauritius	0.115	Bangladesh**	0.825	Lebanon	0.612	Côte d'Ivoire	0.768
Panama	0	Bolivia	0.173	Mexico	0.603	India	0.967
Paraguay	0.104	Brazil	0.625	Moldova	0.652	Malaysia	0.813
Peru	0.007	Bulgaria	0.179	Nigeria	0.225	Morocco	0.761
Qatar	0.122	Chile	0.390	Oman*	0.159	Pakistan	0.727
Uruguay	0.003	Colombia	0.630	Poland**	0.724	Philippines	0.854
Zambia	0	Ecuador	0.390	Romania	0.318	Sri Lanka	0.992
		Egypt*	0.174	Russia	0.614	Tunisia	0.994
		Ghana	0.520	Saudi Arabia	0.666	Ukraine	0.796
		Hungary	0.237	South Africa	0.647	Uzbekistan	0.897
		Indonesia	0.644	Thailand**	0.734		
		Iran	0.660	Turkey	0.456		
		Kazakhstan	0.481	Venezuela	0.413		
		Kenya	0.321	Vietnam**	0.887		
		Kuwait	0.350				
(8)		(31)				(11)	

Notes: The countries with * are classified as "open" in Fernández et al. (2016) (from 1995 to 2013), but "gate" in our analysis (from 1995 to 2019). Although their average capital-control indices are larger than 70%, the countries with ** are classified as "gate" rather than "wall") because they have at least one year with lower than 60%.

2.2　Methodology

To examine the effectiveness of capital controls in international debt flows, we use the local projection method proposed by Jordà (2005), and compute the impulse response of the capital inflow-to-GDP ratio to the implementation of capital controls.[8] The first fixed-effect panel regression equation is given by

$$IF_{i,t+h} = \alpha_i^h + \gamma_t^h + \beta_{ALL,v}^h CC_{i,v,t} + \sum_{k=0}^{1} \phi_k^h \boldsymbol{X}_{i,t-k} + \varepsilon_{i,t+h}, \tag{1}$$

for $h = 1, \cdots, 5$. This is the case, including all sample economies, over the entire sample period ($case1$). $IF_{i,t+h}$ denotes the capital inflow-to-GDP ratio of country i at time $t + h$. α_i^h and γ_t^h denote country-specific and time-fixed effects, respectively. $CC_{i,v,t}$ denotes the capital control index for country i during period t, where $v = \{p, s\}$ indicates the purchase (p) or sale (s) of domestic assets by foreign agents. $CC_{i,p,t}$ and $CC_{i,s,t}$ are equivalent to "bo_plbn" and "bo_siln" respectively in Fernández et al. (2016)'s dataset. $CC_{i,p,t}$ indicates whether capital controls on the *purchase* of domestic debt by foreign agents are in place or not (1 or 0). $CC_{i,s,t}$ indicates whether capital controls on the *sale* of domestic debt by foreign agents are in place or not (1 or 0). Therefore, $\beta_{ALL,v}^h$ denotes the marginal effects of reinforcing capital controls in the inflow-to-GDP ratio h periods ahead in each case (where $v = \{p, s\}$).

We use gross inflows (rather than net inflows) as our measure of capital inflows. As argued in Section 2.1, *gross* inflows are defined as the *net* of purchases and sales of domestic assets by foreign agents. When $CC_{i,p,t}$ is 1, we expect that the imposition of capital controls on the *purchase* by foreign agents *reduces* gross inflows. When $CC_{i,s,t}$ is 1, we expect that the imposition of capital controls on the *sale* by foreign agents *increases* gross inflows.

$\boldsymbol{X}_{i,t-k}$ denotes the vector of control variables. Following related studies (e.g., Nispi Landi and Schiavone, 2021; Ahmed and Zlate, 2014), we choose the following

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[8]Ben Zeev (2017) and Loipersberger and Matschke (2022) also employ the local projection method to examine the effectiveness of capital controls.

control variables:

$$\boldsymbol{X}_{i,t-k} = [\text{IF}_{i,t-k} \ \varDelta\text{Y}_{i,t-k} \ \text{CPI}_{i,t-k} \ \text{FD}_{i,t-k} \ \text{EXR}_{i,t-k} \ \text{R}_{i,t-k} \ \text{TRD}_{i,t-k} \ \text{DBT}_{i,t-k} \ \text{VIX}_{i,t-k}].$$

(2)

The controls are the current and 1-year lagged values of $\boldsymbol{X}$ at horizon $h = 0$. $\text{IF}_{i,t-k}$ denotes the current and lag values of the capital inflow-to-GDP ratio. $\varDelta\text{Y}_{i,t-k}$ and $\text{CPI}_{i,t-k}$ denote the real GDP growth rate and the CPI inflation rate respectively, which are business cycle variables. $\text{FD}_{i,t-k}$ denotes the financial development index, which may affect the effectiveness of the capital controls (Bush, 2019). $\text{EXR}_{i,t-k}$ and $\text{R}_{i,t-k}$ denote the nominal exchange rates (depreciation rates against the US dollar) and nominal interest rates, respectively. $\text{TRD}_{i,t-k}$ denotes a measure of trade integration, defined as the GDP ratio of total exports and imports. $\text{DBT}_{i,t-k}$ represents the external debt-to-GDP ratio. $\text{VIX}_{i,t-k}$ denotes the Volatility Index (VIX) computed by Chicago Board Options, which is a measure of global risk aversion. An increase in VIX, which implies a greater global risk aversion, can reduce capital inflows (Ahmed and Zlate, 2014). We explain the data sources for the control variables in Section 2.1.

In Section 3, in addition to the first case ($case1$), we consider various types of subcategories using indicator variables. We first distinguish between the pre- and post-crisis periods ($case2$). The regression equation for the $case2$ is given by

$$IF_{i,t+h} = \alpha_i^h + \gamma_t^h + \beta_{PR,v}^h I_{PR} CC_{i,v,t} + \beta_{PO,v}^h I_{PO}CC_{i,v,t} + \sum_{k=0}^{1} \phi_k^h \boldsymbol{X}_{i,t-k} + \varepsilon_{i,t+h},$$

(3)

for $h = 1, \cdots, 5$. As in Eq.(1), $CC_{i,v,t}$ denotes the capital control index for country i during period t, where $v = \{p, s\}$ indicates the purchase (p) or sale (s) of domestic assets by the foreign agents. Here, I_{PR} and I_{PO} are the indicator variables for the pre- and post-crisis periods, respectively. If one sample is in the pre-crisis (post-crisis) period, then $I_{PR}(I_{PO}) = 1$; otherwise, $I_{PR}(I_{PO}) = 0$. Therefore, $\beta_{PR,v}^h$ and $\beta_{PO,v}^h$ denote the marginal effects of reinforcing capital controls on the inflow-to-GDP ratio (h periods ahead) in the pre- and post-crisis periods, respectively.

We further differentiate between advanced and emerging economies ($case3$). The regression equation for $case3$ is given by

$$IF_{i,t+h} = \alpha_i^h + \gamma_t^h + \beta_{AD,v}^h I_{AD} CC_{i,v,t} + \beta_{EM,v}^h I_{EM} CC_{i,v,t} + \sum_{k=0}^{1} \phi_k^h \boldsymbol{X}_{i,t-k} + \varepsilon_{i,t+h},$$

(4)

for $h = 1, \cdots, 5$. As in Eq.(1), $CC_{i,v,t}$ denotes the capital control index for country i during period t, where $v = \{p, s\}$ indicates the purchase (p) or sale (s) of domestic assets by the foreign agents. Here, I_{AD} and I_{EM} are the indicator variables for advanced and emerging economies, respectively. If one sample is an advanced (emerging) economy, then $I_{AD}(I_{EM}) = 1$; otherwise, $I_{AD}(I_{EM}) = 0$. Therefore, $\beta_{AD,v}^h$ and $\beta_{EM,v}^h$ denote the marginal effects of reinforcing capital controls on the inflow to GDP ratio (h periods ahead) in advanced and emerging economies, respectively.

We further differentiate between the pre- and post-crisis periods for advanced and emerging economies, respectively ($case4$). The regression equation for the $case4$ is given by

$$\begin{aligned} IF_{i,t+h} = &\; \alpha_i^h + \gamma_t^h + \beta_{AD\text{-}PR,v}^h I_{AD\text{-}PR} CC_{i,v,t} + \beta_{AD\text{-}PO,v}^h I_{AD\text{-}PO} CC_{i,v,t} \\ &+ \beta_{EM\text{-}PR,v}^h I_{EM\text{-}PR} CC_{i,v,t} + \beta_{EM\text{-}PO,v}^h I_{EM\text{-}PO} CC_{i,v,t} \\ &+ \sum_{k=0}^{1} \phi_k^h \boldsymbol{X}_{i,t-k} + \varepsilon_{i,t+h}, \end{aligned}$$

(5)

for $h = 1, \cdots, 5$. As in Eq.(1), $CC_{i,v,t}$ denotes the capital control index for country i during period t, where $v = \{p, s\}$ indicates the purchase (p) or sale (s) of domestic assets by the foreign agents. Here, $I_{AD\text{-}PR}$, $I_{AD\text{-}PO}$, $I_{EM\text{-}PR}$, and $I_{EM\text{-}PO}$ denote the indicator variables for advanced economies in the pre-crisis period, advanced economies in the post-crisis period, emerging economies in the pre-crisis period, and emerging economies in the post-crisis period, respectively. Therefore, $\beta_{AD\text{-}PR,v}^h$, $\beta_{AD\text{-}PO,v}^h$, $\beta_{EM\text{-}PR,v}^h$ and $\beta_{EM\text{-}PO,v}^h$ denote the marginal effects of reinforcing capital controls on the inflow-to-GDP ratio (h periods ahead) in the four above mentioned cases.

Lastly, we distinguish between the "gate" and "wall" countries ($case5$). The

regression equation for $case5$ is given by

$$
\begin{aligned}
IF_{i,t+h} = {} & \alpha_i^h + \gamma_t^h + \beta_{AD\text{-}GT,v}^h \, I_{AD\text{-}GT} \, CC_{i,v,t} \\
& + \beta_{EM\text{-}GT,v}^h \, I_{EM\text{-}GT} \, CC_{i,v,t} + \beta_{EM\text{-}WL,v}^h \, I_{EM\text{-}WL} \, CC_{i,v,t} \\
& + \sum_{k=0}^{1} \phi_k^h \boldsymbol{X}_{i,t-k} + \varepsilon_{i,t+h},
\end{aligned}
\tag{6}
$$

for $h = 1, \cdots, 5$. As in Eq.(1), $CC_{i,v,t}$ denotes the capital control index for country i during period t, where $v = \{p, s\}$ indicates the purchase (p) or sale (s) of domestic assets by the foreign agents. Here, $I_{AD\text{-}GT}$, $I_{EM\text{-}GT}$, and $I_{EM\text{-}WL}$ denote the indicator variables for the "gate" group of advanced economies, "gate" group of emerging economies, and "wall" group of emerging economies, respectively. Therefore, $\beta_{AD\text{-}GT,v}^h$, $\beta_{EM\text{-}GT,v}^h$, and $\beta_{EM\text{-}WL,v}^h$ denote the marginal effects of reinforcing capital controls on the inflow-to-GDP ratio (h periods ahead) in the three above mentioned cases. We do not include the "wall" group of advanced economies in Eq.(6) because no sample of advanced economies is classified as "wall" economies, as shown in Table 1. We also do not include the indicator variables for the "open" group of advanced and emerging economies into Eq.(6), because almost no change in capital control policies is observed for the "open" group of economies.[9]

3　Results

3.1　The whole sample case

Figure 1 shows the impulse responses of international debt flow to imposing capital controls when we use the data for all sample economies over the entire sample period. The left panel plots the impulse response of gross inflow (measured as GDP ratio) to imposing capital controls on the purchase of domestic debt by foreign agents ("CC on Purchase: ALL"). The impulse response shows that the imposition of capital controls on the purchase of domestic debt by foreign agents reduces gross inflow, as expected. However, the result is statistically insignificant, as indicated by the

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[9]There is no change in capital control policies in advanced economies. There is only one change in emerging economies.

shaded area representing a 90 % confidence interval. The right panel plots the impulse response of gross inflow (measured as the GDP ratio) to imposing capital controls on the sale of domestic debt by foreign agents ("CC on Sale: ALL"). As expected, the impulse response shows that the imposition of capital controls on the sale of domestic debt by foreign agents increases gross inflow in the first three years. However, the result is statistically significant only in the second year, as indicated by the shaded areas representing a 90 % confidence interval.

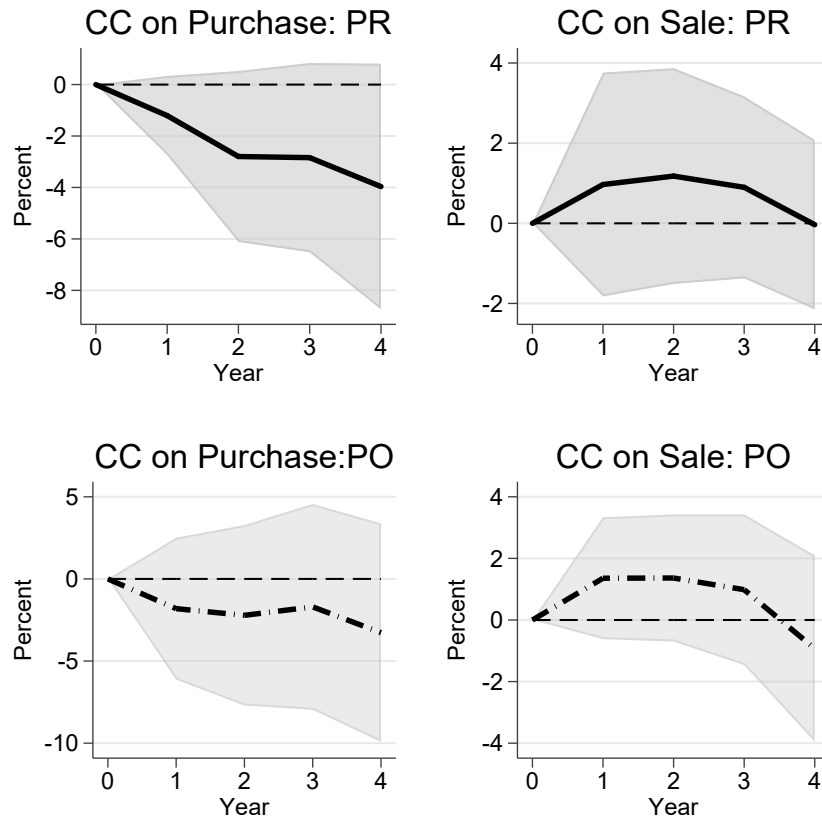Figure 1: The case for all the sample economies over the entire sample period
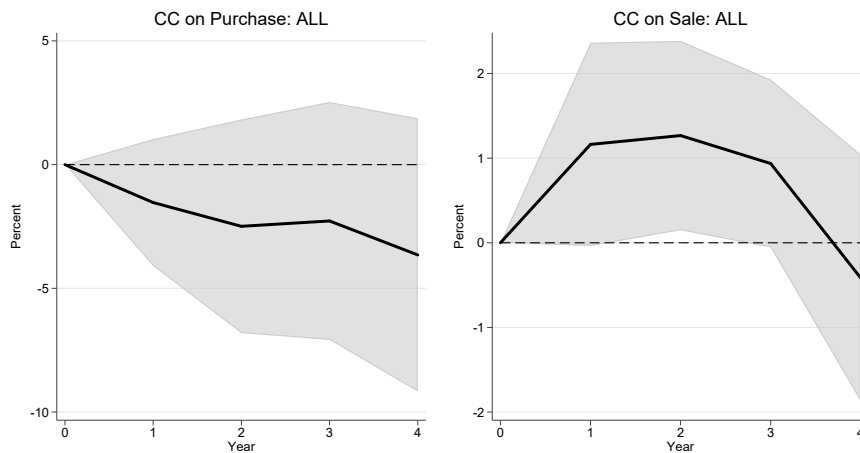
Notes: "CC on Purchase" and "CC on Sale" denote the impulse responses of gross inflow (measured as GDP ratio) to imposing capital controls on the purchase and sale of domestic debt by foreign agents, respectively. The shaded area represents a 90 % confidence interval.

3.2 The case distinguishing between the pre-and-post crisis periods

We further examine whether distinguishing between the pre-crisis (1995-2007) and post-crisis (2008-2019) periods changes the result in Figure 1 (or not). The upper two panels of Figure 2 plot the impulse responses for the pre-crisis period ("CC on Purchase: PR" and "CC on Sale: PR"). The lower two panels of Figure 2 plot those for the post-crisis period ("CC on Purchase: PO" and "CC on Sale: PO"). We notice that both responses in "CC on Purchase: PR" and "CC on Sale: PR" are in the expected direction. However, both results are insignificant, as indicated by the shaded area representing a 90 % confidence interval. We also notice that the same holds for "CC on Purchase: PO" and "CC on Sale: PO." Overall, it is safe

to conclude that the distinction between the pre- and post-crisis periods does not change the main result in Figure 1.

Figure 2: The case separating into the pre-and-post crisis periods (for all the sample economies)

Notes: "CC on Purchase" and "CC on Sale" denote the impulse responses of gross inflow (measured as GDP ratio) to imposing capital controls on the purchase and sale of domestic debt by foreign agents, respectively. "PR" and "PO" denote the pre-crisis (1995-2007) and post-crisis (2008-2019) periods, respectively. The shaded area represents a 90 % confidence interval.

## 3.3 The case distinguishing between advanced and emerging economies

We further distinguish advanced and emerging economies. The upper two panels of Figure 3 depict the impulse responses of advanced economies ("CC on Purchase: AD" and "CC on Sale: AD"). The lower two panels depict those of emerging economies ("CC on Purchase: EM" and "CC on Sale: EM").

In the upper two panels of Figure 3, we notice that although both of the responses in "CC on Purchase: AD" and "CC on Sale: AD" are in the expected direction, both

are statistically insignificant as indicated by the shaded area representing a 90 % confidence interval. It is safe to conclude that the impulse responses of the advanced economies in Figure 3 are relatively similar to the corresponding responses in the entire sample case in Figure 1.

The same holds for the lower right case ("CC on Sale: EM") in Figure 3 (i.e., the response is in the expected direction, but statistically insignificant). However, in the lower left panel ("CC on Purchase: EM") of Figure 3, the response is in the opposite direction to the expected. Overall, it is safe to conclude that when we distinguish between advanced and emerging economies, the result for advanced economies is similar to the entire sample case, whereas the result for emerging economies seems less plausible compared with the entire sample case in Figure 1.

Figure 3: Distinguishing between advanced and emerging economies (over all the sample period)
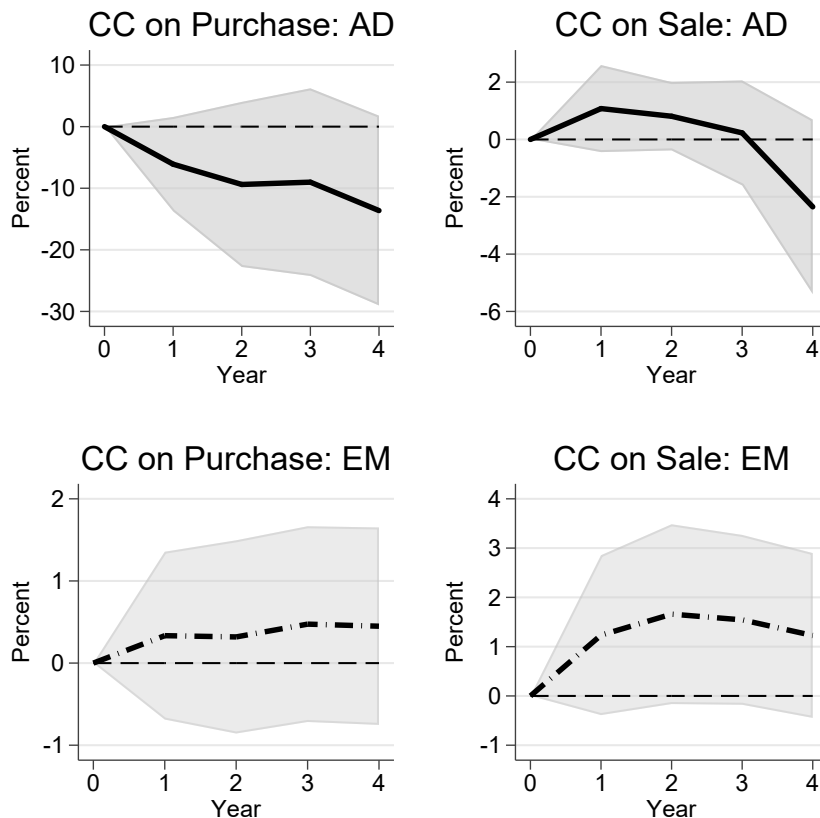
Notes: "CC on Purchase" and "CC on Sale" denote the impulse responses of gross inflow (measured as GDP ratio) to imposing capital controls on the purchase and sale of domestic debt by foreign agents, respectively. The shaded area represents a 90 % confidence interval. "AD" and "EM" denote advanced and emerging economies, respectively.

14

3.4 Distinguishing advanced and emerging economies into the pre-and-post crisis periods

We further divide the two groups of advanced and emerging economies into two sample periods, before and after the global financial crisis, respectively. Panel (a) in Figure 4 depicts cases of advanced economies in the pre- and post-crisis periods. Although they are statistically insignificant, both of the impulse responses of capital controls on the purchase ("CC on Purchase: AD-PR" and "CC on Purchase: AD-PO") are in the expected direction. Accordingly, they are similar between the pre- and post-crisis periods. However, the responses of capital controls on sales ("CC on Sale: AD-PR" and "CC on Sale: AD-PO") are relatively different. While the response in the pre-crisis period ("CC on Sale: AD-PR") is in the expected direction, the response in the post-crisis period ("CC on Sale: AD-PO") is in the opposite direction.

Panel (b) in Figure 4 depicts emerging economies in the pre- and post-crisis periods. Although statistically insignificant, the response of capital controls on purchases in the pre-crisis period ("CC on Purchase: EM-PR") is in the expected direction. However, the response of capital controls on purchases in the post-crisis period ("CC on Purchase: EM-PO") is in the opposite direction to expected. The response of capital controls on sales in the pre-crisis period ("CC on Sale: EM-PR") is statistically insignificant. Additionally, the response direction is ambiguous. In contrast, the response of capital controls on sales in the post-crisis period ("CC on Sale: EM-PO") is statistically significant. Additionally, the response is in the expected direction.

Overall, when we further distinguish the two groups of advanced and emerging economies into two sample periods before and after the global financial crisis, we find that most of the cases are statistically insignificant and that some of the impulse responses are in the opposite direction to the expected. The only exception is the impulse response of capital controls on sales in the post-crisis period ("CC on Sale: EM-PO"), which is statistically significant and in the expected direction.

Figure 4: Distinguishing between the pre-and-post crisis periods for advanced and emerging economies, respectively

(a) Advanced economies: pre-and-post crisis periods
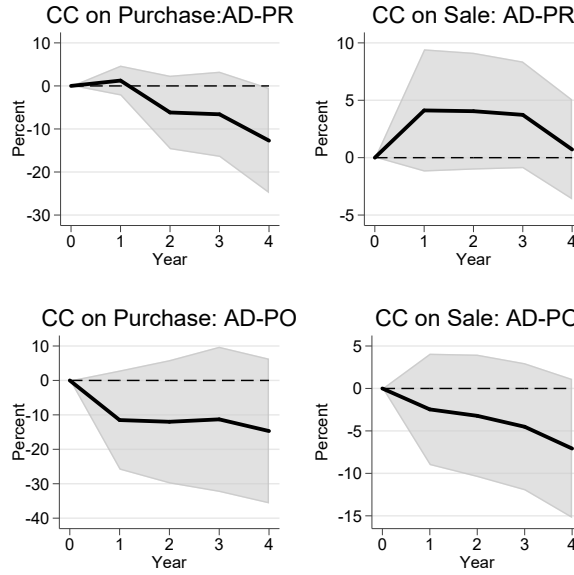
(b) Emerging economies: pre-and-post crisis periods
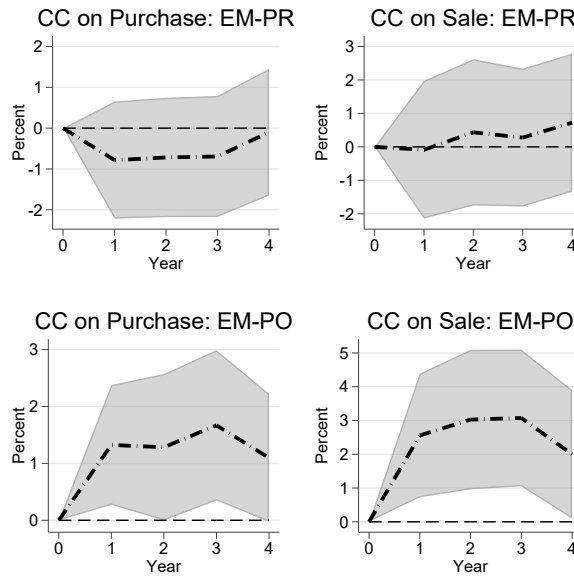
Notes: "CC on Purchase" and "CC on Sale" denote the impulse responses of gross inflow (measured as GDP ratio) to imposing capital controls on the purchase and sale of domestic debt by foreign agents, respectively. The shaded area represents a 90 % confidence interval. "AD" and "EM" denote advanced and emerging economies, respectively. "PR" and "PO" denote the pre-crisis (1995-2007) and post-crisis (2008-2019) periods, respectively.

3.5 Distinguishing between "gate" and "wall" economies

Following the canonical distinction by Klein (2012), we finally make the distinction between "gate" and "wall" for the pattern of capital controls.

Panel (a) of Figure 5 shows the impulse responses of the "gate" advanced economies. As no sample advanced economies are classified as the "wall" economies in our analysis, there is no equivalence of the "wall" advanced economies in Figure 5. As shown in Table 1, 18 advanced economies are classified as "open" economies. However, the 18 economies did not change their capital controls on debt transactions. Therefore, the equivalence of "open" advanced economies is not included in Figure 5. The impulse response of capital controls on purchases in "gate" economies ("CC on Purchase: AD-GT") is similar to that in the case including all advanced economies ("CC on Purchase: AD" in Figure 3). The impulse response of capital controls on the sale in the "gate" economies ("CC on Sale: AD-GT") is also similar to that in the case including all advanced economies ("CC on Sale: AD" in Figure 3).

Panel (b) of Figure 5, shows the impulse responses of the "gate" and "wall" emerging economies. As shown in Table 2, 8 emerging economies are classified as "open" economies. However, there was no change except for one in their capital control policies on debt transactions.[10] Therefore, the equivalence of "open" emerging economies is not included in Figure 5. Comparing the impulse response of the "gate" emerging economies with that of "wall" emerging economies, it is noticeable that the response of capital controls on the purchase in the "wall" economies ("CaCP on Purchase: EM-WL") is in the expected direction and also statistically significant. However, the response in the "gate" economies ("CaCP on Purchase: EM-GT") is in the opposite direction to the expected and also statistically insignificant. It is also noticeable that the response of capital controls on the sale in "wall" economies ("CaCP on Sale: EM-WL") is in the expected direction and also statistically significant. In contrast, although it is in the expected direction, the response in the "gate" economies ("CaCP on Sale: EM-GT") is statistically insignificant.

Overall, when we distinguish between the "gate" and "wall" economies, we find

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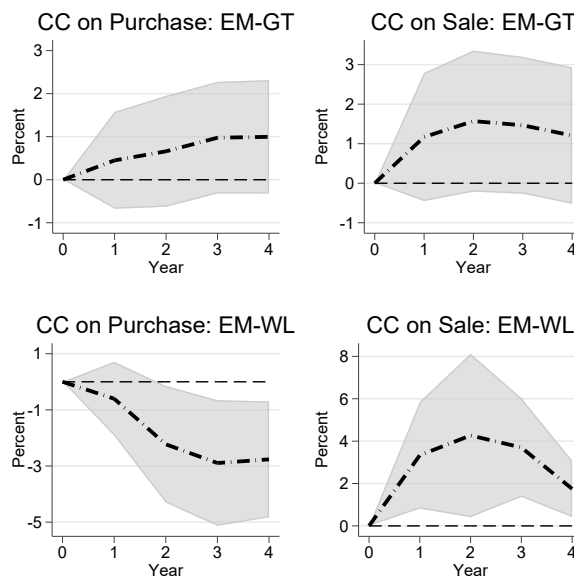[10]Only one policy change was observed in Qatar in 2005.

Figure 5: Distinguishing between "gate" and "wall" economies

(a) Advanced economies
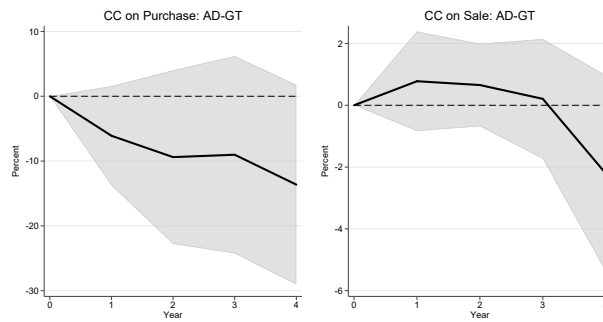
(b) Emerging economies

Notes: "CC on Purchase" and "CC on Sale" denote the impulse responses of gross inflow (measured as GDP ratio) to imposing capital controls on the purchase and sale of domestic debt by foreign agents, respectively. The shaded area represents a 90 % confidence interval. "AD" and "EM" denote advanced and emerging economies, respectively. "GT" and "WL" denote the "gate" and "wall" economies (defined in the main text), respectively.

that while the main result for the advanced economies (compared with the entire sample case) does not change, the result on the emerging economies implies that the effectiveness of capital controls is relevant for the "wall" emerging economies.

4 Conclusions

We analyze the effectiveness of capital controls on international debt flows using data of 81 economies, including both advanced and emerging economies, over the period from 1995 to 2019. Using the total sample economies, we first show that although they are almost statistically insignificant, the impulse responses of capital controls are in the expected direction. We further make various distinctions between the samples. We find that distinguishing between the pre- and post-crisis periods does not change our main result obtained by using the total sample economies. Separating the sample economies into the two groups of advanced and emerging economies, we find that although the effectiveness of capital controls is less relevant to emerging economies than to advanced economies, both results are statistically insignificant. Further distinguishing the two groups of advanced and emerging economies into pre- and post-crisis periods respectively, we find that most results are statistically insignificant or opposite to the expected results. Some might wonder why many cases in our result are statistically insignificant. We think that it does square with the related literature. As argued in Section 1, the empirical literature on the effectiveness of capital controls is inconclusive. Following the canonical classification by Klein (2012), we finally separate the pattern of capital controls into "gate" and "wall." Our result shows that the effectiveness of capital controls is relevant to the emerging economies with the "wall" type of capital controls.

It is beyond the scope of our analysis to consider why long-standing controls, compared with episodic controls, are more effective. However, we think that the following Klein (2012)'s hypotheses are helpful in speculating about the reason. Klein (2012) argues that "[e]pisodic controls are likely to be less efficacious than long-standing controls because evasion is easier in a country that already has experience in international capital markets than in one that does not" (p.319). Related to this, Klein (2012) also argues that "[p]eople in countries with long-standing controls also tend to have fewer options for evasion ... because controls are imposed on a wider set of assets than in countries with episodic controls" (pp.319-320). Although the Klein (2012)'s argument is conjectural, we think that it is insightful and convincing.

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