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THREE ESSAYS ON CAPITAL FLIGHT

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Abstract

Three essays on capital flight

by

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Consequent to developed and liberalized financial markets in emerging market economies, the magnitude of gross capital outflows is getting larger. My dissertation focuses on massive foreign asset purchases by domestic agents which is called capital flight and the study aims to see new empirical evidence on its impact and determinants and the associations between it and other macro variables using diverse methods in econometrics. In particular, I am interested in its role in emerging market economies since they are especially vulnerable to such large and unexpected capital flows.

First chapter investigates the impact of capital flight on domestic countries' real GDP growth and investment. Specifically, it employs diverse GMM estimators (difference, system, and orthogonal deviation GMM) to estimate their causal effects and uses interaction models to test the hypothesis that the effect of flights is conditional on the amount of external loans (gross capital inflows) in the country. The results show that flights are harmful only if there are not enough external loans and, otherwise, they fail to depress domestic economies. They are contrasted with those of capital inflow stops, which consistently decrease growth and, therefore, indicate inflow stops and outflow flights are different phenomena.

Second chapter estimates the impacts of domestic private saving and gross capital inflows on gross capital outflows in 56 emerging market economies over 1990 - 2014 using Powell's (2015) quantile regression methodology. The purpose is to test two hypotheses: first, capital outflows are mostly fueled by capital inflows rather than by domestic saving and, second, the causal impact of capital inflows is stronger in the upper quantiles of capital outflows. According to the result, the response of capital outflows to capital inflows and domestic saving is similar if capital outflows are below the median. However, if they are above the median, the impact of external loans is stronger than that of saving. Furthermore, a country tends to borrow from foreign countries to purchase debts rather than equities in the short run. It is consistent with several stylized facts such as pro-cyclical capital inflows and outflows and high leverage ratio and high probability of serial default and sudden stops during short-term booms.

Third chapter studies the association between extreme gross capital outflow movements (flight and retrenchment) and diverse financial crises (banking, currency, debt, and inflation crises) in 60 emerging markets between 1980 and 2009. Considering that the movements reflect domestic agents' strong preferences for (against) foreign assets, domestic turmoil might have affected or conversely been triggered by their behavior. In either case, large capital outflows are associated with crises and provide valuable information to both foreign interests and domestic policymakers. Results from the complementary log-log model show, first, that banking, currency, and inflation crises are associated with capital flight; second, debt crises are also associated with capital flight, but the result is not robust to different specifications; third, the positive association between capital flight and crises is mainly driven by banking flows rather than FDI and portfolio flows; and finally, capital retrenchment is not associated with any kind of crisis. The results support several arguments addressed in the existing literature, including the "flight-to-safety" hypothesis and the self-fulfilling prophecy.

To my family and my friends

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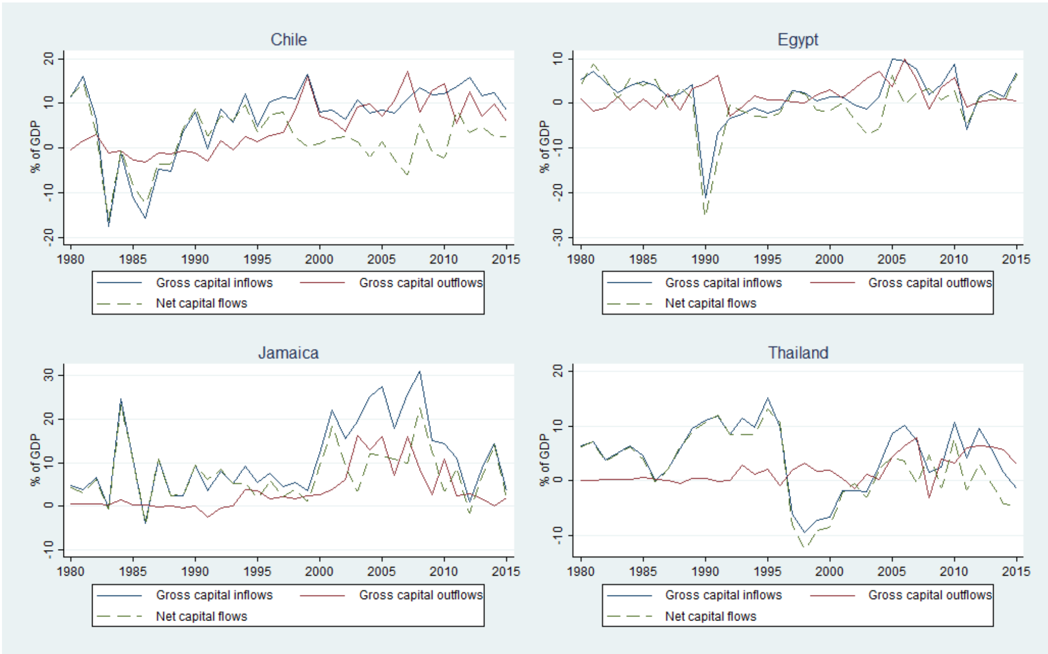
Chapter 1

Does capital flight depress growth and investment in emerging markets?

1.1 Introduction

Thanks to developed and liberalized financial markets, domestic investors in emerging markets are enjoying broader opportunities than ever to diversify their portfolios. As a result, not only capital inflows by foreign investors but also capital outflows by domestic investors play a significant role in their financial accounts. Figure 1.1 describes domestic investors' contribution to financial accounts in selected emerging markets. Before 2000, the magnitude of capital outflows (% of GDP) was very small and hardly fluctuated. Such behavior of capital outflows contrasts with that of capital inflows which was much larger and more volatile. For that reason, net capital flows were almost the perfect proxy for gross capital inflows. Since 2000, however, the magnitude and volatility of gross capital outflows have been getting closer to those of gross capital inflows.[1] This raises the possibility that large and volatile capital outflows may have a substantial impact on domestic economies.

Figure 1.1: Capital flows in emerging markets between 1980 and 2015 (IMF BOPS and WEO)



Motivated by such stylized fact, this essay aims to answer the following three questions:

- What is the impact of massive capital outflows on emerging markets' economic growth?

- Is capital flight a different phenomenon from a sudden stop in capital inflows?

[1]For the stylized facts on gross capital inflows and outflows, see Broner et al. (2013).

- Is the impact of capital flight conditional on external loans available in domestic countries?

Foreign assets are substitutes, to some extent, for domestic assets. Capital flight might, therefore, imply domestic companies' loss of working capital loans by allowing domestic agents to invest abroad. Although this traditional view has represented one of the main concerns on flight events,[2] the impact of capital flight could be conditional upon the availability of external loans. For example, if there are enough external loans in the country and investors have access to financial markets, they may not need to sell their domestic assets to finance foreign investments. In this case, capital flights would not necessarily depress domestic investment. It may, rather, promote economic growth by allowing investors to take fruitful investment opportunities.

Addressing the underlying causality of capital flights and stops is very important for addressing these issues. For example, if flights are fleeing behavior to avoid domestic turmoil, the estimation of flights on domestic economy will overstate the damage from them because simple association cannot tell which came first. Therefore, we need to address endogeneity bias and, for that purpose, I employ three kinds of GMM estimators: difference, system, and orthogonal deviation GMM.[3]

The contribution of this essay to the existing literature is three-fold. First, unlike previous research, which focused on the association between macro variables and capital outflows, I measure unbiased estimates for the causality of capital flights on

[2]For example, see Cuddington (1986).

[3]For the descriptions on GMM estimators, see Appendix A.3.

domestic economies. Second, I use interaction models to test the hypothesis that the impact of capital flight is conditional on the amount of foreign loans. Third, I investigate whether flights reduce domestic investment to shed light on the reason why the impact of flights and that of stops are different.

Previewing the results, I find that capital flight itself does not depress GDP growth on average and the estimates are remarkably different from those of sudden capital stops. However, flights depress growth when there are not enough external loans (coincidence with stops). This is new empirical evidence not discussed in the existing literature, which has emphasized their negative effects and similarity with stops only. To explain the reason, it is necessary to review the previous research examining the channels through which stops affect the real economy. Although there are diverse channels, most of studies agree stops in capital inflows severely reduce domestic investment. On the contrary, this essay shows that the impact of capital outflows on domestic investment is insignificant.

The chapter is organized as follows. Section 1.2 reviews existing literature on capital flight. Section 1.3 explains data, the definitions of episodes on capital flows, and presents stylized facts on them. Section 1.4 introduces regression models and reports the results and Section 1.5 summarizes the essay and concludes it.

1.2 Related literature

Negative description on capital flight stems from the experience of Latin America in the 1970s and 1980s. When several countries in Latin America were in domestic turmoil, domestic investors moved their funds to safer global markets and such behavior certainly worsened the countries' economic situation. After that, many researchers have studied to explain why capital flight is costly. For example, Cuddington (1986) suggests seven reasons why capital flight is harmful, Alesina and Tabellini (1989) argue private capital outflows are associated with low domestic investment because of political uncertainty and Bennett (1988) asserts capital flight brings high external debts by studying four Caribbean countries' cases.

Following them, there have been several attempts to estimate sudden increases in gross capital outflows in recent years. For example, Cowan et al. (2008) call large drops in net capital inflows by gross capital outflows as an outflow-driven sudden stop (sudden start) and argue it is destructive for emerging markets although the adverse effect is smaller than that of a sudden stop. Similarly, Rothenberg and Warnock (2011) call the former as sudden flight and argue the difference in pain experienced during sudden flights and stops is not severe. Cavallo et al. (2015) investigate how the effect of reversal in gross capital outflows changes by corresponding reversals in gross capital inflows and net flows. It is noteworthy that most of them estimate the cyclical behavior of macro variables around capital flight events using time trend models; that is, they focus on the association between macro variables and gross capital outflows. On the contrary, this essay attempts to estimate the causal effects of gross capital outflows using GMM estimators and shows flights are harmless to domestic economies in the sense that they do not depress GDP growth directly.

My study especially focuses on the impacts of flights on domestic investment in order to prove that flights and stops are different phenomena. Stops depress growth by hurting domestic investment. For instance, Calvo (1998) and Calvo and Reignhart (2000) emphasize the incidence of nonperforming loans and following bankruptcies, which are caused by capital inflow slowdown. Mendoza (2010) also emphasizes the role of collateral constraint binding, which might be caused by a cessation of capital inflows. In this case, companies need to pay extra financing premia or liquidate their assets. As a result, they are forced to reduce working capital and production and factor demands drop. However, if a capital flight fails to depress domestic investment, it indicates the channels through which a capital stop depresses domestic economies do not work for a capital flight. For this reason, the essay will show that capital flights do not reduce domestic investment and prove capital stops and flights are different.

1.3 Data, definitions, and stylized facts

1.3.1 Data

The data consists of 56 emerging market economies from 1990 to 2014 excluding (1) major oil-exporting countries, (2) bank havens, and (3) those which are categorized as low-income groups according to 2008 GNI per capita by the World Bank considering they might work as strong outliers in the group (see Appendix A.1 for the list of countries). All countries have at least 15 years and 10 consecutive years of gross capital outflow data (source: IMF BOPS). As specified in other papers, IMF data does not clarify whether some missing values in outflows are zero or not available (e.g., see Forbes and Warnock (2012a)). Following others, I replaced them with zero if the surrounding values are zeros or left them empty, otherwise.

Gross capital outflows (inflows) are net foreign-asset purchases by domestic agents (net domestic-asset purchases by foreign agents) that include (1) FDI, (2) portfolio investments (equities and debts), and (3) other investments (e.g., trade credits, loans, and deposits). Total investment (domestic investment) is gross capital formation. Data sources and the definition of variables can be found in Appendix A.2 in detail.

1.3.2 The definitions of capital flow episodes: flight and stop

The formal definitions of flight and stop are as follows:

- Flight: a large purchasing of foreign assets by domestic agents
- Stop: a large selling (or large reduction in purchase) of domestic assets by foreign agents

Furthermore, such flows should be evaluated as large deviations from country-specific experiences and by global experiences. Accordingly, each episode is defined by dummies as follows:

- Flight:

$$\begin{cases} 1 & if\ KO_{jt} \in \{top\ 30\%\ of\ (KO_{js})_{s=1}^{T}\} \cap \{top\ 30\%\ of\ (KO_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- Stop:

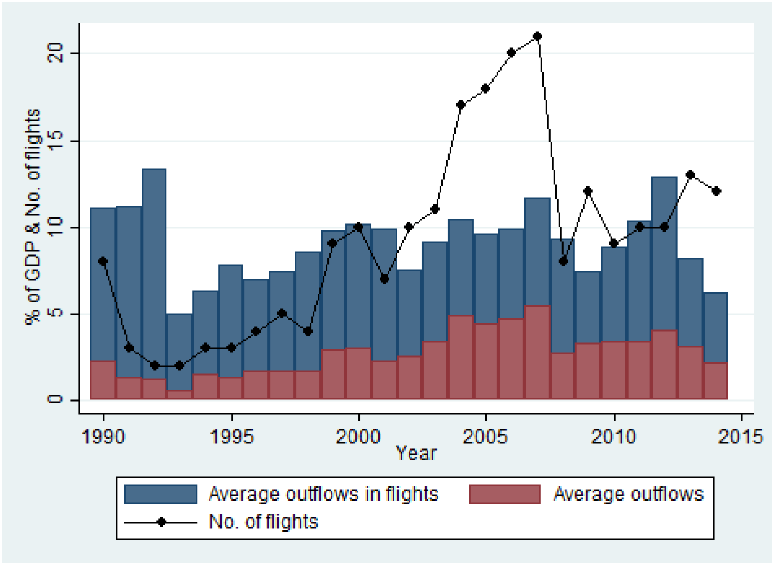
$$\begin{cases} 1 & if\ KI_{jt} \in \{bottom\ 30\%\ of\ (KI_{js})_{s=1}^{T}\} \cap \{bottom\ 30\%\ of\ (KI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

where KO_{jt} is gross capital outflows (% of GDP) in country j at time t. Likewise, KI_{jt} is gross capital inflows (% of GDP) in country j at time t. Therefore, 'top 30% of $(KO_{js})_{s=1}^{T}$' implies gross capital outflows are remarkably large by country j's own experience and 'top 30% $(KO_{js})_{i=1,s=1}^{N,T}$' implies outflows are also remarkably large by cross-country experiences. Using these dummy variables, I estimate the impact of capital flights and stops in emerging markets.

1.3.3 Stylized facts

This section provides some stylized facts on capital flight. Figure 1.2 shows the number of flights and annual average of gross capital outflows. Two interesting points emerge from it. First, the number of flights has been constantly increasing except 2008 when the global financial crisis occurred. Considering gross capital outflows were normalized by current GDP, it indicates the growth rate of capital outflows surpasses that of GDP in emerging market economies. Second, there is a remarkable change in gross capital outflows when a country experiences capital flights. We can see gross capital outflows are at least three times larger during flights compared to those during tranquil times. It confirms capital flights are distinctive events when domestic agents strongly preferred foreign assets.

Figure 1.2: Annual capital flights and average gross capital outflows (1990-2014)



Notes: the y-axis represents average overall outflows (red bar) and average outflows in flights (blue bar) in % of GDP and the number of flights (black line).

Figure 1.3 and Table 1.1 report the relationship between capital flights and stops. Only 10% of flights coincided with stops and they exhibit negative correlations between two episodes.[4] It might indicate countries had enough external loans when they were experiencing capital flights. In this case, the loss of working capital by domestic agents could be minimized by borrowing from abroad. For this reason, to precisely estimate the impact of capital flights, we need to consider not only the amount of capital outflows but also the amount of capital inflows in a country.

[4]The correlation between flights and stops in this essay is -0.1193.

Figure 1.3: The relation between flights and stops

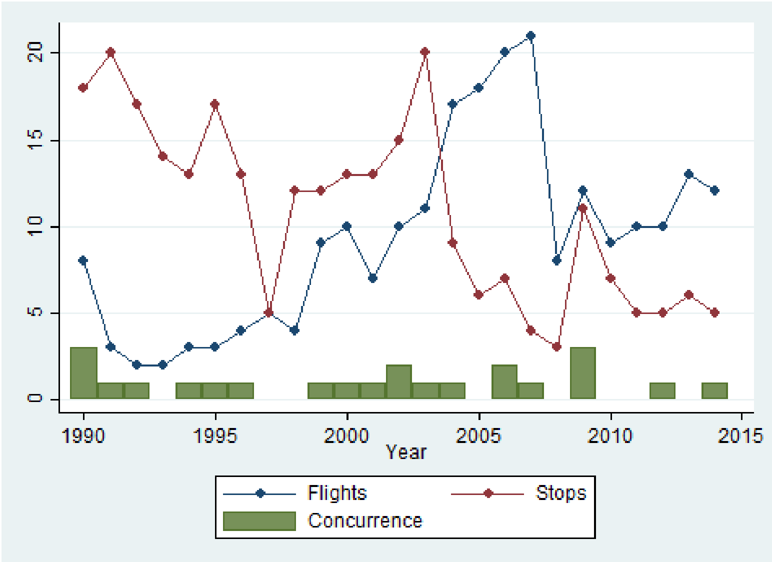


Table 1.1: The concurrence of flights and stops

	Flight	No flight	Total
Stop	23 (2%)	240 (18%)	263 (20%)
No stop	208 (16%)	827 (64%)	1,035 (80%)
Total	231 (18%)	1,067 (82%)	1,298 (100%)

Notes: the number of episodes as a percentage of total observations in parenthesis. The data cover the years 1990 - 2014

1.4 Estimation strategy and results

1.4.1 The summary of selected variables

Before getting into the main results, this section reports the description of variables in the models. They are summarized in two periods separately—when flights occurred and when they did not—to see how they change between two episodes. Table 1.2 shows the summary. As we can see from Figure 1.2, gross capital outflows were almost seven times larger but gross capital inflows also doubled during flights. On the contrary, private saving was smaller during flights so it is assumed that people are more dependent on external loans rather than saving to increase foreign asset purchases. A more interesting result is that emerging markets were actually enjoying higher growth during flights while domestic investment was hardly affected. This brief summary again supports the hypothesis that capital flight is the behavior to take global opportunities rather than to flee from domestic turmoil.

Table 1.2: The summary of selected variables

Flight

	Obs.	Mean	Std. Dev.	Min	Max
Gross capital outflows (% of GDP)	231	9.468***	5.638	3.405	50.815
Gross capital inflows (% of GDP)	231	11.015***	11.778	-24.566	71.014
Real GDP growth (%)	229	4.708***	5.228	-15.136	22.593
Exchange rate regime	231	6.653**	4.175	1	14
Capital market openness	228	0.486	0.353	0	1
Total investment (% of GDP)	230	24.053	8.385	2.212	58.151
Private saving (% of GDP)	194	11.996*	12.971	-51.706	48.131

No flight

	Obs.	Mean	Std. Dev.	Min	Max
Gross capital outflows (% of GDP)	1,067	1.409	3.128	-15.048	15.029
Gross capital inflows (% of GDP)	1,067	5.406	7.049	-38.985	47.089
Real GDP growth (%)	1,066	3.751	4.142	-23.983	25.788
Exchange rate regime	1,067	7.371	4.045	1	15
Capital market openness	1,047	0.45	0.326	0	1
Total investment (% of GDP)	1,043	23.356	7.148	3.824	59.464
Private saving (% of GDP)	850	13.873	11.081	-69.272	61.769

Notes: ***, **, and * indicate significant differences between two periods at the 1%, 5%, 10% level, respectively. Welch's approximation was used.

1.4.2 Linear-additive model

The study using GMM estimators begins with linear-additive models assuming the impacts of capital flights and stops on real GDP growth (zgdp) and total investment (toinv) are simply linear. Regression models are

$$
\begin{aligned}
zgdp_{it} &= \beta_1 flight_{it} + X_{it}^{'}\gamma + u_{it} \\
zgdp_{it} &= \beta_2 stop_{it} + X_{it}^{'}\gamma + u_{it} \\
zgdp_{it} &= \beta_1 flight_{it} + \beta_2 stop_{it} + X_{it}^{'}\gamma + u_{it}
\end{aligned}
\tag{1.1}
$$

where stop and flight are dummies and X_{it} is the matrix for independent variables, which includes a lagged dependent variable (lzgdp), exchange rate regime (exregime), and capital market openness (kaopen). Flights and stops are separated from them to emphasize that they are the main interests. Two episodes were estimated separately first and then estimated together to perform a Wald test to see whether they are significantly different ($H_0 : \hat{\beta}_1 = \hat{\beta}_2$).[5] u_{it} is the disturbance term that may contain individual-fixed components and time-fixed components.

Likewise, the impacts of two episodes on total investment (toinv) are estimated to provide empirical evidence that the channel through which stops hurt domestic economy does not work for flights. Regression models are

$$
\begin{aligned}
toinv_{it} &= \beta_1 flight_{it} + X_{it}^{'}\gamma + u_{it} \\
toinv_{it} &= \beta_2 stop_{it} + X_{it}^{'}\gamma + u_{it} \\
toinv_{it} &= \beta_1 flight_{it} + \beta_2 stop_{it} + X_{it}^{'}\gamma + u_{it}
\end{aligned}
\tag{1.2}
$$

[5]The interaction of them is estimated in the next subsection.

where X_{it} includes real GDP growth (zgdp), private saving (save), and capital market openness (kaopen), as controlling for these three variables are especially important to estimate precise impacts of capital flows on domestic investment. A Wald test is again performed to see whether $\hat{\beta_1}$ and $\hat{\beta_2}$ are significantly different. In (1.1) and (1.2), not only capital flow episodes but also all other independent variables are treated as endogenous except the lagged dependent variable, which is predetermined and time dummies.

Table 1.3 shows the results on real GDP growth. Stops undoubtedly depress emerging markets' growth and it is already a well-known fact discovered by existing literature. On the other hand, flights fail to depress it and positively but not significantly contribute to domestic economies on average. More importantly, the result from the Wald test indicates the impacts of two episodes are significantly different (less than 5% level). It confirms that capital flight does not depress domestic growth, unlike capital stop, and flights and stops are different phenomena.

The coefficients on the lagged dependent variable are moderate, significant, and range from 0.23 to 0.34, which justify the employment of the dynamic model. For example, with the coefficient of 0.3 for lagged dependent variable, the damage from stops increase about 43% in the long run. The estimates of exchange regime are all negative and significant, which indicates flexible regime hurts the domestic economy. This is probably because of its negative impact on net exports. The impact of capital market openness on real GDP growth is inconclusive. All of them are not significant and the sign of coefficient also changes according to control variables. It is consistent

Table 1.3: The impacts of stops and flights on real GDP growth (linear model)

	Dependent Variable: Real GDP growth (1990 - 2014)											
	FEOLS	DGMM	SGMM	OGMM	FEOLS	DGMM	SGMM	OGMM	FEOLS	DGMM	SGMM	OGMM
STOP	-1.0586***	-2.4375***	-2.293*	-1.565*					-1.0031**	-2.0012**	-2.0907	-1.0872
	(0.3708)	(0.9446)	(1.2413)	(0.8681)					(0.3927)	(0.933)	(1.302)	(0.8341)
FLIGHT					0.5211	1.6967	1.5866	2.1086	0.4229	1.3773	1.6323	1.9567*
					(0.3394)	(1.8273)	(2.0582)	(1.319)	(0.3571)	(1.6749)	(1.9623)	(1.1152)
LZGDP	0.2306***	0.3133***	0.3458***	0.2733***	0.2382***	0.3454***	0.3297***	0.3086***	0.2242***	0.3207***	0.334***	0.276***
	(0.0609)	(0.9818)	(0.1016)	(0.069)	(0.0618)	(0.1227)	(0.1199)	(0.078)	(0.0625)	(0.1076)	(0.1146)	(0.0662)
EXREGIME	-0.1843***	-0.2944*	-0.3168**	-0.2368**	-0.2132***	-0.3589*	-0.2552*	-0.284**	-0.199***	-0.2622	-0.3428**	-0.2666**
	(0.0438)	(0.1708)	(0.1311)	(0.1187)	(0.0487)	(0.2064)	(0.1339)	(0.1424)	(0.0468)	(0.169)	(0.1565)	(0.124)
KAOPEN	-0.2108	-2.3198	0.1191	-0.3474	0.0772	-0.0368	0.5341	1.7335	-0.1695	-1.7339	0.6527	0.7754
	(0.409)	(2.5261)	(1.314)	(1.9068)	(0.4578)	(2.3289)	(1.6)	(1.7308)	(0.4345)	(2.4744)	(1.9569)	(1.7895)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	56	56	56	56	56	56	56	56	56	56	56	56
Observations	1,257	1,201	1,257	1,201	1,231	1,168	1,231	1,175	1,231	1,168	1,231	1,175
R2	0.2374				0.2263				0.2326			
Hansen test		0.429	0.161	0.484		0.229	0.184	0.602		0.541	0.311	0.740
A-B AR(2) test		0.705	0.614	0.917		0.823	0.879	0.898		0.748	0.668	0.919
No. of Instruments		39	44	39		39	44	39		43	44	43
Diff-in-Hansen test			0.256				0.388				0.506	
$H_0 : \hat{\beta}_1 = \hat{\beta}_2$									0.0005	0.0414	0.0269	0.0088

Notes: FEOLS is fixed-effects estimators, DGMM is two-step difference GMM estimators, SGMM is two-step system GMM estimators, and OGMM is two-step orthogonal deviation GMM estimators.

Robust standard errors are in the parenthesis (clustered by country in FEOLS and Windmeijer-corrected in DGMM, SGMM, and OGMM. *, **, *** for significance at 10%, 5%, and 1% level respectively.

P-values are reported in each test.

Table 1.4: The impacts of stops and flights on total investment (linear model)

	Dependent Variable: Total investment (1990 - 2014)											
	FEOLS	DGMM	SGMM	OGMM	FEOLS	DGMM	SGMM	OGMM	FEOLS	DGMM	SGMM	OGMM
STOP	-2.0792***	-2.6073	-3.9509***	-4.6054**					-2.1843***	-1.909*	-2.279**	-4.4067*
	(0.436)	(1.6304)	(1.412)	(1.9201)					(0.4302)	(1.1533)	(1.1257)	(2.3916)
FLIGHT					-0.0008	1.0664	1.7056	7.3081	-0.2283	2.9894	2.7036	3.9547
					(0.5336)	(3.9527)	(4.4889)	(4.6617)	(0.5579)	(2.8832)	(4.0255)	(6.0705)
ZGDP	0.3642***	0.2263	0.0746	0.2785	0.3953***	0.3284*	0.3528*	0.2995	0.3555***	0.3153**	0.3632*	0.3579
	(0.1123)	(0.2281)	(0.2345)	(0.3277)	(0.1144)	(0.1733)	(0.2132)	(0.3144)	(0.1094)	(0.1293)	(0.2036)	(0.3867)
SAVE	0.0794**	-0.0845	-0.1387*	-0.06	0.0809*	-0.0615	0.0187	-0.2426	0.098**	-0.0813	0.0261	-0.0383
	(0.03)	(0.1112)	(0.0718)	(0.1191)	(0.0423)	(0.1361)	(0.1366)	(0.1982)	(0.0425)	(0.1077)	(0.1101)	(0.1942)
KAOPEN	4.026**	10.4392	-5.6739	3.5788	4.6024**	14.5049***	3.1345	4.7833	3.8077**	9.9203*	1.1698	4.2443
	(1.9007)	(6.2452)	(3.5976)	(5.488)	(1.8654)	(5.4208)	(3.2007)	(5.5774)	(1.8069)	(5.9282)	(3.2068)	(6.1792)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	55	55	55	55	55	55	55	55	55	55	55	55
Observations	1,033	949	1,033	978	1,018	929	1,018	963	1,018	929	1,018	963
R2	0.164				0.1481				0.1807			
Hansen test		0.167	0.305	0.162		0.257	0.263	0.453		0.327	0.270	0.193
A-B AR(2) test		0.916	0.694	0.505		0.441	0.545	0.875		0.866	0.725	0.528
No. of Instruments		40	45	40		40	45	40		49	50	49
Diff-in-Hansen test			0.559				0.100				0.105	
$H_0 : \hat{\beta}_1 = \hat{\beta}_2$									0.0035	0.0552	0.2148	0.1643

Notes: FEOLS is fixed-effects estimators, DGMM is two-step difference GMM estimators, SGMM is two-step system GMM estimators, and OGMM is two-step orthogonal deviation GMM estimators. Robust standard errors are in the parenthesis (clustered by country in FEOLS and Windmeijer-corrected in DGMM, SGMM, and OGMM. *, **, *** for significance at 10%, 5%, and 1% level respectively. P-values are reported in each test.

with Stiglitz' (2000) argument that capital market liberalization is not always beneficial for growth because it increases economic instability in many cases.

Table 1.4 shows the impacts of capital flow episodes on domestic investment. Interestingly, the result shows capital flight does not depress domestic investment either. If the opportunity cost of foreign asset purchases is purchases of the same amount of domestic assets, capital flight has to reduce domestic investment but the result contradicts this intuition. As suggested before, it might indicate domestic agents mostly use foreign borrowings rather than their savings to increase foreign asset purchases substantially. If so, savings do not necessarily flow overseas during capital flights and domestic investment might not be hurt, consequently. Moreover, the results from OLS and DGMM show that the impacts of two episodes are significantly different. The results from OGMM and SGMM are against them but it is due to large standard errors in capital flight.[6] For this reason, we can also conclude from Table 1.4 that capital flights are different from capital stops because they do not reduce domestic investment.

As expected, we can see that real GDP growth and liberalized capital markets promote domestic investment. On the contrary, it is not clear whether private saving also promotes domestic investment. Assuming private sectors have two options to put their savings (domestic markets and global markets), they would not always finance domestic companies increasing saving in the short term. Their decisions may vary according to the surrounding environment. Finally, the estimates of control variables rarely change in both (1.1) and (1.2) regardless of estimators.

[6]Large standard errors from flights may imply the impact of capital flights vary substantially across countries.

For the robustness check, the dummy variables for capital flow episodes are replaced with gross capital outflows (outflow) in (1.1) and (1.2). Accordingly, the models are as follows:

$$zgdp_{it} = \beta outflow_{it} + X_{it}^{'}\gamma + u_{it} \tag{1.3}$$

$$toinv_{it} = \beta outflow_{it} + X_{it}^{'}\gamma + u_{it}$$

Table 1.5 shows the result and we can see most of coefficients for independent variables, including capital flight, are similar to previous results. It confirms the previous conclusions that 1) capital flight does not depress real GDP growth and domestic investment in emerging market economies and 2) capital inflow stops and capital outflow flights are different phenomena.

1.4.3 Interaction model

In the previous section, it was assumed the impact of flights is linear and not affected by the amount of gross capital inflows. This section tests the hypothesis that the impact varies according to available external loans in the country. For example, if domestic companies can simply borrow from foreign countries during capital flights, the loss of investment by domestic agents can be quickly recovered and the impact of flights can be minimized. High correlation between inflows and outflows in emerging markets (Broner et al, 2013) also supports this hypothesis because it indicates domestic companies increase foreign borrowings while domestic agents purchase a large amount

Table 1.5: The impacts of gross capital outflows on real GDP growth and total investment (linear model)

	Dependent Variable: real GDP growth					Dependent Variable: Total investment			
	FEOLS	DGMM	SGMM	OGMM		FEOLS	DGMM	SGMM	OGMM
OUTFLOW	0.0777*	-0.0054	0.0424	0.0282	OUTFLOW	-0.0124	0.1614	0.271	0.4318
	(0.039)	(0.1065)	(0.0904)	(0.0933)		(0.0936)	(0.1791)	(0.2235)	(0.4019)
LZGDP	0.2374***	0.2867***	0.2989***	0.2861***	ZGDP	0.3964***	0.313**	0.4558*	0.3067
	(0.0611)	(0.0958)	(0.0892)	(0.0772)		(0.1137)	(0.1495)	(0.2391)	(0.3062)
EXREGIME	-0.2107***	-0.3644*	-0.2947**	-0.2586*	SAVE	0.0811*	-0.0869	-0.0261	-0.2154*
	(0.0488)	(0.211)	(0.1224)	(0.1408)		(0.0428)	(0.1056)	(0.1048)	(0.1223)
KAOPEN	0.017	-0.3667	0.6058	1.5888	KAOPEN	4.6202**	8.6508	2.7691	6.32
	(0.479)	(0.249)	(1.4634)	(1.4784)		(1.8884)	(5.7189)	(3.2)	(4.9546)
Time Dummies	Yes	Yes	Yes	Yes	Time Dummies	Yes	Yes	Yes	Yes
Countries	56	56	56	56		55	55	55	55
Observations	1,231	1,168	1,231	1,175		1,018	929	1,018	963
R2	0.2252					0.1466			
Hansen test		0.227	0.166	0.504			0.453	0.451	0.445
A-B AR(2) test		0.954	0.988	0.960			0.247	0.302	0.260
No. of Instruments		39	44	39			40	45	40
Diff-in-Hansen test			0.428					0.189	

Notes: FEOLS is fixed-effects estimators, DGMM is two-step difference GMM estimators, SGMM is two-step system GMM estimators, and OGMM is two-step orthogonal deviation GMM estimators. Robust standard errors are in the parentheses (clustered by country in FEOLS and Windmeijer-corrected in DGMM, SGMM, and OGMM. *, **, and *** for significance at the 10%, 5%, and 1% level, respectively. P-values are reported in each test.

of foreign assets. The model is

$$y_{it} = \beta_1 flight_{it} + \beta_2 stop_{it} + \beta_3 flight_{it} * stop_{it} + X_{it}^{'}\gamma + u_{it} \tag{1.4}$$

where the dependent variable, y, is real GDP growth and total investment as well.

Table 1.6 shows the result on real GDP growth and total investment. When the dependent variable is real GDP growth, constitutive terms of flights ($\widehat{\beta}_1$) in all estimators are positive. Moreover, a single flight does not depress total investment as well. They, therefore, confirm the previous result from linear models that a flight alone is not harmful to the domestic economy. Nonetheless, negative interaction terms ($\widehat{\beta}_3$), when the dependent variable is GDP growth, suggest flights might depress domestic growth if there is "capital flee" from domestic financial markets not only by domestic investors but also by foreign investors. On the contrary, it is interesting to see that interaction terms vary when the dependent variable is total investment. This might indicate domestic investment does not depress even if flights and stops occur simultaneously, which is counterintuitive. Further study is warranted on this issue. Indeed, Section 1.4.4 shows that domestic investment has been severely depressed when two capital flow episodes occurred simultaneously in emerging market economies. Lastly, there is little change in the coefficients of other independent variables.

For further analysis, an alternative specification is employed, which replaces flight dummies with gross capital outflows. The model is

$$y_{it} = \beta_1 outflow_{it} + \beta_2 stop_{it} + \beta_3 outflow_{it} * stop_{it} + X_{it}^{'}\gamma + u_{it} \tag{1.5}$$

The estimates are reported in Table 1.7.

Table 1.6: The impacts of stops and flights on real GDP growth & total investment (interaction model)

	Dependent Variable: Real GDP growth (1990 - 2014)					Dependent Variable: Total investment (1990 - 2014)			
	FEOLS	DGMM	SGMM	OGMM		FEOLS	DGMM	SGMM	OGMM
FLIGHT	0.5153	2.6334	0.9019	2.4037**	FLIGHT	-0.2111	3.1283	4.7341	6.5359
	(0.3497)	(2.1681)	(2.6025)	(1.2234)		(0.6255)	(3.3179)	(2.962)	(4.7965)
STOP	-0.9235**	-1.1285	-1.1556	-0.296	STOP	-2.1705***	-2.3183**	-1.577	-2.4326
	(0.3867)	(1.3031)	(1.8582)	(0.8371)		(0.442)	(1.0715)	(1.67)	(2.7902)
FLIGHT*STOP	-0.9507	-5.7214	-2.3539	-7.768*	FLIGHT*STOP	-0.1653	5.4526	0.1679	-5.1394
	(1.4622)	(6.0759)	(6.0312)	(4.6568)		(1.6653)	(3.7109)	(3.4236)	(8.2399)
LZGDP	0.2226***	0.263*	0.3119**	0.2396***	ZGDP	0.3553***	0.2976	0.253*	0.3302
	(0.0626)	(0.1363)	(0.123)	(0.0793)		(0.1092)	(0.1492)	(0.1453)	(0.3962)
EXREGIME	-0.1981***	-0.2344	-0.2407*	-0.2348*	SAVE	0.0981**	-0.1152	-0.0325	-0.0877
	(0.0462)	(0.2031)	(0.1232)	(0.1322)		(0.0428)	(0.1309)	(0.1153)	(0.1723)
KAOPEN	-0.203	-2.1702	-0.081	1.3372	KAOPEN	3.7987**	10.2448**	3.1181	4.5159
	(0.4359)	(2.5607)	(1.7547)	(1.8888)		(1.8172)	(4.008)	(3.5842)	(5.7824)
Time Dummies	Yes	Yes	Yes	Yes	Time Dummies	Yes	Yes	Yes	Yes
Countries	56	56	56	56		55	55	55	55
Observations	1,231	1,168	1,231	1,175		1,018	929	1,018	963
R2	0.2239					0.1811			
Hansen test		0.755	0.400	0.819			0.372	0.245	0.150
A-B AR(2) test		0.841	0.797	0.857			0.644	0.645	0.792
No. of Instruments		47	54	47			54	49	54
Diff-in-Hansen test			0.359				0.126		

Notes: FEOLS for fixed-effects estimators, DGMM for two-step difference GMM estimators, SGMM for two-step system GMM estimators, and OGMM for two-step orthogonal deviation GMM estimators. Robust standard errors are in the parentheses (clustered by country in (1)s and Windmeijer-corrected in (2)s, (3)s, and (4)s.*, **, and *** for significance at the 10%, 5%, and 1% level, respectively. P-values are in each test.

Table 1.7: The impacts of gross capital outflows on real GDP growth & total investment (interaction model)

Dependent Variable: Real GDP growth (1990 - 2014)					Dependent Variable: Total investment (1990 - 2014)				
	FEOLS	DGMM	SGMM	OGMM		FEOLS	DGMM	SGMM	OGMM
OUTFLOW	0.0735*	0.084	0.0885	0.0889	OUTFLOW	-0.0158	-0.0687	-0.1675	0.1686
	(0.0398)	(0.1195)	(0.1102)	(0.0879)		(0.1014)	(0.2321)	(0.2747)	(0.2105)
STOP	-0.8596**	-1.35	-0.4944	-0.43	STOP	-1.9469***	-2.297*	-3.2858*	-5.3684***
	(0.4148)	(1.1434)	(1.2495)	(0.978)		(0.48)	(0.2686)	(1.7831)	(1.9249)
OUTFLOW*STOP	-0.062	-0.3171	-0.3735	-0.4376*	OUTFLOW*STOP	-0.1731	-0.1281	0.2126	0.0057
	(0.0836)	(0.3033)	(0.3489)	(0.2267)		(0.1141)	(0.2686)	(0.4575)	(0.2678)
LZGDP	0.2233***	0.2707***	0.28***	0.23***	ZGDP	0.354**	0.3121*	0.3445***	0.2357
	(0.0621)	(0.0786)	(0.0714)	(0.0724)		(0.1084)	(0.1665)	(0.1133)	(0.3255)
EXREGIME	-0.1998***	-0.2184	-0.3312***	-0.2638**	SAVE	0.0971**	0.0023	0.0616	-0.0114
	(0.0468)	(0.1787)	(0.1158)	(0.1253)		(0.0428)	(0.0948)	(0.0888)	(0.1339)
KAOPEN	-0.2017	-2.3291	0.7745	1.0129	KAOPEN	3.863**	4.4118	-0.3918	0.7016
	(0.4527)	(2.8019)	(1.5427)	(1.9039)		(1.8083)	(4.9106)	(3.0695)	(4.7536)
Time Dummies	Yes	Yes	Yes	Yes	Time Dummies	Yes	Yes	Yes	Yes
Countries	56	56	56	56		55	55	55	55
Observations	1,231	1,168	1,231	1,175		1,018	929	1,018	963
R2	0.2318					0.1797			
Hansen test		0.743	0.388	0.753			0.311	0.310	0.606
A-B AR(2) test		0.858	0.840	1.000			0.870	0.757	0.354
No. of Instruments		47	54	47			54	55	54
Diff-in-Hansen test			0.399					0.289	

Notes: FEOLS for fixed-effects estimators, DGMM for two-step difference GMM estimators, SGMM for two-step system GMM estimators, and OGMM for two-step orthogonal deviation GMM estimators. Robust standard errors are in the parentheses (clustered by country in (1)s and Windmeijer-corrected in (2)s, (3)s, and (4)s. *, **, and *** for significance at the 10%, 5%, and 1% level, respectively.

There is no significant difference from previous results. $\hat{\beta_1}$s are mostly positive and insignificant, which indicates gross capital outflows hardly hurt domestic economies. On the other hand, $\hat{\beta_2}$s are negative with all estimators and the impact is especially strong on domestic investment. If we see the interaction term, which shows the impact of gross capital outflows during capital stops, although $\hat{\beta_3}$s are negative when GDP growth is the dependent variable, the sign of it changes according to estimators when total investment is the dependent variable. While it supports the previous result that capital flights are harmful under the presence of capital stops, it also suggests even a small amount of gross capital outflows depress the economies when there are not enough external loans. For example, the result from OGMM shows that 1% (of GDP) increase in gross capital outflows may decrease about 0.44% of real GDP growth in the short run if there are not enough financial resources. In sum, the results from Table 1.6 and Table 1.7 demonstrate policymakers have to manage both gross capital inflows and outflows to prevent the damage caused by domestic investors fleeing from domestic markets.

Although the result from interaction models ratify the hypothesis that capital flights are harmful conditional on the existence of capital stops to some extent, insignificant interaction terms make it suggestive rather than conclusive. In order to understand why, it is worth noting the feature of interaction models. which is multicollinearity between constitutive terms and interaction terms. For instance, the interaction terms of two constitutive terms (capital stops and flights in (1.4) and gross capital outflows and capital stops in (1.5)) are simply the intersection or the product of them. As a result, standard errors of the coefficients are inflated and, in many cases, they contribute to the coefficients being insignificant. Furthermore, a small number of interaction terms worsens this issue. Although a few papers have suggested the solutions, to my knowledge, there is no consensus. However, as Friedrich (1982) and Brambor et al. (2006) argue, it is desirable to use it if there is any chance that interaction is present because it provides additional information that cannot be discovered by a linear-additive model. For this reason, the next subsection uses time trend models. It complements the result here by showing that GDP growth and total investment actually have decreased when flights concurred with stops.

1.4.4 Time trend model

This subsection employs time trend models to investigate how growth and investment have evolved around the capital flight events. To be specific, flight episodes are now separated into two different groups: the ones that concurred with capital stops and the ones that occurred alone. That is,

$$\{Flights\} = \{Flights\ w/\ Stops\} \cup \{Flights\ only\}$$

and

$$\{Flights\ w/\ Stops\} \cap \{Flights\ only\} = \emptyset.$$

The model is

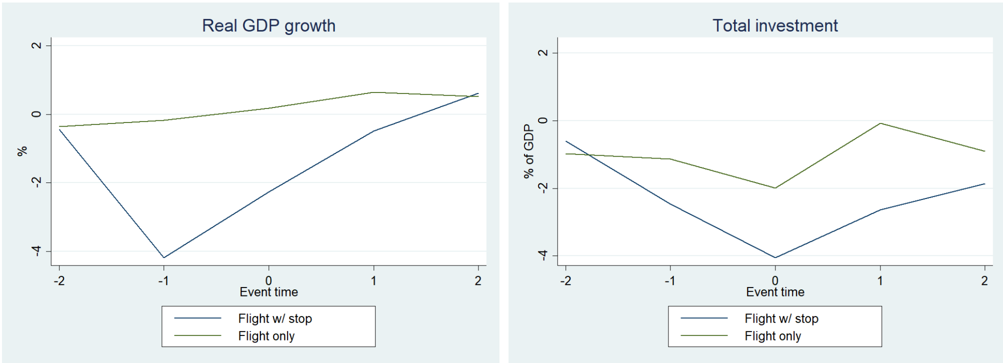
$$y_{it} = \alpha + \sum_{0 \leq s \leq 4} \beta_s episode^j_{i,t-2+s} + \gamma year + \eta_i + \epsilon_{it} \tag{1.6}$$

where j is an index for two groups of flights: {flights w/ stops} and {flights only}. 'year' is the time trend to get rid of linear trend in GDP growth and investment. Therefore, the model estimates the behavior of real GDP growth and total investment around two events from T-2 to T+2 where T is the year when the event occurred.

Table 1.8 reports the result and Figure 1.4 summarizes it. It is noteworthy that the behavior of real GDP growth and domestic investment around capital flights are starkly different according to the presence of capital stops. For example, during simultaneous flights and stops, GDP growth gets the lowest at T-1 and begins to recover slowly after that. Likewise, total investment gets the lowest at T when two events occur simultaneously. In other words, GDP growth has decreased about 1.8% compared to GDP growth two years before the event and it took two years to recover fully. The damage to domestic investment is worse. Domestic investment has decreased about 3.4% of GDP compared to domestic investment two years before the event. Moreover, it is not fully recovered even two years after the event, which indicates it takes longer to recover from the shocks.

On the other hand, there is little change in both when flights occur alone. Although domestic investment slightly decreased during single flight periods, it was already at a low level at T-2 so it is doubtful that they played a major role in domestic investment at T. The result from the time trend models, therefore, confirms the hypothesis that the impact of flights are conditional on available external loans. It shows emerging markets are the most damaged when flights and stops occur simultaneously.

Figure 1.4: The trend of real GDP growth and total investment around episodes



1.5 Summary and concluding remarks

The essay has estimated the causal effect of capital flights on emerging market economies employing diverse GMM estimators. Moreover, it adopted interaction models and time trend models to test the hypothesis that the causal effect might be conditional on the amount of gross capital inflows available for working capital. This differs from previous research that focused on the association and assumed the impact of flights is linear. As a result, the essay provides quite a different conclusion. Namely, flights alone do not depress emerging markets' growth and investment. This differs from the effect of capital inflow stops by foreigners, which has consistently depressed domestic economies. On the other hand, capital flights coinciding with sudden capital stops have worsened the shocks and we could see that the growth and investment were severely affected by them. It suggests flights could be still dangerous if domestic companies and banks cannot have access to international credit markets.

The result necessitates us to see capital flights from a new angle and makes

Table 1.8: The trend of real GDP growth and total investment around episodes

	Real GDP growth		Total investment	
	Flights w/ Stops	Flights only	Flights w/ Stops	Flights only
T-2	-0.4397	-0.3549	-0.6036	-0.9715*
	(1.1359)	(0.4318)	(1.363)	(0.4955)
T-1	-4.1767***	-0.1695	-2.462*	-1.1374**
	(1.1689)	(0.4519)	(1.4028)	(0.5189)
T	-2.2541**	0.1787	-4.0543***	-1.997***
	(1.1367)	(0.4595)	(1.3645)	(0.5249)
T+1	-0.4853	0.6487	-2.641*	-0.075
	(1.135)	(0.4619)	(1.3623)	(0.5275)
T+2	0.6218	0.5171	-1.8576	-0.9023*
	(1.059)	(0.4573)	(1.271)	(0.5223)
Wald test				
$y_{t-1} - y_{t-2}$	-3.737**	0.1854	-1.8584	-0.1629
$y_t - y_{t-1}$	1.9226	0.3482	-1.5923	-0.8596
$y_{t+1} - y_t$	1.7688	0.47	1.4133	1.922**
$y_{t+2} - y_{t+1}$	1.1071	-0.1316	0.7834	-0.8273
$y_t - y_{t-2}$	-1.8144	0.5336	-3.4507*	-1.0255
$y_{t+2} - y_t$	2.8759*	0.3384	2.1967	1.0947
Country dummies	Yes	Yes	Yes	Yes
Time trend	Yes	Yes	Yes	Yes
R2	0.1348	0.1242	0.4947	0.5552
Countries	56	56	55	55
Observations	1,155	1,044	1,139	1,023

Notes: Constant terms are not reported. Robust standard errors are in the parentheses. *, **, and *** for significance at the 10%, 5%, and 1% level, respectively.

us to ponder the implementation of appropriate capital outflow policies such as capital outflow restrictions. Liberalized capital markets allow domestic agents to diversify their portfolios while reducing the risks and to take advantage of foreign investment. However, if the benefits are by the loss of the country's investment and growth, social welfare would eventually decrease as a consequence. The essay denies such possibility and argues that more liberalized gross capital outflows are beneficial for emerging market economies.

Nonetheless, note that the main conclusion of this essay is not that capital flights do not necessarily harm emerging markets or are negligible, because they still might affect the countries through diverse channels. For example, capital flights may indicate domestic investors' currency attacks on their own currency to depreciate it. In this case, the country might experience currency crises and inflation crises and its growth may decrease as a result. Another important caveat is that capital flights might be associated with capital inflow surges. As emphasized in this essay, domestic investment is severely depressed if companies cannot borrow not only from domestic agents but also from foreigners. Therefore, they would be tempted to increase foreign borrowings if they observe domestic agents fleeing from domestic markets. The country might then experience "capital inflow bonanzas" and subsequent financial crises (see Reinhart and Reinhart (2008) and Ghosh et al. (2016)).

The intuitions above suggest a future research agenda on gross capital outflows. Although there has been significant research on capital inflow reversals, there still remains relatively little research on capital outflow flights caused by domestic agents. Considering the increasing role of capital outflows in emerging market economies, better knowledge on this phenomenon would help the design and implementation of sound policies.

Chapter 2

The heterogenous effects of saving and capital inflows on capital outflows: a quantile regression approach

2.1 Introduction

What is the main driver of gross capital outflows in developing countries? Although capital outflows are generally fueled by domestic and external saving, the answer to this suggests different policy implications especially when domestic agents are purchasing a large amount of foreign assets (capital flight). Capital flight might be harmful but the reason why would be different according to its main fuel. For example, if domestic agents are saving in foreign countries to avoid expected taxation, governments' tax base erodes and social welfare might be reduced consequently (Dooley and Kletzer, 1994). Conversely, if they borrow from foreign countries to increase leverage, such behaviors might increase the probability of external default and sudden stops in the country (Gosh et al., 2016). In either case, different policy responses may be required.

As one way to answer it, I investigate the causal effects of private saving and gross capital inflows on gross capital outflows using panel data that consists of 56 emerging market economies over 1990 - 2014. In particular, it focuses on extreme movements of capital flows that may motivate the implementation of macroprudential policies. Recent literature has provided empirical evidence that capital inflows and outflows are both pro-cyclical (e.g., Broner et al., 2013). This might indicate that capital outflows are mainly fueled by external loans rather than by domestic saving especially during boom times. Accordingly, the essay tests two hypotheses: first, capital outflows are mostly fueled by capital inflows rather than by domestic saving and, second, the causal impact of capital inflows are stronger than that of domestic saving especially during capital flight.

Using Powell's (2015) quantile regression methodology, it sheds light on the relationship between capital outflows and their two main resources. First, it estimates quantile treatment effects of gross capital inflows and domestic saving that might vary according to the distribution of gross capital outflows. It is motivated by the procyclical nature of capital flows which, in turn, might indicate their varying association with capital inflows. Moreover, according to Forbes and Warnock (2012a, b), the determinants of capital flight (large foreign asset purchases by domestic agents) and capital retrenchment (small foreign asset purchases) are different. It implies capital flight and retrenchment are different phenomena and that the causal impacts of capital inflows and private saving on them also might be different. Ordinary least squares methods estimate the mean effects of the determinants but do not allow for heterogenous effects at different points in the conditional distribution of the outcome variable. If this is the case for gross capital outflows, OLS models are inappropriate to estimate the impact of two financial resources. On the other hand, quantile regression methodology can provide more robust evidence on the impacts of them when outflows are far from the mean or median.

A quantile plot (Figure 2.1) and the summary (Table 2.1) of gross capital outflows also support the desirability of the methodology in this circumstance. Across diverse fractions of the data, gross capital outflows range from -15.04% to 50.81% and even after getting rid of outliers, they range from -2.2% to 12.01%. Therefore, the essay attempts to estimate the impacts of two financial resources across the fraction of gross capital outflows.

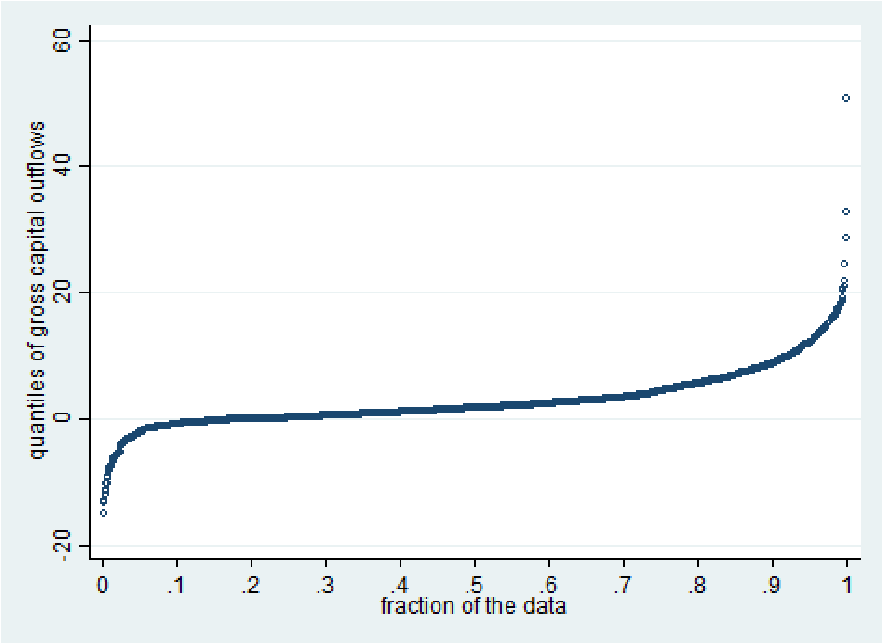
Table 2.1: The summary and quantiles of gross capital outflows (% of GDP)

Obs.	Mean	Std. Dev.	Min	Max
1,298	2.84%	4.81	-15.04%	50.81%
Quantile				
5_{th}	25_{th}	50_{th}	75_{th}	95_{th}
-2.2%	0.17%	1.72%	4.44%	12.01%

Notes: Data source is IMF BOPS and WEO, and the data consist of 56 emerging markets and cover the years 1990 - 2014

Second, I estimate the causal impacts of domestic saving and capital inflows on capital outflows. Addressing causality is important for the study because the asso-

Figure 2.1: Quantile plot of gross capital outflows (IMF BOPS and WEO)



ciation might simply reflect national income accounting in sample countries (i.e., total saving=total investment). In this case, the association between gross capital outflows and two resources would barely vary across the distribution of the former unless there exist large errors and omissions in the data. [1] Powell (2015) adopts Chernozhukov and Hansen's (2005) IV quantile regression methodology and, therefore allows us to estimate not only the association but also causal effects of the determinants.

According to the result, the marginal effect of external loans on foreign asset purchases is analogous to that of saving when private sectors are purchasing a small amount of foreign assets (e.g., less than the median). However, when asset purchases significantly increase, they switch their resources in favor of external loans and reduce

[1]To confirm it, see the result in Section 2.5.1.

the dependency on saving. It suggests capital flight is fueled by borrowing rather than by saving and it might be a reason why capital inflows are strongly and positively correlated with capital outflows. Furthermore, the impacts of two financial resources on equity outflows and debts outflows are quite different. By showing the past outflows are the best predictor of current equity outflows, the estimates indicate equity outflows are very persistent during capital flight. As a result, although the temporary effect of capital inflows is small, the permanent effect becomes significantly large. On the contrary, debt outflows are less persistent than equity outflows but quantile treatment effects of current determinants are larger. It indicates private sectors overborrow to purchase debts rather than equities in the short run and is consistent with several stylized facts (e.g., high leverage ratio and procyclicality of capital flows and financial systems).

The essay is organized as follows. Section 2 reviews existing literature on the relationship between capital outflows and two financial resources, saving and borrowing. Section 3 describes Powell's (2015) IV quantile regression for panel data. Section 4 explains data and introduces regression models and Section 5 reports the results. Section 6 summarizes the essay and concludes it by discussing some policy implications.

2.2 Related literature

We might be able to surmise the impact of private saving on foreign investment by a well-known stylized fact, "Home equity bias". According to Feldstein and Horioka (1980), the empirical evidence indicates saving is mostly spent to purchase domestic capital stock rather than foreign capital stock. Their results suggest very strong correlation between saving and domestic investment: one percentage increase in the saving rate increases almost one percentage investment rate. After their study, researchers consistently have attempted to test "home equity bias" and many of them have confirmed it.[2] Furthermore, recent empirical literature argues this phenomenon is not restricted to developed countries and equities. Coeurdacier and Rey (2012) show such bias is stronger and more persistent in emerging markets and the share of home bonds and bank loans in investors' portfolios are also higher. Feldstein (1995) also studies the relationship between capital outflows and domestic investment by investigating how outbound FDI affects domestic capital stock in 24 OECD countries. According to him, one dollar spending on outbound FDI is associated with a decrease in domestic investment by almost the same amount so that they are substitutes. If such strong correlation between saving and domestic investment holds, we should expect the causal effect of saving on capital outflows is small. However, this long-term relationship between saving and domestic investment does not confirm the causal effect of saving on foreign investment in the short term which is the main purpose of this essay.

On the other hand, other researchers have focused on the simultaneous capital inflows and outflows in Latin America in the 1970s and 1980s and tried to explain this strong correlation by modeling domestic risks that are unique in developing countries. For example, Khan and Ul Haque (1985) argue it is because of the "expropriation" risk that cannot be hedged because of political instability and poor infrastructures in

[2]See e.g., Feldstein (1982), Feldstein and Bacchetta (1991), and Tesar (1991).

developing countries. As a result, private sectors prefer to purchase risk-free foreign assets and governments are forced to borrow from external markets. Similarly, Alesina and Tabelini (1989) point out political uncertainty as a reason for the association. According to them, noncooperative two social groups cause governments' moral hazard to borrow excessively before the change of the terms. Therefore, individuals who are afraid of the increase in tax in the future purchase foreign assets as the insurance against it. These papers suggest theoretical frameworks as to why large capital inflows are associated with capital flight.

Recent studies also provide the empirical evidence on strong positive correlation between capital inflows and outflows. For instance, Broner et al. (2013) show there is strong positive correlation between capital inflows and outflows regardless of countries' incomes and argue the correlation is getting stronger. Likewise, Rey (2013) and Miranda-Agrippino and Rey's (2015) results emphasize strong correlation between two flows and point out global common factors, such as global risk aversion and growth as the main drivers of this strong correlation. This might indicate capital inflows are the main drivers of capital outflows. Providing a detailed interpretation on this strong correlation is one of the purposes of this essay.

To my knowledge, this essay is one of few studies employing quantile regression to estimate the impacts of private saving and gross capital inflows on gross capital outflows. The main motive is to treat capital outflows at different quantiles as different dependent variables. Forbes and Warnock (2012a, b) argue the determinants of capital retrenchment and flight are different. According to them, global common factors are the main determinants of capital flight although domestic specific factors also play some roles. It implies they are indeed different phenomena. If so, the causal effects of private saving and capital inflows on capital outflows may be different according to the amount of them and then the quantile regression methodology allows us to estimate them. I expect its result could suggest more flexible policy responses according to the amount of capital outflows.

2.3 Quantile regression with nonadditive fixed effects

This section summarizes Powell's (2015) quantile regression with nonadditive fixed effect. Powell (2015) suggests not to estimate fixed effects separately in the model being concerned that the distribution of outcome variable, Y_{it} , changes after conditioning on fixed effects, α_i: i.e., $Y_{it}|D_{it} \neq (Y_{it} - \alpha_i)|D_{it}$.[3] As each country's fixed characteristics might explain a certain amount of capital flows, it could be more desirable to leave them as a part of the disturbance terms, which decide the rank of Y_{it}.[4] By not estimating fixed effects, computational gains are large but any fixed components in the instruments are eliminated in the sample moments using generalized method of moments (GMM). Furthermore, by developing Chernozhukov and Hansen's (2005) IV quantile regression approach, it allows using instruments to estimate treatment effects with more simplified assumptions using the panel nature of the data. Parameter identi-

[3]Following Chernozhukov and Hansen's (2005) notation, I use capital letters to designate random variables and lowercase letters for realized values in the random variable.

[4]For quantile regression with fixed effects, see Koenker (2004), Ponomareva (2011), and Galvao (2011).

fication is solely done by within-individual variations in the instruments. In this section, I mostly focus on necessary assumptions and the estimation process of quantile regression. For a detailed explanation on it (e.g., properties and proofs), see Chernozhukov and Hansen (2005) and Powell (2015).

2.3.1 The basic framework

Potential outcomes are modeled using the linear-in-parameters framework; that is,

$$Y_{it} = D_{it}^{'}\beta(U_{it}^{*}), \quad U_{it} \sim U(0,1) \tag{2.1}$$

where $D_{it}^{'}\beta(\tau)$ is strictly increasing in τ. Outcomes are latent (potential) in the sense that we can only observe a part of them given d: $Y_{it}^{d} = q(d, U_{it}^{d*})$. The disturbance term, U_{it}^{*}, is normalized in the uniform distribution and let $U_{it}^{*} = f(\alpha_i, U_{it})$, where $U_{it} \sim U(0,1)$: i.e., it is the function of fixed components and time-varying components. The model does not require a specific form of $f(\cdot)$ except it exists. As U^{d*} determines relative rankings of realized values of potential outcomes, it is referred to as the rank variable. It can also be interpreted as "ability" or "proneness" (Doksum, 1974) because U_{it}^{*} in the upper quantile implies people are more prone to purchase foreign assets. In this model, quantile treatment effects (QTEs) are the causal effect of the treatment variables from d_1 to d_2 on Y_{it} holding τ fixed:

$$d_2^{'}\beta(\tau) - d_1^{'}\beta(\tau) \tag{2.2}$$

The structural quantile function (SQF) that describes the τ^{th} quantile of Y for a given d is

$$S_Y(\tau|d) = d^{'}\beta(\tau), \quad \tau \in (0,1) \tag{2.3}$$

On the contrary, the SQF with fixed effect is $S_Y(\widetilde{\tau}|d,\alpha_i) = \alpha_i + d^{'}\widetilde{\beta}(\widetilde{\tau})$. It is clear that $\widetilde{\tau} \neq \tau$ so that $\widetilde{\beta}(\widetilde{\tau}) \neq \beta(\tau)$. Finally, quantile regression relies on two restrictions: the conditional restriction, (4), and the unconditional restriction, (5):

$$P(Y_{it} \leq D_{it}^{'}\beta(\tau)|D_i) = P(Y_{is} \leq D_{is}^{'}\beta(\tau)|D_i) \tag{2.4}$$

$$P(Y_{it} \leq D_{it}^{'}\beta(\tau)) = \tau \tag{2.5}$$

where $D_i = (D_{i1}, \cdots, D_{iT})$. The conditional restriction is especially notable because the probability that the potential outcome is less than the estimated model varies across individuals. The estimator only uses within-individual comparisons of the probability and it is possible by observing the same individual several times using panel data.

2.3.2 Assumptions

All conditions are assumed to hold jointly with probability one.

A1 *Potential Outcomes and Monotonicity:* $Y_{it}^d = q(d, U_{it}^{d*})$, $U_{it}^{d*} \sim U(0,1)$, *where* $q(d,\tau)$ *is strictly increasing in* τ.

A1 is a standard monotinicity condition from Chernozhukov and Hansen (2005). U_{it}^{d*} is a normalized disturbance term that may be a function of several unobservable disturbance terms. Let ϵ_{it}^{d*} be a non-normalized disturbance term, then there exists one-to-one mapping of ϵ_{it}^{d*} to U_{it}^{d*}.

A2 *Independence:* $E\Big[1(U_{it}^{d*} \leq \tau) - 1(U_{is}^{d*} \leq \tau)|Z_i\Big] = 0$ *for all s, t and for each d.*

$Z_i = (Z_{i1}, \cdots, Z_{iT})$ is the set of instruments. **A2** is satisfied under conditional and unconditional restrictions and requires instruments do not systemically change the distribution of U_{it}^{d*} over time. It relaxes Chernozhukov and Hansen's (2005) assumption, which is $E\Big[1(U_{it}^{d*} \leq \tau)|Z_{it}\Big] = \tau$.

A3 *Selection:* $D_{it} = \delta_t(Z_i, V_i)$ *for some unknown funtion* $\delta_t(\cdot)$ *and random vector* V_i.

A3 defines the function of a treatment variable and it is the function of instruments and some random vectors. This structure ensures Z_i is a valid instrument and the relationship between D_{it} and V_i necessitates using Z_i.

A4 *Rank Similarity:* $U_{it}^{d*}|Z_i, V_i \sim U_{it}^{d'*}|Z_i, V_i$ *for each* d, d'.

A4 is the most important assumption. According to it, a country that is already purchasing a large amount of assets (highly ranked) still tends to purchase a large amount of them with changes in saving or loans compared to the others.[5] The stronger assumption is rank invariance but the rank similarity condition relaxes it by allowing the ranks to change. It only requires such change is not systematic.

A5 *Observables: The observed random vector consists of* $Y_{it} \equiv Y_{it}^{D}, D_{it}, Z_{it}$

Conditions **A1-A5** lead to the following main results:

Theorem: Suppose **A1-A5** hold. Then, the following three conditions hold with probability one:

1. For $U_{it}^{*} := U_{it}^{D*}$, $Y_{it} = q(D_{it}, U_{it}^{*})$, $U_{it}^{*} \sim U(0,1)$.

2. For each $\tau \in (0,1)$, $E\Big[1(Y_{it} \leq q(D_{it},\tau)) - 1(Y_{is} \leq q(D_{is},\tau))|Z_i\Big] = 0$ for all s, t.

3. For each $\tau \in (0,1)$, $P\Big[Y_{it} \leq q(D_{it},\tau)\Big] = \tau$.

Condition 1 states a quantile regression model with a nonadditive disturbance term is generated by **A1-A5**. Condition 2 and 3 provide two moment conditions that are needed for GMM estimation. The two moment conditions are:

[5] That is, the rank of outcomes does not change systematically by realized treatment variables.

Moment Conditions: Suppose **A1-A5** hold. Then for each $\tau \in (0,1)$,

$$E\left\{\frac{1}{2T^2}\sum_t\sum_s(Z_{it}-Z_{is})\Big[1(Y_{it}\le q(D_{it},\tau))-1(Y_{is}\le q(D_{is},\tau))\Big]\right\} \tag{2.6}$$

$$E\Big[1(Y_{it}\le q(D_{it},\tau))-\tau\Big]=0 \tag{2.7}$$

Moment condition (2.6) can be simplified as

$$E\left\{\frac{1}{T}\sum_t(Z_{it}-\bar{Z}_i)\Big[1(Y_{it}\le q(D_{it},\tau))\Big]\right\}=0 \tag{2.8}$$

where $\bar{Z}_i=\frac{1}{T}\sum_{t=1}^{T}Z_{it}$. It shows that identification is solely done by within-individual variation in the instruments: $Z_{it}-\bar{Z}_i$.

2.3.3 Estimation

GMM is used for the estimation. Simplified sample moments for the practical estimation are

$$\hat{g}(b)=\frac{1}{N}\sum_{i=1}^{N}g_i(b) \;\; with \;\; g_i(b)=\frac{1}{T}\left\{\sum_{t=1}^{T}(Z_{it}-\bar{Z}_i)\Big[1(Y_{it}\le D_{it}^{'}b)\Big]\right\} \tag{2.9}$$

If time fixed effects are included, moment conditions (2.6) and (2.7) imply $P(Y_{it}\le D_{it}^{'}\beta(\tau))=\tau$ for all t. Powell (2015) defines the parameter set as

$$\mathfrak{B}\equiv\left\{b \mid \tau-\frac{1}{N}<\frac{1}{N}\sum_{i=1}^{N}1(Y_{it}\le D_{it}^{'}b)\le\tau \;\; for \;\; all \;\; t\right\} \tag{2.10}$$

to force $Y_{it}\le D_{it}^{'}b$ to hold for $100\tau\%$ of the observations in each time period. Then,

$$\widehat{\beta(\tau)}=arg\min_{b\in\mathfrak{B}}\hat{g}(b)^{'}\hat{A}\hat{g}(b) \tag{2.11}$$

with a weighting matrix $\hat{A}$. $\hat{A}$ is an identity matrix in one-step GMM and two-step GMM is possible if the model is overidentified.

As traditional GMM estimators, including time fixed effects is important because it allows the interpretation of panel quantile regression estimates to be equivalent to the interpretation of cross-sectional quantile regression estimates. For example, without shifting the distribution of capital flows every year, the upper quantiles mostly will belong to later year periods. Let $\mathbf{D} \equiv (\mathbf{X}, 1(t = 1), ..., 1(t = T))$, where $\mathbf{X}$ is the set of independent variables and 1(t=s) is a dummy variable for time at s. Let $\tilde{b}$ represent coefficients on $\mathbf{X}$ such that $\mathbf{D}'_{it}b = \gamma_t + \mathbf{X}'_{it}\tilde{b}$ and

$$set\ \ \hat{\gamma}_t(\tau, \tilde{b})\ \ such\ that\ \ \tau - \frac{1}{N} < \frac{1}{N}\sum_{i}^{N} 1(Y_{it} - X'_{it}\tilde{b} \leq \hat{\gamma}_t(\tau, \tilde{b})) \leq \tau. \tag{2.12}$$

$\hat{\gamma}_t(\tau, \tilde{b})$ that satisfies (2.12) is the τ^{th} quantile of the distribution of $Y_{it} - \mathbf{X}'_{it}\tilde{b}$ at time t. The steps to estimate b is as follows:

1. Calculate the year fixed effects to constrain the parameter set to $\mathfrak{B}$.

2. Evaluate the objective function, $-\frac{N}{2}\hat{g}(b)'\hat{A}\hat{g}(b)$, where $g_i(b)$ is defined in (2.9).

3. b that maximizes $-\frac{N}{2}\hat{g}(b)'\hat{A}\hat{g}(b)$ is $\widehat{\beta(\tau)}$.

Although the process is clear, it is easier said than done because, in many cases, the objective function $-\frac{N}{2}\hat{g}(b)'\hat{A}\hat{g}(b)$ is non-convex and has many local optima even when the global optimum is well-defined (Chernozhukov and Hong, 2003). Powell (2015) suggests using adaptive Markov Chain Monte Carlo to estimate $\widehat{\beta(\tau)}$ by drawing b from the quasi-posterior density of parameters. Appendix B.1 explains the AMCMC algorithm that was used for the estimation in the essay.

2.4 Data and estimation strategy

2.4.1 Data

Unbalanced panel data consists of 56 emerging market economies from 1990 to 2014 excluding (1) major oil-exporting countries, (2) bank havens, and (3) low-income groups according to 2008 GNI per capita by the World Bank, considering they might work as strong outliers in the group.[6] All countries have at least total 15 years and 10 consecutive years of gross capital outflows data (source: IMF BOPS). As it is specified in other papers, IMF data does not clarify whether some missing values in outflows are zero or not available. Following others, (e.g., Forbes and Warnock, 2012a) I replace them with zero if the surrounding values are zeros or leave them empty, otherwise.[7] Selected variables for estimation are: gross capital outflows (outflow) for the dependent variable, gross capital inflows (inflow), private saving (prsave), and exchange rate regime (exregime) for the explanatory variables, and real GDP growth (zgdp), capital market openness (kaopen), public saving (pubsave), and domestic credit to private sector (credit) for the instrumental variables. I also added the lagged dependent variable as an explanatory variable to estimate the permanent effects of other independent variables. The details on data sources and the definition of variables are in Appendix

[6]The sample countries are: Angola, Armenia, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Chile, Colombia, The Rep. of Congo, Costa Rica, Cote d'Ivore, Dominica, The Dominican Republic, Egypt, El Salvador, Georgia, Grenada, Guatemala, Honduras, India, Indonesia, Jamaica, Jordan, Kazakhstan, Latvia, Lesotho, Lithuania,, Malaysia, Maldives, Mexico, Moldova, Mongolia, Morocco, Namibia, Nigeria, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russia, Saint Lucia, Seychelles, South Africa, Sri Lanka, Syria, Thailand, Tunisia, Turkey, Ukraine, Uruguay, and Venezuela.

[7]One of the strengths of quantile regression is that estimated QTEs are robust to this kind of censoring.

B.2.[8]

The followings is the summary of selected variables and the correlations between them. As Table 2.3 shows us, gross capital inflows is the only variable that is strongly correlated with gross capital outflows. On the other hand, the correlation between private saving and gross capital outflows is very small, as home bias implies, and it gives us a clue that the impact of it on capital outflows might be insignificant. Private saving and gross capital inflows are negatively correlated, which confirms saving decreases as people borrow more. Finally, endogenous variables (gross capital inflows and private saving) and instrumental variables (real GDP growth, capital market openness, public saving, and domestic credit) are strongly correlated, which indicates the instruments can represent instrumented variables.

Table 2.2: The summary of selected variables

	Obs.	Mean	Std. Dev.	Min	Max
Gross capital outflows (% of GDP)	1,298	2.84%	4.81	-15.04%	50.81%
Gross capital inflows (% of GDP)	1,326	6.45%	8.53	-38.98%	71.01%
Private saving (% of GDP)	1,061	13.50%	11.48	-69.27%	61.76%
Exchange rate regime	1,400	7.36%	4.22	1	15
Real GDP growth (%)	1,355	3.78%	4.71	-30.90%	25.78%
Capital market openness	1,321	0.45	0.33	0	1
Public saving (% of GDP)	1,073	6.31%	11.68	-55.68%	75.71%
Domestic credit (% of GDP)	1,302	38.05%	28.83	0%	166.50%

[8] As you can see in Appendix B.2, I used Chinn and Ito's (2006) aggregate control index and this is to prevent observations from being reduced only by the index. As the dependent variable is gross capital outflows, the outflow control index will give better information for the estimation but using it significantly decreases available observations. For example, Fernández et al.'s (2016) outflow control index decreases the number of observations from 1,321 to 740.

Table 2.3: The correlations between selected variables

	outflow	inflow	prsave	exregime	zgdp	kaopen	pubsave	credit
outflow	1.0000							
inflow	0.4000	1.0000						
prsave	-0.0023	-0.3563	1.0000					
exregime	-0.0958	-0.1290	0.1726	1.0000				
zgdp	0.0850	0.1364	-0.0375	-0.0020	1.0000			
kaopen	-0.0181	0.1669	-0.0362	-0.0032	0.0187	1.0000		
pubsave	0.1322	0.2276	-0.6753	-0.0977	0.2695	0.0239	1.0000	
credit	0.0952	0.1500	0.1100	-0.0046	-0.0940	-0.0149	-0.0726	1.0000

Notes: outflow: gross capital outflows, inflow: gross capital inflows, prsave: private saving, exregime: exchange rate regime, zgdp: real GDP growth, kaopen: capital market openness, pubsave: public saving, credit: domestic credit

2.4.2 Estimation strategy

To estimate the association between the dependent variable and explanatory variables, I use quantile regression methodology to estimate quantile treatment effects across every 5th quantile of gross capital outflows (from 0.05 to 0.9). As is described in Section 2.3, the model is a linear quantile regression, which is

$$Y_{it} = D_{it}^{'}\beta(\tau) \tag{2.13}$$

where Y is the dependent variable (gross capital outflows), D is the set of explanatory variables (lagged dependent variable, gross capital inflows, private saving, and exchange rate regime) and, $\tau \in \{0.05, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9\}$. The result from the OLS is also provided to see how quantile treatment effects are different from the mean effect in each quantile.[9] The basic OLS

[9]However, it is worth noting that the results from OLS regression and quantile regression are not one-to-one comparable because their regression strategies are different. Unlike the OLS estimators, Powell's (2015) quantile regression method is the maximum likelihood estimator.

model is

$$outflow_{it} = \beta_0 + \beta_1 loutflow_{it} + \beta_2 inflow_{it} + \beta_3 prsave_{it} + \beta_4 exregime_{it} + \alpha_i + \gamma_t + \epsilon_{it} \tag{2.14}$$

where $loutflow_{it}$ is the lagged dependent variable for country i at time t. βs are estimated using the fixed effect model so the constant term β_0 and individual fixed effects α_i disappear. β_2 and β_3, which represent the association between capital outflows and other two resources, are our main interests. Moreover, adopting the dynamic model allows us to estimate permanent effects of two variables, which are $\beta_2/(1-\beta_1)$ for capital inflows and $\beta_3/(1-\beta_1)$ for saving, respectively. According to (2.13), the corresponding quantile regression (QR) can be expressed as

$$\begin{aligned} outflow_{it}(\tau) &= q(D_{it}, \tau) \\ &= \beta_1(\tau) loutflow_{it} + \beta_2(\tau) inflow_{it} + \beta_3(\tau) prsave_{it} \\ &\quad + \beta_4(\tau) exregime_{it} + \gamma_t(\tau) \end{aligned} \tag{2.15}$$

where $q(D_{it}, \tau)$ is the τ_{th} quantile function of capital outflows. There exits one-to-one mapping of ϵ_{it} to the normalized disturbance term, U_{it}, so that τ_{th} quantile can be interpreted as the τ_{th} quantile of U_{it}.

Next, to estimate the causal effects of explanatory variables, I use the same quantile regression with four instruments (real GDP growth, capital market openness, public saving, and domestic credit) for gross capital inflows and private saving, as these two variables are in main interests.[10] For the mean effect, I use two-stage least squares with fixed effect (FE2SLS). The models for FE2SLS and IVQR are the same as FEOLS

[10]On the other hand, exchange rate regime instruments itself.

and QR except they use instruments. As is done for the association, the mean effect by FE2SLS and quantile treatment effects by IVQR will be compared with each other.

As I argued before, a quantile regression method allows us to test more diverse hypotheses than an OLS regression method does. There are three hypotheses to test for the purpose of the study. First, the causal impact of capital inflows on capital outflows is stronger during capital flight: $\beta_2(\tau') \geq \beta_2(\tau) \;\; if \;\; \tau' > \tau$. Second, the causal impact of capital inflows on outflows is stronger than that of saving: $\beta_2(\tau) \geq \beta_3(\tau)$. Third, the impact of saving on capital outflows, therefore, might be similar to the mean effect during capital flight: $\beta_3(\tau) \approx \beta_3 \;\; for \;\; \tau \in [0.5, 0.9]$. Moreover, the nature of the dynamic model allows us to test the same hypotheses for permanent impacts: (1) $\frac{\beta_2(\tau')}{1-\beta_1(\tau')} \geq \frac{\beta_2(\tau)}{1-\beta_1(\tau)} \;\; if \;\; \tau' > \tau$, (2) $\frac{\beta_2(\tau)}{1-\beta_1(\tau)} \geq \frac{\beta_3(\tau)}{1-\beta_1(\tau)}$, and (3)$\frac{\beta_3(\tau)}{1-\beta_1(\tau)} \approx \frac{\beta_3}{1-\beta_1} \;\; for \;\; \tau \in [0.5, 0.9]$.[11] The interpretations of the result in Section 2.5 will be based on these total six hypotheses.

Additionally, for the detailed analysis, I separate gross capital outflows into gross equity outflows (FDIs + portfolio equities) and gross debt outflows (portfolio debts + other investments). Although they are frequently aggregated as gross capital outflows, the characteristics of two capital flows might be quite different because debt flows are larger and more volatile than equity flows (Forbes and Warnock, 2012b).[12] Therefore, the impacts of private saving and capital inflows on equity outflows and debt outflows might be different so the answers to the hypotheses are different. For

[11] If three hypotheses for temporary effects are true, it is sufficient to show that $\beta_1(\tau') \geq \beta_1(\tau)$ and $\beta_1(\tau) \geq \beta_1$ for (1) and (3), respectively. (2) necessarily holds if $\beta_2(\tau) \geq \beta_3(\tau)$.

[12] In the data, the mean and standard deviation of equity outflows and debt outflows are 0.62% and 1.61, and 2.24% and 4.3, respectively.

this reason, I regard two kinds of capital outflows as different dependent variables and estimate the effects of the explanatory variables on them using the same models used for gross capital outflows. To be specific, OLS models for gross equity outflows and debt outflows are

$$\begin{aligned} equity_{it} = \beta_0 + \beta_1 lequity_{it} + \beta_2 inflow_{it} + \beta_3 prsave_{it} \\ + \beta_4 exregime_{it} + \alpha_i + \gamma_t + \epsilon_{it} \end{aligned} \tag{2.16}$$

$$\begin{aligned} debt_{it} = \beta_0 + \beta_1 ldebt_{it} + \beta_2 inflow_{it} + \beta_3 prsave_{it} \\ + \beta_4 exregime_{it} + \alpha_i + \gamma_t + \epsilon_{it} \end{aligned} \tag{2.17}$$

where $equity_{it}$ and $debt_{it}$ are gross equity outflows and gross debt outflows for country i at time t, respectively. Accordingly, QR models are

$$\begin{aligned} equity_{it}(\tau) &= q(D_{it}, \tau)_{equity} \\ &= \beta_1(\tau) lequity_{it} + \beta_2(\tau) inflow_{it} + \beta_3(\tau) prsave_{it} \\ &\quad + \beta_4(\tau) exregime_{it} + \gamma_t(\tau) \end{aligned} \tag{2.18}$$

$$\begin{aligned} debt_{it}(\tau) &= q(D_{it}, \tau)_{debt} \\ &= \beta_1(\tau) ldebt_{it} + \beta_2(\tau) inflow_{it} + \beta_3(\tau) prsave_{it} \\ &\quad + \beta_4(\tau) exregime_{it} + \gamma_t(\tau) \end{aligned} \tag{2.19}$$

where $q(D_{it}, \tau)_{equity}$ and $q(D_{it}, \tau)_{debt}$ are the τ_{th} quantile functions of equity outflows and debt outflows, respectively.

2.5 Results

2.5.1 Fixed effect model and quantile regression model

2.5.1.1 Gross capital outflows

The results from FEOLS and QR are reported in Table 2.4 and summarized in Figure 2.2. First, the coefficient of the lagged dependent variable from QR is similar to the one from FEOLS until the median but gets larger after it, which indicates foreign asset purchases become more persistent during capital flight. As a result, the permanent effects of explanatory variables also become larger in the upper quantiles. Second, the coefficient of gross capital inflows gets larger in the upper quantiles, too, but the difference is not significant and none of them is larger than the coefficient from FEOLS. It is, therefore, not clear whether the effect of capital inflows on outflows is stronger during capital flight. However, because of the persistence in the upper quantiles, the permanent effect of capital inflows is certainly larger in the upper quantiles. For example, a 1% increase in gross capital inflows is associated with only 0.1% increase in gross capital outflows at 0.05th quantile but it is about 0.33% at 0.9th quantile. It might suggest the permanent effect of capital inflows is stronger when there are large foreign asset purchases.

On the contrary, the association between private saving and capital outflows is weak at any quantile and all of them (including FEOLS) are less than 0.1. It implies saving and capital outflows are weakly associated and it might indicate home bias holds in the short term even during capital flight. One interesting feature is that the coefficient is actually larger at lower quantiles but it gets smaller when capital outflows are larger than the median. A 1% increase in private saving at 0.3th quantile is associated with 0.12% permanent increase in capital outflows but it is only 0.07% at 0.7th quantile.

Summarizing the results, the association between capital outflows and the other two variables is not substantially different in the lower quantiles but the association between capital outflows and inflows becomes stronger in the upper quantiles. This might indicate private sectors use external loans rather than private saving when they attempt to increase foreign asset holdings significantly. They support the second and third hypotheses for temporary and permanent effects but it is suggestive rather than conclusive until causal effects are estimated. Moreover, as was concerned before, the association does not vary much across the quantiles. Therefore, the first hypothesis that the impact of capital inflows on outflows is stronger in the upper quantiles is still inconclusive.

Lastly, the coefficient of exchange rate regime is negative in the lower quantiles but steadily increases and becomes positive in the upper quantiles. It indicates investors prefer fixed regimes when they purchase a small amount of foreign assets but prefer a floating regime when purchases are large. On the one hand, the floating exchange rate increases the risk but, on the other hand, it provides an arbitrage opportunity by changing expected future asset price. The result suggests the latter is a stronger motive during capital flight.[13]

[13] This trend of QTEs for exchange rate regime does rarely change with other estimators.

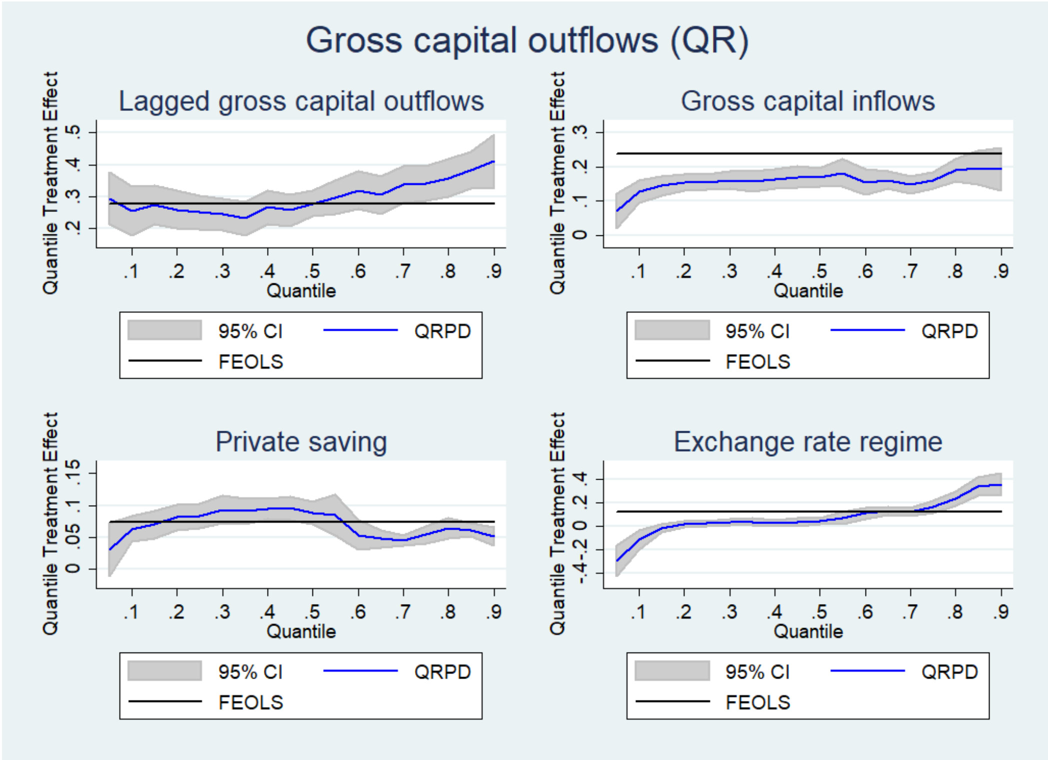
Table 2.4: The association between gross capital outflows and selected variables: fixed effect regression and quantile regression

					Quantile Regression					
	FEOLS	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45
LOUTFLOW	0.2772***	0.2948***	0.2559***	0.2747***	0.2592***	0.2501***	0.2441***	0.2314***	0.2662***	0.2568***
	(0.0701)	(0.0423)	(0.0393)	(0.0314)	(0.03)	(0.0263)	(0.0249)	(0.0272)	(0.0273)	(0.0248)
INFLOW	0.2375***	0.0715***	0.1281***	0.1449***	0.1544***	0.1562***	0.1625***	0.1586***	0.165***	0.1707***
	(0.0639)	(0.0263)	(0.0162)	(0.0145)	(0.0124)	(0.0118)	(0.0126)	(0.0147)	(0.0146)	(0.0159)
SAVE	0.0741**	0.0309	0.0637***	0.0703***	0.0815***	0.0833***	0.0939***	0.0914***	0.095***	0.0958***
	(0.0309)	(0.021)	(0.0103)	(0.0108)	(0.01)	(0.0095)	(0.0108)	(0.01)	(0.008)	(0.0091)
EXREGIME	0.1202*	-0.2933***	-0.1139***	-0.0137	0.0173	0.0237**	0.0364***	0.0394***	0.0246*	0.0397**
	(0.0675)	(0.0662)	(0.0424)	(0.0166)	(0.0138)	(0.0094)	(0.0133)	(0.0147)	(0.0137)	(0.0172)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2/Mean Acceptance Rate	0.4166	0.319	0.310	0.304	0.297	0.301	0.370	0.301	0.310	0.299
Countries	56	56	56	56	56	56	56	56	56	56
Observations	989	989	989	989	989	989	989	989	989	989

	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9
LOUTFLOW	0.2788***	0.2973***	0.3191***	0.3051***	0.339***	0.3417***	0.3577***	0.3822**	0.4131***
	(0.0209)	(0.0266)	(0.0301)	(0.03)	(0.0125)	(0.0279)	(0.0303)	(0.0291)	(0.0424)
INFLOW	0.1698***	0.1823***	0.1553***	0.1618***	0.1477***	0.1614***	0.1895***	0.198***	0.1932***
	(0.0137)	(0.0206)	(0.0191)	(0.013)	(0.0125)	(0.0119)	(0.0167)	(0.0245)	(0.032)
SAVE	0.0887***	0.0849***	0.0542***	0.0479***	0.0447***	0.0547***	0.0642***	0.0618***	0.052***
	(0.009)	(0.0163)	(0.0121)	(0.0067)	(0.004)	(0.007)	(0.0079)	(0.0054)	(0.0071)
EXREGIME	0.0463***	0.0721***	0.1128***	0.1334***	0.1192***	0.1687***	0.2392***	0.3397***	0.3584***
	(0.0144)	(0.0263)	(0.025)	(0.0188)	(0.0179)	(0.0274)	(0.0305)	(0.0402)	(0.0463)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Acceptance Rate	0.293	0.319	0.327	0.329	0.273	0.264	0.266	0.265	0.273
Countries	56	56	56	56	56	56	56	56	56
Observations	989	989	989	989	989	989	989	989	989

Notes: The dependent variable is gross capital outflows. The first column is from fixed effect regression and robust standard errors are in the parentheses. Quantile regression is from Powell (2015), which uses adaptive Markov Chain Monte Carlo sampling algorithm and point estimates that correspond to mean of draws and standard errors in the parentheses are derived from variance of draws (total 8,000 draws after burning the first 2,000 draws). R^2 for the fixed effect model and mean acceptance rate for quantile regression. *, **, *** for significance at the 10%, 5%, and 1% levels, respectively.

Figure 2.2: The association between gross capital outflows and selected variables: fixed effect regression and quantile regression



2.5.1.2 Equity outflows and debt outflows

This section disaggregates gross capital outflows into gross equity outflows (FDIs + portfolio equities) and gross debt outflows (portfolio debts + other investments). Although they are usually aggregated for gross capital outflows, the characteristics of two forms of capital are quite different because debt flows are larger and more volatile than equity flows (Forbes and Warnock, 2012a).

The results for equity flows are reported in Table 2.5 and summarized in Figure

2.3. Note that six countries[14] are excluded because of small observations. The most outstanding explanatory variable is the lagged dependent variable. The coefficient is only 0.191 at 0.05th quantile but consistently increases and becomes 0.5765 at 0.9th quantile. The result from FEOLS also designates its persistent nature (0.481). The intuition suggests private sectors purchase equities in the long run aspects and, therefore, the best predictor for current equity asset purchases is equity asset purchases in the past. On the other hand, the association between equity outflows and saving or borrowing is weak. As a result, the permanent change of capital outflows by current capital inflows or saving is small although the influence of past equity purchases is strong.[15] It might be the evidence that private sectors do not purchase equities with sudden and unexpected increase in external loans or saving. However, they keep purchasing the securities once they decide to do so. The results, therefore, support three hypotheses but they are in favor of permanent effects rather than temporary effects.

The result (Table 2.6 and Figure 2.4) for debt outflows is quite different from that for equity outflows and is similar to the one for gross capital outflows; the QTEs of past asset purchases and gross capital inflows are larger in the upper quantiles but the latter are still smaller than the mean effect from FEOLS. The QTEs of private saving are also larger when gross capital outflows are less than the median. The overall conclusion is similar to the one in Section 2.5.1.1. It might indicate, therefore, the main

[14]Dominica, Grenada, Saint Lucia, Maldives, Mongolia, and Syria

[15]As robust checks, I ran several different OLS regression for equity flows: 1) including the twice-lagged dependent variable as an explanatory variable, 2) excluding the lagged dependent variable (Achen, 2000), and 3) excluding a lagged dependent variable and including lagged explanatory variables. However, none of them provided a significantly different result, so I do not report them. They are available upon the request.

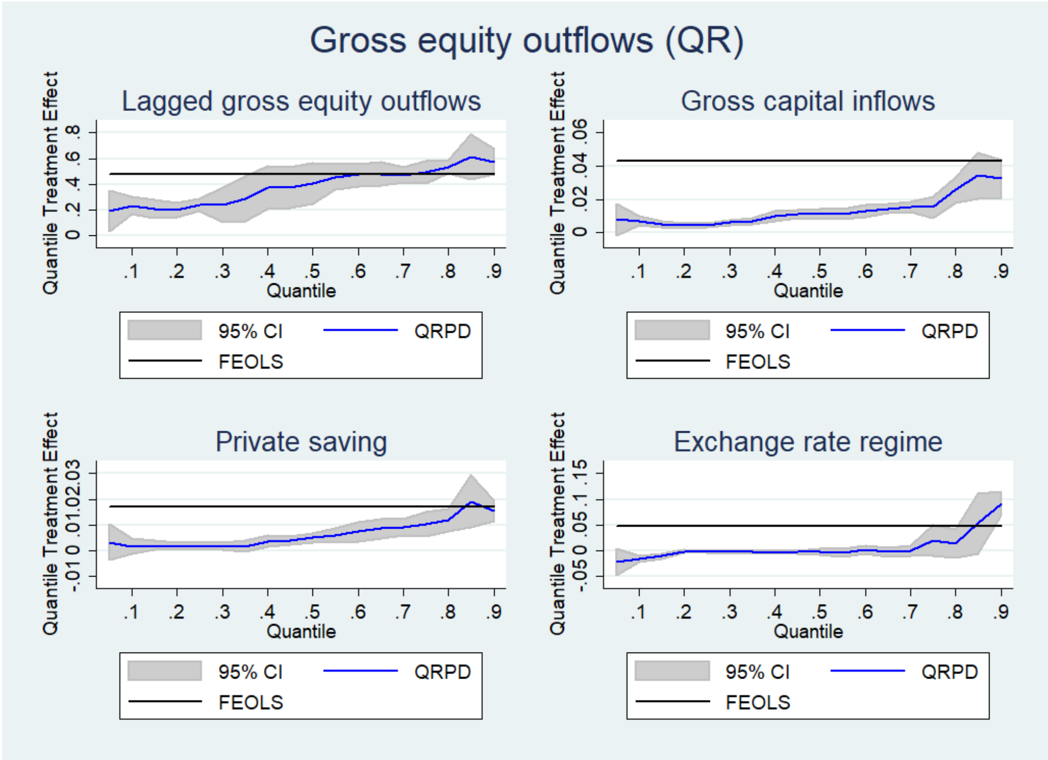
Table 2.5: The association between gross equity outflows and selected variables: fixed effect regression and quantile regression

		Quantile Regression								
	FEOLS	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45
LEQTY	0.481***	0.191**	0.2315***	0.206***	0.2012***	0.2364***	0.2396***	0.2886***	0.3761***	0.3741***
	(0.0843)	(0.0823)	(0.0342)	(0.0372)	(0.0282)	(0.024)	(0.0695)	(0.0888)	(0.0846)	(0.0795)
INFLOW	0.0431	0.0078	0.007***	0.0049***	0.0043***	0.0045***	0.0061***	0.0068***	0.0098***	0.0111***
	(0.0263)	(0.0048)	(0.0014)	(0.0009)	(0.0007)	(0.0007)	(0.0007)	(0.0009)	(0.0016)	(0.0012)
SAVE	0.0169*	0.0033	0.0017	0.0021**	0.0016**	0.0016**	0.0017**	0.0016	0.0037***	0.0039***
	(0.0099)	(0.0035)	(0.0014)	(0.0009)	(0.0007)	(0.0007)	(0.0007)	(0.0011)	(0.001)	(0.0008)
EXREGIME	0.048	-0.0223*	-0.0167***	-0.0104***	-0.0016	-0.0017*	-0.0033***	-0.0033***	-0.0035**	-0.0033**
	(0.0305)	(0.0128)	(0.0027)	(0.0025)	(0.0012)	(0.001)	(0.0011)	(0.001)	(0.0016)	(0.0016)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2/Mean Acceptance Rate	0.5126	0.285	0.243	0.270	0.292	0.374	0.338	0.344	0.343	0.387
Countries	50	50	50	50	50	50	50	50	50	50
Observations	777	777	777	777	777	777	777	777	777	777

	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	
LEQTY	0.4071***	0.4557***	0.4798***	0.4811***	0.4724***	0.4953***	0.5351***	0.6124***	0.5765***	
	(0.0818)	(0.0513)	(0.05)	(0.0464)	(0.0315)	(0.0438)	(0.0256)	(0.0908)	(0.0499)	
INFLOW	0.0113***	0.0111***	0.0128***	0.0144***	0.0155***	0.0154***	0.0257***	0.0342***	0.0325***	
	(0.0015)	(0.0015)	(0.0018)	(0.0015)	(0.0015)	(0.0033)	(0.004)	(0.0069)	(0.0058)	
SAVE	0.005***	0.0059***	0.0073***	0.0086***	0.0089***	0.0101***	0.0118***	0.0192***	0.0155***	
	(0.0009)	(0.0013)	(0.0018)	(0.0019)	(0.0016)	(0.0024)	(0.0023)	(0.0051)	(0.002)	
EXREGIME	-0.0028	-0.0043	0.001	-0.003	-0.0008	0.0192	0.0132	0.0525*	0.0921***	
	(0.003)	(0.0036)	(0.0042)	(0.0046)	(0.005)	(0.0152)	(0.0143)	(0.0297)	(0.0117)	
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Mean Acceptance Rate	0.353	0.338	0.307	0.300	0.295	0.285	0.316	0.292	0.344	
Countries	50	50	50	50	50	50	50	50	50	
Observations	777	777	777	777	777	777	777	777	777	

Notes: The dependent variable is gross equity outflows (FDI+portfolio equities). The first column is from fixed effect regression and robust standard errors are in the parentheses. Quantile regression is from Powell (2015), which uses adaptive Markov Chain Monte Carlo sampling algorithm and point estimates that correspond to mean of draws and standard errors in the parentheses are derived from variance of draws (total 8,000 draws after burning the first 2,000 draws). R^2 for the fixed effect regression and mean acceptance rate for quantile regression. *, **, *** for significance at the 10%, 5%, and 1% levels, respectively.

Figure 2.3: The association between gross equity outflows and selected variables: fixed effect regression and quantile regression



result in Section 2.5.1.1 is mainly driven by debt outflows rather than equity outflows and it is consistent with Forbes and Warnock (2012b).

2.5.2 Two-stage least squares and IV quantile regression model

2.5.2.1 Gross capital outflows

This section estimates the causal effects of explanatory variables by focusing on two-stage least squares and IV quantile regression. The result with gross capital outflows is reported in Table 2.7 and Figure 2.5. Although the result from 2SLS is not

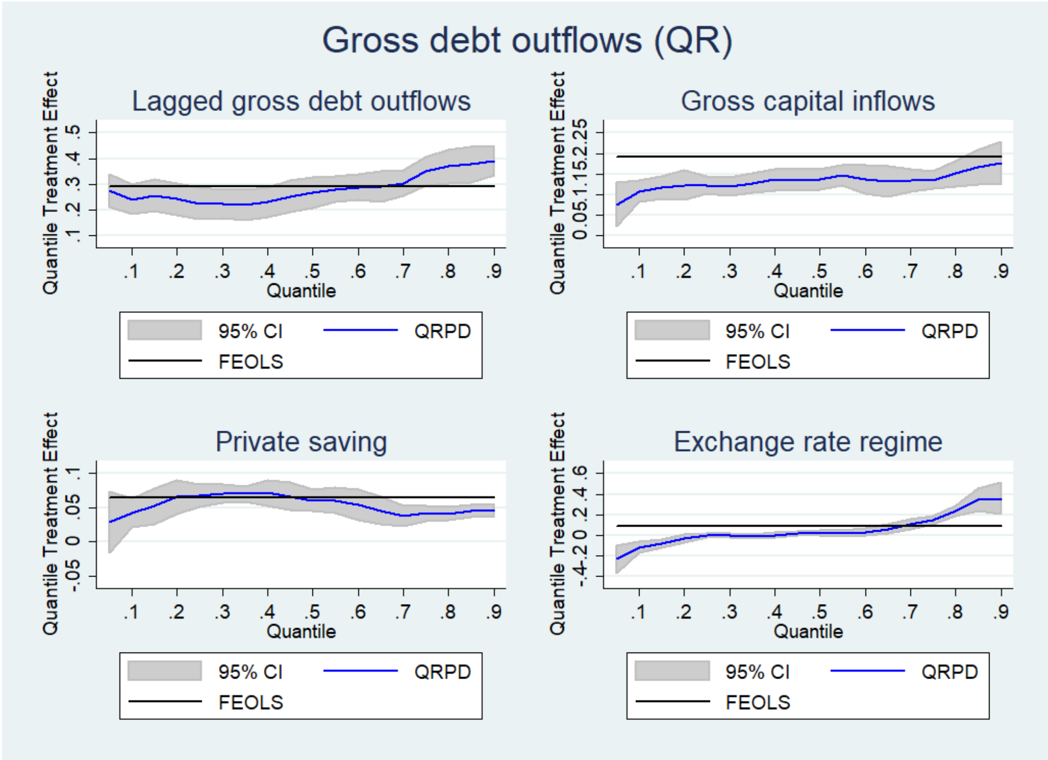
Table 2.6: The association between gross debt outflows and selected variables: fixed effect regression and quantile regression

		Quantile Regression								
	FEOLS	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45
LDEBT	0.2906***	0.2731***	0.2401***	0.2569***	0.2418***	0.2249***	0.2227***	0.2187***	0.2298***	0.2529***
	(0.0843)	(0.0324)	(0.0295)	(0.0322)	(0.0318)	(0.0317)	(0.0283)	(0.0308)	(0.0296)	(0.0308)
INFLOW	0.1916***	0.0746***	0.1078***	0.117***	0.1225***	0.1225***	0.119***	0.1273***	0.1356***	0.135***
	(0.056)	(0.0273)	(0.0132)	(0.0138)	(0.0182)	(0.0106)	(0.011)	(0.0117)	(0.0135)	(0.013)
SAVE	0.0651**	0.0293	0.0425***	0.0524***	0.0657***	0.0678***	0.0713***	0.0701***	0.0716***	0.0669***
	(0.0263)	(0.0227)	(0.0132)	(0.0132)	(0.0126)	(0.0086)	(0.0067)	(0.0057)	(0.0095)	(0.01)
EXREGIME	0.0898*	-0.2363***	-0.1192***	-0.0819***	-0.0307	-0.0052	-0.0049	-0.0099	0.0014	0.0197*
	(0.0496)	(0.0666)	(0.0269)	(0.0192)	(0.0198)	(0.011)	(0.0111)	(0.0108)	(0.0121)	(0.0112)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2/Mean Acceptance Rate	0.4026	0.282	0.305	0.249	0.302	0.313	0.314	0.320	0.298	0.328
Countries	56	56	56	56	56	56	56	56	56	56
Observations	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011

	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9
LDEBT	0.2665***	0.2801***	0.2882***	0.2905***	0.304***	0.3505***	0.3688***	0.3769***	0.3923***
	(0.0296)	(0.0256)	(0.0248)	(0.0311)	(0.0247)	(0.0277)	(0.0338)	(0.0354)	(0.0299)
INFLOW	0.1375***	0.1463***	0.1365***	0.1327***	0.1341***	0.1346***	0.1504***	0.1671***	0.1773***
	(0.0126)	(0.0122)	(0.0173)	(0.0189)	(0.0137)	(0.0107)	(0.0154)	(0.0216)	(0.0256)
SAVE	0.0611***	0.061***	0.0541***	0.0461***	0.038***	0.0417***	0.0414***	0.0451***	0.047***
	(0.0082)	(0.0092)	(0.0113)	(0.0101)	(0.0076)	(0.0056)	(0.0051)	(0.0045)	(0.0047)
EXREGIME	0.0191	0.0133	0.0318*	0.0608***	0.1088***	0.1488***	0.2359***	0.3452***	0.3599***
	(0.0124)	(0.0156)	(0.0182)	(0.0233)	(0.0258)	(0.0212)	(0.024)	(0.0566)	(0.0783)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Acceptance Rate	0.374	0.315	0.275	0.278	0.345	0.271	0.267	0.350	0.242
Countries	56	56	56	56	56	56	56	56	56
Observations	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011

Notes: The dependent variable is gross debt outflows (portfolio debts+other investments). The first column is from fixed effect regression and robust standard errors are in the parentheses. Quantile regression is from Powell (2015), which uses adaptive Markov Chain Monte Carlo sampling algorithm and point estimates that correspond to mean of draws and standard errors in the parentheses are derived from variance of draws (total 8,000 draws after burning the first 2,000 draws). R^2 for the fixed effect regression and mean acceptance rate for quantile regression. *, **, *** for significance at the 10%, 5%, and 1% levels, respectively.

Figure 2.4: The association between gross debt outflows and selected variables: fixed effect regression and quantile regression



significantly different from that from FEOLS, there are significant changes in the QTEs. The impact of previous capital outflows is stronger during capital flight and it is similar to the result from QR. On the contrary, the impact of capital inflows are much larger compared to the result from QR and they are larger than the mean effect from FE2SLS in the upper quantiles. As a result, a 1% increase in capital inflows at 90th quantile increases about 0.75% in capital outflows and it is much larger than that from QR, which was only 0.33%. However, when foreign asset purchases are less than the median, the permanent effect is still small (e.g., 0.13% increase in capital outflows permanently at 0.2th quantile).

The QTEs of saving from IVQR are also different from them from QR. In contrast to the QTEs from QR that were larger than the mean effect in the lower quantiles, the QTEs from IVQR keeps decreasing until 0.65th quantile so that they exhibit a U-shaped curve over quantiles. As a result, although the impact of current private saving is the largest at 0.05th quantile, because of the small QTE of the lagged dependent variable at the same quantile, the long-run impact of it is not large (0.22%). It is similar to the long-run impact at 0.9th quantile where the capital outflows are the most persistent (0.15%). The conclusion from Section 2.5.1.1 is still valid: 1) the causal impact of capital inflows is larger during capital flight, 2) it is larger than that of private saving across quantiles, and 3) the causal impact of private saving is similar to the mean effect (except at 0.05th and 0.1th quantiles). It means private sectors use some saving when they purchase a small amount of foreign assets but during capital flight, they increase borrowing rather than saving to increase foreign asset purchases. The QTEs of exchange rate regime from IVQR is not significantly different from those from QR except they are larger in the upper quantiles with IVQR.

2.5.2.2 Equity outflows and debt outflows

Equity outflows become even more persistent with IVQR as the QTEs are larger than 0.8 after the median (Table 2.8 and Figure 2.6). On the contrary, the roles of capital inflows and saving are still limited. None of them is larger than the estimates from 2SLS, which again indicates temporary increase in capital inflows and saving rarely

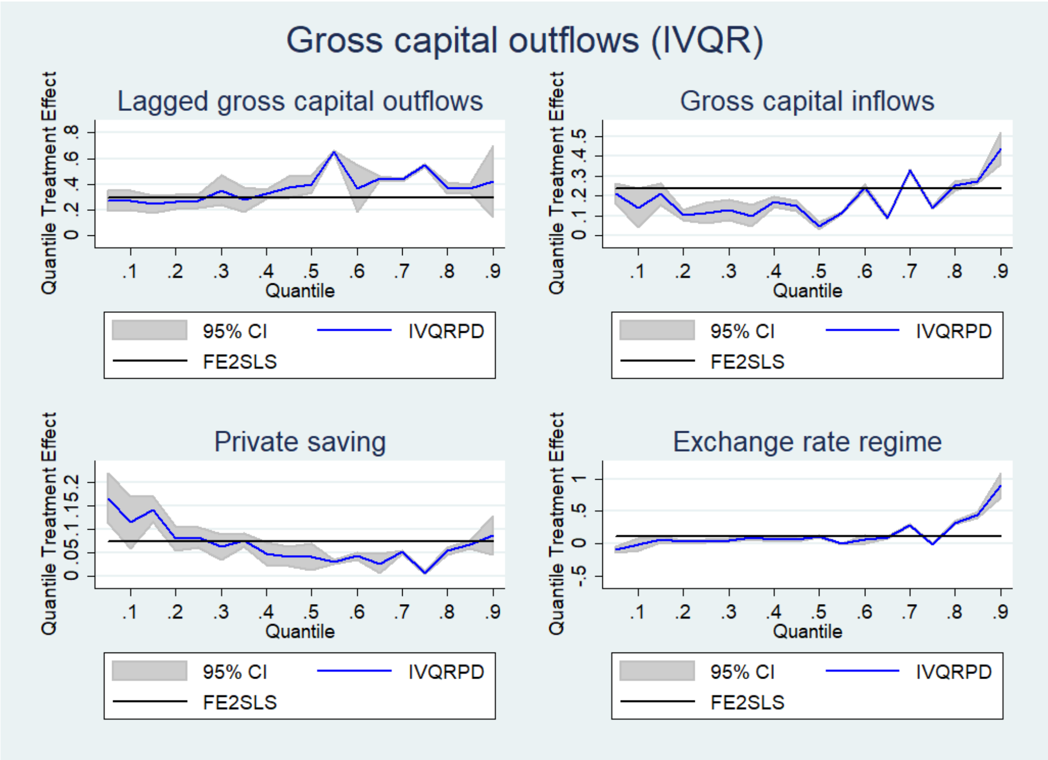
Table 2.7: The impacts of selected variables on gross capital outflows: two-stage least squares and IV quantile regression

		IV Quantile Regression								
	FE2SLS	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45
LOUTFLOW	0.2913***	0.2686***	0.2723***	0.2452***	0.2602***	0.269***	0.353***	0.281***	0.3233***	0.3755***
	(0.0663)	(0.041)	(0.039)	(0.0349)	(0.0287)	(0.0259)	(0.0573)	(0.0486)	(0.0191)	(0.0425)
INFLOW	0.2673***	0.2109***	0.1377***	0.2089***	0.1025***	0.1118***	0.1286***	0.1002***	0.1688***	0.1487***
	(0.0842)	(0.0256)	(0.0501)	(0.0268)	(0.0132)	(0.0259)	(0.026)	(0.0283)	(0.0131)	(0.0122)
SAVE	0.0639*	0.1652***	0.1142***	0.1418***	0.0807***	0.0813***	0.0623***	0.076***	0.0472***	0.042***
	(0.0347)	(0.0269)	(0.0284)	(0.0139)	(0.0133)	(0.0111)	(0.014)	(0.0071)	(0.012)	(0.0103)
EXREGIME	0.1365*	-0.0965***	-0.0134	0.0622***	0.029**	0.0363***	0.0507***	0.0923***	0.0628***	0.0703***
	(0.0598)	(0.025)	(0.0476)	(0.0222)	(0.0138)	(0.0108)	(0.0011)	(0.0103)	(0.0169)	(0.0209)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2/Mean Acceptance Rate	0.3384	0.264	0.252	0.277	0.256	0.249	0.291	0.248	0.344	0.318
Countries	56	56	56	56	56	56	56	56	56	56
Observations	945	989	989	989	989	989	989	989	989	989

	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9
LOUTFLOW	0.4014***	0.652***	0.3644***	0.4439***	0.4349***	0.5464***	0.3702***	0.3653***	0.4215***
	(0.036)	(0.0042)	(0.0937)	(0.007)	(0.0071)	(0.0062)	(0.0226)	(0.0178)	(0.1416)
INFLOW	0.0479***	0.1116***	0.2418***	0.0885***	0.3286***	0.14***	0.2501***	0.2755***	0.4406***
	(0.0086)	(0.0022)	(0.0079)	(0.0037)	(0.0043)	(0.004)	(0.0124)	(0.0071)	(0.0398)
SAVE	0.0411***	0.0302***	0.0423***	0.0268***	0.0514***	0.0069***	0.0539***	0.0669***	0.086***
	(0.0145)	(0.0019)	(0.0042)	(0.01)	(0.0014)	(0.0014)	(0.0039)	(0.0047)	(0.0208)
EXREGIME	0.1167***	-0.0038	0.0695**	0.0969***	0.2844***	-0.0088*	0.321***	0.4466***	0.8939***
	(0.0078)	(0.0046)	(0.0324)	(0.0064)	(0.0054)	(0.0047)	(0.0112)	(0.0253)	(0.0951)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Acceptance Rate	0.329	0.333	0.403	0.276	0.370	0.389	0.289	0.312	0.288
Countries	56	56	56	56	56	56	56	56	56
Observations	989	989	989	989	989	989	989	989	989

Notes: The dependent variable is gross capital outflows. The first column is from two-stage least squares and robust standard errors are in the parentheses (underidentification test:0.0000 (P-value), Kleinbergen-Paap rk Wald F statistic:10.263, and Hansen J statistic:0.7338 (P-value)). Quantile regression is from Powell (2015), which uses the adaptive Markov Chain Monte Carlo sampling algorithm and point estimates that correspond to mean of draws and standard errors in the parentheses are derived from variance of draws (total 8,000 draws after burning the first 2,000 draws). R^2 for two-stage least squares and mean acceptance rate for quantile regression. *, **, *** for significance at the 10%, 5%, and 1% levels, respectively.

Figure 2.5: The impacts of selected variables on gross capital outflows: two-stage least squares and IV quantile regression



affect equity outflows. It confirms again that individuals purchase equities in the long-run aspects. Furthermore, it is noteworthy that because of the strong influence of the lagged equity outflows, the permanent effect of capital inflows is also strong for equity outflows, although temporary effects are still small in all quantiles. For example, permanent increase in capital outflows by a 1% increase in capital inflows is only 0.027% at 0.05th quantile while it becomes 1.76% at 0.85th quantile (0.21% for private saving). Therefore, the influence of capital inflows is still large for equity outflows unlike private saving.

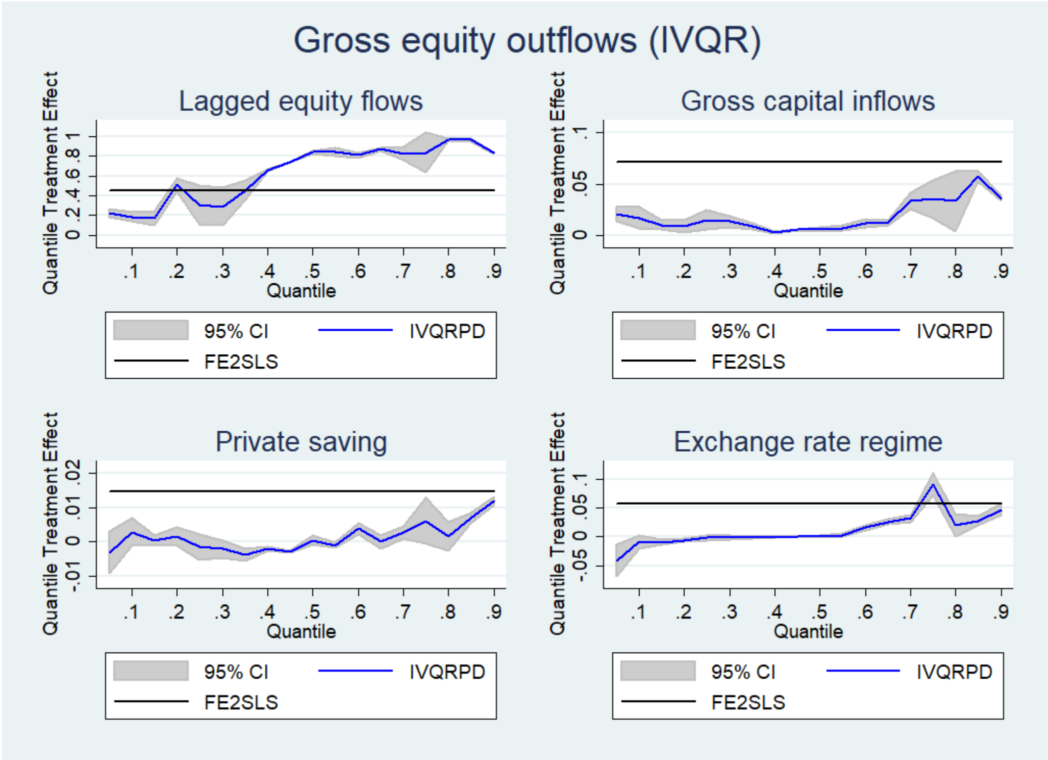
Table 2.8: The impacts of selected variables on gross equity outflows: two-stage least squares and IV quantile regression

		IV Quantile Regression								
	FE2SLS	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45
LEQTY	0.4485***	0.2259***	0.1854***	0.1748***	0.5097***	0.3042***	0.2889***	0.4555***	0.6588***	0.7398***
	(0.0753)	(0.0194)	(0.0235)	(0.0356)	(0.0331)	(0.1)	(0.0968)	(0.0492)	(0.0061)	(0.0014)
INFLOW	0.0713***	0.0211***	0.017***	0.0103***	0.0092***	0.0152***	0.0136***	0.0087***	0.0033***	0.0055***
	(0.0328)	(0.0035)	(0.0053)	(0.0023)	(0.003)	(0.0049)	(0.0027)	(0.0014)	(0.0005)	(0.0001)
SAVE	0.0149	-0.003	0.0028	0.0004	0.0015	-0.0014	-0.002	-0.0037***	-0.0021***	-0.0029***
	(0.0134)	(0.003)	(0.0021)	(0.0007)	(0.0014)	(0.0018)	(0.0013)	(0.0008)	(0.0002)	(0.0001)
EXREGIME	0.0583**	-0.0407***	-0.0088	-0.0093***	-0.0056	-0.0015	-0.0006	-0.0004	-0.0005	0.0004**
	(0.0227)	(0.0138)	(0.0056)	(0.002)	(0.0012)	(0.0021)	(0.0019)	(0.0008)	(0.0004)	(0.0002)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2/Mean Acceptance Rate	0.2782	0.330	0.280	0.353	0.331	0.300	0.244	0.373	0.403	0.334
Countries	50	50	50	50	50	50	50	50	50	50
Observations	742	777	777	777	777	777	777	777	777	777

	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9
LEQTY	0.8383***	0.8427***	0.8078***	0.8694***	0.8236***	0.8332***	0.9661***	0.9667***	0.8286***
	(0.0085)	(0.0194)	(0.0117)	(0.0066)	(0.0334)	(0.1018)	(0.0055)	(0.0088)	(0.0033)
INFLOW	0.0061***	0.0073***	0.012***	0.0125***	0.0341***	0.0353***	0.0333**	0.0575***	0.0361***
	(0.0009)	(0.0014)	(0.0018)	(0.0012)	(0.0039)	(0.0093)	(0.0147)	(0.0026)	(0.0011)
SAVE	0.0005	-0.001**	0.0039***	-0.00001	0.0028***	0.0061*	0.0015	0.0071***	0.0121***
	(0.0007)	(0.0004)	(0.0009)	(0.001)	(0.0008)	(0.0034)	(0.0021)	(0.0007)	(0.0006)
EXREGIME	0.0013	0.0034***	0.016***	0.0262***	0.0318***	0.0905***	0.0205**	0.0281***	0.0477***
	(0.001)	(0.0011)	(0.0024)	(0.0024)	(0.0033)	(0.0097)	(0.0096)	(0.0039)	(0.005)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Acceptance Rate	0.315	0.400	0.349	0.358	0.439	0.351	0.275	0.404	0.270
Countries	50	50	50	50	50	50	50	50	50
Observations	777	777	777	777	777	777	777	777	777

Notes: The dependent variable is gross equity outflows (FDI+portfolio equities). The first column is from two-stage least squares and robust standard errors are in the parentheses (underidentification test:0.0000 (P-value), Kleinbergen-Paap rk Wald F statistic:8.508, and Hansen J statistic:0.3029 (P-value)). Quantile regression is from Powell (2015), which uses the adaptive Markov Chain Monte Carlo sampling algorithm and point estimates that correspond to mean of draws and standard errors in the parentheses are derived from variance of draws (total 8,000 draws after burning the first 2,000 draws). R^2 for two-stage least squares and mean acceptance rate for quantile regression. *, **, *** for significance at the 10%, 5%, and 1% levels, respectively.

Figure 2.6: The impacts of selected variables on gross equity outflows: two-stage least squares and IV quantile regression



The QTEs of the lagged dependent variable on gross debt outflows are larger than the mean effect after 0.4th quantile and they are the largest at 0.75th and 0.85th quantiles (Table 2.9 and Figure 2.7). Therefore, although it is less than equity outflows, debt outflows are also persistent in the upper quantiles and they make the permanent effects of capital inflows large, too. Meanwhile, the QTE of capital inflows increases in the upper quantiles and it is the largest at 0.85th quantile. As a result, a 1% increase in capital inflows increases only about 0.14% of capital outflows at 0.05th quantile but it increases about 1.32% at 0.85 quantile. On the contrary, the influence of private saving is still small in all quantiles. For example, a 1% increase in private saving increases capital outflows by 0.13% permanently at both the 0.05th and 0.9th quantiles. Moreover, at 0.75th quantile where capital outflows are the most persistent, the increase in capital outflows by private saving is the largest but increases only about 0.19%.

Section 2.5 can be summarized as follows. People are more dependent on external loans than their saving when they purchase foreign assets and this tendency is especially strong during capital flight. On the other hand, the impact of private saving is relatively small regardless of the amount of assets purchased. This conclusion holds for both gross equity outflows and gross debt outflows in the big picture.

2.6 Conclusions

The essay has estimated the quantile treatment effects of private saving and gross capital inflows on gross capital outflows using Powell's (2015) quantile regression methodology. The main purpose was to see the impacts of two financial resources on foreign asset purchases according to the conditional distribution of the outcome variable. I especially focused on capital flight because it might designate the exodus of domestic capital, and thus necessitates proper policy responses to prevent it. The result justifies the quantile regression approach by confirming there are heterogeneous effects of explanatory variables according to the conditional distribution of capital outflows. In particular, during capital flight, the impact of gross capital inflows increases and it is larger than the mean effect estimated by 2SLS. On the other hand, the impact of private

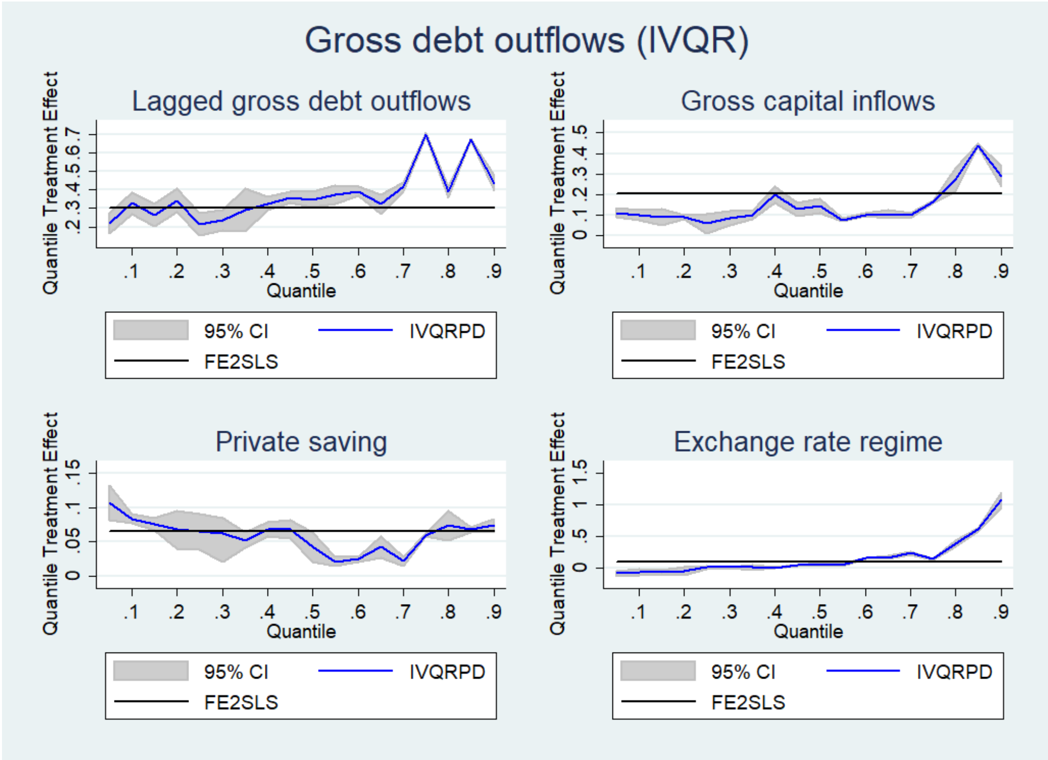
Table 2.9: The impacts of selected variables on gross debt outflows: two-stage least squares and IV quantile regression

		IV Quantile Regression								
	FE2SLS	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45
LDEBT	0.3034***	0.2194***	0.3271***	0.2633***	0.3423***	0.2151***	0.2377***	0.2929***	0.3246***	0.3584***
	(0.0695)	(0.0279)	(0.0295)	(0.0298)	(0.0319)	(0.0312)	(0.0277)	(0.0591)	(0.0184)	(0.0152)
INFLOW	0.2037***	0.1098***	0.0976***	0.0899***	0.0897***	0.059**	0.0825***	0.1***	0.1988***	0.1271***
	(0.073)	(0.0116)	(0.0122)	(0.02)	(0.0049)	(0.0242)	(0.0176)	(0.0092)	(0.0201)	(0.0163)
SAVE	0.0649**	0.1076***	0.0836***	0.0756***	0.0682***	0.065***	0.0525***	0.0528***	0.0682***	0.0684***
	(0.0315)	(0.0127)	(0.0033)	(0.0046)	(0.0139)	(0.0132)	(0.0164)	(0.0059)	(0.0052)	(0.0069)
EXREGIME	0.1011*	-0.0819***	-0.0534**	-0.0636***	-0.0392	0.017	0.0156**	0.019	0.014**	0.0467***
	(0.0517)	(0.0204)	(0.0242)	(0.0174)	(0.0347)	(0.013)	(0.0069)	(0.0193)	(0.006)	(0.0058)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2/Mean Acceptance Rate	0.3041	0.346	0.353	0.343	0.371	0.363	0.348	0.290	0.397	0.351
Countries	56	56	56	56	56	56	56	56	56	56
Observations	965	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011

	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9
LDEBT	0.3478***	0.3748***	0.3902***	0.3227***	0.4149***	0.6972***	0.3873***	0.6695***	0.4363***
	(0.0211)	(0.0257)	(0.0127)	(0.027)	(0.0212)	(0.0045)	(0.0148)	(0.0027)	(0.0219)
INFLOW	0.144***	0.0759***	0.1016***	0.1043***	0.0988***	0.1645***	0.2721***	0.438***	0.2899***
	(0.017)	(0.0035)	(0.0032)	(0.009)	(0.0061)	(0.0029)	(0.0286)	(0.0035)	(0.0251)
SAVE	0.0428***	0.0213***	0.025***	0.0428***	0.0216***	0.06***	0.074***	0.0679***	0.0745***
	(0.0111)	(0.0033)	(0.0018)	(0.0078)	(0.0032)	(0.0009)	(0.011)	(0.0018)	(0.0045)
EXREGIME	0.0546***	0.0577***	0.1627***	0.1743***	0.2407***	0.1445***	0.393***	0.6115***	1.081***
	(0.0123)	(0.0068)	(0.0036)	(0.0155)	(0.0134)	(0.003)	(0.0275)	(0.0097)	(0.0592)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Acceptance Rate	0.337	0.360	0.310	0.272	0.438	0.378	0.342	0.237	0.338
Countries	56	56	56	56	56	56	56	56	56
Observations	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011

Notes: The dependent variable is gross debt outflows (portfolio debts+other investments). The first column is from two-stage least squares and robust standard errors are in the parentheses (Underidentification test0.0000 (P-value), Kleinbergen-Paap rk Wald F statistic:10.49, and Hansen J statistic:0.4117 (P-value)). Quantile regression is from Powell (2015), which uses the adaptive Markov Chain Monte Carlo sampling algorithm and point estimates that correspond to mean of draws and standard errors in the parentheses are derived from variance of draws (total 8,000 draws after burning the first 2,000 draws). R^2 for two-stage least squares and mean acceptance rate for quantile regression. *, **, *** for significance at the 10%, 5%, and 1% levels, respectively.

Figure 2.7: The impacts of selected variables on gross debt outflows: two-stage least squares and IV quantile regression



saving actually decreases as individuals increase foreign asset purchases. It implies people use external loans rather than their incomes if there is any reason to increase foreign investments substantially. Moreover, the result shows foreign investments are more persistent in the upper quantiles and, because of this persistence, not only the temporary effects but also the permanent effects of explanatory variables have increased in the upper quantiles. Finally, it suggests people prefer a flexible exchange rate regime during capital flight.

Dividing gross capital outflows into gross equity outflows and gross debt outflows provides further information. Unlike gross debt outflows, which followed the characteristics of gross capital outflows, the best predictor for equity outflows is the past of them. Meanwhile, the QTEs of two financial resources is small and is smaller than the mean effect. As a result, although the temporary effect of capital inflows is small, it eventually becomes large in the long run because of the persistence of equity outflows. On the contrary, the long-run effect of private saving for equity outflows is still small even after considering the persistent nature of gross equity outflows. Thus, the conclusion is that for both equities and debts, the impact of external saving on foreign investment is larger than that of domestic saving especially during capital flight. It is consistent with existing literature.

The result suggests capital flight is not a market-exiting behavior by domestic agents because they use borrowings rather than their saving to increase foreign asset holdings. Therefore, it is unlikely that capital flight significantly decreases domestic agents' domestic asset holdings and it is consistent with the result in the first chapter of my dissertation. For the same reason the result shows capital flight is associated with capital inflow surges. Existing literature also supports debts-fueled capital outflows because they point out global factors representing external booms are the most important factors causing capital flight. For instance, the global interest rate is usually low during the boom and, as a result, it is easier for domestic firms to increase leverage. In this case, the probability of domestic crises increases (e.g., see Reinhart and Reinhart, 2008) and, therefore, the government has to implement policies such as capital controls to prevent the economy from facing credit booms.

Chapter 3

Are extreme capital outflow movements indicators of financial crises?

3.1 Introduction

As capital outflows by domestic agents in emerging market economies have been increasing significantly in recent years, a new literature is focusing on its impacts on these economies. This essay investigates the association between extreme gross capital outflow movements (capital flight and retrenchment) and diverse financial crises in emerging markets, including banking, currency, debt, and inflation crises. Specifically, we examine whether extreme gross capital outflow movements are leading or lagging indicators (signal or symptom) of financial crises. Here, capital flight means a large amount of foreign asset purchases by domestic agents, while retrenchment designates a sharp drop in foreign asset purchases by these agents.[1] Three strands of literature

[1]See Section 3.3.2 for the formal definitions.

motivate the study.

First, domestic agents have better access to their local markets and therefore have more information than foreigners. For example, Bae et al. (2008), Malloy (2005), and Orpurt (2004) argue that local investors' information advantage due to their proximity to the market explains their superior performance at predicting earnings. Their results suggest that local investors will prefer to invest in foreign markets with less risk if they expect the domestic economy to face a financial crisis. Capital flight could then occur as a result.

Second, recent research (e.g., Forbes and Warnock, 2012a, b and Calderón and Kubota, 2013) has investigated the determinants of extreme capital outflow movements, arguing that global factors, especially global risk aversion, are the main determinants driving them. Similarly, Fratzscher (2012) and Milesi-Ferretti and Tille (2011) have studied the main drivers of capital outflows during the global financial crisis of 2007-2009. However, few of them directly address the association between extreme capital outflow movements and financial crises, the main purpose of this essay.[2] We therefore aim to shed new light on the link between the two.

Third, although there are few empirical studies of this association, some work using DSGE models describes how productivity shocks affect optimal portfolio allocations between two countries. Regarding a financial crisis as a kind of negative produc-

[2]Some papers have, of course, studied the association between capital outflows and financial crises (e.g., Dermirgüç-Kunt and Detragiache, 1998 and Mishikin, 1999). However, they differ from this essay in two ways; first, they focus on general outflows rather than extreme movements, and second, they study net rather than gross outflows and so do not discriminate between decisions made by domestic investors and foreign investors.

tivity shock, its impact on capital outflows can be explained theoretically. However, some of the results are contradictory. For example, Tille and van Wincoop (2010) argue that negative productivity shocks decrease the price of domestic equity and expected excess returns on it. As a result, people reduce domestic asset purchases and gross capital outflows become counter-cyclical. To the contrary, Hnatkovska (2010) argues that gross capital outflows are pro-cyclical. By her account, negative productivity shocks in the nontradable sector raise the relative riskiness of domestic tradable equity while increasing its relative risk premium. As a result, domestic agents are motivated by the prospect of higher returns to purchase domestic rather than foreign equity. These contradictory theoretical explanations of gross capital outflows emphasize the importance of empirical evidence on the question.

Broner et al. (2013) is one of the few empirical studies investigating cyclical behaviors of gross capital outflows during crises. Although they focus on general capital outflows rather than extreme movements, their work is similar to this essay in the sense that it explains the behaviors of capital outflows in middle income countries experiencing diverse financial crises. Their results show that capital outflows are pro-cyclical and therefore suggest that capital retrenchment, not flight, might be associated with domestic turmoils. However, such cyclical behaviors do not address the association because there might be some omitted variables affecting capital flows symmetrically during crisis and non-crisis periods.[3] In fact, our study shows that it is capital flight, not retrench-

[3]For example, governments might restrict capital outflows during a crisis to prevent sharp reductions in domestic investment. In this case, capital market openness is an omitted variable affecting capital outflows during crises.

ment, that is positively associated with financial crises. This is one of our contributions to the literature.

To briefly explain our results: first, banking, currency, and inflation crises are positively associated with capital flight. Second, debt crises are also associated with capital flight, although they are not robust to the specification of the regression. Third, the results show that positive associations between capital flight and domestic crises are mainly driven by banking flows rather than FDI and portfolio flows. FDI and portfolio flows are actually negatively associated with financial crises. Finally, capital retrenchment is not associated with most financial crises. Therefore, it necessitates proper policy reactions to prepare for and respond to related financial crises when the country is experiencing capital flight.

The essay is organized as follows. Section 2 discusses the relationships between capital outflows and financial crises, while Section 3 explains the data used for the study, the formal definitions of flight and retrenchment, and the estimation strategy. Section 4 presents the main results and robustness checks. Section 5 concludes.

3.2 Linkages between capital outflows and financial crises

Capital outflows and financial crises could be related to each other in diverse ways. On the one hand, financial crises might cause capital flight because people would prefer to purchase less risky foreign assets if severe financial distress is present in the domestic economy. Conversely, capital outflows may cause financial crises. For example, speculative attacks by domestic investors can cause currency crises and following inflation crises in a country. Moreover, joint causality between two events is plausible. Specifically, investors' expectations of future crises due to bad fundamentals may encourage them to invest abroad, making their prediction of these crises self-fulfilling. This section briefly discusses the relationships between capital outflows and financial crises.

The relationship between capital outflows and banking crises is straightforward. According to our definition, a banking crisis generates significant signs of financial distress in the country's banking system and necessitates policy intervention. In this case, domestic agents would withdraw their deposits from domestic banks and transfer to foreign banks, consequently causing bankruptcies. More importantly, such bank runs could be triggered by panic rather than agents' rational expectations. Since the seminal paper of Diamond and Dybvig (1983), many papers have attempted to prove panic-based contagion in banking crises, and experimental economics has made an especially notable contribution. For instance, Chakravarty et al. (2014) show that a run on one bank triggers a run on other banks even though their liquidity and solvency are unrelated. See Dufwenberg (2015) for a survey of the literature. According to them, capital flight, rather than retrenchment, could be positively associated with banking crises.

Given the tendency of large capital outflows to depreciate the domestic currency, the relationship between capital flight and currency crises is also clear. A flight might indicate domestic agents' speculative attacks on the domestic currency. For instance, if domestic investors have internal information that the government does not have enough reserves to defend its peg regime, they will attempt to depreciate it.[4] Moreover, if such depreciation is chronic, speculations could be prolonged, causing the currency to collapse further. In the worst case, an inflation crisis may follow. It is noteworthy that several developing countries tried to stabilize their currencies by managing exchange rates. However, many of them failed and indeed only encouraged attacks.[5] Such historical evidence suggests that currency and inflation crises are related to capital flight.

After observing Latin American debt crises in the 1970s and 1980s and consequent capital flight from the region, many researchers have attempted to explain why private-sector investors fled domestic markets during a period of increasing probability of a debt crisis. Dooley (1988) explains this phenomenon by the difference in domestic-asset risk perceived by residents and nonresidents, respectively. That is, ex ante risk perceived by residents is higher than that perceived by nonresidents due to factors such as taxation on investment or inflation rate risk. As a result, the ex post risk premium underestimates residents' risk while overestimating that of nonresidents', so simultaneous debt inflows and private capital outflows occur. Similarly, Khan and Ul Haque (1985) and Alesina and Tabellini (1989) argue that capital flight is due to expropriation risk that residents tend to face when the government overaccumulates external debts. According to their analyses,, capital flight is a fleeing behavior intended to avoid domestic uncertainty, and they build theoretical frameworks to explain why capital flight is as-

[4]See Obstfeld (1996), for example.
[5]See Dornbusch (1986).

sociated with debt crises. Indeed, they show capital flight to be significantly associated with debt crises even though one does not directly cause the other.

The discussion in this section thus provides the hypothesis of the essay: first, capital flights rather than retrenchments are positively associated with financial crises. Second, banking flows mainly drive this positive relationship between the two.

3.3 Data

3.3.1 Data

We use annual data for 60 emerging market economies from 1980 to 2009.[6] Gross capital outflows, the key variable for defining capital flight, are net foreign asset purchases (gross foreign asset purchases net of sales) by domestic agents that include (1) FDI, (2) portfolio investment (equities and debts), and (3) other investment (e.g., trade credits, loans, and deposits).

For the independent variable, the model uses four different kinds of crises, which are the main interests of this essay; banking, currency, debt, and inflation crises. Each is an indicator variable which is 1 if a country is experiencing the corresponding crisis in a given year and 0 otherwise. Banking and currency crisis data are from Laeven and Valencia (2012). According to them, a country experiences a systemic banking crisis if there are 1) significant signs of financial distress in the banking system (e.g., significant bank runs, losses in the banking system, and/or bank liquidations) and 2) significant

[6]See Table 3.1 for the list of countries.

banking policy intervention measures in response to significant losses in the banking system. A currency crisis is defined as a nominal depreciation of the currency vis-à-vis the U.S. dollar of at least 30 percent and also at a rate of depreciation at least 10 percentage points higher than the rate of depreciation in the previous year. Debt crisis is defined as per Broner et al. (2013), originally from Reinhart and Rogoff (2009) but supplemented by Standard and Poor's data; a country has a debt crisis in a given year if it downgrades to default levels for sovereign local-currency debt (a domestic debt crisis) or for sovereign foreign-currency debt or the sovereign foreign-currency bank loans (an external debt crisis). The indicator variable for an inflation crisis is 1 if the inflation rate in a country is over 40%. Additionally, I define 'financial crisis' using an indicator variable that is 1 if a country has experienced any of these four types of crises in a given year. Note that I only consider the initial year of each crisis since the end of the crisis is ambiguous in several cases. Moreover, it is hard to regard capital flights in the middle of long-lasting crises as a response to them (or vice versa).

For control variables that are expected to reduce omitted-variable bias in the estimator, I added the global real interest rate (GLOBRATE) and global real GDP growth (GLOBGDP) as global common factors and capital market openness (KAOPEN), domestic real GDP growth (ZGDP), and exchange rate regime (EXREGIME) as domestic specific factors. Global real interest rate and global real GDP growth rate are the averages of the G7 countries'[7] real interest rates and real GDP growth, while capital market openness is from Chinn and Ito (2006) which designates more opened

[7]U.S., U.K., Canada, Italy, France, Germany, and Japan

economy with higher values. Finally, the exchange rate regime variable is a fine classification ranging from 1 to 16, with a larger index indicating a more flexible regime.[8] Most of these variables are identified significant determinants of capital flight in other research (e.g., Forbes and Warnock, 2012a and Calderón and Kubota, 2013). See Table 3.2 for a summary of these definitions and sources.

3.3.2 Definition of capital flight and retrenchment

Capital flight indicates large-scale purchasing of foreign assets by domestic agents. That is,

- Flight:

$$\begin{cases} 1 & if\ KO_{jt} \in \{top\ 30\%\ of\ (KO_{js})_{s=1}^{T}\} \cap \{top\ 30\%\ of\ (KO_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

where KO is gross capital outflows.

Additionally, to study the detailed relationships between capital flight and crises, I use different definitions for flight episodes. First, top 30 percent may be generous to indicate a large purchasing of capital assets in a country. For this reason, I define "severe flight" as follows:

- Severe Flight:

$$\begin{cases} 1 & if\ KO_{jt} \in \{top\ 20\%\ of\ (KO_{js})_{s=1}^{T}\} \cap \{top\ 20\%\ of\ (KO_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

[8] Source: Ilzetzki, Reinhart, and Rogoff (2017)

By definition, severe flight is a subset of flight.

Second, gross capital outflows consist of three different kinds of investments (FDI, portfolio investments, and other investments). Foreign direct investments and portfolio investments are associated with direct and indirect controls on enterprise and, therefore, are usually stable and persistent.[9] On the other hand, other investments, comprising short-term debts such as bank loans, are more volatile and more easily reversed. For this reason, other-investment flight might be more relevant to crises than FDI and portfolio flights. To test this hypothesis, I define following the three kinds of capital flight using different investments:

- FDI Flight:

$$\begin{cases} 1 & if\ FDI_{jt} \in \{top\ 30\%\ of\ (FDI_{js})_{s=1}^{T}\} \cap \{top\ 30\%\ of\ (FDI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- PI Flight:

$$\begin{cases} 1 & if\ PI_{jt} \in \{top\ 30\%\ of\ (PI_{js})_{s=1}^{T}\} \cap \{top\ 30\%\ of\ (PI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- OI Flight:

$$\begin{cases} 1 & if\ OI_{jt} \in \{top\ 30\%\ of\ (OI_{js})_{s=1}^{T}\} \cap \{top\ 30\%\ of\ (OI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

where PI and OI are portfolio investments and other investments, respectively. These three forms of flight are not necessarily subsets of 'flight', and there is nonzero overlap

[9]According to IMF BOP6 manual, FDI is associated with more than 10% of the voting power in the enterprise and portfolio investment is associated with less than 10% of it.

among them.

Likewise, I define capital retrenchments symmetrically. Retrenchment designates a large decrease in foreign asset purchases and is defined as follows:

- Retrenchment:

$$\begin{cases} 1 & if\ KO_{jt} \in \{bottom\ 30\%\ of\ (KO_{js})_{s=1}^{T}\} \cap \{bottom\ 30\%\ of\ (KO_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- Severe Retrenchment:

$$\begin{cases} 1 & if\ KO_{jt} \in \{bottom\ 20\%\ of\ (KO_{js})_{s=1}^{T}\} \cap \{bottom\ 20\%\ of\ (KO_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- FDI Retrenchment:

$$\begin{cases} 1 & if\ FDI_{jt} \in \{bottom\ 30\%\ of\ (FDI_{js})_{s=1}^{T}\} \cap \{bottom\ 30\%\ of\ (FDI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- PI Retrenchment:

$$\begin{cases} 1 & if\ PI_{jt} \in \{bottom\ 30\%\ of\ (PI_{js})_{s=1}^{T}\} \cap \{bottom\ 30\%\ of\ (PI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

- OI Retrenchment:

$$\begin{cases} 1 & if\ OI_{jt} \in \{bottom\ 30\%\ of\ (OI_{js})_{s=1}^{T}\} \cap \{bottom\ 30\%\ of\ (OI_{js})_{j=1,s=1}^{N,T}\} \\ 0 & otherwise \end{cases}$$

Table 3.3 and 3.4 summarize investments during flight (retrenchment) and non-flight (non-retrenchment) periods. Note that the mean difference is very large and statistically significant at less than the 1% level. Indeed, each episode is defined only if investments significantly change. Tables 3.5 through 8 show the frequency of each crisis accompanying flight or retrenchment. For example, among a total of 68 banking crises, 19% at year t-1 were accompanied by capital flights at year t and 54% of them in year t-1, t, or t+1 were accompanied by flights at year t. They suggest retrenchments are more closely related to crises since cumulative frequency is higher for them.

3.3.3 Estimation strategy

Flights and retrenchments are abnormal phenomena in the sense that it takes only about 19% of total observations. Since these dependent variables are skewed, normal or logistic distributions, which are symmetric, might not be appropriate to model their distributions. I use the complementary log-log (clog) model for such asymmetric distributions. According to clog model, probability $p(= Pr(y = 1|X))$ is

$$F(X'\beta) = 1 - exp\{-exp(X'\beta)\}$$

and marginal effect of j_{th} variable, $(\partial p/\partial x_j)$, is

$$exp(-exp(X'\beta))exp(X'\beta)\beta_j.$$

The dependent variable is the indicator variable designating capital flight or retrenchment and $X_t'\beta$ is

$$\beta_0 + \beta_1 Crisis_{t-1} + \beta_2 Crisis_t + \beta_3 Crisis_{t+1} + \beta_4 GLOBRATE_t$$
$$+ \beta_5 GLOBGDP_t + \beta_6 KAOPEN_t + \beta_7 ZGDP_t + \beta_8 EXREGIME_t$$

where 'Crisis' is the indicator variable for one of five crisis types; banking, currency, debt, inflation, or financial crises. $Crisis_{t-1}$ and $Crisis_{t+1}$ are included to consider the possibility that domestic agents may purchase foreign assets the year before or after a crisis. If the independent variable is significantly associated with capital flight or retrenchment, it will contribute to increasing the likelihood of extreme capital outflow movements.

3.4 Results

3.4.1 Capital flight and retrenchment and financial crises

Table 3.9 and 3.10 show the estimation results.

First, domestic agents have purchased a large amount of foreign assets one year before and after banking crises. Flights one year after the crisis are not surprising because domestic agents will invest in safer foreign banks when systematic financial distress is experienced in the domestic economy. Flights occurring one year before the crisis may designate self-fulfilling prophecies of banking crises. For example, if domestic agents expect a banking crisis in the near future they will withdraw their deposits from domestic banks beforehand and save in foreign bank accounts. As a result, default risk increases and banks may fail to pay their liabilities. This suggests that capital flights might indicate bank runs and explains why they correlate with increased probability of banking crises in domestic economies. Therefore, when flights are observed, policymakers may have to intervene to prevent domestic banks from defaulting.

Second, currency crises at year t are significantly associated with flights. This suggests that a capital flight could be a speculative attack to take advantage of sustained depreciation in emerging market economies. If so, the domestic government has to implement sound policies against flight to prevent it triggering currency depreciation. The interesting point is that capital inflows usually surge during flight periods.[10] This might indicate that domestic investors have access to internal information that foreign investors do not, which they use to depreciate their currency successfully.

Third, debt crises and flights are not significantly associated. This result stands against Latin America's experiences in the 1970s and 1980s with capital flights during debt crises, and might indicate that a positive association between debt crises and flights was a regional feature of Latin America in the past rather than a global phenomenon in general. However, an alternative specification provides a different result, namely debt crises are positively associated with flights (see Section 3.4.2). For this reason, this essay does not conclude that debt crises and capital flights are not associated.

Fourth, inflation crises at year t are positively associated with flights. This is not surprising considering the positive association between flights and currency crises. Moreover, many emerging markets have dollarized their currencies after the value of those currencies collapsed through hyperinflation.

Lastly, financial crises at years t-1 and t are positively associated with flights at year t. On the one hand, this result shows that investors avoid domestic turmoil and prefer to invest in safer foreign markets supporting the "flight-to-safety" hypothesis. On the other hand, it implies flights cause financial crises by collapsing domestic currencies and self-fulfilling people's expectations of them.

[10]See Rey (2013). In my data, the mean of capital inflows during flight periods is 7.92 % of GDP which is only 3.9% of GDP during no-flight periods. The mean difference is significant at the 1% level.

To the contrary, capital retrenchment is not associated with any type of financial crisis. The results therefore show that it is flight, not retrenchment, that is significantly associated with financial crises. Put simply, domestic agents increase foreign asset purchases during financial crises.

Global real interest rate and growth are both important indicators for flights and retrenchments. Investors increase foreign asset purchases in good times when the global interest rate is low and growth is strong, which implies that investors consider risks more than returns. However, domestic real GDP growth is associated neither with flights nor with retrenchments, a result that does not change even if estimation is done without crisis indicator variables. Capital market openness is associated with both flights and retrenchments because more liberalized capital markets allow domestic agents to increase their investment in foreign countries. The coefficient of exchange rate regime is significant only for flights, showing that investors increase their investments when exchange rates are more rigid so as to avoid exchange rate risk. In sum, this result shows that both global common factors and domestic specific factors are important indicators for estimating the likelihood of extreme capital outflow movements.

3.4.2 Robustness Checks

To verify these results, I perform several robustness checks. First, I use different dependent variables, 'severe flight' and 'severe retrenchment', also defined in Section 3.3.2. Second, I exclude the years of the global financial crisis (2007-2009) on the basis that these three years may have driven significant associations between capital flights and financial crises globally. Third, I include country-fixed effects to estimate the probability of episodes.[11]

The results are reported in Table 3.11 and 3.12 and are almost identical to those in Section 3.4.1.[12] Banking, currency, inflation, and financial crises are still significantly associated with capital flights, but are mostly not associated with retrenchments. Moreover, debt crises are now significantly associated with flights if capital outflows are within the top 20 percent ('severe flights'). These findings are consistent with arguments in the existing literature on the relationship between financial crises and capital outflows and confirm that domestic investors prefer foreign assets during domestic turmoil.

3.4.3 FDI, portfolio investment, and other investment movements and financial crises

Gross capital flows consist of three different kinds of capital flows; foreign direct investments, portfolio investments, and other investments. Since the determinants of each component are different,[13] the relationship between financial crises and flights or retrenchments of each type of flow might be also different. To investigate this hypothesis, I define flight and retrenchment using three kinds of flows, considered separately. In particular, I hypothesize that other investment flows mostly drive the positive association between capital flight and financial crises because this association mostly relates to hot money.

[11]If we include country-fixed effects, the coefficients of them for countries that never experienced crises are unidentifiable and, thus, they are dropped. Since these countries are important control groups, I did not include fixed effects in the main estimation.

[12]I do not report the coefficients of control variables to save space. There is little change.

[13]See Forbes and Warnock, 2012b

The results are reported in Table 3.13 and 3.14. Several interesting features emerge. First, these results confirm the previous results about flights and retrenchments. That is, in most cases it is flight rather than retrenchment that is associated with financial crises. Second, the results also confirm the hypothesis that other investments drive positive association between flight and financial crises: to be specific, other-investment flights are associated with all kinds of financial crises. Although FDI flight in year t is positively associated with a banking crisis in year t+1, we see this is mainly attributable to the global financial crisis (see Table 3.16). Third, PI retrenchment is the only retrenchment that is positively related to financial crises. It is positively associated with currency crises at year t+1 and, considering that OI flight is associated with currency crises at years t-1 and t, this suggests a dynamic of capital outflows: namely, investors retrench their portfolio investments the year before a currency crisis and increase other investments during the crisis. It is reasonable for investors to convert portfolio investments to other investments for currency attacks because the latter are more liquid than the former. Therefore, governments need to monitor and manage other investments such as bank loans and deposits carefully to prevent financial crises or to minimize the damage induced by them.

3.5 Conclusions

This essay has shown that capital flight, especially OI flight, is positively associated with financial crises. The estimation results may be summarized as follows:

- Banking crises and capital flights are positively associated. To be specific, capital flight is a leading and lagging indicator of a banking crisis, suggesting that banking crises could be self-fulfilling prophesies brought about when domestic agents believe domestic banks are likely to go bankrupt. Moreover, banking flows to other countries will increase if severe financial distress is present in the domestic economy.

- Currency crises and capital flights are positively associated. The empirical evidence may imply that, in this case, flights of capital are speculative attacks by domestic investors, which in many cases are successful.

- Debt crises and capital flights are positively associated only if outflows are extraordinarily large. If domestic agents expect sovereign default, they may purchase foreign rather than domestic assets for fear of expropriation risk. However, further research is warranted since the result is not robust.

- Inflation crises and capital flights are positively associated. This is not surprising considering the positive association between currency crises and flights and the fact that many emerging market economies dollarized their currencies during inflation crises.

Overall, capital flights are reliable indicators of financial crises. The results are remarkable considering that only the initial years of crises were considered for the study, while financial crises have been very persistent in developing countries. Governments therefore need to pay attention to gross capital outflows to implement sound policies when investors are purchasing large amounts of foreign assets. Moreover, this essay suggests banking flows are critical to monitor because they are most closely correlated with crises. For example, tight banking outflow controls may prevent domestic agents from converting their domestic deposits into foreign deposits and save domestic banks from systemic bankruptcies. Capital outflows especially need to be managed when they indicate currency attacks by domestic investors. Otherwise, a severe currency collapse and subsequent inflation crisis are likely outcomes.

This essay has described general relationships between extreme capital outflow movements and financial crises. Based on the empirical evidence presented here, an interesting topic for future research would be to study detailed relationships (particularly causality) between capital flights and each type of crisis, and the mechanisms behind them.

Table 3.1: The list of countries

Total: 60

Albania	Angola	Argentina
Armenia	Azerbaijan, Rep. of	Belarus
Bolivia	Bosnia and Herzegovina	Botswana
Brazil	Bulgaria	Chile
China, P.R.: Mainland	Colombia	Congo, Republic of
Costa Rica	Croatia	Dominican Republic
Ecuador	Egypt	El Salvador
Gabon	Georgia	Guatemala
Honduras	India	Indonesia
Jamaica	Jordan	Kazakhstan
Latvia	Libya	Lithuania
Macedonia	Malaysia	Mauritius
Mexico	Moldova	Mongolia
Morocco	Namibia	Nicaragu
Pakistan	Paraguay	Peru
Philippines	Poland	Romania
Russian Federation	South Africa	Sri Lanka
Swaziland	Syrian Arab Republic	Thailand
Tunisia	Turkey	Ukraine
Uruguay	Venezuela, R.B.	Vietnam

Table 3.2: Data sources

Variable	Definition	Source
Gross capital outflows (% of GDP)	Net foreign-asset purchase by domestic agents. Foreign assets consist of foreign direct investment, portfolio investment, and other investment	IMF BOPS
Crisis	Indicator variables that is	
Banking Crisis	1 if there is 1) significant signs of financial distress and 2) significant banking policy intervention in the banking system.	Laeven and Valencia (2012)
Currency Crisis	1 if nominal depreciation of the currency vis-à-vis the U.S. dollar is at least 30 percent and also at least 10 percentage points higher than the rate of depreciation in the year before.	Laeven and Valencia (2012)
Debt Crisis	1 if a country defaults by local-currency debts or by foreign-currency debts	Reinhart and Rogoff (2009) and Broner et al. (2013)
Inflation Crisis	1 if inflation rate is larger than 40%	Author's calculation
Financial Crisis	1 if a country experiences any of banking, currency, debt, and inflation crises.	Author's calculation
Global real interest rate (%)	The average of G7 countries' real interest rate	IMF IFS
Global real GDP real growth (%)	The average of G7 countries' GDP growth	World Bank
Real GDP growth (%)		IMF WEO
GDP (nominal and real)		IMF WEO
Capital market openness	The index ranged from 0 to 1. 1 means the most liberalized market.	Chinn and Ito (2006)
Exchange rate regime	The index ranged from 1 to 16. 16 means the most flexible regime.	Ilzetzki, Reinhart and Rogoff (2016)

Table 3.3: The summary of capital flows during flight and non-flight periods

Flight=1

Episode	Outflows	Obs.	Mean	Std. Dev	Min	Max
Capital Flight	Gross	285	7.8456	5.2199	2.5659	41.548
Severe Capital Flight	Gross	157	9.9521	5.6044	4.1297	41.548
FDI Flight	FDI	176	1.5315	1.8799	0.3192	13.8796
PI Flight	Portfolio	156	2.9891	3.4678	0.455	16.7802
OI Flight	Others	268	6.2804	4.5202	2.1485	39.4907

Flight=0

Episode	Outflows	Obs.	Mean	Std. Dev	Min	Max
Capital Flight	Gross	1,219	0.875	2.6105	-15.0481	13.5752
Severe Capital Flight	Gross	1,347	1.2919	2.9629	-15.0481	18.2399
FDI Flight	FDI	1,328	0.0842	0.3643	-2.9665	5.2214
PI Flight	Portfolio	1,348	0.1198	0.9397	-4.8828	12.4681
OI Flight	Others	1,236	0.4937	2.2313	-14.9735	9.9569

Notes: Mean difference for all investments between two periods is significant at less than the 1% level.

Table 3.4: The summary of capital flows during retrenchment and non-retrenchment periods

Retrenchment=1

Episode	Outflows	Obs.	Mean	Std. Dev	Min	Max
Capital Retrenchment	Gross	307	-1.5993	2.392	-15.0481	0.1697
Severe Capital Retrenchment	Gross	198	-2.188	2.6983	-15.0481	-0.0437
FDI Retrenchment	FDI	110	-0.3201	0.5112	-2.9665	-0.002
PI Retrenchment	Portfolio	189	-0.4021	0.6805	-4.8828	-0.00002
OI Retrenchment	Others	315	-1.7255	2.4245	-14.9735	0

Retrenchment=0

Episode	Outflows	Obs.	Mean	Std. Dev	Min	Max
Capital Retrenchment	Gross	1,197	3.1693	4.0857	-5.3839	41.548
Severe Capital Retrenchment	Gross	1306	2.8605	4.0538	-6.2403	41.548
FDI Retrenchment	FDI	1,394	0.2988	0.8692	-0.1687	12.8796
PI Retrenchment	Portfolio	1,315	0.5352	1.7387	-0.563	16.7802
OI Retrenchment	Others	1,189	2.3859	3.2983	-5.3839	39.4907

Notes: Mean difference for all investments between two periods is significant at less than the 1% level.

Table 3.5: The frequency of banking crises accompanying flight or retrenchment

Obs.=1,800

	No. of Crises	Frequency t-1	t	t+1	Cumulative Frequency
Flight	68	19%	13%	19%	54%
Retrenchment	68	16%	18%	16%	50%

Table 3.6: The frequency of currency crises accompanying flight or retrenchment

Obs.=1,800

	No. of Crises	Frequency t-1	t	t+1	Cumulative Frequency
Flight	81	15%	21%	14%	49%
Retrenchment	81	21%	22%	14%	57%

Table 3.7: The frequency of debt crises accompanying flight or retrenchment

Obs.=1,638

	No. of Crises	Frequency t-1	t	t+1	Cumulative Frequency
Flight	76	17%	12%	11%	38%
Retrenchment	76	17%	20%	17%	50%

Table 3.8: The frequency of inflation crises accompanying flight or retrenchment

Obs.=1,432

	No. of Crises	Frequency t-1	t	t+1	Cumulative Frequency
Flight	46	9%	17%	9%	35%
Retrenchment	46	22%	19%	22%	57%

No. of Crises: The number of initial years of crisis

Cumulative Frequency: Total flights in year t accompanied by crises in year t-1, t, or t+1

Table 3.9: The association between capital flight and crises

	Banking	Currency	Debt	Inflation	Financial
Crisis					
(t-1)	0.7071**	0.4641	0.3576	-0.5986	0.4012**
	(0.2961)	(0.3036)	(0.3038)	(0.72)	(0.1962)
(t)	0.1607	1.1487***	0.0985	1.1391**	0.4123**
	(0.3599)	(0.2685)	(0.3452)	(0.4644)	(0.1992)
(t+1)	0.5775*	0.3967	-0.0342	-0.1745	0.2008
	(0.3063)	(0.3317)	(0.3836)	(0.6923)	(0.2245)
GLOBRATE	-0.4152***	-0.4146***	-0.422***	-0.3881***	-0.4171***
	(0.0502)	(0.0494)	(0.0504)	(0.0504)	(0.0498)
GLOBGDP	0.197***	0.1934***	0.1865***	0.2073***	0.1947***
	(0.0651)	(0.0658)	(0.0657)	(0.069)	(0.0649)
KAOPEN	0.0995**	0.1118**	0.1251***	0.1229***	0.1068**
	(0.0446)	(0.0451)	(0.048)	(0.0465)	(0.0451)
ZGDP	1.36	2.1648	0.6773	0.5767	1.7957
	(1.8304)	(1.6874)	(2.035)	(1.9957)	(1.7384)
EXREGIME	-0.0378**	-0.0509***	-0.0336*	-0.0361*	-0.0491***
	(0.0175)	(0.0174)	(0.0191)	(0.0193)	(0.0175)
Constant	0.1004	0.1288	0.1631	0.0038	0.1237
	(0.2606)	(0.252)	(0.2769)	(0.2706)	(0.2551)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	263	263	237	238	263

Notes: Dependent variable is capital flight that is defined in Section 3.2. Each column represents banking, currency, debt, inflation, and financial crises for the variable 'Crisis', respectively. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.10: The association between capital retrenchment and crises

	Banking	Currency	Debt	Inflation	Financial
Crisis					
(t-1)	-0.3201	-0.0522	-0.2781	0.3438	-0.2605
	(0.3144)	(0.2667)	(0.3044)	(0.3433)	(0.1897)
(t)	-0.3113	-0.0555	-0.1703	-0.0899	-0.2388
	(0.3236)	(0.2714)	(0.3001)	(0.4749)	(0.1959)
(t+1)	-0.1138	-0.3707	0.027	0.5358	-0.0286
	(0.312)	(0.3136)	(0.2922)	(0.3623)	(0.1869)
GLOBRATE	0.0985*	0.0868*	0.101**	0.0922*	0.0924*
	(0.049)	(0.0491)	(0.0511)	(0.0505)	(0.0492)
GLOBGDP	-0.1112*	-0.1052*	-0.1365**	-0.1388**	-0.1104*
	(0.0599)	(0.06)	(0.0628)	(0.0629)	(0.0601)
KAOPEN	-0.0881*	-0.0891*	-0.0932*	-0.0976*	-0.0936*
	(0.0487)	(0.0489)	(0.051)	(0.0504)	(0.0487)
ZGDP	-1.362	-1.0853	-0.4325	-0.8895	-1.7087
	(1.2189)	(1.2114)	(1.3629)	(1.2913)	(1.2597)
EXREGIME	0.0171	0.0197	0.0167	0.0205	0.0239
	(0.0156)	(0.0163)	(0.0169)	(0.0168)	(0.016)
Constant	-1.7247***	-1.7647***	-1.7723***	-1.7444***	-1.7495***
	(0.2988)	(0.3014)	(0.3167)	(0.3133)	(0.3005)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	285	285	262	267	285

Notes: Dependent variable is capital retrenchment that is defined in Section 3.2. Each column represents banking, currency, debt, inflation, and financial crises for the variable 'Crisis', respectively. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.11: Robustness Check; Flight

	Severe Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.4534	0.6367	0.9011**	0.1848	0.5622**
	(0.4623)	(0.4013)	(0.3517)	(0.7318)	(0.2587)
$Crisis_t$	0.1754	1.202***	0.6623*	1.1265*	0.5299**
	(0.5083)	(0.375)	(0.3952)	(0.6521)	(0.2569)
$Crisis_{t+1}$	0.8124**	0.6312	-0.5518	0.6689	0.28
	(0.3888)	(0.4293)	(0.7252)	(0.7002)	(0.3028)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	147	147	130	131	147
	Excluding Global Financial Crisis				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.6933**	0.5267*	0.3259	-0.5536	0.4291**
	(0.2968)	(0.3036)	(0.3204)	(0.7211)	(0.1998)
$Crisis_t$	-0.2339	1.1517***	0.0978	1.1865**	0.3826*
	(0.4544)	(0.2808)	(0.3659)	(0.4713)	(0.2096)
$Crisis_{t+1}$	0.2166	0.4128	-0.1433	-0.142	0.0439
	(0.3921)	(0.3514)	(0.421)	(0.6922)	(0.2496)
Country	60	60	60	60	60
Obs.	1,243	1,243	1,143	1,128	1,243
No. of events	219	219	196	198	219
	Including Country-fixed Effects				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.7434**	0.4249	0.482	-0.5168	0.5255**
	(0.3032)	(0.3232)	(0.3262)	(0.7265)	(0.207)
$Crisis_t$	0.1451	1.0655***	0.1353	1.162**	0.4578**
	(0.3693)	(0.2914)	(0.3565)	(0.5253)	(0.2054)
$Crisis_{t+1}$	0.5896*	0.3996	-0.0597	-0.0332	0.291
	(0.3265)	(0.3486)	(0.3999)	(0.7441)	(0.2331)
Country	55	55	51	54	55
Obs.	1,222	1,222	1,112	1,106	1,222
No. of events	263	263	235	238	263

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.12: Robustness Check; Retrenchment

	Severe Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.1777	0.0949	-0.5724	0.6602*	-0.2819
	(0.373)	(0.3122)	(0.4256)	(0.3825)	(0.2372)
$Crisis_{t}$	-0.0609	0.0124	0.11	-0.1752	-0.0423
	(0.3618)	(0.3249)	(0.3284)	(0.6067)	(0.2297)
$Crisis_{t+1}$	0.1568	-0.3743	-0.1932	0.6142	-0.0486
	(0.3473)	(0.3939)	(0.3883)	(0.4296)	(0.2306)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	189	189	172	176	189
	Excluding Global Financial Crisis				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.2879	-0.0376	-0.2404	0.3393	-0.2403
	(0.3138)	(0.2663)	(0.3039)	(0.3423)	(0.1898)
$Crisis_{t}$	-0.2157	-0.022	-0.1103	-0.0837	-0.186
	(0.3261)	(0.274)	(0.3019)	(0.4734)	(0.1981)
$Crisis_{t+1}$	-0.0288	-0.3413	0.0592	0.5441	0.0136
	(0.3141)	(0.3158)	(0.2919)	(0.3635)	(0.1892)
Country	60	60	60	60	60
Obs.	1,243	1,243	1,143	1,128	1,243
No. of events	261	261	239	243	261
	Including Country-fixed Effects				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.327	-0.0251	-0.2905	0.4159	-0.2825
	(0.3259)	(0.2744)	(0.3164)	(0.3748)	(0.1982)
$Crisis_{t}$	-0.2545	-0.019	-0.1482	-0.0341	-0.2466
	(0.3319)	(0.2901)	(0.3163)	(0.5157)	(0.2064)
$Crisis_{t+1}$	-0.0717	-0.3166	0.0853	0.6802*	-0.0027
	(0.3257)	(0.3198)	(0.3119)	(0.3883)	(0.1998)
Country	54	54	51	54	54
Obs.	1,246	1,246	1,151	1,163	1,246
No. of events	285	285	262	267	285

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.13: The association between FDI, portfolio, and other-investment flight and crises

	FDI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	Omitted	-0.1644	-1.2371*	Omitted	-0.8584**
		(0.4706)	(0.7309)		(0.4072)
$Crisis_t$	0.6093	-0.5579	-0.464	Omitted	-0.1647
	(0.3714)	(0.5814)	(0.5194)		(0.3186)
$Crisis_{t+1}$	1.0568***	-0.0052	0.1229	Omitted	0.4463
	(0.3327)	(0.4687)	(0.4649)		(0.2817)
Country	60	60	60	60	60
Obs.	1,297	1,356	1,250	1,168	1,356
No. of events	169	169	158	154	169
	PI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.0227	0.3127	-0.044	Omitted	0.137
	(0.5218)	(0.4116)	(0.4485)		(0.3151)
$Crisis_t$	-0.323	-0.8376	-0.9197	Omitted	-0.5588
	(0.6017)	(0.7392)	(0.7067)		(0.4097)
$Crisis_{t+1}$	-1.3454	-1.5066	-1.4736	Omitted	-1.3327**
	(1.0034)	(1.0083)	(1.0031)		(0.5999)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,168	1,356
No. of events	152	152	139	135	152
	OI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.5645*	0.6309**	0.6287**	0.4527	0.4343**
	(0.3042)	(0.2938)	(0.2925)	(0.4568)	(0.1943)
$Crisis_t$	0.1302	1.3497***	0.1849	1.0344**	0.5301***
	(0.3668)	(0.2621)	(0.3471)	(0.4802)	(0.1938)
$Crisis_{t+1}$	0.2917	0.3065	0.1399	-0.1881	0.0762
	(0.3431)	(0.3486)	(3694)	(0.7067)	(0.2323)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	238	238	213	214	238

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.14: The association between FDI, portfolio, and other-investment retrenchment and crises

	FDI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.0788	0.2841	-0.6156	0.2177	-0.359
	(0.4554)	(0.4253)	(0.5945)	(0.712)	(0.3328)
$Crisis_{t}$	-0.8389	0.4061	-0.0138	0.3257	-0.1541
	(0.7124)	(0.4054)	(0.4604)	(0.7111)	(0.3149)
$Crisis_{t+1}$	-0.2223	-0.0584	-0.3419	Omitted	-0.2244
	(0.587)	(0.5211)	(0.5922)		(0.3518)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,216	1,356
No. of events	101	101	83	90	101
	PI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3507	-0.1458	-0.0913	-1.0533	-0.265
	(0.4543)	(0.4309)	(0.4004)	(1.0008)	(0.2724)
$Crisis_{t}$	-0.1228	0.2864	-0.2514	-0.2132	-0.0656
	(0.4026)	(0.3643)	(0.4243)	(0.7515)	(0.2617)
$Crisis_{t+1}$	-0.3495	0.7708**	-0.2639	-0.8938	0.0556
	(0.5072)	(0.312)	(0.4742)	(1.0273)	(0.2698)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	175	175	162	162	175
	OI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.392	-0.0204	-0.5792*	0.4077	-0.345*
	(0.33)	(0.2691)	(0.3463)	(0.3571)	(0.1987)
$Crisis_{t}$	-0.4079	-0.0864	-0.0621	-0.0472	-0.2331
	(0.3403)	(0.2827)	(0.295)	(0.4813)	(0.2021)
$Crisis_{t+1}$	0.0292	-0.4159	-0.2357	0.2094	-0.1409
	(0.2985)	(0.3246)	(0.3294)	(0.4203)	(0.1958)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	293	293	265	271	293

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.15: Robustness Check (Flight); Severe Flight

	FDI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	Omitted	-0.6661	Omitted	Omitted	-1.6271**
		(0.745)			(0.7378)
$Crisis_t$	0.2735	-1.3903	-1.3459	Omitted	-0.4009
	(0.5277)	(1.0063)	(1.0132)		(0.4577)
$Crisis_{t+1}$	1.0409**	-1.1934	0.4531	Omitted	0.4842
	(0.4451)	(1.0001)	(0.5354)		(0.3823)
Country	60	60	60	60	60
Obs.	1,297	1,356	1,185	1,168	1,356
No. of events	97	97	88	87	97

	PI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.6843	0.3506	0.3799	Omitted	0.448
	(0.5454)	(0.5392)	(0.5162)		(0.3824)
$Crisis_t$	-0.7905	-0.8504	-0.263	Omitted	-0.5279
	(1.0054)	(1.016)	(0.7172)		(0.5208)
$Crisis_{t+1}$	Omitted	-0.882	Omitted	Omitted	-1.8486*
		(1.0127)			(1.0092)
Country	60	60	60	60	60
Obs.	1,304	1,356	1,195	1,168	1,356
No. of events	89	89	81	81	89

	OI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.7321*	0.7277*	1.0044***	-0.5777	0.519**
	(0.4063)	(0.3948)	(0.348)	(1.0121)	(0.2615)
$Crisis_t$	0.3621	1.7253***	0.7007*	1.0529	0.832***
	(0.4708)	(0.3123)	(0.3925)	(0.6444)	(0.2355)
$Crisis_{t+1}$	0.5729	0.4466	-0.1547	0.5927	0.0918
	(0.4285)	(0.468)	(0.596)	(0.7151)	(0.3149)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	131	131	115	114	131

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.16: Robustness Check (Flight); Excluding Global Financial Crisis

	FDI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	Omitted	0.0591	-0.9095	Omitted	-0.6201
		(0.4733)	(0.7334)		(0.4155)
$Crisis_t$	0.3718	-0.7541	-0.1082	Omitted	-0.1912
	(0.474)	(0.7052)	(0.5196)		(0.3708)
$Crisis_{t+1}$	0.7017	0.0201	0.3284	Omitted	0.4084
	(0.4358)	(0.5212)	(0.4717)		(0.324)
Country	60	60	60	60	60
Obs.	1,184	1,243	1,143	1,057	1,243
No. of events	117	117	108	102	117
	PI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.0318	0.3595	0.0224	Omitted	0.1723
	(0.5211)	(0.4109)	(0.4512)		(0.3201)
$Crisis_t$	-0.1334	-0.7619	-0.827	Omitted	-0.3966
	(0.5999)	(0.7457)	(0.7071)		(0.4204)
$Crisis_{t+1}$	Omitted	-1.4075	-1.3925	Omitted	-1.6334**
		(1.0095)	(1.0027)		(0.7278)
Country	60	60	60	60	60
Obs.	1,195	1,243	1,143	1,059	1,243
No. of events	131	131	120	114	131
	OI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.5221*	0.6255**	0.534*	0.4357	0.4**
	(0.3024)	(0.2942)	(0.3087)	(0.4617)	(0.1985)
$Crisis_t$	-0.1146	1.2523***	0.0959	0.9586**	0.4769**
	(0.4201)	(0.2708)	(0.3708)	(0.4837)	(0.2023)
$Crisis_{t+1}$	-0.0234	0.2446	-0.0104	-0.2194	-0.0904
	(0.4203)	(0.3697)	(0.4001)	(0.7029)	(0.2525)
Country	60	60	60	60	60
Obs.	1,243	1,243	1,143	1,128	1,243
No. of events	206	206	182	186	206

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.17: Robustness Check (Flight); Including Country-fixed Effects

	FDI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	Omitted	-0.0565	-1.2514	Omitted	-0.8336**
		(0.4527)	(0.7659)		(0.402)
$Crisis_t$	0.5091	-0.4234	-0.3379	Omitted	-0.146
	(0.4213)	(0.5581)	(0.5634)		(0.3276)
$Crisis_{t+1}$	1.019***	0.021	0.1636	Omitted	0.4976*
	(0.3513)	(0.5005)	(0.5119)		(0.3015)
Country	42	42	41	41	42
Obs.	899	846	891	817	946
No. of events	169	169	156	154	169
	PI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.0201	0.438	0.2799	Omitted	0.2368
	(0.5054)	(0.4019)	(0.4489)		(0.3084)
$Crisis_t$	-0.6063	-0.6417	-0.8077	Omitted	-0.5539
	((0.6293)	(0.7354)	(0.7529)		(0.4135)
$Crisis_{t+1}$	-1.7219*	-1.6465	-1.5245	Omitted	-1.518**
	(1.0154)	(1.0305)	(0.9635)		(0.5986)
Country	43	43	41	42	43
Obs.	1,007	1,007	936	847	1,007
No. of events	152	152	138	135	152
	OI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.5337*	0.5987*	0.6777**	0.4015	0.5076**
	(0.3122)	(0.3145)	(0.34)	(0.4824)	(0.2121)
$Crisis_t$	0.0923	1.2443***	0.2483	0.8015	0.5673***
	(0.378)	(0.2832)	(0.3568)	(0.5345)	(0.1998)
$Crisis_{t+1}$	0.2718	0.3042	0.1467	-0.2206	0.1539
	(0.3669)	(0.3623)	(0.3932)	(0.7492)	(0.2399)
Country	55	55	51	53	55
Obs.	1,216	1,216	1,106	1,091	1,216
No. of events	238	238	211	214	238

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. ‘Financial crisis’ is an indicator variable that takes on a value of unity if a country experiences any crisis. ‘Omitted’ means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.18: Robustness Check (Flight); Excluding Intersection

	FDI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	Omitted	-1.3888	Omitted	Omitted	-2.4511**
		(1.0168)			(1.0263)
$Crisis_{t}$	0.6901	-1.4722	-0.2278	Omitted	-0.0776
	(0.4495)	(0.9827)	(0.5819)		(0.3962)
$Crisis_{t+1}$	0.7155	0.1749	0.0583	Omitted	0.357
	(0.4768)	(0.5218)	(0.6176)		(0.3548)
Country	60	60	60	60	60
Obs.	1,297	1,356	1,185	1,168	1,356
No. of events	84	84	78	80	84
	PI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.0997	-0.022	0.0787	Omitted	-0.0184
	(0.7436)	(0.625)	(0.58)		(0.4461)
$Crisis_{t}$	-0.0636	-0.9946	Omitted	Omitted	-0.8026
	(0.7404)	(1.0569)			(0.6333)
$Crisis_{t+1}$	Omitted	-1.0086	Omitted	Omitted	-1.8867*
		(1.0171)			(1.0133)
Country	60	60	60	60	60
Obs.	1,304	1,356	1,136	1,168	1,356
No. of events	74	74	63	66	74
	OI Flight				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.4741	0.6071*	0.6163*	0.6589	0.3996*
	(0.3303)	(0.3276)	(0.333)	(0.4674)	(0.2147)
$Crisis_{t}$	-0.2354	1.3565***	0.1557	1.1886**	0.5227**
	(0.4649)	(0.2786)	(0.4024)	(0.489)	(0.2145)
$Crisis_{t+1}$	-0.1682	0.3877	0.233	-0.0317	0.0127
	(0.4578)	(0.3731)	(0.3963)	(0.7211)	(0.2581)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	163	163	142	146	163

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.19: Robustness Check (Retrenchment); Severe Retrenchment

	FDI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.267	0.2972	-0.5008	-0.3109	-0.4427
	(0.4623)	(0.4614)	(0.6114)	(1.0042)	(0.3727)
$Crisis_t$	-1.3484	0.3958	-0.1005	0.4637	-0.0818
	(0.9942)	(0.4426)	(0.5146)	(0.7098)	(0.3361)
$Crisis_{t+1}$	0.0295	0.1841	-0.2178	Omitted	0.0042
	(0.5879)	(0.5231)	(0.6003)		(0.3578)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,216	1,356
No. of events	83	83	71	74	83
	PI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.4237	-0.4304	-0.3186	Omitted	-0.6408*
	(0.5083)	(0.522)	(0.4656)		(0.3374)
$Crisis_t$	-0.1417	0.2378	-0.5446	-0.8972	-0.0323
	(0.4302)	(0.3916)	(0.5208)	(1.0511)	(0.2857)
$Crisis_{t+1}$	-0.0879	0.5049	-1.1099	Omitted	-0.2444
	(0.5076)	(0.3737)	(0.7052)		(0.3272)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,189	1,356
No. of events	149	149	138	138	149
	OI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3226	-0.0718	-0.5582	0.571	-0.4464*
	(0.3985)	(0.3442)	(0.4245)	(0.4108)	(0.2616)
$Crisis_t$	-0.5746	-0.151	-0.4215	-0.5758	-0.5244**
	(0.4453)	(0.345)	(0.3996)	(0.722)	(0.2658)
$Crisis_{t+1}$	-0.1089	-0.1584	-0.7826	0.1939	-0.3216
	(0.3935)	(0.3631)	(0.5038)	(0.5096)	(0.2603)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	190	190	171	177	190

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.20: Robustness Check (Retrenchment); Excluding Global Financial Crisis

	FDI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.0336	0.2444	-0.6348	0.2175	-0.4033
	(0.456)	(0.4283)	(0.5969)	(0.7131)	(0.3351)
$Crisis_t$	-0.7217	0.4265	-0.03	0.32	-0.1124
	(0.7144)	(0.4092)	(0.4614)	(0.7133)	(0.3198)
$Crisis_{t+1}$	-0.1507	-0.0104	-0.3697	Omitted	-0.205
	(0.5894)	(0.5254)	(0.594)		(0.3574)
Country	60	60	60	60	60
Obs.	1,243	1,243	1,143	1,107	1,243
No. of events	97	97	80	86	97
	PI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3526	-0.138	-0.0351	-1.0242	-0.2232
	(0.454)	(0.4322)	(0.4062)	(1)	(0.2755)
$Crisis_t$	-0.3618	0.1808	-0.3746	-0.201	-0.1964
	(0.5031)	(0.3854)	(0.4637)	(0.7554)	(0.2862)
$Crisis_{t+1}$	-0.2143	0.7304**	-0.2202	-0.8704	0.0888
	(0.5096)	(0.3303)	(0.4801)	(1.0302)	(0.2825)
Country	60	60	60	60	60
Obs.	1,243	1,243	1,143	1,128	1,243
No. of events	144	144	133	132	144
	OI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3582	0.0014	-0.5301	0.4037	-0.3213
	(0.3294)	(0.269)	(0.3456)	(0.356)	(0.1993)
$Crisis_t$	-0.2648	-0.0363	0.0134	-0.0377	-0.156
	(0.3413)	(0.2859)	(0.2981)	(0.4795)	(0.2054)
$Crisis_{t+1}$	0.1359	-0.369	-0.2003	0.2208	-0.0888
	(0.3008)	(0.3269)	(0.3291)	(0.4204)	(0.1984)
Country	60	60	60	60	60
Obs.	1,243	1,243	1,143	1,128	1,243
No. of events	262	262	236	240	262

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.21: Robustness Check (Retrenchment); Including Country-fixed Effects

	FDI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	0.3101	0.4167	-0.6739	0.9404	-0.1617
	(0.4749)	(0.4317)	(0.5774)	(0.7799)	(0.344)
$Crisis_t$	-1.1357*	0.2397	-0.0723	1.7717***	-0.2227
	(0.6746)	(0.4532)	(0.4614)	(0.6714)	(0.3616)
$Crisis_{t+1}$	-0.4308	-0.1191	-0.4045	Omitted	-0.1629
	(0.6493)	(0.5486)	(0.6477)		(0.3873)
Country	33	33	30	33	33
Obs.	739	739	656	654	739
No. of events	101	101	83	90	101

	PI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3751	-0.2411	-0.2234	-1.1385	-0.3864
	(0.4549)	(0.4711)	(0.4054)	(0.9806)	(0.2918)
$Crisis_t$	-0.1159	0.1769	-0.3866	-0.2155	-0.175
	(0.4126)	(0.3891)	(0.456)	(0.8113)	(0.2879)
$Crisis_{t+1}$	-0.3714	0.6701**	-0.3688	-0.8456	-0.0512
	(0.5323)	(0.3295)	(0.5226)	(1.0907)	(0.2858)
Country	53	53	51	52	53
Obs.	1,205	1,205	1,137	1,125	1,205
No. of events	175	175	161	162	175

	OI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.4542	-0.0406	-0.6224*	0.3789	-0.3933*
	(3401)	(0.279)	(0.3622)	(0.3918)	(0.2082)
$Crisis_t$	-0.4306	-0.1096	-0.0575	-0.1389	-0.2718
	(0.3509)	(0.3039)	(0.3249)	(0.5224)	(0.218)
$Crisis_{t+1}$	-0.0143	-0.4031	-0.1526	0.1858	-0.1483
	(0.3149)	(0.3314)	(0.347)	(0.4524)	(0.2062)
Country	59	59	55	58	59
Obs.	1,343	1,343	1,233	1,222	1,343
No. of events	293	293	265	271	293

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3.22: Robustness Check (Retrenchment); Excluding Intersection

	FDI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.0703	-0.131	Omitted	Omitted	-0.737
	(0.5949)	(0.584)			(0.4653)
$Crisis_{t}$	-0.4054	0.0679	0.1459	-0.1411	-0.0819
	(0.7107)	(0.5405)	(0.5284)	(1.0074)	(0.3721)
$Crisis_{t+1}$	-0.2448	-0.4618	0.0409	Omitted	-0.0951
	(0.7097)	(0.7142)	(0.6)		(0.3962)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,185	1,189	1,356
No. of events	65	65	56	58	65
	PI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3807	0.2304	0.0328	Omitted	-0.1521
	(0.5875)	(0.4668)	(0.4822)		(0.323)
$Crisis_{t}$	0.183	0.4831	0.0639	0.3639	0.26
	(0.4574)	(0.4601)	(0.4623)	(0.7743)	(0.3026)
$Crisis_{t+1}$	-0.6449	0.8343**	-0.3742	-0.3358	0.0278
	(0.7155)	(0.3878)	(0.6154)	(1.0257)	(0.3425)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,209	1,356
No. of events	113	113	110	104	113
	OI Retrenchment				
	Banking	Currency	Debt	Inflation	Financial
$Crisis_{t-1}$	-0.3603	0.0689	-0.7536*	0.3273	-0.2709
	(0.3648)	(0.2869)	(0.4158)	(0.4056)	(0.2158)
$Crisis_{t}$	-0.2553	-0.0706	0.044	-0.0094	-0.0759
	(0.3622)	(0.3143)	(0.3219)	(0.5349)	(0.2181)
$Crisis_{t+1}$	0.0721	-0.9451**	-0.2328	0.4747	-0.1968
	(0.3275)	(0.4583)	(0.3628)	(0.4208)	(0.2222)
Country	60	60	60	60	60
Obs.	1,356	1,356	1,250	1,237	1,356
No. of events	227	227	208	211	227

Notes: Control variables are global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term. 'Financial crisis' is an indicator variable that takes on a value of unity if a country experiences any crisis. 'Omitted' means there is no sample to estimate, and the coefficient is unidentifiable. Robust standard errors are in the parenthesis and *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Appendix A

Chapter 1 Appendix

A.1 The list of countries

Country	Year	Country	Year
Angola	1990	Lesotho	1990
Armenia	1995	Lithiania	1995
Belarus	1997	Malaysia	1990-2009
Belize	1990	Maldives	1990
Bolivia	1990	Mexico	1990
Bosnia and Herzegovina	1998	Moldova	1995
Botswana	1990	Mongolia	1990
Brazil	1990	Morocco	1990
Bulgaria	1990	Namibia	1990
Chile	1990	Nigeria	1990
Colombia	1990	Pakistan	1990
The Rep. of the Congo	1990-2007	Paraguay	1990
Costa Rica	1990	Peru	1990
Cote d'Ivore	1990-2013	Philippines	1990
Dominica	1990-2013	Poland	1990
Dominican Republic	1990	Romania	1990
Egypt	1990	Russia	1995
El Salvador	1990	Saint Lucia	1990-2013
Georgia	1997	Seychelles	1990
Grenada	1990-2013	South Africa	1990
Guatemala	1990	Sri Lanka	1990
Honduras	1990	Syria	1990-2010
India	1990	Thailand	1990
Indonesia	1990	Tunisia	1990
Jamaica	1990	Turkey	1990
Jordan	1990	Ukraine	1995
Kazakhstan	1994	Uruguay	1990
Latvia	1995	Venezuela	1990-2013

Notes: Total 56 countries. Year indicates available gross capital outflow data in each country. It covers until 2014, unless specified.

A.2 Data sources

Variable	Definition	Source
Gross capital inflows (% of GDP)	Net domestic-asset purchase by foreign agents. Domestic assets consist of foreign direct investment, portfolio investment, and other investment	IMF BOPS
Gross capital outflows (% of GDP)	Net foreign-asset purchase by domestic agents. Foreign assets consist of foreign direct investment, portfolio investment, and other investments	
GDP (nominal and real)		IMF WEO
Real GDP growth (%)		
Total investment (% of GDP)	Gross capital formation	
Capital market openness	The index ranged from 0 to 1. 1 means the most liberalized market	Chinn and Ito (2006)
Exchange rate regime	The index ranged from 1 to 16. 16 means the most flexible regime	Ilzetzki et al. (2016)
Private saving	Gross national saving - Gross public saving Gross national saving= (Gross national disposable income) -(Consumption expenditure)	Alfaro et al. (2014)

A.3 Generalized Method of Moments estimator

Appendix A.3 briefly introduces three kinds of two-step GMM estimators (difference GMM, system GMM, and orthogonal deviation GMM) that were used in this essay.[1] Appendix A.3.1 explains how two-step GMM estimators become feasible and efficient and Appendix A.3.2 describes three GMM estimators: difference GMM (DGMM), system GMM (SGMM), and orthogonal deviation GMM (OGMM). Appendix A.3.3 discusses the tests to prove their validity.

A.3.1 Two-step GMM: efficiency and feasibility

We begin with following simple model:

$$y = X^{'}\beta + u \tag{A.1}$$

where y is the column vector for a dependent variable, X is the matrix for k independent variables ($(x_1, x_2, ..., x_k)^{'}$), and β is the column vector for coefficients. The primary purpose of IV regression is to find instruments matrix, Z, that satisfies

$$E[Z\widehat{u}] = 0 \tag{A.2}$$

where $\widehat{u}$=$y-X^{'}\widehat{\beta}$=$(\widehat{u}_1, \widehat{u}_2, ..., \widehat{u}_N)^{'}$ and Z is the matrix for j instruments, ($(z_1, z_2, ..., z_j)^{'}$) for $j \geq k$. Each IV regression has their own strategy but the GMM estimator uses positive-semidefinit matrix, A, to measure the magnitude of it, which is $(1/N)\widehat{u}^{'}ZAZ^{'}\widehat{u}$.

[1] Appendix A.3 is the summary of Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (1998), and Roodman (2009a). See their papers for detailed descriptions of GMM estimators.

The first order condition of it is

$$\frac{1}{N}\widehat{u}^{'}ZAZ^{'}X = 0 \tag{A.3}$$

Accordingly,

$$\begin{aligned}
&\frac{1}{N}\widehat{u}^{'}ZAZ^{'}X = 0 \\
\Rightarrow&(y - X\widehat{\beta})^{'}ZAZ^{'}X = y^{'}ZAZ^{'}X - \widehat{\beta}^{'}X^{'}ZAZ^{'}X = 0 \\
\Rightarrow&X^{'}ZAZ^{'}X\widehat{\beta} = X^{'}ZAZ^{'}y \qquad (A = A^{'}) \\
\Rightarrow&\widehat{\beta} = (X^{'}ZAZ^{'}X)^{-1}X^{'}ZAZ^{'}y
\end{aligned}$$

$\widehat{\beta}$, here, is a GMM estimate.

Feasibility and efficiency depend on weighting matrix A. If the estimator is unbiased, $\widehat{\beta}$ does not change regardless of A but the magnitude of each moment is largely affected by it even if each moment condition is satisfied. The magnitude especially can be inflated by the variance of each instrument if some instruments have high variance and they will prevent $\widehat{\beta}$ being efficient. To suppress such high variance of each instrument, the GMM estimator uses the inverse of variance matrix of moments as a weighting matrix (var(Z$\widehat{u}$)$^{-1}$). As a result, we can get an efficient GMM estimate such as

$$\begin{aligned}
\widehat{\beta} &= (X^{'}Z[var(Z\widehat{u})]^{-1}Z^{'}X)^{-1}X^{'}Z[var(Z\widehat{u})]^{-1}Z^{'}y \qquad \text{(A.4)} \\
&= (X^{'}Z[Z^{'}E(\widehat{u}^{'}\widehat{u}|Z)Z]^{-1}Z^{'}X)^{-1}X^{'}Z[Z^{'}E(\widehat{u}^{'}\widehat{u}|Z)Z]^{-1}Z^{'}y
\end{aligned}$$

Although it is an efficient estimate, we still don't know if it is feasible, yet. Defining $H = E(\widehat{u}^{'}\widehat{u}|Z)$, a remaining issue is that we need to estimate $E(\widehat{u}^{'}\widehat{u}|Z)$ before estimating $\widehat{\beta}$. It necessitates reasonable and minimal assumptions on $\widehat{u}$. The most reasonable and safest assumption would be that it is homoscedasticity. Under this i.i.d. assumption, $E(\widehat{u}'\widehat{u}|Z) = ME(u'u|Z)M' = \sigma^2 MIM' = \sigma^2 MM'$, where M is the matrix to transform u according to the estimator and I is an identity matrix. The One-step GMM estimator, therefore, uses it as a weighting matrix. To be specific, $\widehat{\beta}_{1step} = (X'Z[Z'HZ]^{-1}Z'X)^{-1}X'Z[Z'HZ]^{-1}Z'y$ where

$$H_{DGMM} = \begin{bmatrix} 2 & -1 & 0 & \dots \\ -1 & 2 & -1 & \dots \\ 0 & -1 & 2 & \dots \\ 0 & 0 & -1 & \dots \\ \vdots & \vdots & \vdots & \ddots \end{bmatrix}, H_{SGMM} = H_{OGMM} = I^2 \tag{A.5}$$

Of course, this one-step estimator is not robust to heteroscedastistic error terms. To estimate $\widehat{\beta}$, which is robust to them, we estimate H by running the regression with $\widehat{\beta}_{1step}$. Therefore,

$$\widehat{\beta}_{2step} = (X'Z[Z'\widehat{H}_{1step}Z]^{-1}Z'X)^{-1}X'Z[Z'\widehat{H}_{1step}Z]^{-1}Z'y \tag{A.6}$$

and it is flexible to heteroscedastistic errors. This essay uses this two-step GMM estimator. A weakness of the two-step GMM estimator is that it underestimates standard errors. To fix this problem, I follow Windmeijer's (2005) correcting algorithm.

[2]Roodman (2009a) suggests slightly different H_{SGMM} considering the transformation of equations and this essay follows his suggestion. See (26) in his paper.

A.3.2 Difference, system, and orthognal deviation GMM estimators

We now begin with the following panel data model in which i is for individuals and t is for time with traditional assumptions.

$$y_{it} = X_{it}^{'}\beta + u_{it} \tag{A.7}$$

$$u_{it} = \eta_i + \epsilon_{it}$$

$$E(\eta_i) = E(\epsilon_{it}) = E(\eta_i \epsilon_{it}) = 0$$

We first take difference of it to get rid of fixed effects, which generates:

$$\Delta y_{it} = \Delta X_{it}^{'}\beta + \Delta\epsilon_{it} \tag{A.8}$$

where $\Delta y_{it} = y_{it} - y_{it-1}$, for example. At this stage, $\Delta X_{it}^{'}\beta$ and $\Delta\epsilon_{it}$ are still correlated with each other under the assumption that X_{it} and ϵ_{it} are correlated with each other. In difference GMM estimator, we construct the instrument set, Z, which contains twice and further lagged Xs (adding the first lag if X is predetermined) to satisfy the moment conditions, $E(\epsilon|z) = 0$. The lags are suitable instruments for original variables as they are strongly correlated with the latter and, therefore, satisfy the exclusion restriction condition. However, two additional conditions should be satisfied for the validity of the instruments. First, they have to be orthogonal to error terms. Second, differenced error terms should not be serially correlated. Specifically, they are

$$E[(X_{it-s}\epsilon*_{it})] = 0 \; for \; t \geq 3 \; and \; s \geq 2 \tag{A.9}$$

where $\epsilon*_{it}$ is the transformed error term and

$$E[(\epsilon_{it} - \epsilon_{it-1})(\epsilon_{it-2} - \epsilon_{it-3})] = 0 \; for \; t \geq 3 \tag{A.10}$$

When these conditions are satisfied, lagged variables become appropriate instruments.

On the contrary, Blundell and Bond (1998) argue that the first-differenced GMM estimator can work as a weak instrument if original variables are highly persistent, as lagged levels will be weakly correlated with subsequent first differences. If so, it causes large finite-sample biases and it motivated them to extend the system by adding level equations. Accordingly, $\widehat{\beta}$ is estimated by the following equation

$$\begin{pmatrix} \Delta y_{it} \\ y_{it} \end{pmatrix} = \begin{pmatrix} \Delta X_{it} \\ X_{it} \end{pmatrix}' \widehat{\beta} + \begin{pmatrix} \Delta u_{it} \\ u_{it} \end{pmatrix} \tag{A.11}$$

and ΔX_{it-1} is used as the instruments for level equations.[3]

With (A.9) and (A.10), an additional condition is required for ΔX_{it-1} to be valid instruments. Since fixed effects are still left in level equations, differenced lags themselves need to be orthogonal to fixed effects, which means

$$E[\Delta X_{it-1}(\eta_i)] = 0 \tag{A.12}$$

This indicates samples are not too far from steady states throughout the sampled period and, therefore, the deviations are not systematically correlated with fixed effects. Assuming $X_{it} = \gamma X_{it-1} + (\delta\eta_i + \upsilon_{it})$, Blundell and Bond (1998) show the following condition should be satisfied for (C.12) with the first observation, x_{i1}:

$$E\left[\left(x_{il} - \frac{\delta\eta_i}{1-\gamma}\right)\delta\eta_i\right] = 0 \tag{A.13}$$

The sufficient condition (but not necessary) for (A.13) is that x_{it} and y_{it} both have stationary processes ($|\gamma| < 1$).

[3]First differences can be replaced with orthogonal deviations, which are described below.

Difference GMM also might not work well with unbalanced panel data because if some observations are missing, available equations may significantly decrease. For example, if y_{it-1} is not observed, not only the equation for y_{it-1} but also the one for y_{it} is not available. This might cause small sample bias and make GMM inefficient. Furthermore, Bun and Windmeijer (2010) argue the system GMM estimator for the dynamic panel data models might have a similar weak instrument problem as the difference GMM estimator does. Under this circumstance, the system GMM estimator is not a consistent estimator anymore. In this case, orthogonal deviation GMM (Arellano and Bover (1995)) could be a solution. Orthogonal deviation GMM requires each equation to be subtracted from the average of future available samples. That is,

$$\Delta^* x_{it} = c_{it}(x_{it} - \frac{1}{T_{it}} \sum_{s>t} x_{is}) \tag{A.14}$$

where $c_{it} = \sqrt{T_{it}/(T_{it}+1)}$ and T_{it} is the number of observations from time t for individual i. Multiplying c_{it} allows H_{OGMM} to be an identity matrix under i.i.d. assumption and we can see only one equation is unavailable for missing x_{it} with unbalanced panel data. Hayakawa (2009) shows that the orthogonal deviation GMM estimator has smaller finite sample biases than the difference GMM estimator under the dynamic panel data model using Monte Carlo simulations.

A.3.3 Tests for validity

As stated above, (A.9) and (A.10) have to be satisfied for GMM estimators to be valid. First, the Sargan or Hansen test can be performed to test (A.9). The Sargan test and Hansen test have their own pros and cons. For instance, if error terms are heteroscedastic, the result from the Sargan test is not robust, unlike the Hansen test. On the other hand, the Hansen test is vulnerable to too many instruments, unlike the Sargan test. Considering homoscedasticity is hardly satisfied, this essay has performed Hansen tests and reported them in the results.[4] Additionally, when we estimate system GMM estimator, we need to check whether newly added instruments (differenced lags) are also orthogonal to error terms without the original instrument set because the Hansen test only reports the statistic with the whole instrument set. We can verify this condition by performing a difference-in-Hansen test that performs the test only with newly added instruments. The null hypothesis of the Hansen test (and difference-in-Hansen test) is that (additional) instruments are orthogonal to error terms.

Second, to prove (A.10), we test whether differenced error terms are second-order serially correlated. It is called an Arellano-Bond test, as they first suggested it. The null hypothesis is that differenced error terms are not serially correlated of order 2.

GMM requires time span, T, to be short because of possible problems that might be caused by too many instruments.[5] First, too many instruments can overfit instrumented variables. In extreme cases, instruments might perfectly predict instrumented variables and, as a result, the GMM estimator simply becomes an OLS estimator.[6] In this case, GMM fails to expunge endogenous components in estimates. Second, because of too many moments to estimate, GMM might estimate a weighting matrix

[4]The methods to reduce the number of instruments are discussed below.
[5]See Roodman (2009b).
[6]Imagine a 2SLS estimator with $R^2 = 1$ in the first stage.

imprecisely. Third, the Hansen test (difference-in-Hansen test) becomes favorable to instruments by reporting a p-value that is almost 1.000. As a result, the Hansen test and GMM estimates lose credibility.

As a result of these problems, any researcher who uses GMM estimators needs to control the number of instruments. Roodman (2009b) suggests two ways of reducing the number. First, we can use only certain lags rather than all lags and, second, we can collapse the instrument matrix. It is also possible to use both methods together. For instance, if we collapse the original instrument set and use only three lags, it becomes as follows:

$$\begin{bmatrix} x_{i1} & 0 & 0 & 0 & 0 & 0 & \dots \\ 0 & x_{i2} & x_{i1} & 0 & 0 & 0 & \dots \\ 0 & 0 & 0 & x_{i3} & x_{i2} & x_{i1} & \dots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \ddots \end{bmatrix} \Rightarrow \begin{bmatrix} x_{it-4} & 0 & 0 \\ x_{it-3} & x_{it-4} & 0 \\ x_{it-2} & x_{it-3} & x_{it-4} \end{bmatrix}$$

We can see that the number of instruments are significantly reduced from T(T-1)/2 to 3 for one variable.

How many instruments are appropriate? Unfortunately, there is no clear answer for this because a small number of instruments also hurts the efficiency of the estimator. As a rule of thumb, Roodman (2009b) suggests the number of instruments to be smaller than the number of individuals in the data. This essay follows his suggestion and the number of instruments are reported in the result to prove it.

Appendix B

Chapter 2 Appendix

B.1 Adaptive Markov chain Monte Carlo sampling algorithm

Appendix B.1 briefly describes the AMCMC sampling algorithm that is used in this essay.[1] As the name "Monte Carlo" implies, AMCMC estimates parameters by calculating the mean of a number of sample parameters from quasi-posterior distribution. The algorithm begins with an arbitrary initial parameter X_0, μ_0, an arbitrary initial covariance matrix Σ_0 for a proposal distribution, an initial value of a scaling parameter λ_0, a targeted acceptance rate α^*, a dampening parameter δ, and draws T. We set t=0 and repeat steps 1-8 while $t \leq T$ (Baker, 2014):

1. Draw a candidate $Y_t \sim MVN(X_t, \lambda_t \Sigma_t)$.

[1]See Andrieu and Thoms (2008) and Baker(2014) for a detailed description of AMCMC and Chernozhukov and Hong (2003) for the application of it.

2. Compute $\alpha(Y_t, X_t) = min\left[\frac{\pi(Y_t)}{\pi(X_t)}, 1\right]$

3. Set $X_{t+1} = Y_t$ with probability $\alpha(Y_t, X_t)$ and $X_{t+1} = X_t$ with probability $1 - \alpha(Y_t, X_t)$.

4. Compute weighting parameter $\gamma_t = \frac{1}{(1+t)^\delta}$.

5. Update $\lambda_{t+1} = exp[\gamma_t(\alpha(Y_t, X_t) - \alpha^*)]\lambda_t$.

6. Update $\mu_{t+1} = \mu_t + \gamma_t(X_{t+1} - \mu_t)$.

7. Update $\Sigma_{t+1} = \Sigma_t + \gamma_t[(X_{t+1} - \mu_t)(X_{t+1} - \mu_t)' - \Sigma_t]$

8. Increment t.

The result is the sequence $\{X_t\}_{t=1}^T$ and the estimate is the mean of them. The performance of MCMC depends on the proposal distribution. If it fails to propose proper candidates, the mean of the sequence will not converge to the target parameter.

AMCMC uses symmetric distribution as a proposal distribution and, in many cases, (multivariate) normal distribution is used. This essay uses multivariate normal distribution with the mean X_t and the variance-covariance matrix $\lambda_t \Sigma_t$ (See, e.g., Andrieu and Thoms, 2008). We can see that the proposal distribution adapts to the new information that is embodied in the mean and covariance matrix. Next, we need to decide whether to accept a new candidate. The probability to accept a candidate is $\frac{\pi(Y_t)}{\pi(X_t)}$ in which $\pi(X_t)$ is the target distribution of X_t. To understand the target distribution, recall our objective function, f(b):

$$f(b) = -\frac{N}{2}\hat{g}(b)'\hat{A}\hat{g}(b) \tag{B.1}$$

and this objective function can be transformed into a quasi-posterior distribution, $p(b|X) = e^{f(b)} \cdot p(b)/\int_{\mathfrak{B}} e^{f(b)}db$ (Chernozhukov and Hong, 2003) and via Bayes' rule, we can see that the posterior distribution is proportional to $e^{f(b)} : p(b|X) \propto e^{f(b)}$.[2] Therefore, the acceptance rate, $min\left[\frac{\pi(Y_t)}{\pi(X_t)}, 1\right]$, implies we accept Y_t in 100% if it increases the value of the target distribution. The acceptance rate provides the information to judge whether AMCMC works properly because too many or too few acceptance of new draws disrupts its convergence. Rosenthal (2011) shows the optimal acceptance rate is 0.234 but argues the algorithm's efficiency remains high in [0.1, 0.6]. The target acceptance rate, α^*, assists the actual acceptance rate $\alpha(Y_t, X_t)$ to be in this range.

Dampening parameter δ controls how quickly the impact of the "tuning" parameters decays through the parameter γ_t. For large values of δ, $\gamma_t = \frac{1}{(1+t)^\delta}$ approaches zero quickly as t grows and, as a result, $\lambda_{t+1} = \lambda_t$, μ_{t+1}, $\Sigma_{t+1} = \Sigma_t$ and the proposal distribution stops adaptation and becomes stable. μ_t is a sort of pseudo-mean in the sense that it is only used to update covariance matrix, Σ_t. Note that the mean of the proposal distribution is X_t. Lastly, the values of parameters used for the estimation are as follows:

- Draws: 10,000
- Burns: 2,000
- $\mu_0 = X_0$
- $\alpha^* =$ 0.3-0.6

[2]The prior distribution of the parameter is assumed to be uniform so that it is constant over the support of the parameter.

- $\delta = 0.234$ (Powell, 2015)
- $\lambda = 2.38^2/29$ (Andrieu and Thoms, 2008)

B.2 Data sources

Variable	Definition	Source
Gross capital outflows (% of GDP)	Net foreign-asset purchase by domestic agents. Foreign assets consist of foreign direct investment, portfolio investment, and other investment	IMF BOPS
Gross capital inflows (% of GDP)	Net domestic-asset purchase by foreign agents. Domestic assets consist of foreign direct investment, portfolio investment, and other investment	IMF BOPS
GDP (nominal and real)		IMF WEO
Private saving	Gross national saving - Gross public saving Gross national saving = (Gross national disposable income) -(Consumption expenditure)	Alfaro et al. (2014)
Exchange rate regime	The index ranged from 1 to 16. 16 means the most flexible regime	Ilzetzki, Reignhart and Rogoff (2016)
Real GDP growth (%)		IMF WEO
Capital market openness	The index ranged from 0 to 1. 1 means the most liberalized market	Chinn and Ito (2006)
Public saving	(Government revenue) - (Government expenditure) + (Grants and other revenue) + (Accumulation of reserves) - (Capital transfer payments abroad)	Alfaro et al. (2014)
Domestic credit	Financial resources provided to the private sector by financial corporations	WDI

Bibliography

[1] Christopher H Achen. Why lagged dependent variables can suppress the explanatory power of other independent variables. *Ann Arbor*, 1001(2000):48106–1248, 2000.

[2] Alberto Alesina and Guido Tabellini. External debt, capital flight and political risk. *Journal of International Economics*, 27:199–220, 1989.

[3] Laura Alfaro, Sebnem Kalemli-Ozcan, and Vadym Volosovych. Sovereigns, upstream capital flows, and global imbalances. *Journal of the European Economic Association*, 12(5), 2014.

[4] Christophe Andrieu and Johannes Thoms. A tutorial on adaptive MCMC. *Statistics and Computing*, 18(4):343–373, 2008.

[5] Manuel Arellano and Stephen Bond. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, 58(2):277, 1991.

[6] Manuel Arellano and Olympia Bover. Another look at the instrumental variable

estimation of error-components models. *Journal of Econometrics*, 68(1):29–51, 1995.

[7] Kee-Hong Bae, René M Stulz, and Hongping Tan. Do local analysts know more? a cross-country study of the performance of local analysts and foreign analysts. *Journal of Financial Economics*, 88(3):581–606, 2008.

[8] Matthew J Baker. Adaptive Markov chain Monte Carlo sampling and estimation in Mata. *The Stata Journal*, (ii):1–37, 2014.

[9] Karl M. Bennett. External debt, capital flight and stabilization policy the experiences of barbados, guyana, jamaica and trinidad and tobago. *Social and Economic Studies*, 37(4):57–77, 1988.

[10] Richard Blundell and Steve Bond. GMM estimation with persistent panel data: an application to production functions. *Econometric Reviews*, 19(3):321–340, 1998.

[11] Thomas Brambor, William Roberts Clark, and Matt Golder. Understanding interaction models: Improving empirical analyses. *Political analysis*, 14(1):63–82, 2006.

[12] Fernando Broner, Tatiana Didier, Aitor Erce, and Sergio L. Schmukler. Gross capital flows: Dynamics and crises. *Journal of Monetary Economics*, 60(1):113–133, 2013.

[13] Maurice JG Bun and Frank Windmeijer. The weak instrument problem of the

system gmm estimator in dynamic panel data models. *The Econometrics Journal*, 13(1):95–126, 2010.

[14] César Calderón and Megumi Kubota. Sudden stops: Are global and local investors alike? *Journal of International Economics*, 89(1):122–142, 2013.

[15] Guillermo a. Calvo. Capital Flows and Capital-Market Crisis: The Simple Economics of Sudden Stops. *Journal of Applied Economics*, 1(1):35–54, 1998.

[16] Eduardo Cavallo, Andrew Powell, Mathieu Pedemonte, and Pilar Tavella. A new taxonomy of Sudden Stops: Which Sudden Stops should countries be most concerned about? *Journal of International Money and Finance*, 51:47–70, 2015.

[17] Surajeet Chakravarty, Miguel A Fonseca, and Todd R Kaplan. An experiment on the causes of bank run contagions. *European Economic Review*, 72:39–51, 2014.

[18] Victor Chernozhukov and Christian Hansen. An IV Model of Quantile Treatment Effects. *Econometrica*, 73(1):245–261, 2005.

[19] Victor Chernozhukov and Christian Hansen. Instrumental variable quantile regression: A robust inference approach. *Journal of Econometrics*, 142(1):379–398, 2008.

[20] Victor Chernozhukov and Han Hong. An MCMC approach to classical estimation. *Journal of Econometrics*, 115(2):293–346, 2003.

[21] Menzie D. Chinn and Hiro Ito. What matters for financial development? Cap-

ital controls, institutions, and interactions. *Journal of Development Economics*, 81(1):163–192, October 2006.

[22] Nicolas Coeurdacier and Hélène Rey. Home Bias in Open Economy Financial Macroeconomics. *Journal of Economic Literature*, 51(210584):63–115, 2012.

[23] Kevin Cowan, José De Gregorio, Alejandro Micco, and Christopher Neilson. Financial Diversification, Sudden Stops, and Sudden Starts. *Current Account and External Financing*, 12:159–194, 2008.

[24] J.T. Cuddington. *Capital Flight: Estimates, Issues, and Explanations*. CPD discussion paper. International Finance Section, Department of Economics, Princeton University, 1986.

[25] Asli Demirgüç-Kunt and Enrica Detragiache. The determinants of banking crises in developing and developed countries. *Staff Papers*, 45(1):81–109, 1998.

[26] Douglas W Diamond and Philip H Dybvig. Bank runs, deposit insurance, and liquidity. *Journal of political economy*, 91(3):401–419, 1983.

[27] Kjell Doksum. Empirical probability plots and statistical inference for nonlinear models in the two-sample case. *The Annals of Statistics*, 2(2):267–277, 1974.

[28] Michael P Dooley. Capital flight: a response to differences in financial risks. *Staff Papers*, 35(3):422–436, 1988.

[29] Michael P Dooley and Kenneth M Kletzer. Capital flight, external debt and domestic policies. Technical report, National Bureau of Economic Research, 1994.

[30] Rudiger Dornbusch. *Inflation, exchange rates, and stabilization.* International finance section, Department of economics, Princeton University, 1986.

[31] Martin Dufwenberg. Banking on experiments? *Journal of Economic Studies*, 42(6):943–971, 2015.

[32] Martin Feldstein. The Effects of Outbound Foreign Direct Investment on the Domestic Capital Stock. *National Bureau of Economic Research*, (January):43–66, 1995.

[33] Martin Feldstein and Philippe Bacchetta. National saving and international investment. *National Saving and Economic Performance*, pages 201–226, January 1991.

[34] Martin Feldstein and Charles Horioka. Domestic Saving and International Capital Flows. *The Economic Journal*, 90(358):314–329, 1980.

[35] Andrés Fernàndez, Michael W. Klein, Alessandro Rebucci, Martin Schindler, and Martín Uribe. Capital Control Measures: A New Dataset. *IMF Economic Review*, 64(3):548–574, August 2016.

[36] Kristin J. Forbes and Francis E. Warnock. Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics*, 88(2):235–251, 2012a.

[37] Kristin J. Forbes and Francis E. Warnock. Debt- and Equity-Led Capital Flow Episodes. *NBER Working Paper Series*, (18329), August 2012b.

[38] Marcel Fratzscher. Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics*, 88(2):341–356, 2012.

[39] Robert J Friedrich. In defense of multiplicative terms in multiple regression equations. *American Journal of Political Science*, pages 797–833, 1982.

[40] Antonio F. Galvao. Quantile regression for dynamic panel data with fixed effects. *Journal of Econometrics*, 164(1):142–157, 2011.

[41] Atish R. Ghosh, Jonathan D. Ostry, and Mahvash S. Qureshi. When do capital inflow surges end in tears? *American Economic Review*, 106(5):581–585, 2016.

[42] Kazuhiko Hayakawa. First Difference or Forward Orthogonal Deviation- Which Transformation Should be Used in Dynamic Panel Data Models ?: A Simulation Study. *Economics Bulletin*, 29(3):2008–2017, 2009.

[43] Viktoria Hnatkovska. Home bias and high turnover: Dynamic portfolio choice with incomplete markets. *Journal of International Economics*, 80(1):113–128, 2010.

[44] Ethan Ilzetzki, Carmen M. Reinhart, and Kenneth S. Rogoff. Exchange arrangements entering the 21st century: Which anchor will hold? *NBER Working Paper Series*, (23134), February 2017.

[45] Mohsin S. Khan and Nadeem Ul Haque. Foreign borrowing and capital flight: A formal analysis. *Staff Papers (International Monetary Fund)*, 32(4):606–628, 1985.

[46] Roger Koenker. Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, 91(1):74–89, 2004.

[47] Luc Laeven and Fabian Valencia. Systemic banking crises database: An update. 2012.

[48] Christopher J Malloy. The geography of equity analysis. *The Journal of Finance*, 60(2):719–755, 2005.

[49] Enrique G. Mendoza. Sudden Stops, financial crises, and leverage. *American Economic Review*, 100(5):1941–1966, 2010.

[50] Gian-Maria Milesi-Ferretti and Cédric Tille. The great retrenchment: international capital flows during the global financial crisis. *Economic policy*, 26(66):289–346, 2011.

[51] Silvia Miranda-Agrippino and Hélène Rey. Us monetary policy and the global financial cycle. *NBER Working Paper Series*, (21722), November 2015.

[52] Frederic S Mishkin. Lessons from the asian crisis. *Journal of International Money and Finance*, 18(4):709–723, 1999.

[53] Maurice Obstfeld. Models of currency crises with self-fulfilling features. *European economic review*, 40(3-5):1037–1047, 1996.

[54] Steven F Orpurt. Local analyst earnings forecast advantages in europe. *Available at SSRN 515723*, 2004.

[55] Maria Ponomareva. Identification in Quantile Regression Panel Data Models with Fixed Effects and Small T. *Working Paper*, pages 1–28, May 2011.

[56] David Powell. Quantile Regression with Nonadditive Fixed Effects. *RAND Working Paper*, (April):1–28, 2015.

[57] Carmen Reinhart and Guillermo Calvo. When Capital Inflows Come to a Sudden Stop: Consequences and Policy Options. *MPRA Paper*, (6982), 2000.

[58] Carmen M. Reinhart and Vincent R. Reinhart. Capital flow bonanzas: An encompassing view of the past and present. *NBER Working Paper Series*, (14321), September 2008.

[59] Carmen M Reinhart and Kenneth S Rogoff. *This time is different: Eight centuries of financial folly.* princeton university press, 2009.

[60] Hélène Rey. Dilemma not trilemma: The global financial cycle and monetary policy independence. *NBER Working Paper Series*, (21162), 2013.

[61] David Roodman. How to Do xtabond2: An Introduction to Difference and System GMM in Stata. *The Stata Journal*, (1):86–136, 2009a.

[62] David Roodman. Practitioners' corner: A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1):135–158, 2009b.

[63] Jeffrey S Rosenthal. Optimal Proposal Distributions and Adaptive MCMC. *Handbook of Markov Chain Monte Carlo*, (1):93–112, 2011.

[64] Alexander D. Rothenberg and Francis E. Warnock. Sudden flight and true sudden stops. *Review of International Economics*, 19(3):509–524, 2011.

[65] Klaus Schmidt-Hebbel, Luis Serven, and Andres Solimano. Saving and investment: paradigms, puzzles, policies. *The World Bank Research Observer*, 11(1):87–117, 1996.

[66] Joseph E Stiglitz. Capital market liberalization, economic growth, and instability. *World development*, 28(6):1075–1086, 2000.

[67] Linda L. Tesar. Saving, investment, and international capital flows. *Journal of International Economics*, 31(1-2):55–78, 1991.

[68] Cedric Tille and Eric Van Wincoop. International capital flows. *Journal of international Economics*, 80(2):157–175, 2010.