Capital Controls and the Global Financial Cycle*

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Abstract

Capital flows to emerging markets are volatile and related to global financial conditions. In this paper, we examine the response of capital inflow controls to the global financial cycle. We make two contributions: First, we provide a normative justification for countercyclical capital inflow restrictions in response to international financial distress. We subsequently examine the factual response of 22 emerging market economies which actively manage their capital inflows. We find that restrictions tend to decrease during financial turmoil and vice versa, consistent with mitigating the exposure to international vulnerabilities.

Keywords: Capital Controls; Global Financial Cycle

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1. Introduction

Capital flows to emerging markets (EMEs) are volatile and may generate macroeconomic imbalances, despite widely recognized benefits from financial integration. This observation has spurred interest in capital controls as a stabilization tool. The theoretical literature motivates capital controls as a consequence of externalities in domestic markets, like pecuniary or demand externalities. As a result, capital controls should respond to the domestic business cycle to reduce financial fragility (see Rebucci and Ma, 2019 for a recent survey). However in reality policy makers do not modify capital controls in response to the domestic cycle (Eichengreen and Rose, 2014; Fernández et al., 2015).

In this paper, we investigate whether EMEs adjust their capital controls in response to global financial conditions. We hence explicitly acknowledge that capital flows to EMEs are frequently related to external factors like global investors' uncertainty and risk aversion, commonly referred to as the financial cycle. To this extent, we first provide a normative foundation that prompts capital inflow restrictions as a reaction to financial boom/bust cycles. Subsequently, we relate theory to data by focusing on a sample of EMEs that actively manage their capital controls.

22 out of 68 countries in our sample actively manage their capital inflow restrictions. Based on these and 23 years of data we observe that active countries indeed respond to global financial conditions, much more than to the domestic cycle. Domestic inflow controls increase during financially calm periods and decrease during distress as implied by our normative analysis. Thus, these adjustments can potentially mitigate the adverse response of international investors during financial crises.

2. Model

We develop a small open economy model that accounts for investors' "flight to safety" during financial distress. As in the literature, this model advocates macroprudential (ex-ante) capital controls to ease the severity (or likelihood) of crises. However, we explicitly link the policy response to international financial boom/bust cycles. We hence do not resort to frictions in domestic markets like pecuniary externalities or domestic demand externalities.

The economy is populated with a unit continuum of identical, infinitely-lived

households. Preferences are given by

$$E_0 \left[\sum_{t=0}^{\infty} \beta^t u(c_t) \right]. \tag{1}$$

In this expression $E_t[\cdot]$ denotes the period t expectation operator. β is the discount factor. The utility function $u(\cdot)$ is increasing in consumption (c_t) and concave. Endowment (y_t) is exogenous and deterministic. Each household can invest into an international one-period bond (b_{t+1}). Negative values indicate borrowing. The gross return on the bond, R, is determined in international markets and therefore exogenous to the small open economy. We normalize the return to 1, which implies that domestic households borrow internationally since $\beta R < 1$. The budget constraint for each household is then

$$b_{t+1} + c_t = b_t + y_t. \tag{2}$$

Access to credit is potentially restricted and tied to a fraction ϕ_t of current income. Specifically,

$$b_{t+1} \geq -\phi_t y_t. \tag{3}$$

The constraint is standard and could arise from various unmodeled frictions in international credit relationships. We introduce the following process for ϕ_t:

$$\phi_t = \begin{cases} \phi_t(B_t) \text{ with } \phi_t'(B_t) > 0 & \text{if } s_t = 1, \\ \infty & \text{if } s_t = 0. \end{cases} \tag{4}$$

The variable s_t is stochastic and reflects international financial conditions. During financial distress akin to a sudden stop ($s_t = 1$), international borrowing is limited and increasing in aggregate domestic savings (indicated by $B_t \equiv \int_0^1 b_t di$). This assumption captures the common notion that international investors' are more lenient towards countries with a lower prior debt burden. On the other hand, during financially calm periods ($s_t = 0$), borrowing is unrestricted and the constraint is not binding.

Fundamentally, households do not internalize the aggregate effect of their borrowing decisions on the credit limit during distress. As such they do not realize that less borrowings during financially stable periods increases the borrowing limit during distress, which, as we will show, serves as a justification for capital inflow

controls. To derive a formula for the optimal level of such controls, we subsequently contrast the decentralized equilibrium with the social planner equilibrium.

Decentralized Equilibrium: In each period, households choose consumption and bonds $\{c_t, b_{t+1}\}$ to maximize utility (1) subject to the constraints (2) and (3). In equilibrium individual borrowing equals aggregate borrowing, i.e. $b_t = B_t, \ \forall \ t$, due to the unit mass of identical households. Optimization leads to a standard Euler equation augmented for the potentially binding credit constraint:

$$u'(c_t) = \beta E_t \left[u'(c_{t+1})\right] + \mu_t. \tag{5}$$

The variable μ_t denotes the Lagrange multiplier of the borrowing constraint. In case the constraint binds ($\mu_t > 0$), borrowing is pinned down by the credit constraint (3) and consumption via the budget constraint (2). Otherwise, agents have a standard Euler equation, which determines $\{c_t, b_{t+1}\}$ in conjunction with the budget constraint.

Social Planner Equilibrium: We consider a constrained planner who maximizes utility on behalf of all domestic agents subject to the international credit constraint. The planner performs the same optimization as decentralized households, however she internalizes that $b_t = B_t, \ \forall \ t$ and hence incorporates the dependency between current aggregate borrowing decisions and future credit limits. A straightforward application of the Envelope Theorem implies

$$u'(c_t^{SP}) = \beta E_t \left[u'(c_{t+1}^{SP}) + \mu_{t+1}^{SP} \phi'_{t+1} y_{t+1}\right] + \mu_t^{SP}. \tag{6}$$

The constrained efficient Euler equation internalizes that savings in period t relax the credit constraint in case of a sudden stop in $t+1$ by $\phi'_{t+1} y_{t+1}$, which has a marginal utility benefit of μ_{t+1}^{SP}.

Capital Controls: The social planner's allocation can be implemented by a distortionary tax on international borrowings, which is akin to capital controls on inflows. Households therefore face the following resource constraint: $(1 - \tau_t) b_{t+1} + c_t = b_t + y_t + T_t$, where τ_t represents time varying capital controls and T_t the corresponding lump sum transfer. Subsequently, τ_t is chosen to align the decentralized and constraint efficient allocations. If the credit constraint does not bind in period t, optimal capital controls equal

$$\tau_t^* = \frac{\beta E_t \left[\mu_{t+1}^{SP} \phi'_{t+1} y_{t+1}\right]}{u'(c_t^{SP})}. \tag{7}$$

Crucially, the tax is positive whenever there is a chance for a future credit crunch, i.e. when $E\left[\mu_{t+1}^{SP}\phi'_{t+1}\right] > 0$ which requires $Pr(s_t = 1|s_t = 0) > 0$. On the other hand, if the credit constraint binds in t, borrowing and consumption are determined via the credit and budget constraint both in the decentralized and centralized equilibrium. Capital controls would be obsolete, hence $\tau_t^* = 0$, which immediately suggests a countercyclical response to global financial conditions. We subsequently examine the factual response of EMEs.

3. Data

We resort to Fernández et al. (2016) for data on capital controls for 68 EMEs over 23 years.[1] The authors provide a granular assessment for up to ten asset categories split by controls on inflows or outflows. The latter distinction is crucial to relate the empirical measures to their theoretical counterpart and to the recent policy debate which centers around managing capital inflows from international investors. Most countries do not adjust their capital controls, hence we restrict ourselves to countries that actively manage their inflow controls. We identify a country as active, if their average inflow restrictions (excluding FDI[2]) are more volatile than the sample average. Table 1 lists the 22 EMEs that satisfy this criterion. Next, we construct binary indicators that measure whether a country increased or decreased its overall inflow restrictions relative to the previous year.

Table 1: *Countries with Active Controls on Capital Inflows*

Algeria	Colombia	Lebanon	Tanzania
Argentina	Ecuador	Mexico	Uganda
Bahrain	Ethiopia	Moldova	Venezuela
Brazil	Ghana	Nigeria	Vietnam
Bulgaria	Hungary	Poland	.
Chile	Kazakhstan	Russia	.

We proxy global financial conditions by variants of the S&P 500 volatility index (VIX, Source: St. Louis FED). High values are associated with global distress and sudden stops in EMEs (e.g. Rey, 2013), which provides a link to the shock process in our model (s_t). We analyze the logarithm of the volatility index (ln(VIX)) and the standard deviation (SD(VIX)), which constitutes a separate risk factor (Huang et al., 2018).

[1] The classification into EMEs follows the convention of the IMF. We exclude Iran.

[2] Restrictions on FDI are frequently politically motivated. The results are insensitive to this choice.

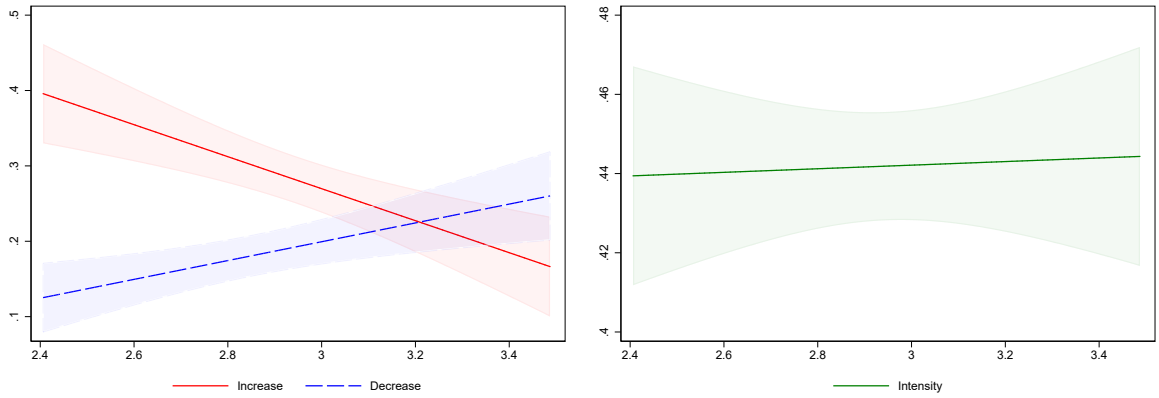
Though our primary focus is on international financial conditions, we contrast their relevance with the domestic businesses cycle. All domestic variables (current account to GDP ratio, GDP per capita, inflation (Source: all World Bank) and the nominal exchange rate vis-à-vis the US-dollar (Source: Bloomberg)) have been identified as potentially important determinants of capital inflow restrictions in the literature.

4. Empirical Analysis

Figure 1a plots bivariate regressions between changes in inflow controls (vertical axis) and the level of ln(VIX). Clearly, at lower levels, countries tend to increase (solid line) rather than decrease (dashed line) their inflow restrictions. Patterns reverse for higher levels of distress, which points towards a countercyclical use of inflow restrictions with respect to global financial conditions. Figure 1b emphasizes the importance of analyzing countries that actively manage capital controls, a subtle point which is frequently neglected in the literature. The figure shows an insignificant relationship between the intensity of the capital inflow controls (vertical axis) and the global financial cycle (ln(VIX)) if we focus on all 68 countries in the sample.

Figure 1: *Capital Inflow Controls and the Global Financial Cycle*

(a) *Increase/Decrease, Active Countries* ***(b)*** *Intensity of Controls, All Countries*



Notes: Both panels display bivariate OLS regressions with 90% predictive margins. Horizontal axis: ln(VIX). Vertical axis: Panel (a) - Probability that a country increases (solid line) or decreases (dashed line) inflow controls. Panel (b) - Capital inflow control index $\in [0, 1]$, where 0 means no restrictions. See text.

We provide a more nuanced analysis with the following logit model:

$$Prob(y_{it} = 1) = F(X^G_{i,t}\beta_G + X^D_{i,t-1}\beta_D), \tag{8}$$

where y_{it} is a binary variable that takes the value of 1 if country i increases (decreases)

inflow controls. $X^G_{i,t}$ is a vector of global financial variables (ln(VIX), SD(VIX)) including their interaction with a post-2009 indicator. The post-2009 indicator is supposed to capture potentially different responses after the Financial Crisis when active capital control policies received considerable policy interest. Since global financial conditions emerge from advanced economies rather than EMEs, the variables in $X^G_{i,t}$ are exogenous to the domestic environment. $X^D_{i,t-1}$ contains domestic variables as specified in the previous section to proxy for the domestic business cycle (in logarithmic differences except for inflation). The variables are lagged by one year to avoid potential reverse causality. We also experimented with country fixed-effects (not reported). However, since we focus *adjustments* in capital inflow restrictions among active countries rather than their incidence, most country fixed-effects are insignificant. Further, they do not change the size or significance of any variable.

We report estimates for β_G in Table 2. According to Equation (7) we would expect countries to increase (decrease) inflow restrictions during tranquil (treacherous) financial conditions. Indeed we find that higher values of ln(VIX) significantly decrease inflow restrictions (columns 3 and 4), while we observe less countries that increase their restrictions (columns 1 and 2), though this coefficient is only significant in combination with the post 2009 sample. It is difficult to reconcile a systematic effect for the volatility of the VIX.

We observe that countries make fewer adjustments in response to financial conditions post 2009. Countries are less likely to increase or decrease inflow restrictions, despite recent academic and political advocacy for active capital flow management. Domestic variables have an insignificant effect on the decision to change capital controls (not reported) and are inconsequential for the explanatory power of the model as visible from the R^2.

5. Conclusion

This article explores the response of capital inflow controls to the global financial cycle. In a simple model, international investors' "flight to safety" adds a wedge between optimal and decentralized borrowing decisions, which subsequently justifies countercyclical capital inflow restrictions to curb the build-up of international vulnerabilities.

Based on a subsample of EMEs which actively manage their capital inflow controls, we indeed find that countries respond countercyclically to exogenous international financial conditions, i.e. they are more likely to decrease inflow restrictions during

Table 2: *Results Logit Model*

	Increase in Inflow Restrictions		Decrease in Inflow Restrictions	
	(1)	(2)	(3)	(4)
$ln(VIX)$	-0.95	-1.03	1.36**	1.41**
	(0.70)	(0.74)	(0.66)	(0.72)
$SD(VIX)$	0.05	0.06	-0.12*	-0.13*
	(0.06)	(0.06)	(0.07)	(0.07)
$post2009 \times ln(VIX)$	-0.68**	-0.67**	-0.41*	-0.45*
	(0.29)	(0.30)	(0.24)	(0.24)
$post2009 \times SD(VIX)$	0.13	0.13	0.15	0.17
	(0.18)	(0.18)	(0.14)	(0.14)
Domestic Variable	No	Yes	No	Yes
Pseudo R^2	0.053	0.059	0.033	0.048
Observations	406	406	406	406

Notes: Huber-White robust standard errors in parentheses. Stars indicate significance levels (*10%, **5%, ***1%). See text for details.

global financial distress and vice versa.

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