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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Restrictive policy impacts in emerging economies

Chokri Zehri*

Abstract: The policy responses to capital flows in emerging markets are multiple. However, capital inflow controls, if applied sufficiently broadly, can buttress all other policies by limiting the volume of capital inflows and address balance sheet vulnerabilities. The study analyzes the effects of capital controls (CC) domestically and internationally. Applied to 24 emerging economies (EEs) from 2009 to 2016, a panel vector autoregression model using a quarter dataset provides further evidence on these effects. Domestically, the results show that following the 2008 financial crisis, strengthening CC may support policymakers' actions to improve their macroeconomic policies. Unpredictably, there is no relationship founded between CC and international reserves accumulation. However, a combination of controls and reserves are needed to manage well the volatile capital flows. Internationally, restrictions on capital flows may cause spillovers between countries introducing controls and neighboring countries. These multilateral effects raise the challenge of optimal policy coordination.

Subjects: Macroeconomics; International Economics; International Finance

Keywords: capital; flows; restrictions; policy; spillovers

JEL Classification: F32; G15; F41; F42.

1. Introduction

The 2008 financial crisis and its consequence of boom-bust cycles in cross-border capital flows of exceptional scale, reviving debates on whether—and how—to cope with these flows. Conventionally, EE were recommended not to obstruct capital flows, but to employ exchange rate flexibility and careful monetary policy in front of large inflows. Yet since 2008, there have been recommended for



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Chokri Zehri is assistant professor of economics at Prince Sattam bin Abdulaziz University in Saudi Arabia. A Tunisian citizen, he taught at Gabes University and al-baha international college of sciences before coming to Prince Sattam University in 2019. Zehri received his B.Ec. from the Institute of Higher Commercial Studies of Carthage-Tunis in 2001 and completed his master and Ph.D. in Economics at Aix-Marseille II University – France in 2007.

Zehri's research interests include the macroeconomics policies; financial crises; capital account liberalization, capital controls; income inequality; external debts; and econometric methods for program and policy evaluation. He published many papers in these areas and got several awards for outstanding publications.

PUBLIC INTEREST STATEMENT

The study analyzes the domestic and international impacts of capital controls. The findings highlight the necessary coordination between different macroeconomic policies, particularly, those related to capital controls. Policymakers need to use effectively the restrictive policy to curb capital inflows and to support the overall macroeconomic policy. Regarding the spillovers of capital controls, these effects give rise to the requirement of actions harmonization, internally, and between countries, before deciding to introduce CC. Globally, Governments through the use of restrictions on capital account face the challenge of finding an optimal policy mix.

EEs to take a more active position and deploy wide array of policy tools—including cautiousness measures and capital controls—to better manage the eventual risks related to capital movements. The issues that capital flows pose to EEs are often totally distinct from those they pose to advanced countries. It is also only over the past years that most EEs have opened their frontiers to capital flows sufficiently that great flows produce the risks that might require an effective response.

Effective CC reduce capital flows volume, alter the composition from short-term to long-term capital flows, make more stable the exchange rate, and allow autonomy of the monetary policy (Magud et al., 2018). Previous studies have highlighted various problems concerning capital control, it is unclear whether these controls achieve their objective or not (Benigno et al., 2013; Bianchi & Mendoza, 2011; Korinek, 2011). The identified problems include the absence of a theoretical framework to define the macroeconomics consequences of these controls, heterogeneity between countries applying CC, and the success of these restrictions. Several studies have also identified the difficulties occurring due to isolation of the direct effect of CC, which limits the success of capital flows and their objectives (Alfaro et al., 2017; Fernández et al., 2015; Forbes et al., 2015). CC are used in countries all around the globe, but the efficiency is still not clear. It is complicated for developing a standard of best practices to accomplish the influential regulation of international capital flows due to specific characteristics of economies and different market responses (Forbes et al., 2015). There are two aspects of studying the effectiveness of CC: (a) actions on capital control and (b) achieving macroeconomic objectives (autonomy of monetary policy, reduction of exchange rate pressures, etc.). The present study has discussed the impact of controls on emerging markets. After the Great Recession 2008, several economies used restrictions especially, on short term capital inflows, while others increased these restrictions (Fernández et al., 2015). The study is associated with the studies of monetary policy and exchange policy in influencing the financial crisis nature. Recently, monetary policy is restricted by the global financial cycle under a flexible exchange rate regime when capital flow management is preferable to maintain monetary autonomy, and there is free capital mobility (Passari & Rey, 2015; Rey, 2015). Optimal CC and monetary policy were explored with small open countries, considering risk premium shocks (Farhi & Werning, 2014). These studies have reported that CC retain monetary autonomy in a fixed exchange rate and work as trade manipulation in a flexible exchange rate regime. Exchange rate policies are beneficial to lower the severity of a financial crisis beyond CC (Benigno et al., 2016; Chamon & Garcia, 2016). Likewise, Devereux et al. (2017) have shown that CC can be considered as state-improving tools when optimally merged with monetary policy in the presence of policy commitment. Many older studies on CC was focused on the incompatibility triangle so that CC was usually related to hope for keeping an extent of autonomy of the monetary policy although applying fixed exchange regimes. Last several years, some emerging economies tend to use a more flexible exchange rate. The fear of floating will cause these countries to intervene massively on the exchange markets or to vary their director rate to prevent huge fluctuations in the exchange rate.

We contribute to previous empirical studies in two ways. First, we use a recent, large dataset on capital control acts, which give us to more exactly detect the policy whose efficiency is evaluated. Most of the previous studies on the effectiveness of CC have used infrequent data, usually annual. The capital control measures thus used are less precise, they suffer from two essential shortcomings, they do not reflect a fair intensity of their application among the countries and are often confused with other policies simultaneously applied with CC. The use of quarterly data in this study allows for a larger time interval and allows for a more correct analysis of the actions taken by policymakers.

Second, the efficiency of CC is examining by the use of a model regrouping the components of monetary policy trilemma which indicates that it is difficult to use together with a fixed exchange rate, an independent monetary policy, and an open capital account. These components are usually studied undependably. A major contribution of the paper is to regroup the three elements of the incompatibility triangle in one model. The incompatibility triangle framework also presents that the *de jure* and *de facto* changes in the opening of the capital account are related (Rebucci & Ma, 2019). This is how we can examine whether the applied controls are effective from this incompatibility triangle. We thus

test, from a Panel VAR model, whether capital markets affect the autonomy of monetary policy and changes in the exchange rate. As presented in several studies, CC are endogenous, which highlights the recurrent changes in these controls among countries and therefore we will know their repercussions on other macroeconomic policies. To our knowledge, there is no previous study using a Panel VAR approach to study the repercussions of CC changes on monetary and exchange policies.

As regards CC effects, we analyze the domestic and multilateral impacts. Domestically, our main finding is that CC by reducing capital inflows makes it possible to better stabilize the economy. It allows more independence to monetary policy and allows less pressure on the exchange policy at which the exchange rate manifests slight fluctuations.

Empirical evidence shows that EEs accumulated excessive international reserves after the 2008 crisis. Our study has shown that despite the strict capital controls applied, after the crisis, by several emerging countries, this did not prevent the accumulation of reserves. The latter supported the decisions of monetary policy and exchange rate policy. As our knowledge few previous studies have highlighted the association between capital controls actions with the accumulation of international reserves (Jeanne, 2016; Korinek, 2018).

For the multilateral effects, the study presents an understanding of the spillovers that may happen following restrictions applied by a country. The other countries will be affected after the migration of capital flows to their frontiers. Little empirical evidence exists on this spillover effect (Forbes et al., 2017; Lambert et al., 2011; Zehri, 2020). We were among the first to demonstrate empirically these policy changes towards capital controls as a reaction to the early policy of another country which has already applied similar controls.

Our paper is organized as follows. After displaying the literature review of the impacts of CC in Section 2, we present the data and methodology in Section 3. The results of the model regressions are presented in Section 4. The last section gives conclusions.

2. Capital controls impacts

2.1. Impacts on monetary and exchange rate policies

The theoretical and empirical literature on the effectiveness of CC on monetary and exchange policies has several methodological shortcomings. There are several criticisms for the indexes used to reflect the intensity of CC. It is often difficult to separate the effects caused by controls from effects caused by other macroeconomic policies such as the effectiveness of prudential supervision. The CC in different countries have been successful; however, the degree of success is not equal for all countries.

The empirical literature shows multiple impacts of CC on variables proxies of monetary and exchange policies. Some recent studies have shown evidence that these controls can effectively affect the monetary and exchange policies under some macroeconomic conditions and also can protect economies from external shocks (Pasricha et al., 2018; Magud et al., 2018). Some studies are focused on the macroeconomic framework in which CC are instituted. Among these studies, Bayoumi et al. (2015) studied 37 countries that introduced outflow restrictions from 1995–2010. The results found evidence that capital outflow restrictions reduce the pressure on both policies under certain conditions. These conditions include strong macroeconomic fundamentals (growth rate, inflation, fiscal and current account balances), good institutions (World Bank Governance Effectiveness Index), and existing restrictions (intensity of CC or comprehensiveness). When none of the three conditions are met, controls will fail to support these policies. Furthermore, some studies suggest that controls are more effective in advanced countries than in others, perhaps because of the better quality of institutions and regulations (Binici et al., 2010).

Some recent studies (Pasricha et al. (2018) and Magud et al. (2018)) analyzed the conditions of success of capital controls and especially their impacts on the country which applies these controls as for the countries which did not apply these restrictions. Pasricha et al. (2018) have used a recent frequency dataset on capital control instruments in 16 emerging market economies from 2001 to 2012, they give novel evidence on the domestic and multilateral impacts of these instruments. Increases in financial liberalization constraint monetary policy autonomy and decrease exchange rate instability, confirming the incompatibility trilemma. Magud et al. (2018) present a meta-analysis of the literature on CC. The authors sought to standardize the results of the close to 40 empirical studies. They build two indices of capital controls: Capital Controls Effectiveness Index, and Weighted Capital Controls Effectiveness Index. Their results show that CC on inflows seems to make monetary policy more independent and alter the composition of capital flows; there is less evidence that they reduce real exchange rate pressures. Kim and Yang (2012) determine that a fixed exchange rate allows CC to support the independence of the monetary policy. This impact is clearer with wide and long time CC.

Klein and Shambaugh (2015) find that economies with large CC are more covered concerning external monetary shocks. Liu and Spiegel (2015) show that the wide use of CC allows countries to maintain the desired interest rate differential between domestic and foreign markets. Besides, these strict controls didn't have any link with the currency appreciation detected in some countries of their sample. Ito et al. (2015) studied a small open economy and focused on simple policy rules; while, Devereux et al. (2019) investigated the optimal monetary policy and optimal CC. A model with fixed exchange rates, downward nominal wage rigidities, and free capital mobility was presented by Bayoumi et al. (2015), where an optimal devaluation eliminates the effects of the wage rigidity.

Table 1 summarizes the results of most studies on this issue and shows that the “Inconclusive” effect dominates the findings.

2.2. Capital controls indexes

Give an exact measure of CC is a hard task. The pre-2008 crisis literature utilizes indexes measuring the degree of capital restrictions. These indexes serve usually to set the extent of restrictions (kind of transactions controlled) and then define which is the most appropriate when evaluating the efficiency of controls. Many improvements in measuring CC are made by recent literature. The relevant novelties of these studies are gathering data on variations in institutional arrangements

Table 1. Summary of studies' results		
Study	Reducing Real Exchange Rate Pressure	Autonomy of Monetary Policy
	Control on Inflows	
Brazil	Inconclusive	Inconclusive
Chile	Inconclusive	Inconclusive
Colombia	Inconclusive	Inconclusive
Malaysia (1989)	Yes	Yes
Malaysia (1994)	Inconclusive	Yes
Thailand	Inconclusive	Inconclusive
Malaysia (1998)	Yes	Yes
	Control on Outflows	
Brazil	Yes	Inconclusive
Chile	Inconclusive	Yes
Colombia	Yes	Inconclusive
Thailand	Inconclusive	Inconclusive
Multi-countries studies	Inconclusive	Inconclusive

(Edison & Warnock, 2003; Ocampo et al., 2008; Qureshi et al., 2011). The advantage of this method is to exactly determine the type of policy action consistent with the time of the action. As discussed in the introduction, the puzzle of similarities of policy effects over time and across EEs continues to arise with this approach.

Finding an exact measure of CC is a difficult task. The empirical literature has employed multiple indexes as proxies for CC intensity, which usually help to set the extent of restrictions (Chinn & Ito, 2008; Edison & Warnock, 2003; Eichengreen & Rose, 2014; Fernández et al., 2016; Rebucci & Ma, 2019). Then it was possible to define which is the most appropriate when evaluating the efficiency of controls. Fernández et al. (2016) presented a new dataset of CC, divided into 10 asset categories along with the structure of inflows and outflows. These indexes were applied to 100 economies over the period between 1995 and 2013. The present study uses the first 3 indexes of the ten asset categories of CC—*ka*, *kai*, and *kao* (controls applied to gross flows, inflows, and outflows, respectively). Chinn and Ito (2008) established an index called *kaopen*, which measures the extent of openness in capital account transactions, and has been regularly updated (the last update was in 2017). The *kaopen* index is a proxy for the country's level of CC, using a dual variable that summarizes the operations displayed in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database. *Kaopen* is applied to 182 economies covering the period between 1970 and 2010 and varies between -1.9 (more capital controls) and 2.5 (fewer capital controls).

The principal distinction between both indexes is that the KAOPEN index is a larger measure of capital account liberalization, including besides regulations to the current account of the balance of payments and on the foreign exchange market, while the Fernández et al. (2016) dataset is smaller, focusing especially on capital flows, however, has further details on the intensity of controls, with distribution data on 10 asset categories. The Fernández et al. (2016) indexes allow detecting more time change when countries set regulations than the Chinn-Ito index. These indexes (Chinn & Ito, 2008; Fernández et al., 2016) catch the cross-country changes in the level of capital account liberalization, unfortunately, they are smaller on the time scope due to their building approach and annual frequency. To divert these shortcomings, we propose to duplicate each annual value of each of these indexes in 4 equals' sub-values, as being quarterly data. This does nothing to lose the robustness of this analysis since CC are often long-term political instruments. This change will allow consistency with the frequency of the other variables in the model which are quarterly. The description, source data, and notation of all study variables and CC indexes are displayed in Table 2.

3. Data and methodology

Capital control instruments may affect a set of variables, at the same time, can be affected by these variables. Thus, we use a Panel VAR model. This model includes a system of equations in which the dependent variables will be representative of CC, capital flows, monetary policy and exchange rate policy. Our sample includes 24 emerging economies experienced with CC over the period 2009Q1 to 2016Q4.¹

We use the interest rate differential as a proxy for monetary policy independence (*rate* variable). A country which maintains a differential of domestic and external interest rate allows to act on the volume of capital inflows and consequently to define a domestic interest rate freely without having a constraint with the external rate. The standard deviation of the bilateral exchange rate (to the US \$) is a proxy used for the volatility of the exchange rate (*xchg* variable). To separate the effect of capital flows variables we distribute them between inflows (*infl* variable) and outflows (*outf* variable). We include a set of exogenous variables to control for drivers that can influence the endogenous variables—the short-term interest rate in the United States (*fed*), the oil price (*oil*), and real gross domestic product growth in the United States (*gdp*). To study the impacts of CC on international reserves, we introduce the international reserves variable (*ir*). The impact of CC used by a country can affect the inflows to other countries, these spillover effects are proxy by the variable (*spill*). To build this variable, we follow the approach of Furceri and Loungani (2018), who

Table 2. Variables description

Variable	Description	Source
ka	Overall restrictions index (all asset categories)	Fernández et al. (2016) “Capital Control Measures: A New Dataset”
kai	Overall inflow restrictions index (all asset categories)	
kao	Overall outflow restrictions index (all asset categories)	
kaopen	The extent of openness in capital account transactions	Chinn, M. D., and H. Ito, The Chinn-Ito Index, http://web.pdx.edu/~ito/Chinn-Ito_website.htm , last updated July 2017.
rate	Interest rate spread (to the US interest rate)	IFS, International Financial Statistics of IMF
xchge	Bilateral exchange rate (to the US \$)	IFS, International Financial Statistics of IMF
ir	Reserves and related items	WDI, World Bank Data
infl	Capital inflows, Portfolio equity and FDI, net inflows (BoP, current US\$)	WDI, World Bank Data
outfl	Capital outflows, Portfolio equity and FDI, net outflows (BoP, current US\$)	WDI, World Bank Data
spill	the annual change of the capital inflows exceeds by two standard deviations the average annual change overall observations	Author’s calculations based on capital inflows data

Source: authors’ illustration.

defined it as an episode where the annual change of the capital inflows exceeds by two standard deviations the average annual change overall observations.

Table 3 shows the result of unit root tests using the ADF unit root test at the first difference level. The null hypothesis of nonstationarity is performed at 1% and 5% significance levels. In Table 3, the result of the ADF test illustrates that all the data series are nonstationary at the level. However, the result of the ADF test on the first difference strongly supports that all data series are stationary after the first difference at the 1% or 5% significance levels.

A panel VAR is the baseline model. The independent variables of this model are all considered endogenous and are explained by a set of exogenous variables previously cited. The model is written as follow:

Table 3. Augmented Dickey-Fuller (ADF) test—Results for unit roots

Variables	Level		First differences	
	Intercept	Intercept and trends	Intercept	Intercept and trends
rate	-2.304	-1.628	-6.312*	-9.639**
xchge	-3.015	-1.836	-7.298**	-8.614**
ir	-1.625	-2,378	-7.645**	-7.235**
gross	-2.865	-2.104	-6.423*	-7.629**
infl	-2.571	-3.817	-6.381*	-8.481**
outfl	-2.763	-2.918	-8.328**	-9.101**

*, ** implies significance at the 5%, and 1% levels, respectively.

Source: author’s calculations.

$$Y_{i,t} = \alpha_0 + Z_1 Y_{i,t-1} + \dots + Z_n Y_{i,t-n} + W_1 X_{i,t-1} + \dots + W_m X_{i,t-m} + \text{crisis} + FE_{i,t} \quad (1)$$

We use a Panel VAR approach which presents many advantages. When there are few theoretical studies on this relationship, the use of the Panel VAR is recommended for the guidance of the model formulation. For our study, rare is the theoretical literature that examines, particularly, the spillover effect of CC. The endogeneity bias presents a serious problem for many empirical studies on capital controls. These studies have taken into consideration this problem and have tried to solve it by including lagged variables or by imposing additional restrictions to their regressions. Panel VAR may reduce the endogeneity bias by considering all variables as probably endogenous. The Panel VAR approach allows us to analyze the impulse response functions which record any retarded effects of the considered variables; the classical panel models are unable to display these dynamic effects. The missed variable bias is also considered with Panel VAR by employing the country fixed effects, which catch time-unchanging parts that may affect domestic and international impacts of capital controls. Panel VAR has also the merit to be used with a short temporary scale which may be compensated by the gain from the cross-sectional scale.

Our model is described by a system of equations, where Y_t is the vector of endogenous variables for country i , defined as $Y_t = [\text{rate}, \text{xchg}, \text{and } ir]$, x_t is the vector of exogenous variables common to all countries, $\varepsilon_{i,t}$ is the vector of residuals, and “Z” and “W” represents respectively the coefficients for the endogenous and exogenous variables. The vector Z includes the four capital controls indexes, $Z = [\text{kaopen}, \text{ka}, \text{kai}, \text{and } \text{kao}]$. These indexes are introduced in the first difference to highlight the changes in capital flows restrictions. The study employs a fixed-effect estimation method to control for effects of country-specific features. These factors were omitted and may affect the dynamics of the model, and the term “FE_{*i*}” in equation 1 takes into account these countries’ fixed effects. Similarly, the vector “ x_t ” is composed of three exogenous variables: *fed*, *oil*, and *gdp*. These variables are used to control for drivers that can cause symmetric shocks to all countries. To examine if the cross-sectional changes in CC can be well used, we regress the model with the use of the Chinn-Ito (Chinn & Ito, 2008) and Fernández et al. (2016) indexes. All of the explicative’s variables are introduced with one lag length. Besides, we propose a regression with the levels of these indexes and analyze the effect of a shock to them.

4. Results

In this section, we present the evidence from the estimation of the PVAR model for the period 2009:1–2016:4. We analyze if variations in CC are effective on monetary and exchange rate policies and are under the forecasts of the incompatibility triangle. We investigate also the impact on international reserves and the multilateral effects. We are examining the effect of a shock to CC, considered as an inside policy instrument, on different national policy variables including differential interest rate, exchange rate volatility, capital movements, international reserves accumulation, spillover effect further exogenous variables, fixed effects country and constant.

The results of the PVAR analysis are displayed in Tables 4 and 5. The results show that CC indexes were more effective after the financial crisis compared to the period before the crisis; the coefficients of CC indexes in the second period are more significant. Basing on the results of Table 5, we note a positive and significant coefficient of the changes in “ka” and “kaopen” in the equation in which the differential interest rate is the independent variable. These findings show that changes in capital controls rise the differential of interest rate and subsequently allow more autonomy of the monetary policy. The two other indexes of capital controls (kai and kao) are without effect on the monetary policy. The results present negative and significant coefficients of the changes in “ka” and “kaopen” in the equation of exchange rate volatility (comparing to the US dollar) suggesting that capital controls support the stability of the exchange rate policy i.e. more liberalization conduct to higher exchange rate instability.

Table 4. Impacts Analysis (Panel Vector Autoregressive model, before the 2008 crisis)

		Coefficient	Std. Err.	t-student	P> t	[95% Conf. Interval]
rate	ka	0.022	0.655	0.35	0.325	-0.898 0.238
	kai	0.135	0.267	0.18	0.545	0.765 0.257
	kao	0.035	0.768	0.22	0.657	0.838 0.149
	kaopen	0.613	0.657	0.45	0.587	3.625 2.457
	xhge	-0.017	-0.879	-0.03	0.923	-2.339 -2.576
	gross	0.041	0.467	0.58	0.365	1.625 4.457
	spill	0.045	0.658	1.15	0.247	0.958 3.549
	ir	0.535	0.785	0.44	0.000	-0.738 0.218
xhge	ka	-0.129	-0.085	-1.21	0.476	-0.738 0.218
	kai	0.228	0.407	0.15	0.297	0.559 0.659
	kao	0.139	0.415	1.05	0.009	0.098 0.982
	kaopen	-0.042	0.433	-1.62	0.000	-0.128 -0.018
	rate	-0.146	-0.237	-1.54	0.032	0.223 0.970
	gross	0.180	0.150	1.06	0.063	0.147 0.575
	spill	0.596	0.437	1.45	0.068	0.123 0.770
	ir	0.096	0.537	1.68	0.148	0.253 0.958
ir	ka	0.012	0.327	1.24	0.001	0.213 0.854
	kai	0.132	0.322	1.38	0.005	1.925 3.257
	kao	0.345	0.456	0.85	0.517	0.468 1.549
	kaopen	0.041	0.350	1.06	0.013	0.147 0.575
	rate	0.358	0.157	1.35	0.587	0.257 1.970
	xhge	0.326	0.254	0.14	0.000	0.683 0.870
	gross	0.754	0.076	2.14	0.000	0.013 0.940
	spill	0.546	0.357	0.08	0.000	0.983 1.835
spill	ka	0.236	0.057	0.35	0.568	0.157 1.970

(Continued)

Table 4. (Continued)

	Coefficient	Std. Err.	t-student	P> t	[95% Conf. Interval]
kai	0.038	0.322	0.15	0.000	0.059 0.659
kao	0.009	0.015	0.85	0.009	0.098 0.982
kaopen	0.156	0.257	1.29	0.000	0.145 0.970
rate	0.127	0.154	1.35	0.437	0.178 0.754
xchge	0.458	0.022	0.15	0.197	0.059 0.659
gross	0.359	0.415	2.05	0.009	0.098 0.982
ir	0.101	0.037	1.32	0.302	0.021 0.587

Source: author's calculations.

Table 5. Impacts Analysis (Panel Vector Autoregressive model) after the 2008 crisis)

		Coefficient	Std. Err.	t-student	P> t	[95% Conf. Interval]
rate	ka	0.019	0.055	2.17	0.006	-0.998 0.118
	kai	0.049	0.767	0.58	0.365	0.915 3.157
	kao	0.035	0.858	0.15	0.247	0.758 2.549
	kaopen	0.541	0.467	3.58	0.000	1.625 4.457
	xhge	-0.227	-0.569	-4.00	0.000	-0.339 -0.116
	gross	0.041	0.467	0.58	0.365	1.625 4.457
	spill	0.045	0.058	2.15	0.047	0.958 3.549
	ir	0.7195	0.085	2.44	0.000	-0.738 0.218
xhge	ka	-0.319	-0.085	-2.44	0.000	-0.738 0.218
	kai	0.228	0.407	0.15	0.297	0.559 0.659
	kao	0.139	0.415	1.05	0.009	0.098 0.982
	kaopen	-0.742	0.283	-3.62	0.000	-0.128 -0.018
	rate	-0.396	-0.437	-2.24	0.032	0.223 0.970
	gross	0.180	0.150	1.06	0.063	0.147 0.575
	spill	0.036	0.007	3.45	0.001	0.123 0.770
	ir	0.096	0.537	1.68	0.148	0.253 0.958
ir	ka	0.096	0.427	3.24	0.001	0.213 0.854
	kai	0.141	0.592	2.38	0.005	1.925 3.257
	kao	0.345	0.456	0.85	0.517	0.468 1.549
	kaopen	0.080	0.350	2.06	0.013	0.147 0.575
	rate	0.358	0.157	1.35	0.587	0.257 1.970
	xhge	0.326	0.254	0.14	0.000	0.683 0.870
	gross	0.754	0.076	2.14	0.000	0.013 0.940
	spill	0.546	0.157	3.08	0.000	0.983 1.835
spill	ka	0.236	0.057	0.35	0.568	0.157 1.970

(Continued)

Table 5. (Continued)

	Coefficient	Std. Err.	t-student	P> t	[95% Conf. Interval]
kai	0.258	0.322	3.15	0.000	0.059 0.659
kao	0.009	0.015	0.85	0.009	0.098
kaopen	0.046	0.257	2.29	0.000	0.145 0.970
rate	0.127	0.154	1.35	0.437	0.178 0.754
xchge	0.458	0.022	0.15	0.197	0.059 0.659
gross	0.359	0.415	2.05	0.009	0.098
ir	0.101	0.037	1.32	0.302	0.021 0.587

Source: author's calculations.

The trilemma purpose is confirmed using the index related to gross flows (ka). However, for the two other indexes for inflows and outflows controls (kai and kao), results are insignificant. By the use of the Chinn-Ito index results support the compromises of the incompatibility triangle. The decomposition of the annual data from these indexes into quarterly data is very useful, it has made it possible to have a greater frequency of data and has also made it possible to highlight the variations made to these restrictive policies in the short term.

The Granger causality test, presented in Table 6, confirms the previous results. It demonstrates the presence of causality between the indexes of capital controls with the “rate” and “xchge” i.e. the CC actions cause the monetary and the exchange policies.

As displayed in Table 7, this causality is bidirectional for the indexes “ka” and “kaopen” and unidirectional for “kai” and “kao” indexes.

We suppose that the vector of endogenous variables listed in the system represented as: $Y_t = [\text{rate}, \text{xchge}, \text{ir} \text{ and } \text{spill}]$. To investigate the fraction of the fluctuations in the endogenous variables that are due to the capital controls shock, Table 8 summarizes the forecast-error variance decomposition. The findings of Table 8 show that unpredicted changes in the “ka” and “kaopen” indexes explain a big percentage of the dynamics in differential interest rate (78.1% and 78.8%, respectively) and the exchange rate fluctuation (78.4% and 81.5%, respectively) at the 4-quarters horizon.

Concerning the impact on international reserves, for 4 quarters ahead, the “ka” and “kaopen” shocks explain 75.4% and 52.1% respectively, the variation in international reserves and 59.5%

Table 6. Granger Causality Test

Equation	Excluded	Chi2	Prob > chi2
rate	ka	15.983	0.000
	kai	35.367	0.002
	kao	23.687	0.004
	kaopen	27.692	0.000
	xchge	57.427	0.000
	gross	13.548	0.041
	spill	55.327	0.021
	ir	17.692	0.000
xchge	ka	6.833	0.009
	kai	35.367	0.002
	kao	26.324	0.013
	kaopen	23.687	0.004
	rate	27.692	0.000
	gross	36.324	0.000
	spill	12.568	0.312
	ir	9.254	0.048
ir	ka	12.505	0.009
	kai	35.312	0.002
	Kao	23.639	0.004
	kaopen	47.615	0.000
	rate	23.622	0.004
	xchge	67.692	0.000
	gross	18.257	0.024
	spill	54.576	0.000

Table 7. Direction of Causality			
Null Hypothesis	F-Statistic	Prob.	Remarks
	Ka index		
Ka does not Granger Cause rate	7.888	0.001	Bidirectional
rate does not Granger Cause ka	4.296	0.015	
ka does not Granger Cause Debt xchg	9.970	0.000	Bidirectional
xchg does not Granger Cause ka	2.662	0.073	
	Kai index		
kai does not Granger Cause rate	15.348	0.007	Unidirectional
rate does not Granger Cause kai	36.872	0.359	
kai does not Granger Cause xchg	25.687	0.025	Unidirectional
xchg does not Granger Cause kai	8.657	0.252	
	Kao index		
kao does not Granger Cause rate	25.315	0.017	Unidirectional
rate does not Granger Cause kao	43.482	0.359	
kao does not Granger Cause xchg	15.587	0.005	Unidirectional
xchg does not Granger Cause kao	29.157	0.252	
	Kaopen index		
kaopen does not Granger Cause rate	45.302	0.017	Bidirectional
rate does not Granger Cause kaopen	15.459	0.009	
kaopen does not Granger Cause xchg	41.526	0.002	Bidirectional
xchg does not Granger Cause kaopen	27.037	0.000	

Table 8. Forecast-error variance decomposition due to a CC shocks				
Variable	1 quarter ahead	2 quarter ahead	3 quarter ahead	4 quarter ahead
	Ka			
rate	0.002	0.141	0.258	0.380
xchg	0.456	0.242	0.151	0.025
ir	0.154	0.178	0.197	0.225
spill	0.054	0.148	0.165	0.228
	Kaopen			
rate	0.015	0.141	0.258	0.374
xchg	0.501	0.232	0.057	0.025
ir	0.201	0.185	0.074	0.061
spill	0.021	0.101	0.131	0.489

and 52.1% respectively, the variation in spillovers. The impact of the CC indexes shocks on “spill” is also great, demonstrating that CC conduct intensively to spillover on other countries.

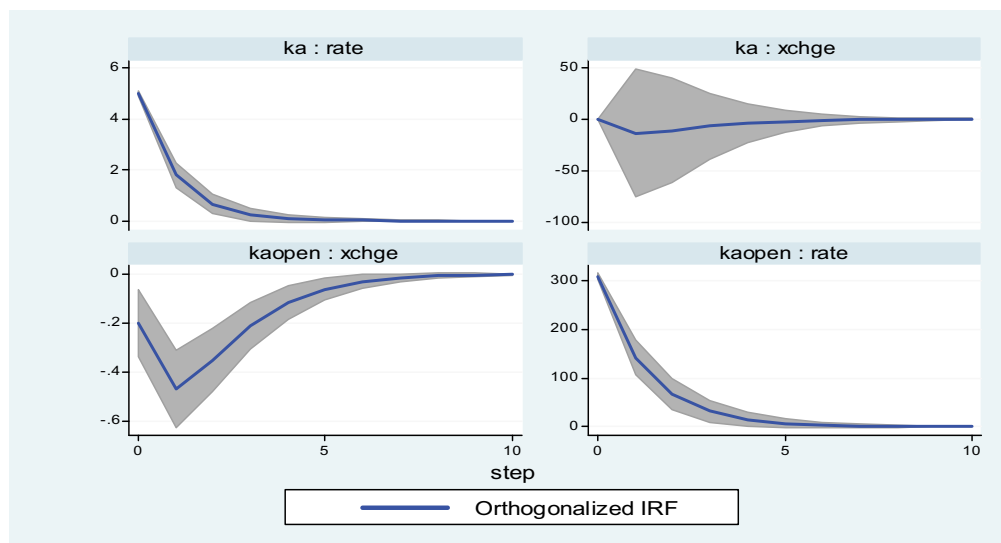
Figure 1 displays the impulse-response functions to a positive shock in CC indexes (kaopen and ka) after a one unit shock on capital account (i.e. a rise by one weighted unit in capital account restriction). These effects are significant and happen rapidly following the shock, however, they remain for a short time. For the exchange rate response, the major portion happens in the first quarter ahead. While, the differential interest rate response is longer, lasting more than 1 year. This temporal difference in impact suggests that the waste of the autonomy of monetary policy is longer than the instability of the exchange rate. In the short run, applying CC may give the monetary ability to adapt the local interest rate, reducing the vulnerability to higher instability of the exchange rate related to the occurrence of intensive short-term flows generated by United States monetary policy variation.

The constraints of choice of economic policies in a context of free movement of capital can be circumvented following an accumulation of international reserves. In the 2000s, several EEs sought an optimal combination aimed at safeguarding an autonomous monetary policy, stabilizing the exchange rate and liberalizing the capital account via an accumulation of reserves (Bianchi et al., 2018). The results show positive and significant coefficients of “ka”, “kaopen” and “kai” to explain the changes in international reserves, only the coefficient of controls on outflows (“kao” index) is insignificant (Table 4).

These reserves made it possible to correct the impossibility recourse to certain macroeconomic policies. Our results confirm this positive effect of reserves on monetary policy and on exchange rate policy, the coefficient of the variable “ir” is positive and significant in the equations explaining the differential interest rate and the exchange rate fluctuation.

The multilateral impacts of CC policies are important for many causes. First, CC applied by the country receiving international flows may motivate flows to reach other recipient economies that do not apply such controls and aggravate their local financial instability. Second, CC may obstruct foreign adjustment, for example, when controls on capital inflow are utilized to maintain a certain value of a currency. The cross-sectional equivalence of restrictions on capital flows is detected by the fixed effects of each EE and, to a limited degree, by the displaying declarations and changes related to the international investment position of the country.

Figure 1. Impulse-response functions to positive capital controls (ka and kaopen) shocks.



We find proof that a net strict of inflow controls in the EEs (kai index) produces effective spillovers to other economies starting by driving these inflows into those economies and by causing tensions on their exchange rate. The short-term interest rates of these countries will fall as a response to discourage these inflows. These reactions are short term and are difficult to detect statistically, the shock and the response to this shock happen in the same trimester. Our results (Tables 4 and 5) show a positive and significant coefficient of “kai” in the equation of “spill”, besides, the Chinn and Ito index “kaopen” is also positive and significant. These findings are in line with the literature evidence. The other indexes of capital controls on outflows and gross flows “kao” and “ka” are insignificant.

As a response to these high inflows and oppose their negative effects on the domestic currency, the local policymakers react by strengthening inflow controls. This policy response is efficient and conducts to a turnaround of the capital inflow in the next quarter, which causes a fall which covers massive inflows of the previous period.

Our results that CC cause spillovers to strategy in other economies are approved by theory, but this study is among the earliest to discover empirical proof for these spillovers. Lu et al. (2017) examine the political response of one country following the intensive application of CC by another country. These capital controls provoked a negative externality and induced a similar reaction in the country which consequently received massive inflows of capital also leading them to practice capital controls. Nevertheless, Lu et al. (2017) don't verify empirically this spillover effect.

The evidence for this spillover became clearer after the 2008 crisis, it was found that capital controls instituted by one country caused an appreciation of the currencies of other countries and a massive inflow of capital to these countries. During the following periods, these effects will gradually decrease and will end with the introduction of capital controls by the other countries, there will be a fall in inflows and an increase in the short-term interest rate differential.

5. Conclusions

The study examined the domestic and international impacts of CC. Domestically, restrictions on capital flows allow for more monetary policy autonomy, more exchange rate stability, and, unpredictably, have no impact on international reserves accumulation. The study suggests a joint use of these policies, particularly, CC and the reserves policy. The use of CC as a restrictive policy has considerable advantages in supporting other economic policies and achieving an optimal policy mix. Internationally, multilateral effects are highlighted through spillover effects. The results highlight the requirement of policy coordination across countries to deal with capital flows reversal.

The evidence shows that EEs tightened prudential policies and inflow controls as inflows surged, and relaxed them when flows receded. With controls on capital outflows, EEs can relax these restrictions to lower the volume of net flows, reducing overheating and currency appreciation pressures. The EE policymakers responded to capital inflows through various tools, they have potentially five tools to manage capital flows and mitigate any untoward consequences: monetary (interest rate) policy, fiscal policy, exchange rate policy, prudential measures, and capital controls. In deploying these tools, there is a logical reasoning (or natural mapping) between instruments and risks. Monetary and fiscal policies can help address the inflation and economic overheating concerns raised by capital inflows. When the currency is not undervalued, foreign exchange intervention can be used to limit currency appreciation that threatens competitiveness. Prudential measures can be applied to curb excessive credit growth and related financial stability risks. Capital inflow controls, if applied sufficiently broadly, can buttress these other policies by limiting the volume of capital inflows in the first place, or more targeted controls can be used to address balance sheet vulnerabilities such as currency and maturity mismatches.

Policymakers in EEs have responded to capital flows by deploying a combination of instruments. Central banks used the policy interest rate to address inflation and overheating concerns and intervened heavily in the face of capital inflows. Beyond these policies, EEs tightened

macroprudential measures, capital controls, and currency-based measures that affect capital inflows, while countries with relatively closed capital accounts tended to relax restrictions on capital outflows. Moreover, there has been some correspondence between the tool deployed and the nature of the risk—thus, central banks intervened when the real exchange rate was appreciating, tightened monetary policy when the economy was overheating, and used macroprudential tools when financial-stability concerns dominated. Inflow controls were typically used when there were many, aggravated, risks. The orthodox policy prescription to tighten fiscal policy in the face of capital inflows was the least used instrument in practice, with no strong evidence that EEs systematically tightened fiscal policy in response to large capital flows.

Several shortcomings can be identified in this analysis; in particular, the capital control indexes used. Other studies may use other indexes and may obtain different results. This is a common problem in the majority of capital control studies. Similarly, the choice of differential interest rate as an indicator of monetary policy autonomy is problematic. Although the differential in domestic and foreign interest rates is often seen as a proxy for the independence of the monetary policy, it is subject to debate.

Our study was conducted within the framework of a relatively simple empirical model; in reality, however, the connections between restrictive policies and other macroeconomic policies are complex. It is very difficult to find an optimal policy mix that combines monetary, exchange rate, international reserves, and CC policies; this topic is left for future research. To a certain extent, our analysis can be considered as an investigation of CC impacts that consider other macroeconomics policies, yet we admit that a more developed model would be essential to set a combination of multiple macroeconomic policies. Such a model would need to define robust proxies for monetary policy autonomy, exchange rate stability, and particularly for robustness check with more robust CC indexes.

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Note

1. Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, South Africa, Taiwan, Thailand, Turkey, and United Arab Emirates. The list is established according to the Morgan Stanley Capital International Emerging Market Index.

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