

Capital controls on inflows, the global financial crisis and economic growth: Evidence for emerging economies

by

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The results of an IMF study on controls on capital inflows in emerging economies, using a probit regression approach, are first replicated and tested for stability. The IMF results, downplayed by the authors, have been used by others to suggest controls can be helpful in a crisis situation. However, the stability findings suggest the results are not sufficiently robust to make strong claims in this regard. The same 37 countries and the IMF capital control measures are then used in a panel regression study to examine the impact of capital inflows on annual real GDP growth around the Global Financial Crisis. The results between the pre-crisis and the crisis periods are inconsistent with the IMF study – finding that capital restrictions on inflows (particularly debt liabilities) are most useful in good times when inflows to emerging markets are strong and upward pressure on managed exchange rates and reserves accumulation is greatest. However, lower controls on bonds and on FDI inflows seem to be associated with better growth outcomes during the crisis period studied. These findings are more consistent with studies that see capital controls as part of exchange rate targeting policies and concerns about excess reserves accumulation.

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I. Introduction

Economic theory predicts that capital controls have significant negative effects: they reduce the supply of capital; raise the cost of financing; increase financial constraints for domestic firms that do not have direct access to international capital markets; reduce the discipline of markets on decision making; increase the risk or corruption; lead to costly effects of avoidance and enforcement; and reduce property rights so that approvals for long-term investors (on the part of pension funds, insurance companies, mutual funds) are normally excluded.¹ The removal of such controls should improve prospects for economic growth (see for example Obstfeld, 1998). It is for reasons such as these that the OECD Codes of Liberalisation² are one of OECD's most important legal instruments, being a signatory to which is one of the prerequisites for joining the Organisation. Yet there are important differences of view. Rodrik (1998) makes an alternative case that asymmetric information and implicit insurance can result in excessive lending for risky projects that increase the chance of credit boom and bust cycles. More favourable views on capital controls in developing countries have had some ascendancy in recent years, particularly following the Asia crisis in the late 1990s and Chile's apparent success in using capital controls to avert currency crises.

There is a considerable body of microeconomic evidence showing that emerging economies that lift capital controls do experience the positive benefits predicted by economic theory. Particularly where firms do not have ready access to international capital markets, lifting controls sees a reduced dependence on cash flows for capital expenditure (Harrison et al., 2004; Forbes, 2003). Similarly, property rights improve and newly "investible" firms see increased investment, rising stock prices and a fall in the cost of equity (Chari and Henry, 2004). Yet on the macroeconomic side studies have found at best ambiguous results. For example, Prasad et al. (2003) found no significant relationship between openness and growth in per capita income between countries, after controlling for initial endowments, and their survey of other studies shows mixed results (though none found that liberalisation reduces growth). Similarly, Satyanath and Berger (2007),³ in a panel of 50 (mostly) emerging economies, controlling for standard economic growth determinants, find that there is no statistically significant linkage between capital controls on inflows and lower average economic growth over the period 1995-05, i.e. prior to the global financial crisis (GFC).

Most of the support for capital controls derives from experiences where the defence of falling exchange rates and the loss of reserves in a crisis are an issue, and/or where countries wish to avoid exchange rate appreciation to support trade while also wishing (inconsistently) to run independent monetary policies by avoiding excess foreign exchange reserves accumulation. With respect to crises, the International Monetary Fund (IMF) was one of the first international organisations to change its tone (e.g. Fischer, 2001), and more recently this has continued with published empirical research that shows capital controls in emerging markets were very helpful in avoiding output loss in the GFC. Ostry et al. (2010) review the arguments about controls on certain types of capital inflows – notably debt and some components of financial foreign direct investment (FDI) – that can make emerging

countries more susceptible to crises due to lower risk sharing between creditors and borrowers. Furthermore, debt inflows and some components of FDI might be associated with domestic lending booms and foreign-exchange mismatches in the domestic banking system (Wakeman-Linn, 2007), which could lead to greater financial fragility. In testing these ideas the authors find empirical evidence that controls on such capital inflows prior to the GFC is associated with reduced financial vulnerability during the crisis.

The purpose of this paper is to further investigate the issue of whether countries that had such controls on inflows⁴ in place prior to the crisis were indeed less vulnerable during the GFC, and also to examine the more general question of whether capital controls have an adverse effect on economic growth over the entire economic cycle. The main results suggest that the IMF probit model approach is not robust to a stability test. An alternative panel regression approach, using the same countries and capital control measures as the IMF study, finds somewhat different results between the pre-crisis and the crisis periods – that capital restrictions on inflows (particularly debt liabilities) are most useful in good times when inflows to emerging markets are strong and upward pressure on managed exchange rates and reserves accumulation is greatest. However, lower controls on bonds and on FDI inflows seem to be associated with better growth outcomes during crisis periods. These findings are more consistent with studies that see capital controls as part of exchange rate targeting policies and concerns about excess reserves accumulation.

The remainder of this paper is structured as follows. Section II presents and replicates the probit regression results by Ostry et al. (2010), and carries out a test of their robustness. Section III further examines the issue of capital controls for the same sample of countries and over the same time period using a panel regression approach. Section IV concludes.

II. Capital controls and financial fragility during the GFC: a probit model approach

II.1. IMF methodology and the data

Ostry et al. (2010) use a probit regression approach⁵ to investigate whether implementing controls on capital inflows before a financial crisis cushions the subsequent decline in output during the crisis. This frequently cited econometric analysis is run on a sample of 37 mostly emerging economies⁶ over the period 2003-09. The authors first calculate the difference between the average annual real GDP growth rate from 2008 to 2009 (i.e. the crisis period) and the average annual real GDP growth rate from 2003 to 2007 (i.e. the pre-crisis period). These data are then sorted into deciles, and the dependent variable is a dummy variable that takes the value of 1 for countries with a real GDP growth crisis slowdown versus the pre-crisis growth that is in the sample's lowest decile ("crisis countries"). Explanatory variables are capital control indicators based on the Schindler (2009) index, using information taken from the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) published by the IMF. Using a structured approach, the AREAER divides capital inflows/outflows into several subcategories at the level of resident/non-resident restrictions. The information is presented annually in a binary form, taking values of 0 (unrestricted) and 1 (restricted). Based on the Schindler Index (2009), the following types of capital inflows are considered to construct the several capital inflows indices used in the study:

- Shares or other securities of a participating nature:
 - ❖ Purchased locally by non-residents.
 - ❖ Sales or issues abroad by residents.

- Bonds or other debt securities:
 - ❖ Purchased locally by non-residents.
 - ❖ Sales or issues abroad by residents.
- Money market instruments:
 - ❖ Purchased locally by non-residents.
 - ❖ Sales or issues abroad by residents.
- Collective investments:
 - ❖ By non-residents to residents.
- Financial credits:
 - ❖ By non-residents to residents.
- Direct investment:
 - ❖ Inward direct investment.

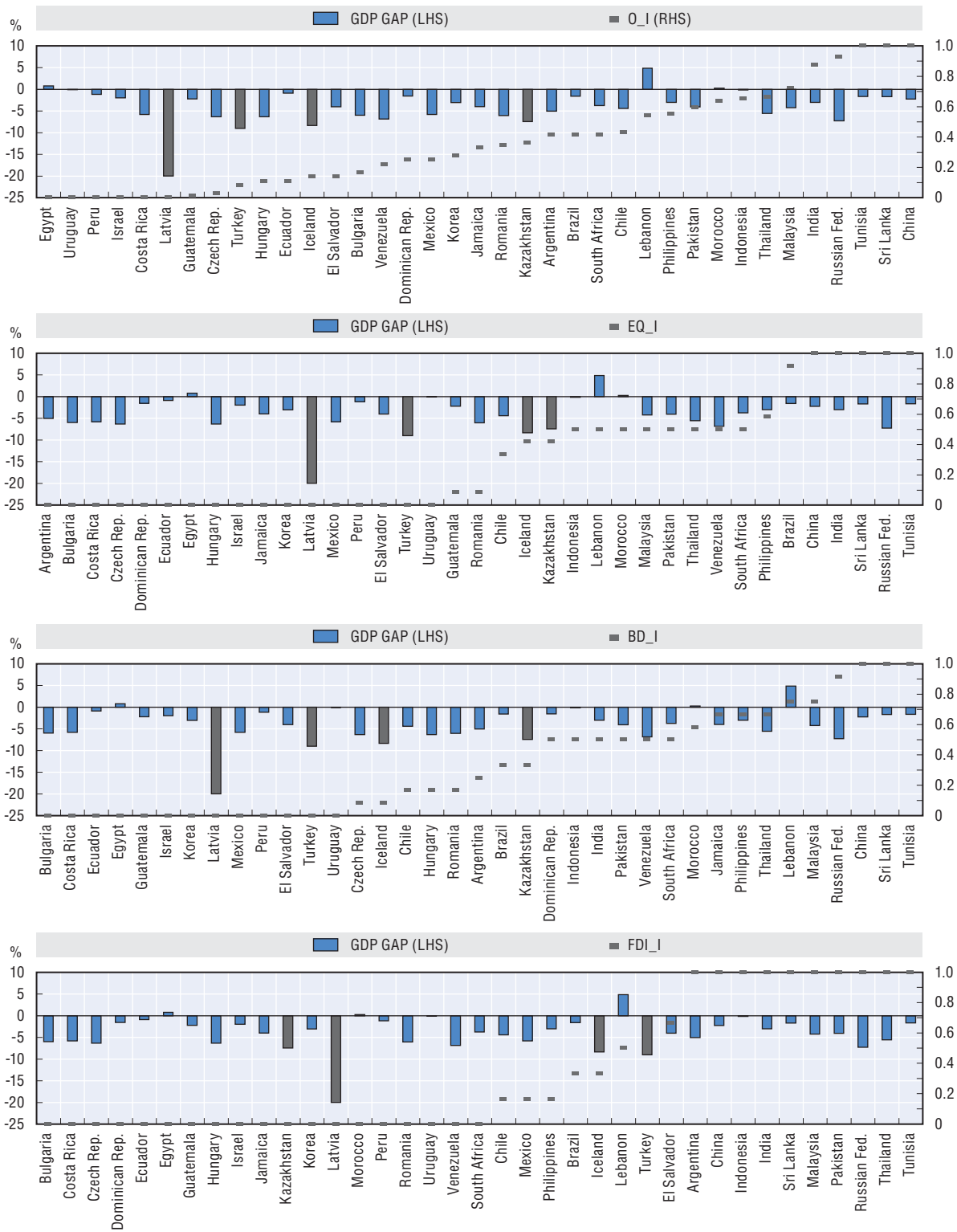
For an individual asset category in a given country, the level of controls on capital inflows is calculated by taking the average of the binary indicators. Ostry et al. (2010) considered four capital control measures. The first overall indicator (O_I) is based on the six components of capital inflows. Then, three additional indicators are considered to capture, respectively, the level of controls on FDI (FDI_I), bonds (BD_I) and equities (EQ_I) inflows. Each of the four indices is averaged over the period 2000-05.⁷ Figure 1 shows the ranking of all countries in the sample by the overall level of capital controls (shown by the height of the dots). Figure 1 also shows the GDP gap in the columns (the difference in average annual real GDP growth rate during the crisis versus the pre-crisis period) which was the basis for constructing the dummy for the dependent variable. The crisis countries that take the value of 1 in the regressions are highlighted in grey and they are: Latvia (-19.97%), Turkey (-9.00%), Iceland (-8.33%) and Kazakhstan (-7.45%). This group does not include any Asian or Latin American developing countries.

II.2. Main results of the IMF study and stability analysis on the results

The probit model regression postulated in the paper by Ostry et al. (2010) is run in two steps, which are replicated in Table 1 below. First, the model uses only the indicator of controls on overall inflows (equation [1] in Table 1). Second, the model includes separate indices for controls on FDI, equity and bond inflows (equation [2] in Table 1). A positive coefficient means that the capital control indicator would be associated with a larger decline in the real GDP growth rate, and a negative coefficient a smaller decline.

Ostry et al. (2010) suggest that their results are suggestive correlations only. They conclude tentatively that there is at least some evidence, based on this work, which suggests that emerging economies with greater capital controls on inflows, especially on bond inflows, experienced lower decline in output growth rates during the GFC.⁸ However, there is a high degree of heterogeneity among the crisis countries, as shown by the extreme values of the GDP gap for Latvia. A stability analysis of the replicated results is therefore performed in three steps. First, equations [1] and [2] are estimated by excluding Latvia from the sample (thus only 3 countries of the 36 take on a value of 1 in the dependent variable). Second, regressions are run on the sample of 37 countries by also including the country with the next largest GDP gap, Russia, as a crisis country (Russia has virtually the same decline in output as in Kazakhstan which is already included).⁹ Thus 5 of 37 countries are

Figure 1. Decline in GDP growth and capital control indices



Note: GDP gap is the difference between average annual real GDP growth rate in 2008-09 and that in 2003-07.
 Sources: IMF, World Economic Outlook (April 2013), Schindler (2009) database and authors' calculations.

Table 1. **Capital controls and financial fragility during crisis**

	[1]	[2]
O_I	-2.026** (1.029)	-
FDI_I	-	-0.032 (1.190)
EQ_I	-	2.057 (1.357)
BD_I	-	-4.054* (2.263)
C	-0.712* (0.379)	-0.900*** (0.346)
Observations	37	37
McFadden R ²	0.116	0.168
Obs with Dep = 0	33	33
Obs with Dep = 1	4	4

Notes: This table shows the results of estimating a standard Probit model for a sample of 37 mostly emerging economies. See Section II.1 for definition of the dependent variable all the capital control indices. A positive coefficient means the capital control indicator is associated with a larger decline in the real GDP growth rate. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Robust standard errors are in parentheses.

Sources: OECD, IMF.

included with a value of 1 in the dependent variable. Third, equations [1] and [2] are estimated by combining steps one and two, to exclude Latvia from the sample and include Russia in the sample of crisis countries. The results are shown in Table 2.

Table 2. **Stability analysis of the regression results**

	By excluding Latvia from the sample		By also including Russia as a crisis country		By excluding Latvia from the sample and including Russia as a crisis country	
	[1]	[2]	[1]	[2]	[1]	[2]
O_I	-1.447* (0.812)	-	-0.417 (0.925)	-	-0.011 (0.905)	-
FDI_I	-	0.175 (1.313)	-	0.259 (0.837)	-	0.409 (0.963)
EQ_I	-	2.203 (1.396)	-	1.807 (1.220)	-	2.006 (1.295)
BD_I	-	-3.853* (2.340)	-	-2.328 (1.434)	-	-2.281 (1.582)
C	-0.964*** (0.399)	-1.167*** (0.355)	-0.958*** (0.400)	-1.085*** (0.367)	-1.216*** (0.441)	-1.368*** (0.392)
Observations	36	36	37	37	36	36
McFadden R ²	0.070	0.161	0.009	0.078	0.000	0.098
Obs with Dep = 0	33	33	32	32	32	32
Obs with Dep = 1	3	3	5	5	4	4

Notes: This table shows the results of estimating a standard Probit model for a sample of 37 mostly emerging economies. The dependent variable is a dummy variable described in Section II.1. Capital control indicators are based on the Schindler (2009) index, averaged over the period 2000-05 (see Section II.1). A positive coefficient means the capital control indicator is associated with a larger decline in the real GDP growth rate. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Robust standard errors are in parentheses.

When Latvia with its 20% output drop is excluded, the coefficient on overall inflows remains positive but falls in significance from the 5% level (in Table 1) to the 10% level (in

Table 2). The bond inflow coefficient remains significant, though only modestly so, at the 10% level. When Russia is included alongside Latvia as crisis country (5 crisis countries in total) the coefficient on overall controls is rendered insignificant, while the bond inflow coefficient continues to find support at the 10% level. When Latvia is excluded and replaced by Russia as crisis country (again 4 crisis countries in total) all of the capital control coefficients are found to be insignificant. The IMF results, fully replicated in Table 1, appear not to be sufficiently robust to these stability tests to make any strong claims about the success of capital controls.

III. Capital controls and economic growth around the GFC: A panel data approach

III.1. Definition of the variables

The following analysis augments the previous one by moving away from the use of dummy variables as the dependent variable in the probit model approach, to a more standard dynamic panel regression approach where the dependent variable is annual national real GDP growth (N_GDP). The explanatory variables include the same set of indicators of capital controls on inflows based on the Schindler (2009) index used by Ostry et al. (2010), but updated to 2011, as well as basic macro control variables for world activity and real terms of trade shocks. Annual real world GDP growth (W_GDP) is included to take into account any benefits in terms of national growth that emerging economies may have from global growth according to their degree of trade openness. The expected sign for the coefficient of this variable is positive. Real oil prices (i.e. the logarithm of the ratio of oil price to CPI, both denominated in national currencies) are used to control for the impact of energy prices on the terms-of-trade, which affect real transfers between net importers and exporters of oil. The expected sign for the coefficient of this variable is ambiguous.

III.2. The model and the data

A dynamic panel regression approach is used to study the relationship between controls on capital inflows and annual real GDP growth around the GFC. To account for autocorrelation in the real GDP growth rate its lagged value is added as an explanatory variable. In addition, as annual real world GDP growth is presumably (in part) endogenous to annual national real GDP growth,¹⁰ this explanatory variable has been instrumented.¹¹ The empirical model for overall controls is shown as equation [A], while equation [B] includes the set of capital control indices for FDI, equity and bond inflows. Subscripts *i* and *t* denote country and period, respectively.

$$N_GDP_{i,t} = \alpha_0 + \alpha_1 N_GDP_{i,t-1} + \alpha_2 W_GDP_{i,t} + \alpha_3 LN_OIL_CPI_{i,t} + \alpha_4 O_I_{i,t} + \varepsilon_{i,t} \quad [A]$$

$$N_{GDP_{i,t}} = \alpha_0 + \alpha_1 N_{GDP_{i,t-1}} + \alpha_2 W_{GDP_{i,t}} + \alpha_3 LN_{OIL_{CPI_{i,t}}} + \alpha_4 FDI_{i,t} + \alpha_5 EQ_I_{i,t} + \alpha_6 BD_I_{i,t} + \varepsilon_{i,t} \quad [B]$$

This model is estimated with the Generalized Method of Moments (GMM) using first differences (Arellano and Bond, 1991).¹² This estimation is robust to heteroskedasticity and autocorrelation. The correlations between the exogenous variables are appropriately weak. This econometric analysis is run on the same sample of 37 mostly emerging economies used by Ostry et al. (2010) over the period 2003-09. All macroeconomic data are extracted from the IMF's World Economic Outlook database (April 2013) and its AREAER surveys. The exchange rate data used in the calculation of oil prices in domestic currencies were taken

from Bloomberg. Table 3 presents the descriptive statistics of the data used in the regressions for the different sample time periods.

Table 3. **Some characteristics of the data**

	N_GDP	W_GDP	LN_OIL_CPI	O_I	FDI_I	EQ_I	BD_I
2003-09							
Mean	4.36	3.78	2.31	0.41	0.45	0.38	0.39
Median	4.64	4.27	1.95	0.33	0.00	0.50	0.50
Max.	18.29	5.44	9.04	1.00	1.00	1.00	1.00
Min.	-17.73	-0.59	-1.97	0.00	0.00	0.00	0.00
Std. Dev.	3.81	1.66	2.45	0.36	0.50	0.40	0.41
2003-07							
Mean	5.88	4.79	2.41	0.36	0.36	0.32	0.36
Median	5.79	4.97	2.02	0.25	0.00	0.00	0.00
Max.	18.29	5.44	9.04	1.00	1.00	1.00	1.00
Min.	-7.76	3.69	-1.71	0.00	0.00	0.00	0.00
Std. Dev.	2.88	0.62	2.43	0.36	0.48	0.40	0.41
2008-09							
Mean	1.83	1.11	2.29	0.48	0.65	0.48	0.46
Median	2.61	1.11	1.88	0.50	1.00	0.50	0.50
Max.	9.80	2.81	8.72	1.00	1.00	1.00	1.00
Min.	-17.73	-0.59	-1.86	0.00	0.00	0.00	0.00
Std. Dev.	4.82	1.71	2.48	0.36	0.48	0.41	0.44
2003-11							
Mean	4.74	3.96	2.51	0.42	0.51	0.41	0.42
Median	5.13	4.77	2.07	0.33	1.00	0.50	0.50
Max.	18.29	5.44	9.04	1.00	1.00	1.00	1.00
Min.	-17.73	-0.59	-1.86	0.00	0.00	0.00	0.00
Std. Dev.	3.89	1.90	2.44	0.36	0.50	0.41	0.43
2008-11							
Mean	3.19	2.85	2.52	0.48	0.66	0.50	0.46
Median	3.63	3.38	2.12	0.50	1.00	0.50	0.50
Max.	11.23	5.22	8.91	1.00	1.00	1.00	1.00
Min.	-17.73	-0.59	-1.86	0.00	0.00	0.00	0.00
Std. Dev.	4.30	2.17	2.46	0.35	0.48	0.40	0.43

Notes: Descriptive statistics for a sample of 37 mostly emerging economies. N_GDP and W_GDP are expressed in per cent. Sources: International Monetary Fund, Bloomberg.

Figure 2 shows the ranking of all countries in the sample by the average level of capital controls (the height of the dots) alongside the average annual real GDP growth rates over the period 2003-09 (shown by the columns).

The regression results obtained by estimating a dynamic panel model with GMM on a sample of 37 mostly emerging economies are shown in Table 4. To check for robustness and to be consistent with the stability analysis reported in Section II.2, equations [A] and [B] were also run with Latvia excluded from the sample. In all cases, the results are consistent with those reported in Table 4. They are not presented in the paper but are available from the authors upon request.

Figure 2. Annual real GDP growth rate and capital control indices



Note: All figures are averaged over the period 2003-09.

Sources: IMF, World Economic Outlook (April 2013), Schindler Database (2009) and authors' calculations.

Table 4. **Capital controls and economic growth**

	Whole period				Pre-crisis period		Crisis period			
	2003/09		2003/11		2003/07		2008/09		2008/11	
	[A]	[B]	[A]	[B]	[A]	[B]	[A]	[B]	[A]	[B]
O_I	0.003 (0.91)	-	-0.001 (-0.28)	-	0.07*** (5.65)	-	-0.02 * (-1.89)	-	-0.01*** (-5.64)	-
FDI_I	-	-0.01*** (-5.08)	-	-0.01*** (-4.78)	-	0.004 (0.59)	-	0.001 (0.24)	-	-0.01*** (-5.03)
EQ_I	-	-0.01 (-1.35)	-	0.002 (0.20)	-	-0.01 (-0.85)	-	0.01 (0.69)	-	0.02*** (2.97)
BD_I	-	0.03*** (3.72)	-	0.02 ** (2.08)	-	0.05*** (2.50)	-	-0.03 * (-1.81)	-	-0.03*** (-4.30)
N_GDP(-1)	0.19*** (14.94)	0.17*** (11.47)	0.24*** (31.17)	0.23*** (18.30)	0.15*** (6.51)	0.19*** (8.12)	0.47 * (1.85)	0.62*** (3.01)	0.24*** (17.96)	0.22*** (24.36)
W_GDP	1.25*** (43.79)	1.24*** (36.67)	1.22*** (75.57)	1.20*** (37.33)	1.22*** (9.16)	1.01*** (8.12)	0.98*** (9.36)	0.98*** (10.60)	1.12*** (40.79)	1.11*** (26.50)
LN_OIL_CPI	-0.01*** (-10.01)	-0.01*** (-6.47)	-0.01*** (-10.69)	-0.01*** (-6.03)	-0.01*** (-2.89)	-0.01*** (-3.20)	-0.01 * (-1.66)	-0.01 (-1.37)	-0.01*** (-6.71)	-0.01*** (-7.80)
J-statistic	29.40	32.72	33.92	31.15	14.57	17.90	14.41	18.20	28.41	27.81
Prob(J-statistic)	0.65	0.38	0.42	0.46	0.75	0.53	0.42	0.20	0.70	0.63
Observations	259	259	333	333	185	185	74	74	148	148

Notes: This table shows the results of estimating a dynamic panel model with the GMM estimator proposed by Arellano and Bond (1991) for a sample of 37 mostly emerging economies. The dependent variable is annual real GDP growth rate. See Section III.1 for the definition of all the explanatory variables. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Standard errors are corrected for heteroskedasticity following White's methodology.

III.3. Estimation results

For the whole sample period from 2003 to 2009 (as in the Ostry et al., 2010, study), or for the updated 2003-11 period, there is no evidence supporting the notion that overall capital controls as measured by the IMF improve prospects for emerging market growth. For the pre-crisis sub-period the coefficient of the overall capital control indicator is positive and significant at the 1% level. This relationship, however, is inverted in the subsequent crisis sub-period: the coefficient is negative and significant at the 1% level over the period 2008-11, and at the 10% level from 2008 to 2009.¹³ This is in contrast to the Ostry et al. (2010) probit model results which suggest that controls are most helpful during the crisis period. While more research is required here, the results appear to be more consistent with capital controls on inflows helping countries to maintain undervalued currencies in the good times, and therefore benefit from greater trade. Managed exchange rate policies in such periods also result in reserves accumulation and credit bubbles which authorities would try to avoid by inflow controls; this has less negative effects in good times as companies' cash flow is strong and credit constraints are less binding. The reversal of the result in the crisis period is broadly consistent with the idea that inflows dry up so that there is less upward pressure on the exchange rate, and perhaps the reverse when net inflows are negative, while domestic liquidity constraints became more binding. Countries with lower levels of capital controls on inflows may have performed better since more open economies are more appealing to foreign investors – they are less subject to political risk and the imposition of controls on outflows in a crisis. This helps to alleviate domestic company cash flow constraints in the global recession.

While the Ostry et al. (2010) study and the results presented here focus on inflows, the interpretation put forward here is consistent with other studies that have focused on controls on capital outflows. Aizenman and Pasricha (2013) find that countries tighten outflows in economic recessions when inflows are more volatile, but loosen controls on outflows in good times when inflows are strong, currency appreciation is a concern and domestic reserves accumulation risks a credit boom – greater outflows in such periods help to ease such pressures. This interpretation is supported *versus* the alternative hypothesis that outflow controls are related to the need to keep savings at home to lower fiscal funding costs.

These above interpretations of the findings in this paper do not support the case for capital controls. In this view, the country objective is to benefit in the “good times” by targeting a lower exchange rate in the face of inflows and benefit from higher export competitiveness. Capital controls help to resolve the resulting conflict between policy objectives that can arise as foreign exchange market intervention leads to domestic credit and house price cycles.

This interpretation is not contradicted when the composition of capital controls is considered. “Bonds” in the sense used here are essentially portfolio and bank obligation flows that drive exchange rate pressures in the short run and are associated with foreign currency wholesale funding of the banking system (and hence the credit cycle). FDI on the other hand is longer-term in nature and often associated with multinational enterprises, where access to international capital markets is less problematic. Equity flows have quite different risk sharing characteristics compared to “bonds” or FDI.

The impact of capital controls on “bond” inflows on annual real GDP growth is significantly positive for the full sample periods and for the pre-crisis period (at the 1% level). However, this variable is significantly negative during the crisis (at the 10% level in the 2008-09 and at the 1% level in the longer 2008-11 period). This is not inconsistent with the interpretation posited for overall controls. These shorter-term capital flows are associated with exchange rate speculation and the foreign currency funding of banks that provide finance to smaller firms with less access to international markets. Such flows are often in the front line of capital control measures to support exchange rate targeting policies. When cash flow is strong prior to the crisis the benefits of exchange rate targeting may be more dominant, whereas during the crisis smaller companies are more dependent on bank finance which may be inhibited by controls on inflows.

The coefficient on controls on FDI is negative and significant at the 1%-level in the 2003-09 and the updated full sample period (2003-11). It is also highly significant in the updated crisis sub-sample period (2008-11). It is insignificant in the shorter (2003-07) pre-crisis period. Thus it seems overall that lower restrictions on FDI inflows allow countries to sustain greater economic growth from higher levels of investment inflows, which is particularly important during crisis periods.

Capital controls on equity inflows seem to have an insignificant relationship with annual real GDP growth over the full sample period, the pre-crisis period and the post-crisis period to 2009. The effect of adding two additional years to the crisis period (2007-11, versus 2007-09) leads to a significant positive coefficient. Given the strong possibility of measurement issues on all of these measures of capital controls, the instability here does not warrant any possible interpretation at this stage.

IV. Conclusion

High levels of potential profit from investments in emerging economies drive both longer-term and short-term capital flows into and out of these countries. Hence, policy makers and regulatory authorities of emerging economies face challenges to understand and appropriately manage these inflows and their impact at both the micro and the macro level. By performing a probit model regression on 37 mostly emerging economies, Ostry et al. (2010) found some modest evidence that controls on certain types of capital inflows before the GFC were associated with reduced financial vulnerabilities during the crisis. However, this study was replicated and tested for stability. The results of these stability tests suggest the findings are not sufficiently robust to make any strong conclusions about the success or failure of the capital controls tool. Therefore, it is premature to use this study to support any policy conclusions about the usefulness of such measure in emerging market economies.

The study was then extended to look at the impact of the IMF measures of capital controls on annual real GDP growth around the global crisis. The main results of the panel regressions contrast with the idea that controls are most beneficial in a crisis. Instead, the findings showed: that there was no support for overall controls over the full sample; that beneficial effects were found in the pre-crisis period; and negative effects were supported by the data for the crisis period itself. Most emerging countries focus on exchange rate targeting. In pre-crisis periods, when inflows are strong and the risk of exchange rate appreciation is high, imposing controls on inflows to reduce appreciation gives rise to strong trade benefits. And this takes place at a time when cash flows are strong and restraint on foreign funding of the banking system is less problematic for domestic firms. In a crisis, however, funding constraints are more binding on firms as cash flows decline while the reversal of capital inflows puts downward pressure on the exchange rate. Controls on capital inflows at these times are more problematic for firms, with negative implications for GDP growth. This interpretation was not contradicted by the results presented here when considering the composition of capital controls between bonds, equity and FDI.

The finding that controls on bond portfolio inflows helps GDP growth via exchange rate management in the “good times” is not surprising. When inflows are strong, upward pressure on the exchange rate is high and when there is a desire to avoid too rapid money and credit growth that results from foreign exchange market intervention, capital controls may help. But one should not lose sight of the fact that these distorting policies are the result of a choice not to follow an independent monetary policy supported by flexible exchange rates. Flexible exchange rates and openness puts more pressure on governments and the private sector to carry out micro-structural and competition reforms, for both of these sectors face the disciplines of market pressure that tends to reduce the prevalence of rent-seeking behaviour and corruption. Certainly no evidence is found in the data used in this study to support the notion that controls on capital inflows benefit GDP in crisis periods.

However, more research is required to establish the impact of capital controls on economic wellbeing in crisis and non-crisis periods. It will be important to use alternative measures of capital controls, as the IMF binary measures do not distinguish between the extensiveness and intensity of different controls in the various countries. Similarly, GDP is influenced by a complex interaction of factors that change over time as globalisation

progresses, and it is difficult to control for these factors in order to isolate the effects of barriers to investment inflows *per se* in macro level studies. For this reason, a greater focus on micro research might be particularly useful.

Notes

1. See, for example, Edwards and Ostry (1992).
2. OECD Codes of Liberalisation of Capital Movements and of Current Invisible Operations, see www.oecd.org/daf/investment/codes.
3. Satyanath and Berger (2007) and Forbes (2007) both present an extensive review on the theoretical and empirical literatures about the impact of capital controls on economic growth.
4. The paper focuses on capital controls on inflows and does not consider controls on outflows. Although relaxing controls on capital outflows may have an impact on aggregate net inflows, the direction of the impact is not clear cut. Liberalising capital outflows reduces net inflows (gross inflows minus outflows). However, greater assurance that invested capital can be repatriated may make the country more attractive for foreign investors.
5. The coefficients are estimated by the maximum likelihood using the Huber-White robust covariance method.
6. The sample is restricted to 37 mostly emerging economies due to data limitations. The following countries are included in the final sample: Argentina, Brazil, Bulgaria, Chile, China, Costa Rica, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Hungary, Iceland, India, Indonesia, Israel, Jamaica, Kazakhstan, Korea, Latvia, Lebanon, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Romania, Russia, South Africa, Sri Lanka, Thailand, Tunisia, Turkey, Uruguay, and Venezuela.
7. 2005 is the last year covered by the *Schindler Database* (2009) which is available online: www.palgrave-journals.com/imfsp/journal/v56/n1/supinfo/imfsp200828s1.html.
8. The results of Ostry et al. (2010) are in line with those of Gupta et al. (2007) considering a sample of about 200 crisis episodes in about 90 countries over the period 1970-2007.
9. The GDP gap for Russia is -7.27%, which is very close to Kazakhstan's GDP gap of -7.45%. The crisis dummy variable for Russia is thus changed from 0 to 1.
10. National GDP growth can be driven by global economic growth. However, national GDP growth can also contribute to boost world GDP growth.
11. After testing for weak instruments, the two-year lagged value of the annual real world GDP growth rate is introduced in the regressions.
12. The model has also been estimated with the Generalized Method of Moments (GMM) using orthogonal deviations (Arellano and Bover, 1995). All results are consistent with those obtained using first differences. Detailed results are not presented in this article but are available from the authors upon request.
13. This fall in the level of significance is possibly due to a relatively low number of observations over this short period of time.

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