Restrictions on Short-term Capital Inflows and the Response of Direct Investment

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Capital controls remain a common approach to capital flows management. Meanwhile, the IMF has revised its position regarding selective use capital controls. However, the effects of granular variation in capital controls by asset category and direction of flow are not fully documented. Using a new dataset on capital control measures, I find that countries using capital controls on short-term capital inflows receive a higher level of direct investment inflows, and that this effect is decreasing in the country's growth rate. I show that this result is consistent with the interpretation that the capital control serves as a signal of stability in slower-growing countries.
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For decades, capital controls have been a controversial policy decision. Throughout the 1980s and 1990's, the position of the IMF was clear: liberalize capital markets—remove capital controls. Nevertheless, volatile capital flows and the subsequent debt crises of the 1990's have challenged the IMF's position. Surges in short-term capital flows have been observed to invoke systemically-destabilizing volatility, contributing to the 1994 Tequila Crisis in Mexico, the 1997 Asian Financial Crisis, and the 1998 Russian Financial Crisis[1]. Many countries have since used capital controls. Well-studied examples are Brazil, Chile, Colombia, and Malaysia[2]. However, the evidence on the effectiveness of capital controls is mixed. There is a general consensus that capital controls are effective at modifying the composition of capital flows, but not for stemming the volume of capital flows[3]. The growing evidence on capital controls and their role in cash flows management is evident in the evolution of the IMF's policy guidance. During the 1990's, the IMF suggested the use of controls on inflows for just 2 of 27 episodes of surging capital inflows (IMF Independent Evaluation Office [2005]). Confronted with years of experience with volatile external capital flows, the IMF faced a need to revise its policy guidance with respect to capital controls. In 2011, the IMF released a comprehensive research series on capital flows policy guidance that concluded with the *Institutional View on the Liberalization and Management of Capital Flows* in which the IMF recognizes that in certain circumstances, capital flow management measures can be useful. The IMF stressed that capital controls should not however substitute for warranted macroeconomic adjustment[4].

To the extent that capital controls can mitigate risks attributed to external capital flows, controls on short-term capital inflows are of particular interest. The maturity structure of short-term capital flows enables sustained surges in inflows to be followed by a sudden reversal with a shift in market conditions (Calvo [1998]). The volatility of short-term capital flows can destabilize financial markets that are underdeveloped. Exposure to volatility through external capital flows is a common motive for capital controls, and I find that controls are commonly used. Since 2007, more than 1 in 2 economies have used restrictions on short-term capital inflows, and more than 1 in 4 economies have added restrictions in the same time[5]. With controls on short-term capital inflows persistent if not growing in use, it is worthwhile to ask what an economy gives up by imposing this particular capital control? This paper focuses specifically on the relationship between capital controls on short-term capital inflows and the level of direct investment inflows; does an economy give up its direct investment in using a capital control on short-term capital inflows? Further, I consider the conditions under which capital controls on short-term capital inflows might be useful or harmful for direct investment. This will be important for policymakers reviewing the use of capital controls in the case that the policymaker values the level of direct investment inflows.

Using a new dataset by Fernández et al. [2015] with information on capital control measures covering 100 countries over the years 1995–2015 and panel data fixed

effects regression, I find that countries which use capital controls on short-term capital inflows receive a higher level of direct investment inflows. Further, I find that this effect is decreasing in the country's per capita growth rate. Thus, lower (higher) growth countries that use restrictions on short-term capital inflows have higher (lower) direct investment inflows, all else equal. The evidence shows that the use of controls on short-term capital inflows serves as a signal of stability to attract investors to lower-growth countries. If an investor enters a country that is growing slowly conditional on the capital control, that investor must expect that the country must at least be a stable environment for their investment. This result is consistent with Cordella [2003], where capital control policy increases the expected return on investment, thereby increasing capital inflows. I test this relationship in alternative specifications, including instrumental variables panel data random effects regression and Arellano-Bond generalized method of moments. Policy questions concerning capital flows carry significant implications for reverse causality—this is addressed in the paper using the alternative specifications and I confirm that the results hold.

The essay proceeds as follows. The next section presents a brief literature review. Following the literature review is a discussion on the theoretical background which forms the basis for the empirical work. Next, I present some facts about the data used including the dataset used as the capital controls index. The following section contains the results of the baseline model. After discussing the baseline results, I re-estimate the baseline model using instrumental variables, then discuss sensitivity analysis. The final section concludes.

LITERATURE REVIEW

Capital flows management is an important branch of the international economics literature. The Research Department at the IMF has published several working papers that serve as the analytical basis for the policy guidance series on capital flows discussed in the introduction[6]. The IMF's revised policy guidance recognizes the capacity for capital controls to address macroeconomic and financial stability concerns in the face of inflow surges, *only after* all macroeconomic and exchange rate policy options have been exhausted (Ostry et al. [2011]). The IMF's revised position on capital controls highlights the substantial trade-offs that a policymaker must consider when evaluating a capital control. These trade-offs remain unsettled in the literature on many of the objectives that have been associated with capital controls. Forbes et al. [2015] find little support that capital controls are effective in any of 15 objectives. Forbes et al. [2015] however do not consider restrictions at the granular level like short-term capital inflows, nor do they study the influence of capital controls on direct investment. Several studies have found that capital controls push the maturity composition of external capital flows towards more long-term flows such as direct investment, but do not have an effect on the volume of external capital flows (Montiel and Reinhart [1999], Carlson and Hernandez [2002], Alfaro et al. [2005]). Many studies have

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also found that capital controls improve growth resilience or reduce the vulnerability to crisis (Qureshi et al. [2011],Gupta et al. [2007],Edwards and Rigobon [2009] Pyun and An [2016]) but there is evidence that this comes at the expense of efficiency losses and market discipline (Cardarelli et al. [2010], Forbes [2005b]). Finally, there is an important branch of this literature which has looked at the costs of capital controls at the firm/investor level, where lower returns, higher cost of firm financing, and lower investment are significant (Alfaro et al. [2017], Forbes [2005b], Forbes et al. [2016]).

The contribution of this paper adds to a subset of papers which have studied the economic consequences of capital controls on particular asset categories as opposed to broadly-defined capital control indices (see e.g., Eichengreen and Rose [2014], Alfaro et al. [2017], Asiedu and Lien [2004]). In a closely related paper, Dell'Erba and Reinhardt [2015] show using an event study that restrictions on short-term debt flows decrease the likelihood of banking debt surges but increase the likelihood of financial sector foreign direct investment surges. The results presented here indicate that slower-growing countries with capital controls on short-term capital inflows receive higher levels of foreign direct investment. This result is similar to Dell'Erba and Reinhardt [2015], and is consistent with Cordella [2003], where foreign lenders in a theoretical economy find it profitable to invest in an emerging market if and only the emerging government imposes taxes on short-term capital inflows. In Cordella [2003], the policy imposed on short-term capital inflows can prevent bank-runs, increasing expected returns to investing and in turn increasing the volume of capital flows.

THEORETICAL BACKGROUND

The focus of this paper is a country-level analysis on the response of direct investment to capital controls on short-term capital inflows. In the appendix, I extend the framework in Magud et al. [2011] to characterize the relationship between long-term inflows and a capital control. Magud et al. [2011] use the portfolio balance approach to identify the optimal behavior of short-term capital inflows in response to a capital control on short-term capital inflows. An extension naturally follows, beginning with the optimal portfolio allocation with respect to long-term inflows. In the second subsection of the theoretical framework section in the appendix, I establish the optimal behavior of long-term inflows in response to a capital control on short-term inflows.

The conditions that describe the optimal behavior of long-term capital inflows when the economy is subject to a capital control on short-term capital inflows depend on the elasticity of long-term flows to total flows. Specifically, if the elasticity of direct investment to total inflows is greater than one, a capital control on short-term capital inflows increases the level of direct investment. However, if the elasticity of direct investment to total inflows is less than one, a capital control on short-term inflows leads to a lower level of direct investment. This means that the way direct investment responds to a capital control on short-term

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capital inflows may differ for some countries—increasing in some, decreasing in others. The value that this elasticity will ultimately take is exogenous to the model.

The objective of this paper is to determine, on average, how direct investment responds to a capital control on short-term capital inflows. I will also this test whether this relationship is different for countries that are growing slower or faster. In this way, an objective of this paper is to test the average sign of this elasticity.

DATA

I use annual data on net foreign direct investment inflows from 1995–2015 for 100 countries. Data on the determinants for direct investment is sourced from World Bank's *World Development Indicators* and the International Monetary Fund's *International Financial Statistics*. Additional data is obtained in the Gurevich and Herman [2018] *Dynamic Gravity Dataset*. The data for capital controls is provided by the new dataset presented in Fernández et al. [2015]. Data on the level of institutional quality is provided by the Fraser Institute's *Economic Freedom of the World* database, which measures the degree to which the policies and institutions of countries are supportive of economic freedom. Additional measures on institutional quality are obtained from the *World Governance Indicators* project, which are published with the *World Development Indicators* by World Bank. Finally, data for instrumental variables is obtained on legal origins from Porta et al. [1998], on central bank independence from Garriga [2016], and political institutions from Cruz et al. [2016a]. A complete list of the variables with their definitions and their sources is included in the appendix. In the following, I will provide a brief description of the Fernández et al. [2015] dataset and how it is used in this paper, as well as some facts regarding the data in general.

Capital Control Measures

The capital control measures used in this paper originate in a new dataset made available by Fernández et al. [2015]. Using information in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), Fernández et al. [2015] build on a dataset presented in Schindler [2009]. Fernández et al. [2015] further disaggregate the capital control measures by 10 distinct capital asset categories and by the direction of flows for 100 countries from 1995–2015[7]. The capital control measures draw from the *de jure* information contained in the IMF's AREAER. *De jure* information in this context is correlated with official rules and practices, referring to the state of affairs in accordance with the law. In contrast, *de facto* information would measure actual outcomes, the extent to which rules and practices are enforced, independent of their official status.

Capital control measures by definition restrict capital transactions on the basis of residency, limiting capital mobility between residents and non-residents. There

exist two types of capital inflow transactions and two types of capital outflow transactions on which most capital controls can be imposed. Table 1 distinguishes each type of transaction according to the residency of the initiating party and the direction of flow. Transactions that result in inflows or outflows can be initiated by a resident or non-resident. For example, the transaction recorded as a *purchase locally by non-resident* is a non-resident transaction and a capital inflow. An example of this transaction would be a Mexican firm purchasing a United States bond, where the United States is the home country.

TABLE 1—CAPITAL TRANSACTIONS BY RESIDENCY AND FLOW DIRECTION

	Capital Outflow	Capital Inflow
Resident Transaction	Purchase Abroad by Resident	Sale or Issue Abroad by Resident
Example	United States firm purchases Mexican bond	United States firm sells bond in Mexico
Non-resident Transaction	Sale/Issue Locally by Non-resident	Purchase Locally by Non-resident
Example	Mexican firm sells bond in the United States	Mexican firm purchases United States bond

Fernández et al. [2015] use the narrative description in the AREAER to determine whether a restriction on any of the four transactions in Table 1 are present. Additionally, Fernández et al. [2015] repeat this procedure across 10 capital asset categories, including short-term capital (money market instruments). With this information, I build a set of capital control dummies for money market inflows and direct investment inflows in addition to an aggregate capital control index. The first money market inflows dummy variable equals one in a given year when a country only uses one of the restrictions in the second column of Table 1: either a restriction on a sale or issue abroad by a resident or a restriction on a local purchase by a non-resident. The second money market inflows dummy variable equals one in a given year when a country uses restrictions on both transactions in the second column of Table 1. I create a dummy variable for capital controls on direct investment inflows, and an aggregate control index over the remaining 8 capital asset categories, excluding money market instruments and direct investment[8]. The event that a country uses zero restrictions on inflows transactions serves as the numeraire for each asset-specific set of dummy variables.

While some countries have placed restrictions on money market inflows and money market outflows at the same time, these instruments have objectives which are theoretically opposing. Forbes et al. [2015] observe that increasing controls on
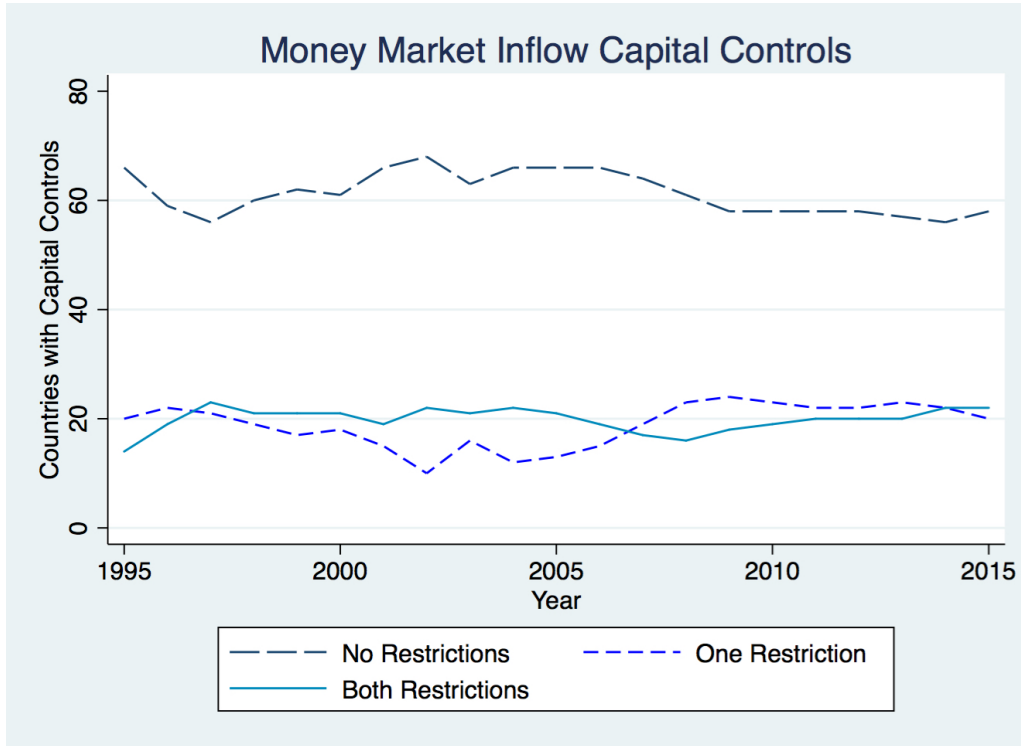
FIGURE 1. MONEY MARKET INFLOWS CAPITAL CONTROLS

inflows and decreasing controls on outflows are policy decisions that are meant to address strong net capital inflows, currency appreciation, rapid credit growth, and the related vulnerabilities. Likewise, removing controls on inflows but increasing controls on outflows theoretically address sudden stops, currency depreciation, or a contraction in credit. What's more, restrictions on inflows help to prevent (rather than to respond to) crises, and they are considered to decrease uncertainty and increase transparency by providing creditors information regarding transaction costs at the beginning of a transaction (Ocampo and Stiglitz [2008]). Finally, capital controls on outflows have been associated with meeting budgetary needs through financial repression. This last objective is not associated with capital controls on inflows, but is observed to have contributed to the unfavorable perception of capital controls, generally (Ghosh and Qureshi [2016]). As a result of the opposing policy objectives for capital controls in the two different directions, I focus on controls on money market inflows.

Using the detailed nature of the Fernández et al. [2015] dataset, I can determine the incidence of capital control restrictions specific to money market inflows. Following Table 1, a country can impose zero, one, or two restrictions on money market inflows. Three trends are evident in Figure 1. The country-level incidence

for each of the three possible quantities of restrictions used on money market inflows over the years 1995–2015 is plotted in Figure 1. Countries that use either one or two restrictions tend to assume near equal parts of just less than half the sample, while countries that use no restrictions make up the remaining lion's share. Second, the importance of money market capital controls increases in the late 1990's in the wake of several debt crises. The frequency of money market capital controls decrease slightly before the Global Financial Crisis of 2008, and increases again following Global Financial Crisis. The number of countries that use no restrictions falls from 66 in 1995 to 56 in 1997, grows to 66 in 2006, but then steadily falls to 58 in 2013. The number of countries that use one of the restrictions have fallen since the financial crisis, from 23 countries in 2008 to 20 countries in 2015. However, the country-level incidence of two restrictions is steadily increasing following the global financial crisis from 16 countries in 2008 to 22 countries in 2015.

The relative frequency of the three levels of money market inflows capital controls is stable over the duration of the sample period. Countries that have zero restrictions on money market inflows consists approximately of three-fifths of the sample, and countries that have one or two restrictions make up about one-fifth of the sample for the duration of the sample period. However, the stability in relative frequency masks significant temporal variation at the country level. In each year from 1995–2015, there exists at least one country adding restrictions on money market inflows and one country removing restrictions from money market inflows. Figure 2 is a histogram with the frequency of countries adding and removing controls in each year of the sample. There appears to be more countries changing controls in the beginning of the period than the end of the period, with the number of countries removing controls in much higher frequency in the beginning of the sample period. However, in any given year over the sample period, there are more countries adding restrictions than removing restrictions, with 11 years that have more countries adding restrictions versus 6 years that have more countries removing restrictions. A caveat of this illustration is that the dynamics in the various quantities of restrictions are pooled. In the subsection of the Appendix on data visualization, the histogram in Figure 4 breaks down the frequencies respecting each of the three ways a country can add restrictions and the three ways a country can remove restrictions.

Summary Statistics

The dependent variable in the baseline model of this paper is the level of net direct investment inflows (FDI) as a percentage of gross domestic product (GDP). Measuring FDI and its determinants as a percentage of GDP provides cross-country comparability for these variables in a panel data setting. The conventional definition of foreign direct investment is cross-border investment made by a resident in one economy with the objective of establishing a lasting interest in a firm which resides in an economy other than that of the direct investor. Last-
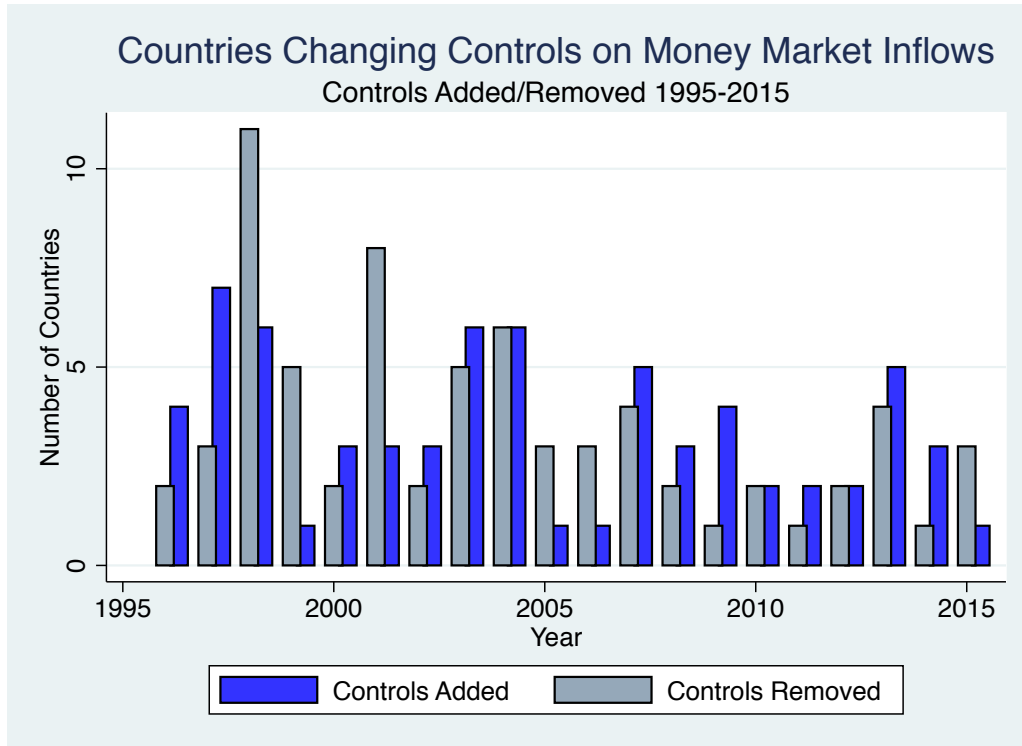
FIGURE 2. CHANGES IN MONEY MARKET INFLOWS CAPITAL CONTROLS

ing interest indicates that the direct investor owns at least 10% of the voting power of the firm, which is meant to signal a long-term investment relationship (OECD [1998]). Direct investment is expected to outlive cyclical movements in output, FDI is robust to economic volatility and short-term movements in interest rates (Ramey and Ramey [1995]). FDI tends not to be associated with the characteristics of "hot money," capital flows that lead to surges and sudden stops (Reinhart and Reinhart [2009]). For these reasons and the notion that FDI crowds in domestic investment, policymakers particularly value the level of foreign direct investment.

Average[9] foreign direct investment and short-term debt flows for 1995–2015 are plotted in Figure 3. The countries have been separated into two groups. The first group consists of countries that have capital controls on money market inflows for the entire period or have introduced the controls by 2007 and are left in place for the remainder of the sample period. The second group consists of countries that have never had capital controls in place or have removed them before 2007 and never introduced them again. The first group of countries is represented by the solid line in Figures 3(a) and 3(b), the second group is represented by the dashed line. The first group has markedly higher direct investment than the

second group for almost the entirety of the sample period. The first group of countries—those using controls the entire period or have introduced by controls by 2007—also tends to have higher net flows on external short-term debt. Net flows on short-term debt appear more volatile than net foreign direct investment, as expected. Average direct investment reaches a high of about 4% of GDP in 1999 and again in 2007 before the Global Financial Crisis, while average net flows on external short-term debt reach a high of 2.5% in 2010 during the height of the Federal Reserve's unconventional monetary policy program. While the two groups track each other more closely in Figure 3(b), this could be evidence of reverse causality. Reverse causality is a principal objective of this paper and is addressed in the instrumental variables and sensitivity analysis sections.

Table 2 provides the summary statistics for the continuous variables used in this study, including the determinants of annual foreign direct investment inflows according to the baseline specification. There is a large set of literature on the determinants of foreign direct investment. The determinants chosen here follow research relevant for external factors affecting FDI flows. Eicher et al. [2012] uses Bayesian model averaging to identify, in probabalistic terms, which determinants are the most important for direct investment inflows. Alfaro et al. [2008] examine determinants of capital flows with an emphasis on the level of institutional quality. Blonigen [2005] provides a comprehensive survey on the determinants of direct investment. These three studies jointly identify trade effects, factor endowments, exchange rates, FDI frictions, institutions, the growth rate, and infrastructure as important determinants for foreign direct investment.

Trade effects follow an important motivation for FDI: export substitution to a host country. From the prospective of the host country, this is import substitution. Countries with larger import markets are expected to attract more FDI. The size of a country's capital endowment also attracts more FDI (Lucas [1990], Bergstrand and Egger [2007]). The capital endowment is captured by gross fixed capital formation. Infrastructure is closely tied to a direct investor's expected return to investment. Strong infrastructure[10], measured by the rate of telephone subscriptions, decreases a firm's transaction costs, increasing the expected return on investment. Foreign direct investment is expected to be increasing in the growth rate, as firms are more likely to establish a stake in countries where a higher future growth rate is reasonably expected (Carlson and Hernandez [2002]). Additionally, direct investment is expected to decrease with the appreciation of the exchange rate. To the extent that a large part of foreign direct investment the result of supply chain dynamics, investors avoid economies whose export sectors are weakened by strong currencies (McKinnon [1999]). Blonigen [2005] and Eicher et al. [2012] find that legal institutions and property rights as well as control of corruption are the most important dimensions in terms of institutional quality for FDI. Finally, to capture FDI frictions, I follow Alfaro et al. [2008] with a measure called distantness that reflects how remote or distant a country may be from the center of economic activity.

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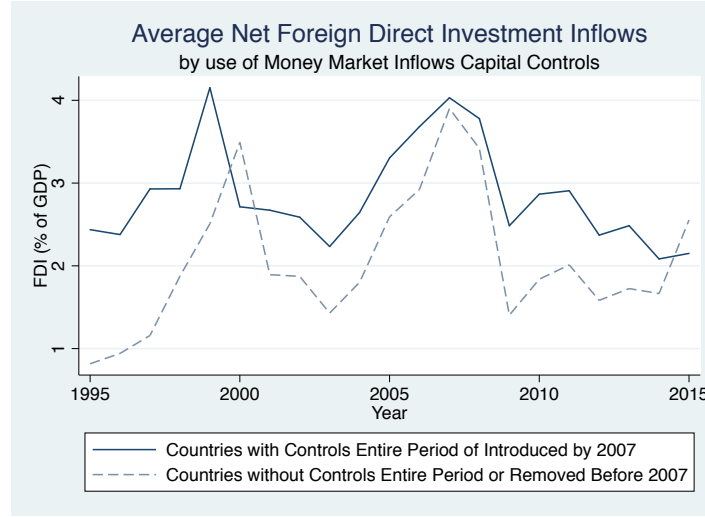
(a) Net Foreign Direct Investment Inflows
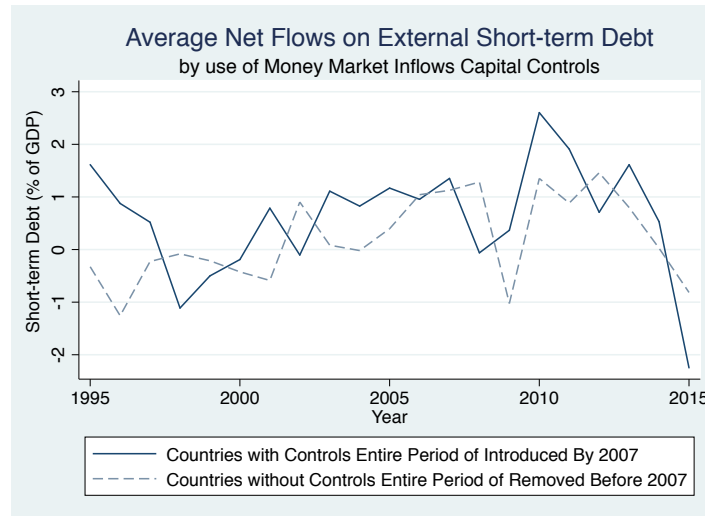
(b) Net Flows on External Short-term Debt

Figure 3. Average Capital Flows 1995-2015

The level of net foreign direct investment inflows averages between 2.4% and 3.4% for the sample. The substantial cross-sectional variation (country-to-country) is evident in the ranges (as measured by the distance between the minimum and maximum values) of the variables in Table 2. This is expected in a sample of 100 countries. The large standard deviations of FDI, telephone lines, and the growth rate give very large coefficients of variation adding to the evidence on the substantial cross-sectional variation in the sample used here.

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TABLE 2—SUMMARY STATISTICS

	Mean	Median	Std Deviation	Min	Max
FDI Inflows	3.4069	2.4077	4.5869	-15.989	70.010
Gross Fixed Capital	.22179	.21936	.05746	.02646	.45514
Legal/Property Rights	5.5540	5.4180	1.610	2.0334	9.1381
Imports	38.154	33.991	17.916	.06470	109.13
Telephone Lines	22.073	16.900	19.119	.10329	74.742
Growth Rate	2.3030	2.3400	3.7917	-25.554	26.510
Exchange Rate	.56771	.45632	.33109	.07646	1.856
Central Bank Independence	.58247	.57356	.2066	.1345	.904
Observations	2100				

EMPIRICAL ANALYSIS

Baseline Model

As Figure 1 indicates, there is an increase in the number of countries that use capital controls on money market inflows starting in 2007. More than 1 in 2 economies have used restrictions on money market inflows since 2007, and more than 1 in 4 have added restrictions in the same time. Motivated by the increasing frequency of money market capital controls and their potential cost (see, e.g. Cardarelli et al. [2010], Forbes [2005a], Forbes [2005b]), I use panel data fixed effects regression in this section to study the relationship between direct investment inflows and the use of money market inflows capital control policy. Specifically, I ask does an economy give up its direct investment in using a capital control on money market inflows?

The baseline regression in Table 3 is a panel data fixed effects regression, the dependent variable is foreign direct investment inflows as a percentage of gross domestic product (FDI). This measure of investment as the dependent variable effectively provides cross-country comparability in a panel data setting. To investigate the relationship between FDI and capital controls, I regress dummy variables for money market capital control policy on FDI. I also test this relationship with an aggregate capital control index. I estimate a panel data fixed effects specification for the determinants of direct investment inflows:

$$(1) \qquad FDI_{it} = \beta_0 + \boldsymbol{x}'_{it}\boldsymbol{\beta} + \boldsymbol{c}'_{it}\boldsymbol{\delta} + \text{PCG}_{it} \times \boldsymbol{c}'_{it}\boldsymbol{\gamma} + d'_{it}\xi + \alpha_i + \lambda_t + \varepsilon_{it}.$$

In Equation 1, FDI_{it} is foreign direct investment inflows as a percent of gross domestic product for a country i in year t. The determinants of FDI are included in the vector $\boldsymbol{x}_{it}$. The vector $\boldsymbol{c}_{it}$ contains the capital control restrictions which are the feature component. In addition, the variable d_{it} represents the dummy

variable for the capital control on direct investment inflows. Finally, PCG_{it} is the per capita growth rate, α_i are the country fixed effects and λ_t are the year fixed effects.

Following Table 1, the set of capital controls in $\boldsymbol{c}_{it}$ are the capital controls on money market inflows MMI1 and MMI2 that track whether a country has one restriction or both restrictions on money market inflows in a given year. Countries with no restrictions serve as the numeraire. The determinants of direct investment are included in the baseline model to determine whether direct investment changes as the result of money market capital controls or otherwise. An interaction term between money market capital controls and the per capita growth rate is included to capture the individuality in the capital control prescription. The interaction will reveal how direct investment responds to policy variation in combination with the expected local return on investment. I also test this relationship using an aggregate capital control index (ACI) which covers the eight other asset categories in the Fernández et al. [2015] dataset for both capital inflows and capital outflows *excluding money market flows and direct investment.* I also include capital controls on direct investment inflows in all regressions when they are present in a given country-year. It is important to be able to distinguish the effects of capital controls on direct investment inflows and capital controls on money market inflows.

Table 3 contains the results of the baseline fixed effects panel data regressions with country and year fixed effects. Cyprus, Malta, The Netherlands, Hong Kong, and Singapore are not included in the final sample due to extreme observations in direct investment or in the determinants. Kuwait, Ethiopia, Qatar, The United Arab Emirates, and Uzbekistan are not included due to data unavailability. The final sample includes 90 countries for the years 1995–2015. The results of the Hausman specification tests rejecting the null hypothesis of no systematic difference in random effects coefficients versus fixed effects coefficients are listed in the last row of Table 3. The joint significance of the year fixed effects is confirmed by an F-test, not presented here for brevity but available from the author. In the first column, the growth rate is significant and positive. The coefficient on the dummy variable for one money market capital control is statistically significant and positive, but this is not the case for the dummy variable for both money market capital controls. This means that country-years with one capital control on money market inflows in place have statistically significantly more direct investment inflows than country-years with no capital controls, but this result does not hold for country-years with both capital controls on money market inflows in place. Finally, the interactions of the two capital control dummies with the growth rate are both statistically significant and negative. The interaction between the per capita growth rate and money market capital controls indicates that high-growth (low-growth) countries which impose strong money market capital controls will receive less (more) direct investment inflows, all else equal. Interpreted jointly, the evidence indicates that the effects of money market capital

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TABLE 3—PANEL DATA FIXED EFFECTS REGRESSION

	(1)	(2)
Gross Fixed Capital Formation	4.179	4.158
	(5.992)	(5.829)
Legal/Property Rights	0.467	0.552*
	(0.312)	(0.3132)
Imports	0.0696	0.0649
	(0.0420)	(0.0415)
Telephone Lines	0.0375	0.0335
	(0.0268)	(0.0266)
Growth Rate	0.281*	0.372**
	(0.145)	(0.170)
Exchange Rate	3.735	3.851
	(2.777)	(2.783)
Distantness	-0.00007	-0.00002
	(0.0006)	(0.0006)
One Money Market Control (MMI1)	0.851**	
	(0.383)	
Both Money Market Controls (MMI2)	0.390	
	(0.650)	
Growth Rate × MMI1	-0.190*	
	(0.109)	
Growth Rate × MMI2	-0.259*	
	(0.132)	
FDI Inflows Control	0.416	.517
	(0.507)	(.529)
Aggregate Control Index (ACI)		0.124
		(0.511)
Growth Rate × ACI		-0.165**
		(0.0707)
Country Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	1415	1416
Countries	90	90
Within R^2	0.133	0.139
Overall R^2	0.140	0.141
Hausman Statistic	35.21	21.66

Panel-robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

control policy on direct investment inflows are larger in slower-growing countries than in faster-growing countries. A country in the first quartile of growth rates at 0.59% and that imposes one restriction on money market inflows expects $.851 - .190 \times 0.59 = .739$ percentage points higher direct investment. Likewise, a country in the third quartile of growth rates at 4.32% and that imposes one restriction on money market capital inflows expects $.851 - .190 \times 4.32 = .03$ percentage points higher direct investment. As the direct investment sample mean is 3.41 percent of GDP, this means that a typical slower-growing country that imposes capital controls on money market inflows expects approximately 21.7% higher direct investment, while a typical faster-growing country expects approximately .88% higher direct investment.

I have shown that the results in Column (1) of Table 3 suggest that countries that use either one of the restrictions on money market inflows receive higher direct investment inflows. This is not the case for the Column (2) which contains the estimates including the aggregate capital control index. A higher value for the aggregate capital control index represents a broader use of capital controls for a particular country in a given year. The statistical insignificance of the aggregate control index suggests that on average, capital controls broadly do not influence the volume of direct investment inflows, all else equal. This result is consistent with the previous findings of the literature on capital controls (see, e.g. Montiel and Reinhart [1999], Carlson and Hernandez [2002], Alfaro et al. [2005]). I do find a statistically significant and negative coefficient on the interaction term implying that faster-growing (slower-growing) countries that impose money market capital controls broadly receive less (more) direct investment.

The principal outcome from the results reported in Table 3 is the statistically significant and positive coefficient on the money market inflows capital control variable. Previous studies have predicted significantly higher FDI as a share of total flows, but insignificantly predicted higher levels of FDI (see, e.g. Montiel and Reinhart [1999] and Carlson and Hernandez [2002]) This is the first study to show that a capital control on short-term inflows can lead to a higher *level* of direct investment. The theoretical framework introduced in earlier and extended in the appendix further informs the interpretation of the positive coefficient on the money market capital control variable. Recall that for the relatively elastic case, a capital control on short-term debt implies an increase in direct investment flows. This follows from the fact that an elasticity greater than 1 reflects increasing marginal returns with respect to the level of direct investment. Finally, the relationship between the growth rate and money market inflows capital controls also gives insight about the underlying mechanism. As discussed above, the joint relationship translates in .739 percentage points higher direct investment for low-growth countries that use money market inflows capital controls, and .03 percentage points higher direct investment for high-growth countries that use money market inflows controls. However, exclusive of the capital control, lower-growth countries attract less direct investment, not more (given the statistically signifi-

cant and positive coefficient on the growth rate). These conditions support the interpretation that investors perceive capital controls on money market inflows in lower-growth countries serve as a signal of stability.

Finally, reverse causality may be the cause of the positive coefficient on the money market inflows capital control dummy in addition to the positive (yet insignificant) coefficient on the direct investment capital control dummy. If policymakers impose capital controls in response to higher capital inflows or if the countries that impose capital controls are the countries with higher inflows, reverse causality may pose a serious challenge. In the next section, I apply instrumental variables panel data random effects regression to address the potential reverse causality and confirm the results hold. When I address the endogeneity of capital controls, I also show that the coefficient on the direct investment capital control dummy becomes statistically significant and negative. In the section on sensitivity analysis, I present the results of Arellano-Bond generalized method of moments estimation.

INSTRUMENTAL VARIABLES

As discussed above, reverse causality is a challenge for regression analysis of capital flows (e.g. direct investment) on policy variables like capital controls[11]. Extra care must be taken to capture exogenous variation in the capital control that is unaffiliated with direct investment to capture the effect that capital controls have on the level of direct investment inflows. The same potentially reverse causality is true for other determinants of direct investment, particularly institutional quality and the level of imports. It is expected that countries with better institutions attract more direct investment. Conversely, the level of direct investment can help a country improve its institutions (Alfaro et al. [2005]). Imports also exist in the potentially reverse direction of causality due to import-substituting direct investment. The potential for reverse causality in Equation (1) is addressed with instrumental variables random effects regression, instrumenting for legal/property rights, imports, and the three capital controls variables.

Instrumental variables panel data random effects regression obtains coefficient estimates for the endogenous determinants using variables (instruments) that naturally exhibit exogenous variation. Following Alfaro et al. [2005] and Porta et al. [1998], I use legal origins as instruments for institutional quality (legal/property rights). Porta et al. [1998] study the legal origins of contemporary nation-states as principle determinants in shaping a country's current financial institutions, the associated legislation on investor protection, the enforcement of such legislation, and the extent of concentration of firm ownership across countries. The authors show that most countries' institutions can be traced back to one of four European legal systems: English common law, French civil law, German civil law, and Scandinavian civil law. Alfaro et al. [2005] adopt these four legal origin variables as exogenous determinants of institutional quality, and find that French legal origin and British legal origin are significantly predictive. I use French and British legal

origins as two instrumental variables for legal/property rights.

Central bank independence has been cited consistently in the literature on the determinants of capital controls (see, e.g. B. Johnston and Tamirisa [1999], Grilli and Milesi-Ferretti [1995]). Central banks which are legally but also operationally more independent are less likely to impose capital controls. Data on central bank independence is obtained from Garriga [2016], a database on central bank independence that covers 172 countries between 1970 and 2012. The measure of central bank independence is a statutory continuous index that reflects the level of independence on dimensions of personnel, finance, and policy. I use central bank independence as an instrument for the capital control on direct investment inflows. Operational monetary aspects of an economy are not attributes that reflect direct investment decisions on the margin. From a longer-term perspective, e.g. an examination of FDI stocks in cross-section, this may be important for FDI through stable growth. Central bank independence in this case is important for FDI inflows, only marginally, through fewer capital controls.

Table 4—First Stage Statistics

Excluded Instrument	First Stage F	Partial–R^2
Legal Origins	406.1	.2263
Electoral Cycle	52.15	.026
Right-leaning Government	.61	.0003
Central Bank Independence	35.00	.022
Interest Rate Hikes	.44	.0003

The next instrument is a binary instrument that captures short-term interest rate hikes or drops. As a conservative measure, I use quarterly data on changes in the deposit rate from the IMF's *International Financial Statistics*. To capture large short-term increases or decreases in the deposit rate, I obtain the annual average of the absolute value of the quarterly changes in the deposit rate. Interest rate hikes is a binary instrument which is equal to 1 in years when the annual average is greater than the median annual average. I use interest rate hikes as an instrument for money market capital controls. Large hikes or drops in the interest rate over short periods generate the incentives for large capital inflows or outflows in the form of short-term debt or portfolio flows. Direct investment is a more restrictive form of external capital, less associated with the forces triggering 'hot money' like short-term debt and portfolio flows. Additionally, the interest rate that is relevant for the direct investor is the interest rate in their home country because that interest rate is the best measure of the opportunity cost of the capital invested.

The next two instruments come from the World Bank's *Database on Political Institutions* (Cruz et al. [2016b]). Following Giordani et al. [2017], Ghosh et al. [2014], Grilli and Milesi-Ferretti [1995], I use an indicator for right-leaning gov-

ernments and an indicator for the electoral cycle. The indicator for right-leaning governments serves as an instrument for money market inflows capital control dummies. The political leaning of the governing party is used because right-leaning administrations tend to be less likely to use capital controls. The Right-leaning Government instrument takes on a within-year GDP-weighted share of all countries with right-leaning administrations. Finally, I use the electoral cycle of a country as an instrument for imports. Government expenditures and disposable incomes are well-documented to increase with the electoral cycle, the same can be reasonably expected of imports. The electoral cycle takes on a within-year GDP-weighted share of all countries with legislative or presidential elections in the following year.

The first stage statistics are provided in Table 4. The first-stage F-statistic demonstrates that the legal-origins variables, the electoral cycle, and central bank independence are not weak instruments. However, the right-leaning government and interest rate hikes instruments have the typical weak instrument challenges.

Table 5 contains the results from the two-stage least squares instrumental variables random effects estimation. The random effects estimator is the default in this case due to the time-invariant legal origins instrumental variables. There are two striking results: the coefficient on both money market capital controls is large at about 2 percentage points, positive, and statistically significant. Additionally, the coefficient on the direct investment inflows capital control is large at about 4 percentage points, negative, and statistically significant. This contrasts the result on the direct investment capital control in the baseline regression, suggesting that reverse causality was a challenge and that it is mitigated using instrumental variables.

The signs and magnitudes remain largely consistent with all previous results. The coefficient on the level of institutional quality is no longer significant. The magnitudes on the coefficient on the dummy that tracks countries with at least one restriction on money market inflows is small and insignificant. The results of this regression however are consistent with Cordella [2003], where a capital control tax has to be high enough to generate the outcome that increases capital inflows. This result complements the results in Table 5, where capital controls must be on both money market inflows transactions to increase direct investment inflows.

The instrumental variables regression is over-identified, so a Sargan-Hansen overidentification test is possible. The χ^2 statistic of 2.48 means that the null hypothesis that the overidentifying restrictions are valid is not rejected. Finally, a Hausman test confirms instrumental variables random effects is the consistent estimator for this model as compared to the usual panel data random effects estimator. The instrumental variables panel data random effects regression addressed the endogeneity of the capital control variables, provided consistent coefficient estimates, and confirmed that countries that use capital controls on money market inflows have higher direct investment.

TABLE 5—INSTRUMENTAL VARIABLES PANEL DATA RANDOM EFFECTS REGRESSION

Dependent Variable: FDI Inflows	(1)
One Money Market Control	0.0227
	(0.671)
Both Money Market Controls	2.013*
	(1.106)
FDI Inflow Control	-4.866**
	(2.083)
Gross Fixed Capital Formation	-0.871
	(6.047)
Imports	0.174**
	(0.0871)
Legal/Property Rights	0.703
	(1.051)
Distantness	0.0002
	(0.0002)
Telephone Lines	-0.0244
	(0.0435)
Growth Rate	0.0883
	(0.0555)
Exchange Rate	1.217
	(3.496)
Country Fixed Effects	No
Year Fixed Effects	Yes
Observations	804
Countries	76
Overall R^2	0.196
Hausman Statistic	17.16
Sargan Statistic	2.48

Panel-robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

SENSITIVITY ANALYSIS

In this section, I perform sensitivity analysis in three ways. First, I implement alternative estimation methodologies to further test the sensitivity of reverse causality. Second, I re-estimate the instrumental variables specification with alternative determinants of direct investment that are emphasized in the FDI determinants literature. Finally, I comment on the relationship between capital controls and short-term debt.

Dynamic Panel

In the previous section, I addressed reverse causality between the dependent variable direct investment inflows and the capital control variables using instrumental variables panel data random effects regression. Reverse causality of imports and the level of institutional quality was also addressed. In this section, I address reverse causality by regressing the dependent variable on the baseline specification lagged one year and by implementing Arellano-Bond generalized method of moments.

Assume that the capital control variables are predetermined in the model if the variables are independent of all subsequent structural disturbances ε_{t+s} for $s \geq 0$. In this case, lagging the right-hand side of Equation (1) is sufficient for controlling for the reverse causality. If however serial correlation is present, the assumption that the variables are predetermined will be violated. Arellano-Bond generalized method of moments is useful in this case, because it uses lags and lags of differenced terms as instruments for the Arellano-Bond specification. I show that serial correlation is mitigated using the Arellano-Bond procedure.

Table 6 presents the results of fixed effects panel regressions with the right-hand side of Equation (1) lagged one year in Column (1) and Arellano-Bond generalized method of moments (GMM) regression in Column (2). The lagged regression estimates the effect of last year's money market capital control policy on *this year's* direct investment inflows. The results are largely consistent with the baseline regression. Importantly, the coefficient on one money market capital control lagged one year is still statistically significant and positive. However, in this regression, the coefficient on the direct investment inflows capital control lagged one year is statistically insignificant from zero. Together, these results indicate that the lagged regression is not sufficient to overcome the problem of reverse causality. The lagged number of telephone lines becomes statistically significant and positive in the lagged regression. The lagged value of infrastructure suggests that improved infrastructure leads to higher FDI with a lag.

The second column of Table 6 contains the results of the Arellano-Bond GMM estimates. FDI inflows remains the dependent variable, and lagged FDI inflows enters Equation 1 as a right-hand side endogenous explanatory variable. Imports and property rights are assumed endogenous as well. The growth rate and the interaction of the growth rate with the capital control variables are assumed

TABLE 6—DYNAMIC PANEL DATA REGRESSIONS

Dependent Variable: FDI Inflows	(Fixed Effects)	(Arellano-Bond GMM)
Lagged MMI1 (L.MMI1)	0.794**	1.172**
	(0.319)	(0.503)
Lagged MMI2 (L.MMI2)	0.0689	0.837
	(0.555)	(0.574)
Lagged Growth Rate × L.MMI1	-0.137**	-0.0331
	(0.0611)	(0.0794)
Growth Rate x MMI1		-0.179**
		(0.0744)
Lagged Growth Rate × L.MMI2	-0.142**	0.0108
	(0.0664)	(0.0901)
Growth Rate x MMI2		-0.243***
		(0.0861)
Lagged Direct Investment Control	0.00277	0.756
	(0.664)	(0.759)
Direct Investment Control		-0.00901
		(0.775)
Lagged FDI Inflows		0.364***
		(0.0292)
Lagged Gross Fixed Capital Formation	1.019	6.489*
	(5.949)	(3.834)
Lagged Legal/Property Rights	0.292	0.0711
	(0.320)	(0.473)
Legal/Property Rights		0.210
		(0.468)
Lagged Imports	0.0741	-0.0599*
	(0.0490)	(0.0323)
Imports		0.111***
		(0.0310)
Lagged Telephone Lines	0.0554**	-0.00336
	(0.0219)	(0.0284)
Lagged Growth Rate	0.149***	-0.0149
	(0.0534)	(0.0477)
Growth Rate		0.287***
		(0.0478)
Lagged Exchange Rate	3.087	3.394**
	(2.054)	(1.467)
Distantness		-0.0000529
		(0.000684)
Lagged Distantness	.0004	
	(.0007)	
Country Fixed Effects	Yes	No
Year Fixed Effects	Yes	Yes
Observations	1416	1163
Countries	90	90
Within R^2	0.0938	
Overall R^2	0.0998	
Hausman Statistic	26.69	
Sargan Statistic		1205.607

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Panel-robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

predetermined, and the remaining variables enter the equation lagged (except for distantness, permitted to enter contemporaneously). Level lags of the endogenous and predetermined variables are used as instruments. The remaining right-hand side variables serve as instruments as lagged differences.

The results obtained using the Arellano-Bond generalized method of moments mirror those obtained through the lagged regression. The coefficient on the money market inflows capital control remains positive and statistically significant, and the coefficient on the interaction with the growth rate is negative and statistically significant (lagged interaction is insignificant with the GMM estimation). Thus, countries which use a capital control on money market inflows have a higher level of direct investment, and this effect is decreasing in the growth rate. The endogeneity of the capital controls has been addressed in three ways, and this result has been confirmed in each of the three ways.

The coefficient on the direct investment inflows capital control however remains statistically insignificant from zero. This may signal that the Arellano-Bond GMM estimation does not in this case sufficiently account for the reverse causality. The Arellano-Bond test for autocorrelation confirms that autocorrelation in the first-differenced errors is not a concern with a test statistic of -16.52 for the first order and 0.687 for the second order. This implies the second order is not rejected, as expected. However, the overidentification test does reject the Arellano-Bond GMM instruments as not valid. This outcome could be expected given our expectation that reverse causality has not been sufficiently mitigated.

Additional Robustness

The literature on the determinants of direct investment describes many attributes that are important for direct investment inflows. It is possible that other determinants of direct investment could be important for the relationship between direct investment inflows and capital controls. For information on additional determinants, I draw on the the sources that jointly inform the selection of the determinants for the baseline specification: Eicher et al. [2012]; Alfaro et al. [2008]; Blonigen [2005]. Other determinants that are commonly cited include control of corruption, the tariff rate, the level of financial development, and macroeconomic volatility.

Control of corruption captures the extent to which public power is exercised for private gain. Control of corruption is an index obtained from the *World Governance Indicators* database. Higher values of the control of corruption index represent better outcomes, and imply lower costs and higher returns for direct investors. Given that direct investment and international trade are highly integrated, the tariff rate represents an implicit FDI friction. Stock market capitalization captures the level of financial development (Beck et al. [2000], Beck et al. [2009]). Improved access to financing as a result of financial development improves long-run economic growth and therefore encourages investment (Benhabib and Spiegel [2000], Claessens and Laeven [2003], Levine and Zervos [1996],

TABLE 7—FIRST STAGE STATISTICS-ALTERNATIVE DETERMINANTS OF DIRECT INVESTMENT

Excluded Instrument	Corruption Control		Tariff Rate		Volatility		Financial Development	
	F	Partial-R^2	F	Partial-R^2	F	Partial-R^2	F	Partial-R^2
Legal Origins	82.38	.034	93.00	.042	84.11	.037	51.52	.027
Electoral Cycle	52.15	.026	43.01	.155	49.78	.402	49.51	.088
Right-leaning Government	.61	.0003	.41	.005	.40	.004	.35	.002
Central Bank Independence	35.00	.022	18.85	.481	38.96	.150	13.45	.138
Interest Rate Hikes	.44	.0003	6.32	.045	3.37	.025	.88	.015

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Levine [2001]). Finally, macroeconomic volatility is measured as the standard deviation of the GDP growth rate for a given country over the sample period. The relationship between capital controls and direct investment may be influenced by macroeconomic volatility. There exists asymmetry in volatility outcomes, affecting investment differently in the source country than in the host country, contributing to ambiguity in the predicted effects on FDI[12] (Chenaf-Nicet and Rougier [2016]).

Table 7 contains the results of the first stage statistics for the four alternative instrumental variables regressions. The first pair of columns displays the first stage statistics for the instrumental variables specification with control of corruption in the place of legal/property rights. The following three pairs of columns provide the first stage statistics with the tariff rate, macroeconomic volatility, and financial development included among the exogenous covariates. The results in Table 7 are categorically consistent with the first-stage statistics presented in Table 4. The right-leaning government indicator and the indicator for interest rate hikes are weak instruments. The partial-R^2 of central bank independence and electoral cycle are improved in the regressions that control for the tariff rate and the level of financial development, but are also not so high such that they suffer from the "strong instrument" problem.

Table 8 contains the results of the instrumental variables panel data random effects regression using the alternative determinants of direct investment. The random effects estimator is used in this case because the legal origins instruments in addition to the measure for macroeconomic volatility are time-invariant. None of the alternative covariates across (1) through (4) in Table 8 are statistically significant. Meanwhile, the results in Columns (1) and (2) are largely consistent with the instrumental variables results in Table 5.

Columns (3) and (4) are different. While consistent in sign, the coefficients on the capital control variables are no longer statistically significant. This suggests that the influence that a money market capital control has on direct investment may share components with the level of financial development or with macroeconomic volatility. Variation in financial development or volatility might partially explain the relationship between capital controls and direct investment that we have observed. This is consistent with the notion that countries with sophisticated capital markets are less likely to benefit from using capital controls. These variables are not statistically significant thus do not contain predictive power.

Short-term Debt Regression Estimation

The level of foreign direct investment inflows is not the purpose of imposing money market inflows capital controls; the purpose of these controls is more likely related to money market inflows. Evidence that money market inflows decrease with money market inflows capital controls is therefore highly relevant to the central research question. Analysis using country-level debt flows is more challenging than with investment flows. Alfaro et al. [2005] discuss the challenges

TABLE 8—ALTERNATIVE COVARIATES INSTRUMENTAL VARIABLES REGRESSION

	(1)	(2)	(3)	(4)
One Money Market Control	-0.538	-0.428	0.224	1.130
	(0.562)	(0.674)	(0.773)	(0.837)
Both Money Market Controls	1.982**	2.585*	0.793	1.493
	(0.932)	(1.367)	(1.031)	(1.301)
FDI Inflows Control	-4.093***	-6.087**	-3.428	-5.993
	(1.479)	(2.424)	(2.267)	(3.814)
Growth Rate	0.118***	0.111**	0.131***	0.0829*
	(0.0414)	(0.0546)	(0.0469)	(0.0478)
Imports	0.112*	0.152**	0.149*	0.196
	(0.0581)	(0.0709)	(0.0813)	(0.120)
Gross Fixed Capital Formation	6.158	5.882	2.977	3.323
	(6.097)	(6.365)	(7.369)	(9.244)
Telephone Lines	-0.0432	0.000647	0.00513	-0.0483
	(0.0480)	(0.0440)	(0.0490)	(0.0708)
Exchange Rate	-0.272	1.164	2.272	0.904
	(2.665)	(2.327)	(2.155)	(2.282)
Legal/Property Rights		0.450	-0.335	1.173
		(0.915)	(1.039)	(1.540)
Distantness	-0.00003	0.0002	0.00006	0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0003)
Corruption Control	1.549			
	(1.551)			
Tariff Rate		0.0979		
		(0.0609)		
Market Capitalization			0.00882	
			(0.00794)	
Volatility				0.224
				(0.467)
Country Fixed Effects	No	No	No	No
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	838	738	704	804
Countries	76	75	68	76
Overall R^2	0.181	0.155	0.169	0.166
Hausman Statistic	21.08	36.26	13.95	11.12
Sargan Statistic	4.777	5.762	4.782	1.834

Panel-robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 9—SHORT-TERM DEBT PANEL DATA RANDOM EFFECTS REGRESSION

	(1)
One Money Market Control (MMI1)	0.338
	(0.356)
Both Money Market Controls (MMI2)	0.337
	(0.299)
Growth Rate × MMI1	-0.240
	(0.171)
Growth Rate × MMI2	-0.209
	(0.163)
FDI Inflows Control	-0.239
	(0.211)
Gross Fixed Capital	5.59
	(4.44)
Distantness	0.0001
	(0.0001)
Legal/Property Rights	-0.167
	(0.159)
Imports	0.0329**
	(0.0148)
Telephone Lines	0.0209**
	(0.00972)
Growth Rate	0.381**
	(0.153)
Exchange Rate	1.12
	(1.13)
Country Fixed Effects	No
Year Fixed Effects	Yes
Observations	843
Countries	56
Overall R^2	0.0791
Hausman Statistic	6.34

Panel-robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

in estimating the economic consequences of debt flows, highlighting measurement discrepancies in the debt flows data. Debt flows are also generally influenced by decisions that are distinct from equity flows. Finally, the sample is much smaller with only 55 countries reporting.

I re-estimate Equation 1 using external short term debt flows as a percent of GDP for the dependent variable. The quantity of money market capital controls imposed in a typical economy in addition to the other determinants in the baseline regression remain. The regression in Table 9 is estimated using panel data random effects regression. The explanatory variables are as expected in sign and significance, except for the capital control variables which are positive and not significant. This is consistent with the majority of the literature which finds that capital controls do not influence volume of capital flows (see, e.g. Montiel and Reinhart [1999], Carlson and Hernandez [2002], Alfaro et al. [2005], Forbes et al. [2015]). The results require some judgment in their interpretation. The influence from equity flow decisions will impose multicollinearity in this specification, causing the coefficient to be biased towards zero. Additionally, Alfaro et al. [2005] point out that measurement error in debt flows data versus changes in the debt stocks data will also cause the coefficients to be biased towards zero. The smaller sample of countries for which data on debt flows is available however are countries which are more likely to use capital controls. These countries tend to be smaller, have lower incomes, but are growing faster[13]. As such, the coefficient on money market capital control faces opposing forces.

CONCLUSION

The use of money market inflows capital controls is increasing in frequency, and yet the costs of using this kind of policy are not fully understood. I have shown that using money market capital controls do not cost a country its direct investment. In fact, slower-growing countries that use capital controls on money market inflows expect higher direct investment inflows. This result is consistent with the interpretation that investors perceive this capital control as a signal of stability. The contribution of this result is novel for two reasons: (1) the focus on the response of FDI to a granular level of variation in capital controls, and (2) the finding that the volume of FDI is increasing with the use of this control. I have put this to result through multiple scenarios of reverse causality including instrumental variables and Arellano-Bond GMM, and confirmed that countries that use money market inflows capital controls receive a higher level of direct investment. Future research should tie down the structural relationship among capital controls, the growth rate, and direct investment. Future research should also look into whether other cash flows management policies or other monetary or fiscal policies that mitigate economic volatility demonstrate the same signal effect. Finally, future work should determine if this signal can be observed at the firm level and study the experience of firms under such conditions.

Acknowledgements

Notes

[1]Benmelech and Dvir [2013], Reinhart and Reinhart [2009], Rodrik and Velasco [1999]

[2]Alfaro et al. [2017], Forbes [2005b], Forbes et al. [2016], Edison and Reinhart [2001], Edwards and Rigobon [2009], Edwards [1999], Reinhart and Smith [1998],Kaplan and Rodrik [2002].

[3]Forbes et al. [2015], Ostry et al. [2011], Kose et al. [2006], Carlson and Hernandez [2002], Montiel and Reinhart [1999].

[4]International Monetary Fund [2010], International Monetary Fund [2011b], International Monetary Fund [2011a], International Monetary Fund [2012], International Monetary Fund [2011c], Arora et al. [2013]

[5]Information derived from the IMF's AREAER report (Fernández et al. [2015])

[6]See Dell'Ariccia et al. [2007], Ghosh et al. [2012], Habermeier et al. [2011], Qureshi et al. [2011], Ghosh and Qureshi [2016], Ostry et al. [2012], Ostry et al. [2011].

[7]Schindler [2009] covers restrictions for 91 countries from 1995–2005 on inflows and outflows over 6 asset categories.

[8]The remaining 8 asset categories are bonds and other debt with maturity of more than one year, equity, collective investment, financial credit, derivatives, guarantees and sureties, and real estate.

[9]The average is the cumulative percent of the cumulative GDP for each group of countries.

[10]See Kinda [2012] for a detailed investigation on the role infrastructure plays as a driver of FDI flows.

[11]I confirm that reverse causality is a mitigating factor in the relationship between foreign direct investment and capital controls on money market inflows. Results using probit and multinomial logit are available in the Appendix.

[12]Additionally, the definition of macroeconomic volatility is distinct from macroeconomic uncertainty. Macroeconomic volatility measures the variability of an economic series by taking into account all of the transitory variations of a statistical series. See Cariolle [2012] for an evaluation of the commonly used for calculating macroeconomic volatility. Macroeconomic uncertainty more specifically intends to measure the unpredictability of variations in total variability (Aizenman and Pinto [2004]). In any case the evidence tends to complement the theory suggesting reduced investment under uncertainty (Dixit and Pindyck [1994]).

[13]For the sample of 55 countries which have data available on short-term debt, mean GDP is $298 billion USD, mean per capita GDP is $4,142 USD, and the mean GDP growth rate is 2.78%.

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I. APPENDIX

A. Theoretical Framework

Magud et al. [2011] use the capital asset pricing model to explain the behavior of external capital flows. The first subsection entails the framework on short-term flows developed in Magud et al. [2011]. In the second subsection, I extend the framework to shift the perspective to long-term flows and characterize the relationship between long-term flows and a capital control imposed on short-term flows.

There are two different categories (maturities) of external capital flows: short-term flows S_t and long-term flows L_t, which together make up total capital flows F_t. Short-term capital flows can be expressed as a share x of total capital flows: xF_t. The interest rate for short-term capital flows is r^* and the interest rate for long-term flows, r. The variance for short-term capital flows is σ_{r*}^2, and the variance for long-term flows is σ_r^2.

SHORT-TERM FLOWS

In Magud et al. [2011], a representative investor maximizes expected utility of wealth given her risk preferences. This means that the representative investor will trade off risk (variance) σ_w^2 for expected return $\overline{w}$ on the portfolio of external capital flows. Expected return on total capital flows can be expressed as

$$(2) \qquad \overline{w} = (1 + r)F_t + (r^* - r)xF_t.$$

The second term on the right-hand side represents the premium attributed to short-term capital flows. The variance of the return on total external capital flows is given by

$$(3) \qquad \sigma_w = F_t^2 \left[(1 - x)^2 \sigma_r^2 + x^2 \sigma_{r*}^2 + 2x(1 - x)\sigma_{rr*} \right].$$

A position in which $x = 1$ implies that all external capital flows are in short-term capital. This is all high risk, high return. The contradistinction $x = 0$ implies that all external capital flows are in long-term capital which is lower risk, and lower return. We solve for the optimal share in short-term capital flows x, by using a log-linearized approximation of expected utility;

$$(4) \qquad \max_x E\left[U(\overline{w})\right] \approx U\left(E[\overline{w}]\right) + \frac{1}{2}V[\overline{w}]U''\left(E[\overline{w}]\right).$$

The first-order condition implies:

$$(5) \qquad x = \frac{r^* - r}{\Phi\sigma} + \alpha,$$

where Φ is the coefficient of relative risk aversion and α is the share of short-term external capital flows that minimizes variance;

$$(6) \qquad \alpha = \frac{\sigma_r^2 - \sigma_{rr^*}}{\sigma_r^2 + \sigma_{r^*}^2 - 2\sigma_{rr^*}}$$
$$= \frac{\sigma_r^2 - \sigma_{rr^*}}{\sigma}.$$

Suppose that we impose a capital control on short-term external capital flows. The capital control can be represented by a tax τ which drives a wedge between the rents paid for short-term capital by the domestic borrower and the return received by the international lender. We can redefine r^* as the after-capital-controls return on short-term external capital flows:

$$(7) \qquad (1 + r^*) = (1 + r^{*'})(1 - \tau).$$

As Equation 7 indicates, a capital control in the form of a positive tax will decrease the return on short-term capital flows. All else equal, this kind of capital control policy implies that short-term capital flows are relatively less rewarding. Formally:

$$(8) \qquad \frac{dx}{dr^*} = \frac{d}{dr^*}\left[\frac{r^* - r}{\Phi\sigma} + \alpha\right]$$
$$= \frac{1}{\Phi\sigma} > 0.$$

thus, a decrease in the return on short-term capital flows r^* implies a decrease in the optimal share of short-term capital flows x.

Aggregation over investors j with wealth W_j implies demand for short term flows $\sum_j x_j W_j$ and total wealth $\overline{W} = \sum_j W_j$. In equilibrium, total supply of short-term flows V^*, should equal total demand for short-term flows:

$$(9) \qquad V^* = \sum_j x_j W_j.$$

We can characterize the aggregation by multiplying through Equation 5 by W_j. This yields, with some manipulation:

$$(10) \qquad r^* - r = \Phi\sigma\left(\frac{V^*}{\overline{W}} - \alpha\right),$$

where $\Phi = \sum_j \frac{\Phi_j}{W_j/\overline{W}}$ is redefined to represent aggregate risk aversion.

In aggregate, the share of short-term capital flows falls with the use of a capital control:

$$(11) \qquad \frac{dr^*}{d(V^*/\overline{W})} = \Phi\sigma > 0.$$

We can also show that aggregate capital flows increase with the use of a capital control:

$$(12) \qquad \frac{dr^*}{d\overline{W}} = -\frac{\Phi\sigma V^*}{\overline{W}^2} < 0$$

Magud et al. [2011] totally differentiate Equation 10 with respect to V^* and $\overline{W}$ to further investigate the way the levels of capital flows change with the use of capital controls:

$$(13) \qquad dr^* = \sigma\Phi\left[\frac{\overline{W}dV^* - V^*d\overline{W}}{\overline{W}^2}\right].$$

Equation 13 is expression that describes how changes in short-term capital flows and total capital flows contribute to changes in the short-term interest rate. The authors elaborate on this relationship with the objective of identifying the elasticity of short-term flows with respect to total flows, $\eta = \frac{dV^*}{d\overline{W}}\frac{\overline{W}}{V^*}$. With some manipulation:

$$(14) \qquad \frac{dr^*}{dV^*} = \frac{\Phi\sigma}{\overline{W}}\left(1 - \frac{1}{\eta}\right)$$

$$(15) \qquad \frac{dr^*}{d\overline{W}} = \frac{\Phi\sigma}{\overline{W}}\frac{V^*}{\overline{W}}(\eta - 1)$$

Equation 14 is an expression for the way changes in the supply of short-term capital flows influence marginal returns on short-term capital flows, as a function of the elasticity of short-term capital flows with respect to total capital flows. Intuitively, this is expected: elasticity reflects the rate at which marginal returns are changing. Where $\eta > 1$, marginal returns are increasing in the level of short-term capital flows. A decrease in the return on capital flows due to a capital control τ is therefore met by a decrease in the level of short-term capital flows. If $\eta = 1$, marginal returns are constant and capital flows do not change in response to a capital control. When $0 < \eta < 1$, marginal returns are decreasing in the level of short-term capital flows. In this case, optimal capital flow behavior is to expand given an additional decrease in the return on short-term capital flows, i.e. from a capital control tax τ. The intuition here is that investors now require a larger quantity of capital invested to earn the same return. The key point is that for the desired outcome of capital control policy to work, the elasticity between

short-term flows and total flows should be greater than 1.

We are interested in the way that a capital control on short-term flows influences long-term flows with respect to total flows. I extend the framework of Magud et al. [2011] to characterize this relationship. Following Equation 5 in the Appendix, the share of long-term flows in total flows are given by:

$$(16) \qquad 1 - x = 1 - \frac{r^* - r}{\Phi\sigma} - \alpha.$$

The share of long-term flows as written in Expression 16 depends on the optimal share of short-term flows. Aggregation over investors j with wealth W_j gives the demand for long-term flows $\sum_j (1 - x_j)W_j$. In equilibrium, the total supply of long-term flows Q^* should equal the total demand for long-term flows:

$$(17) \qquad Q^* = \sum_j (1 - x_j)W_j.$$

We can characterize the aggregation by multiplying through Equation 16 by W_j. This yields with some manipulation:

$$(18) \qquad r^* - r = \Phi\sigma\left(1 - \frac{Q^*}{\overline{W}} - \alpha\right).$$

We can totally differentiate to discern how the return on short-term flows changes with changes in long-term flows and with changes in total flows:

$$(19) \qquad dr^* = \Phi\sigma\left(\frac{Q^* d\overline{W} - \overline{W} dQ^*}{\overline{W}^2}\right).$$

With the objective of identifying the elasticity of long-term flows with respect to total flows $\xi = \frac{dQ^*}{d\overline{W}}\frac{\overline{W}}{Q^*}$, we can characterize the marginal returns following Equation 19:

$$(20) \qquad \frac{dr^*}{dQ^*} = \frac{\Phi\sigma}{\overline{W}}\left(\frac{1}{\xi} - 1\right)$$

$$(21) \qquad \frac{dr^*}{d\overline{W}} = \frac{\Phi\sigma}{\overline{W}}\left(\frac{Q^*}{\overline{W}}\right)(1 - \xi).$$

Equations 20 and 21 are conditions which characterize the response of long-term capital flows and total capital flows to a change in the after-tax return on short-term capital flows, and depend on the value of the exogenous parameter, elasticity ξ.

When the elasticity $\xi > 1$, marginal returns of long-term flows with respect

to total flows are increasing and imply vis-a-vis Equations 20 and 21 that the marginal returns of short-term flows are decreasing. In this case, a capital control on short-term flows τ (implying a decrease in r^*) leads to an expansion of long-term and total capital flows. When $\xi < 1$, marginal returns of long-term flows are decreasing and Equations 20 and 21 are positive. In this case, the capital control implies an decrease in the level of long-term and total flows.

B. Variables

Table 10—Data Definitions and Sources

Variable Name	Definition and Source
Aggregate Control	Aggregate controls index covering the remaining 8 asset categories tracked in Fernández et al. [2015], excluding money market controls and direct investment controls.
Capital Formation	Gross fixed capital formation as a percent of GDP. Land improvements, equipment purchases, construction of infrastructure, public, private, commercial, and industrial buildings. Source: World Bank national accounts data, and OECD National Accounts data files.
Central Bank Independence	Statutory continuous index which reflects the level of independence on dimensions of personnel, finance, and policy. Source: Garriga [2016].
Control of Corruption	Index which captures the extent to which public power is exercised for private gain in addition to state capture. Countries which have higher values of the control of corruption index represent better outcomes. Source: *World Governance Indicators*, World Bank
Distantness	GDP weighted average of the distance between the capital city in a country and the capital city of all other countries. Distance is weighted by the proportion of the country's population residing in the capital city. Source: Gurevich and Herman [2018].
Electoral Cycle	GDP weighted share of the countries which have an election in the next year. Source: World Bank Database of Political Institutions.
Exchange Rate	The exchange rate is the year over year percent change in the price level ratio of the purchasing power parity conversion factor of GDP to a market exchange rate. Source: World Bank, International Comparison Program database.

Table 11—Data Definitions and Sources, Continued

Variable Name	Definition and Source
FDI	Net foreign direct investment inflows as a percent of GDP. Source: IMF International Financial Statistics and Balance of Payments Databases
Growth Rate	Annual difference in the log of real GDP per capita, Source:World Bank national accounts data, and OECD National Accounts data files.
Imports	Imports of goods and services as a percent of GDP. Source: World Bank national accounts data, and OECD National Accounts data files.
Interest Rate Hikes	Dummy variable that equals for a given country and year when the annual average of the absolute value of the quarterly changes in the deposit rate is greater than the median in a given country and year. Source: International Monetary Fund, International Financial Statistics and data files.
Legal Origins	Dummy variables equal to one of a given country has French or English legal origins. Source: Porta et al. [1998].
Legal/Property Rights	Legal system and property rights pertains to the protection of persons and their rightfully acquired property. Source: Gwartney et al. [2016].
Market Capitalization	Market capitalization (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies, as a percentage of GDP. Source: World Bank, World Federation of Exchanges Database.

TABLE 12—DATA DEFINITIONS AND SOURCES, CONTINUED

| Variable Name	Definition and Source
MMI1	Dummy variable, equals 1 if a given country has restrictions either on resident or non-resident transactions that result in inflows of money market funds. Source: Fernández et al. [2015].
MMI2	Dummy variable, equals 1 if a given country has restrictions on both resident and non-resident transactions that result in inflows of money market funds. Source: Fernández et al. [2015].
Political Affiliation	GDP weighted share of the countries where the political party with majority control is right-wing in a given year. Source: World Bank Database of Political Institutions.
SD Cycle	The standard deviation of the cycle isolated by the Hodrick-Prescott filter on the log of real GDP. Source: World Bank national accounts data, and OECD National Accounts data files.
SD GDP Growth	The standard deviation of quarterly GDP for a given country over the sample period. Source: World Bank national accounts data, and OECD National Accounts data files.
SD Residual	The standard deviation of the residual of an ARIMA(3,1,2) regression of the log of Real GDP. Source: World Bank national accounts data, and OECD National Accounts data files.
Short-term Debt	Net flows on external short-term debt as a percent of GDP. Debt with an original maturity of one year or less. Source: World Bank, International Debt Statistics.
Tariff Rate	Simple mean applied tariff is the unweighted average of effectively applied rates for all products subject to tariffs calculated for all traded goods. Source: World Bank staff estimates using the WITS system based on data from the UNCTAD TRAINS database and the WTO IDB and CTS database.

C.   Other Data Visualization
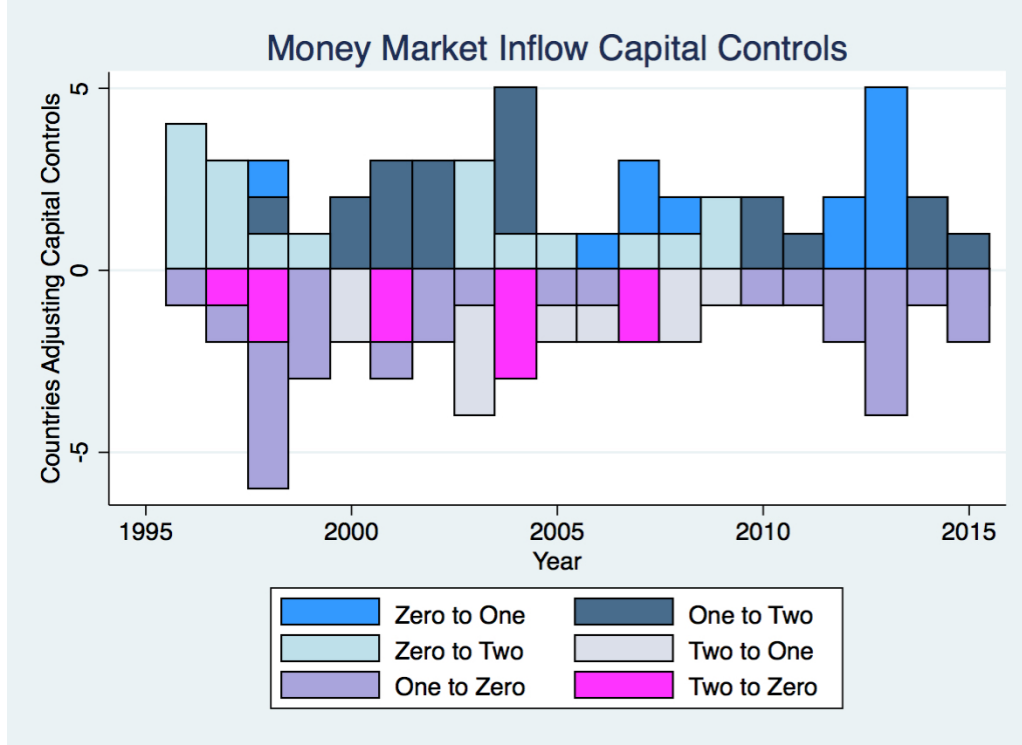
Figure 4. Change in Money Market Inflows Capital Controls

The positive frequencies in Figure 4 for the three different shades of blue represent the three distinct ways one country can add restrictions on short-term capital inflows in a given year, the negative frequencies in three shades of purple represent the three distinct ways one country can remove restrictions on short-term capital inflows in a given year. Thus, blues represent country-year capital control additions, purples represent country-year capital control removals.