Protect and Survive: Did Capital Controls Help Shield Emerging Markets from the Crisis?

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Abstract

Using a new dataset on capital market regulation, we analyze whether capital controls helped protect emerging markets from the real economic consequences of the 2009 financial and economic crisis. The impact of the crisis is measured by the 2009 forecast error of a panel state space model, which analyzes the business cycle dynamics of 63 middle-income countries. We find that neither capital controls in general nor controls that were specifically targeted to derivatives (that and which played a crucial role during the crisis) helped shield economies from the crisis. However, banking regulation that limits the exposure of banks to global risks has been highly successful.

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1 Introduction

In the wake of the financial crisis, the international economy has witnessed a global renaissance of capital controls. Due to the obvious importance of capital market imperfections in the crisis, this reflex seems understandable. However, the strong belief in capital controls is not rooted in empirical evidence. Using the natural experiment provided by the recent crisis, we test whether capital market restrictions truly helped shield emerging markets from the detrimental consequences of the financial turmoil that began in the US. The crisis featured two characteristics that favor an analysis of capital controls. First, the crisis was a global phenomenon, which allows comparison of a large set of countries that were subject to a joint shock.. Second, it is easy to identify the specific market that failed and collapsed, as there is a widespread consensus that failure to account for systemic risks in the US market for credit derivatives (more specifically, mortgage derivatives) was a key component of the crisis. The turmoil in the US financial sector subsequently endangered the stability of the banking sector worldwide, revealing excessive risk exposure in many countries. Thus, we focus on regulation concerning these specific channels of contagion and pose the following related inquiries: (1) were controls operating before the crisis that specifically restricted the derivative market? and (2) had the banking sector been soundly regulated? Through these inquiries, we can substantially reduce the risk of underestimating the impact of controls. As many countries do not uniformly control all sectors of the capital market, controls might not be specifically intended to shield the economy from a specific type of shock. Normally, this would reduce the perceived efficacy of controls. However, despite choosing a setup that favors rather than disadvantages controls, our results are disillusioning concerning the regulation of capital flows. There is no evidence that capital controls on derivatives helped protect the real economy from harm during the crisis. Conversely, we find that banking regulation designed to prevent excessive risk exposure (e.g., equity requirements, limits to open exchange positions) contributed substantially to real stability during the financial crisis.

Besides illuminating the role of capital market restrictions during the crisis, the present paper offers three contributions:

First, to identify the impact of the crisis given the lack of data in emerging markets, we use a panel state space business cycle model that allows for heterogeneity in average growth and in the variance of residuals. Second, we employ a two-step bootstrap that applies a factor model to the residuals to account for cross sectional dependence and allows the use of these results as a dependent variable in a regression model. Finally, we introduce a new set of detailed data on capital controls, building on previous work by El-Shagi (2010) and El-Shagi (forthcoming) and allowing the in-depth analysis of capital controls.

The remainder of the paper is structured as follows. Section 2 gives a brief review of the empirical evaluation data of capital controls. Section 3 outlines recent developments in controls, tracking their renaissance after the financial crisis and introducing our set of control indicators. Section 4 presents our methodology, starting with identification of the shock, followed by a cross-country analysis

of capital controls and finally the bootstrap that allows us to account for uncertainty. Section 5 introduces our sample, our empirical analysis and the results. Section 6 concludes.

2 Literature

In empirically analyzing the ability of capital controls to mitigate financial shocks to the real economy, our paper relates to two of the most important bodies of empirical literature on capital market restrictions.

First, we build on literature examining the impact of capital market restrictions on growth. This issue has been the focus of previous studies that have asked whether capital market regulation impacts the real economy. The earlier evidence on this issue has been inconclusive. While Rodrik (1998) claimed that capital account openness is insignificant, Quinn (1997) found a positive growth effect using a more sophisticated measure of capital controls. Levine (2001) found positive growth effects when looking at several de facto measures of capital market integration. The more recent literature has become more successful in identifying the specific effects of controls. Chanda (2005) found that when capital market liberalization has a positive impact on growth if controlling for the institutional framework and the interaction between capital account liberalization and this framework.[1] Importantly, the positive impact of free capital movement can only be thoroughly exploited in countries with high degrees of ethnic and linguistic homogeneity, which are standard indicators of political stability. Further, Quinn & Toyoda (2008) found that the impact of capital account liberalization is positive when using an appropriate indicator of capital account openness. His results indicate that the heterogeneous findings in the previous literature were mostly due to the lack of sound data. [2]

Duasa & Mosley (2006) belong to the very few authors finding a positive growth effect of capital controls using their indicator for 'smart' controls. However, this indicator essentially is an interaction term of controls (using an indicator very close to the one proposed by citeasnounfreedom(2001)) and institutional quality. Since they do not control for institutional quality their results might rather reflect the positive impact of well designed institutions.

The second body of literature addresses whether capital controls stabilize the economy and thereby create trade-offs between efficiency (i.e., higher growth) and risk exposure. Ranciere, Tornell & Westermann (2006) find evidence sup-

[1] In a survey of the previous literature Edison, Klein, Ricci & Sløk (2004) found that the impact of capital controls often disappears when controlling for institutional quality. Thus, the key contribution of Chanda (2005) was to provide evidence that this relationship does not hold when sufficiently considering the interactions.

[2] In general, data quality has been a major issue in previous econometric analyses of capital market controls. Most contributions that have aimed at alleviating the data problem have focused on the intensity of regulation (Gwartney & Lawson 2001, Gwartney, Lawson & Block 1996). El-Shagi (2010), El-Shagi (forthcoming) and El-Shagi (2007) introduce a set of indices that include information on the direction of controls, their intensity, and their institutional quality.

porting this trade-off, i.e., that capital account liberalization fosters growth but increases the probability of financial crisis. However, the evidence on this issue is inconclusive. For instance, Glick & Hutchison (2005) find that capital controls do not limit the risk of speculative attacks or currency crises. Similarly, Kose, Prasad, Rogoff & Wei (2009) report in their literature synthesis that there is no general evidence that capital account liberalization increases the vulnerability to financial crisis. While this finding might initially seem counterintuitive, there are several reasons why capital openness might foster stability rather than risk. For example, capital controls prevent consumption smoothing and contribute to corruption, as El-Shagi (2007) and Edwards (1999) demonstrate. Thus, capital controls can create instability.

Our study contributes to this literature by treating the recent financial and economic crisis as a natural experiment. The magnitude of the crisis allows us to test the hypothesis that capital controls provide protection from financial and economic crisis, given equal global conditions.

3 Some stylized facts about capital controls

3.1 Measuring capital controls

Following El-Shagi (2010)and El-Shagi (forthcoming), we utilize the information given in the text section of the Annual Reports on Exchange Arrangements and Exchange Restrictions of the International Monetary Fund (IMF) as a data source. In addition to the information provided in the tabular appendices of the Reports, the texts provide a much finer categorization of capital controls. Controls on each asset market are subdivided into the following categories: controls on purchases abroad by residents (PAR); sale or issue abroad by residents (SIAR); purchase locally by nonresidents (PLNR); and sale or issue locally by non-residents (SILNR). Additionally, controls on credit markets are categorized by the direction of credit flow (resident to nonresident or vice versa) for all categories.

Because the crisis originated in the United States, we focus on capital outflow controls that restrict the distribution of foreign derivatives on the domestic market (i.e., controls on SILNR and controls on PAR). The corresponding index can take the values 0 (if no restrictions are present), 0.5 (if one of the two restrictions is in place) or 1 if the market is fully controlled. We treat the non-existence of a market as the equivalent of a control, as such conditions prevent the spread of foreign derivatives on the local capital market.

The second key problem of the crisis has been the excess risk exposure of banks. We thus control for the density of banking regulation. The Annual Reports include information on 17 possible controls on banking regulation, including reserve requirements for foreign liabilities and limits on open positions in foreign currency. The banking regulation index that we propose is created using the share of regulations that are in place in a given country.

Finally, to account for the general level of controls, we propose two further

Table 1: The development of capital controls between 2007 and 2009

	inflow controls			outflow controls		
	2007	2009	Diff.	2007	2009	Diff.
Western industr. economies	0.03	0.07	0.04	0.08	0.13	0.05
Transition economies	0.28	0.34	0.06	0.37	0.46	0.09
East Asia	0.44	0.48	0.04	0.45	0.52	0.07
South Asia	0.53	0.68	0.15	0.48	0.73	0.25
Middle East North Africa	0.32	0.40	0.08	0.45	0.46	0.01
Subsaharan Africa	0.45	0.55	0.10	0.59	0.66	0.07
Latin America	0.31	0.37	0.06	0.31	0.37	0.06

Note: The indices denote the share of markets with operative restrictions . The data cover both controls on equity trade and credit market restrictions. Unlike the outflow control index used in the empirical analysis, the outflow controls reported in this table cover derivative trade.

indices describing the controls on capital inflows and outflows. The indices cover both asset markets (e.g., bonds, shares, money market instruments, securities and derivatives) and credit markets (e.g., commercial credits, financial credits and credit guarantees). We treat asset market controls on PAR and SILNR and controls on credits from residents to non-residents as outflow controls. We treat asset market controls on PLNR and SILR and controls on credits from non-residents to residents as inflow controls. Because controls on capital outflows that concern the trade of derivatives are captured by a separate indicator, derivatives are excluded from the outflow control index. In total, this provides 13 possible inflow controls and 11 outflow controls. The indices represent the share of possible controls that are in place in a given country.

3.2 Pre and post crisis controls

Despite the inconclusive nature of evidence on capital controls, the international economy witnessed a global renaissance of these controls in the wake of the financial and economic crisis. Table 1 outlines the response to the crisis by region. Both inflow and outflow controls increased in every economic region of the world. This development has been particularly pronounced in South Asia.

This development has primarily taken the form of increasing controls on the density of derivative trade. Table 2 shows the share of countries that employed controls on a specific type of derivative transaction in 2007 and 2009. In all four categories, the share of countries employing controls increased by roughly 10 percentage points. While this reflex is understandable given the obvious role of credit derivatives in the recent crisis, controlling cross-border trade does not necessarily protect the market. Whether the controls in operation before the crisis helped to shield economies that employed these controls from the global recession is the central question of this empirical analysis.

Table 2: The development of restrictions on derivative trade

	inflow controls		outflow controls	
	PLNR	SIAR	SILNR	PAR
2007	0.17	0.23	0.27	0.23
2009	0.28	0.32	0.36	0.36

4 Estimation

4.1 Identifying the impact of the crisis

For several reasons, to only examine 2009 growth rates when identifying the impact of the global financial crisis on the real economy in the countries of interest is insufficient. First, the emerging markets did not experience a "great moderation" to an extent that could be observed in the high-income economies. Thus, given the magnitude of business cycle fluctuations within our sample, we must correct for the expected cyclical movement of GDP. Second, the pace of real growth differs strongly among middle-income countries. While the fastest growing country in our sample (China) grew about 8% per year between 1980 and 2008, other countries experienced negative average growth. Therefore, we must also account for the trend growth rates of real GDP in our analysis.

To do this, we perform a standard state space decomposition of GDP into a trend component and a cyclical component. Unlike other univariate filters that only smooth time series, these models include a simple time series model of the underlying economic data that allows forecasting. Thus, we can treat the state space model's 2009 prediction errors as the unexpected shock to the GDP in 2009.

However, the quarterly data commonly used in business cycle models has only become available for many emerging markets since the mid-1990s. This period is much too short to allow a robust analysis of business cycle dynamics. For most countries, the World Bank's annual reports have provided this type of data since 1980. Ultimately, while these data cover a sufficient number of business cycles per country, they leave us with too few observations per country to estimate a state space model.

To overcome these obstacles, we propose a univariate panel state space model to predict GDP. We allow for heterogeneity in both the trend growth rate and the variance of shocks to the business cycle. By allowing heterogeneity in both the business cycle component and the growth path component, we are able to capture the essential differences in GDP dynamics. Furthermore, we can exploit the cross sectional nature of the data to get more efficient estimates for the autoregressive process of the cycle. The resulting model is given by the signal equation

$$y_t = y_t^* + \tilde{y}_t \tag{1}$$

and the two state equations

$$y^*_{i,t} = y^*_{i,t-1} + \mu_i + u_{i,t} \quad u \sim N(0, \sigma_u) \tag{2}$$
$$\tilde{y}_{i,t} = \phi(L)\tilde{y}_{i,t-1} + v_{i,t} \quad v \sim N(0, \sigma_v, i), \tag{3}$$

with the asterisk marking the growth trend component (i.e., equilibrium values) and the tilde denoting the cyclical component.

The model is estimated using a Kalman filter. The initial values for the states were obtained from a Hodrick-Prescott decomposition. these methods to also allow to produce a fairly good initial estimate of σ_u and the $\sigma_{v,i}$ only few prediction errors should be strongly distorted by the choice of the initial values. The error series used to compute the log likelihood thus begin in 1983 already, i.e. quite early in our sample. The log likelihood is maximized with respect to the fit of the model in the pre-crisis era, i.e., until 2007. This ensures that we do not underestimate the effects of the crisis in choosing a model that tries to explain the crisis itself.

Thus, the log likelihood is represented by

$$\ell \propto \sum_{i=1}^{63} \sum_{t=1983}^{2007} -ln(f_{i,t}) - \eta_{i,t} f^{-1}_{i,t} \eta_{i,t}, \tag{4}$$

where η denotes the prediction error, and $f_{i,t}$ denotes the conditional variance of the prediction error.

4.2 The model

To determine whether controls on buying foreign credit derivatives affected the magnitude of the shocks identified by our state space model, we propose a straightforward structure given by

$$\eta_{i,2009} = \alpha + \beta C_i + \Gamma X_i, \tag{5}$$

where $eta_{i,2009}$ denotes the crisis impact on country i (i.e., the prediction error of the state space model), C_i, describes the vector of capital controls operating in 2007 and X is a vector of control variables.

Our set of controls comprises a set of indicators on development, trade and general capital market regulation.

While the epicenter of the recent crisis has been the US securities market, the propagation of the crisis has been driven by real spillovers resulting from the collapse of world trade. We thus include merchandise exports over GDP as a proxy for the general openness of a country. Because the crisis emerged in the US and affected industrialized nations particularly strongly, we also add the share of a country's exports that go the the US and the to capture the special importance of these trade networks. Finally, we include the share of fuels in exports. Given that oil is among the most volatile commodities and displays strong cyclical price and volume movements it might have a special impact. To

account for structural similarities and differences between the countries in the industrialized world where the crisis began, we also control for real GDP per capita. Finally, we include the 2007 indices on capital inflow and capital outflow restrictions mentioned earlier.

4.3 Accounting for uncertainty

To enhance the reliability of our results, we consider the uncertainty of shock estimation when running our final regressions. To do so, we propose the two-step bootstrap outlined below, a method that has two major advantages. First, it allows us to consider cross sectional dependence both in the business cycle and in innovations to potential output when estimating the confidence bounds of the state space model. Second, it ensures that we account for the joint uncertainty of η in the cross section analysis rather than the individual uncertainties of the η_i. In other words, the estimates of η might not be independent. Thus, we must confirm that the estimates used in one repetition of the bootstrap are consistent with each other.

Bootstrapping shocks Within the sample of 63 middle-income economies, there is substantial cross correlation of national business cycles. Thus, the bootstrap must also account for this cross sectional dependence. As the model produces two sets of shocks (one from the trend equation and one from the cycle equations), each country is actually subject to four shocks in each period: a global trend shock, an idiosyncratic trend shock, a global business cycle shock, and an idiosyncratic business cycle shock. To separate the global shock from the panel of shocks, we use a principal components approach to identify a joint factor. From this, we obtain two panels of national shocks:, i.e.(1) the original shocks adjusted for the first principal component;, and (2) two time series of global shocks, i.e., the first principal component of both sets.

Using these errors for the bootstrap, we resample 1000 times, producing new estimates of the parameters of the state space model. These sets of parameters are then used in the Kalman filter to produce alternative sets of reactions to the crisis.

Parameter bootstrap Building on this initial bootstrap, we further bootstrap the uncertainty of the parameter estimates in the cross section model.

A set of crisis reactions is drawn from the initial bootstrap results. The cross section model is estimated based on this set. We then resample again, this time producing a new set of η based on the residuals of the cross section model. We use this new set of η to produce an estimate of the parameters α, β, and Γ.

5 Data and results

5.1 Data

Our shock identification covers 63 of the approximately 120 middle-income economies (using the World Bank classification of national economies); regarding these countries, annual GDP data are available for all years between 1980 and 2009.

To avoid capturing controls that have been implemented as a quick response to the crisis, we rely on the 2007 Annual Reports on Exchange Arrangements and Exchange Restrictions to compute the capital controls indicator. Thus, we only consider controls that had become effective by June 2007.

We use the purchasing power adjusted real GDP per capita in US Dollars (USD) as reported by the World Bank in the World Development Indicators (WDI) both to estimate the impact of the crisis and as a control. Also, we take data on merchandise exports over GDP from the WDI. The share of trade with the US and the EU27 is taken from the WTO reports. If neither the US nor the EU27 is among an economy's top-five trading partners, we assume a share of zero for that economy. While this might seem restrictive, the trading share of the fifth-largest trading partner is usually in the lower one digit percentage region. Given the magnitude of the share of EU and US trade in most countries, the distortion of assuming zeron these cases is negligible. Data on the share of fuel exports for a national economy is also taken from the WDI.

All controls are 2007 values, including revisions published before 2011.

5.2 Results

The results are summarized in Table 3. We run a battery of alternative specifications (R1 to R4) including a different subset of controls. Most notably, we test derivate controls both jointly with and independent from general capital market restrictions to avoid overlooking any impact that might be obscured by multicollinearity effects. However, there is no evidence that derivative restrictions affected the real consequences of the financial shock in 2009. The same holds for both general inflow and outflow controls. The only regulation that is significantly correlated with the negative shock during the crisis is banking regulation. While governments could not shield their economies from the risk of global financial shock by fine-tuning capital flows, they could limit the general risk exposure of banks. Given the small standard deviation of the shock during the crisis (of about 0.05), the coefficients of banking regulation are immense. A change of one standard deviation in banking regulation (0.2) explains one to two percentage points of real GDP growth during the crisis.

We find strong evidence that richer economies suffered more during the crisis, which might reflect the effects of stronger ties to the industrialized economies where the crisis emerged. While we control for trade relations, this does not entirely capture the increasing integration of middle income economies the world

Table 3: Results

	R1	R2	R3	R4
(1) Const.	0.205 (3.856)	0.196 (3.678)	0.176 (3.135)	0.208 (3.547)
(2) derivative controls	0.000 (0.018)	0.005 (0.404)	-0.008(-0.659)	0.008 (0.569)
(3) banking regulation	- -	- -	0.048 (1.690)	0.052 (2.043)
(4) inflow controls	- -	- -	- -	-0.010(-0.323)
(5) outflow controls	- -	- -	- -	-0.016(-0.679)
(6) ln(GDP)	-0.029(-4.377)	-0.026(-3.901)	-0.027(-4.094)	-0.029(-4.051)
(7) σ_η	0.488 (1.510)	0.467 (1.648)	0.576 (1.792)	0.639 (2.102)
(8) exports/GDP	-0.017(-0.611)	-0.074(-2.074)	-0.027(-1.003)	-0.097(-2.682)
(9) fuel exports/GDP	0.054 (2.925)	0.053 (2.926)	0.055 (2.993)	0.054 (3.250)
(10) EU27 share in exp.	0.014 (0.550)	0.012 (0.502)	0.015 (0.615)	0.014 (0.589)
(11) US share in exp.	-0.049(-1.908)	-0.136(-3.024)	-0.046(-1.884)	-0.138(-3.150)
(12) interaction (8,11)	- -	0.003 (2.310)	- -	0.003 (2.581)
adjusted R^2	0.30	0.35	0.32	0.37

Note: (bootstrapped) t-statistics are given in parenthesis

market. For example, the emerging economies attract more multinational enterprises that might have suffered substantially during the crisis.

The export to GDP ratio and the share of exports to the US both correlate significantly and negatively with the crisis. Given the collapse of global trade (the key channel of direct spillovers) and the prominent role of the US at the epicenter of the crisis, this result is unsurprising.

There are, however, two surprising results. Fuel exporting countries have been less affected by the crisis, which might reflect the fact that oil prices react to economic shocks very quickly. Thus, although the global economic recession occurred in 2009, oil prices stopped crashing by the end of 2008. After a few months of stagnation, oil prices recovered strongly, almost doubling in 2009. The second surprising result is the clearly positive interaction between the exports to GDP ratio and the US share of exports. That is, strong dependence on US demand seems to be less important in countries that are very open. This finding suggests that both indicators (the export ratio and the US share in exports) partly act as proxies for real spillover. Because these terms should not be considered twice, their interaction corrects for this "double accounting".

6 Conclusion

Our evidence is consistent with several recent findings. We find that capital controls do little to shelter economies from financial turmoil. Our study is unique because it considers controls specifically targeted to the type of asset that played a key role in the propagation of the crisis. Additionally, previous studies have indicated that while controls alleviate risks, in the process, they also create new risks. Our results suggest that controls do not significantly

alleviate risk in the first place.

By contrast, banking regulation, i.e., providing a sound framework for the financial market, proved to be highly relevant.

Essentially, our findings support the conventional economic wisdom that has recently been doubted: it is unlikely that the government can improve capital allocation directly. In such a scenario economic agents will try to circumvent regulation, leading to higher costs and negligible changes to risk exposure. However, the government can and should provide a regulatory framework that guarantees a smoothly running market. Regarding the financial sector, this includes limiting risk exposure, as taking excessive risk is a dominant strategy in the short run if banks expect a government bailout or believe that they can increase their expected returns while passing risks to the customer.

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