Why Are Capital Flows So Much More Volatile in Emerging Than in Developed Countries?

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One of the most studied subjects in open macroeconomics is what determines capital flows. In general, most papers are concerned with estimating the following regression:

$$K_{i,t} = c_i + X_{i,t}A + \varepsilon_{i,t},$$

where the left-hand side is some measurement of capital flows, either as a percentage of gross domestic product (GDP) or as changes, and the right-hand side introduces several time and cross-sectional controls, such as GDP growth, real exchange rates, the international interest rate, terms of trade, availability of international funds, or some measure of credit constraints. Almost the entire literature focuses on the properties of A, such as the signs and significance of the coefficients and the most important determinants. This paper takes a different perspective: we concentrate on the explanatory power of fundamentals and on the properties of the residuals—that is, the portion of capital flows that is unexplained by fundamentals.

This new dimension allows us to uncover a pattern that has escaped the literature: the fundamentals have some explanatory power for capital flows (the R squared values of the regressions are not zero), but this explanatory power is quite small, especially considering that we are

We thank Alvaro Aguirre, Ricardo Caballero, and Eduardo Levy-Yeyati for very helpful comments.

External Vulnerability and Preventive Policies, edited by Ricardo Caballero, César Calderón, and Luis Felipe Céspedes, Santiago, Chile.

probably overestimating the explanatory power of these variables owing to problems of endogeneity and omitted variables. Furthermore, the ratio of standard deviations between the residuals for emerging countries and the residuals for developed countries is very stable to different measures of capital flows, controls for domestic and external shocks, and nonlinearities and asymmetries. We find that capital flows to emerging countries are 80 percent more volatile than those to developed economies; this ratio falls to 62 percent when we control for a series of macroeconomic variables. In contrast, we find that nonfundamental variables, such as outliers, lags, and contagion effects, reduce this ratio to 16 percent.[1]

The paper is organized as follows. The first section reports the difference in volatility of capital flows to emerging versus developed countries. The second section then outlines the effect of controlling for macroeconomic variables, while the third identifies some statistical regularities of the residuals. The fourth section studies the determinants of the unconditional volatility. The final section concludes.

1. Volatility in Emerging and Developed Countries

This section documents the excess volatility in capital flows to emerging countries, to then explore its determinants in the rest of the paper. We collected data on total capital flows measured as the capital account in the balance-of-payment statistics, GDP, inflation, exchange rate, nominal interest rates, and the terms of trade, yearly for the period 1965–2003 from the International Monetary Fund's *International Financial Statistics* (IFS). The data set includes twenty-three industrialized countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States), seven Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, Uruguay, and Venezuela), nine Asian countries (China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand), thirteen transition countries (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovak Republic, Slovenia, and Ukraine), and six other

1. Hausmann, Panizza, and Rigobon (2004) find very similar patterns in real exchange rate volatilities. The stylized facts in this paper are not of the same nature, however, because the high volatility of the capital flows remained when we controlled for exchange rate movements.

countries (Egypt, Morocco, Nigeria, South Africa, Tunisia, and Turkey).[2] These countries are divided in two broad groups: developed and emerging countries. For the analysis of common components, the emerging countries are also divided into Latin America, Asia, transition countries, and other, since we test for contagion effects within these groups.

We also collected information on real income per capita from the Penn World Table; on financial development (ratios of private domestic credit and liquid liabilities over GDP) from Loayza, Fajnzylber, and Calderón (2005); and on the quality of institutions from the International Country Risk Guide.[3]

Figure 1 shows the standard deviation of capital flows as a percentage of GDP, calculated country by country. The countries have been sorted from the smallest standard deviation to the highest. As can be easily seen, the countries located on the left-hand side of the figure are mostly developed countries, while the emerging countries are concentrated on the right-hand side. Table 1 shows the standard deviation of capital flows for each of the two groups. Capital flows as a percentage of GDP in emerging countries are 80 percent more volatile than in developed countries. In addition, capital flows to both groups are left skewed, but they are substantially more so for emerging countries.

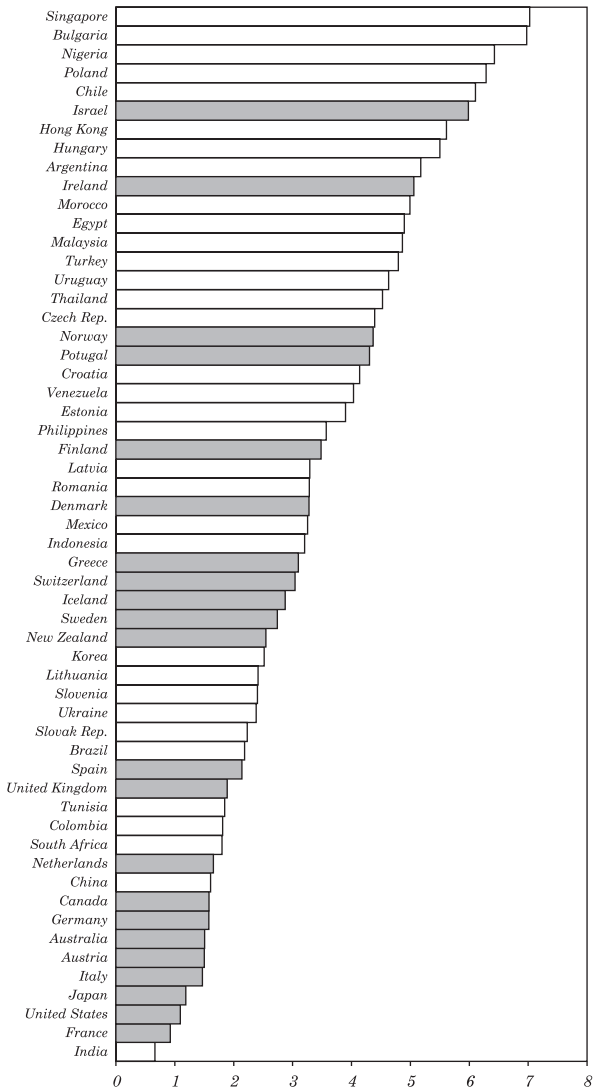
There are at least three possible explanations for this pattern. First, emerging countries might be hit by fundamental shocks that have different stochastic properties than those that affect developed countries, and the capital flows might just reflect those properties. Second, capital flows to emerging and developed countries might respond differently to similar fundamental shocks. Third, emerging countries might be subject to larger sources of nonfundamental shocks, such as crises, persistence, and contagion.

With respect to the first explanation, emerging countries could be, on average, subject to larger and more left-skewed fundamental shocks. Indeed, emerging countries experience larger, more skewed shocks, on average, in terms of inflation, interest rates, real exchange rates, output, and terms of trade. In this case, the difference in the characteristics of capital flows should be reflected in differences in

2. The twenty-three industrialized economies are the members of the Organization for Economic Cooperation and Development (OECD) plus Israel and minus Mexico and Korea. The results are not sensitive to this choice.

3. We thank Norman Loayza for providing us with the data on financial development and institutional quality.

Figure 1. Standard Deviation of Capital Flows[a]



Source: Authors' calculations.
a. The gray bars indicate developed countries; the clear bars emerging countries.

Table 1. Statistics on Capital Flows for Emerging and Developed Countries

Group	*Standard deviation*	*Skewness*
Developed countries	3.175	–0.502
Emerging countries	5.677	–0.760
Ratio	1.790	1.520

Source: Authors' calculations.

the behavior of fundamentals. We study this possibility below, including the role of nonlinearities and asymmetries in explaining the higher volatility of capital flows.

With respect to the second explanation, emerging countries might respond more strongly than developed countries to similar fundamental shocks. If so, the two groups of countries would differ in the sensitivity of capital flows to fundamentals. For example, a large literature studies the amplification of shocks when financial markets are less developed; this amplification means that capital flows would be more volatile in emerging versus developed countries in response to the same shock.

Finally, other, nonfundamental shocks could explain the difference in volatility. This would generate differences in the behavior of the portion of capital flows that is unexplained by fundamental shocks (that is, residuals). We analyze a number of possibilities: crises (left-skewed residuals), contagion (correlated residuals), and persistence of shocks (lags).

This paper provides two complementary types of evidence. First, we examine which factors account for the standard deviation of capital flows in emerging and developed countries (panel regressions). The purpose of this exercise is to decompose the ratio of the standard deviations to determine the relative weight of the explanations mentioned above. These are not variance decompositions because the regressors are not orthogonal, but the decomposition is still informative. Second, we identify characteristics of emerging countries that lead to higher volatility of capital flows (cross-sectional volatility regressions).

Our interpretation of the excess volatility of emerging countries is that it involves a specification problem, and the higher standard deviation reflects omitted variables. This is almost a tautological interpretation, but it guides us in the empirical strategy we pursue in the following sections. We introduce the variables one at a time and test each theory in turn, trying to reduce the excess volatility of residuals from 80 percent to close to zero.

2. Volatility and Fundamentals

Many fundamental variables can have an effect on capital flows, including terms-of-trade shocks, productivity shocks, time preference shocks, and initial endowments. Although it is impossible to construct a large panel that includes emerging countries with all relevant fundamentals, those fundamentals are likely to be reflected in macroeconomic variables (for example, productivity shocks in GDP and time preference shocks in interest rates). We consider GDP, inflation, the interest rate, the exchange rate, and the terms of trade. If we tried to identify causation, we would face problems of endogeneity and omitted variables. Our objective, however, is not to resolve the problem of identification, but rather to determine the extent to which fundamental variables might be responsible for the volatility of capital flows. We find that these variables explain very little of the volatility of capital flows. The possible existence of reverse causation and omitted variables thus suggests that in reality fundamental shocks account for even less of the volatility of capital flows than implied by our low R squared values.

We estimate panel regressions of the following form:

$$K_{i,t} = c_i + X_{i,t}A_i + \varepsilon_{i,t},$$

where $X_{i,t}$ represents the controls or macroeconomic variables. We restrict the coefficients A_i to be the same within the two groups of countries, since we do not have enough data to estimate country-specific coefficients. However, by allowing the coefficients to differ between emerging and developed countries, we allow for different sensitivities to play a role in explaining the higher volatility of capital flows to emerging countries.

This is a reduced-form representation, so no interpretation of the coefficients A_i should be given. Several of the variables that we include on the right-hand side are clearly endogenous to capital inflows, such as the interest rate and the exchange rate. The estimation of A_i thus suffers from simultaneous equations bias. In this paper, however, we are concerned with the possible explanatory power of the fundamentals and with the properties of the residuals, not with the coefficients per se. By projecting the capital flows onto the endogenous variables, we tend to maximize their explanatory power, reducing the standard deviation of the residuals to a minimum. As a result, the true explanatory power of any set of fundamentals we consider should be between zero and the result we report.

Table 2 reports the results of running the regression for different sets of macroeconomic variables. We included the macroeconomic variables one by one to try to understand their incremental effect on the overall variance, standard deviation, and skewness. The control variables are GDP per capita (in logs), the exchange rate depreciation, the inflation rate, the domestic interest rate, and the terms of trade measured by both import and export prices (in logs).[4] The first row in table 2 is our benchmark, in which we control for fixed effects only.[5] From the second to the sixth rows, we introduce macroeconomic variables into the specification one at a time.[6] For each group of countries (developed and emerging), the first column is the fraction of the variance of the residuals that is explained relative to the specification in which we only have fixed effects (first row).[7] The second column is the standard deviation of the residuals, and the third column is the skewness of the residuals. The last two columns are the ratio of the standard deviation and skewness of residuals for the two groups of countries.

The first result worth highlighting is that fundamentals may explain some of the capital flow volatility that we observe: the R squared rises to 5 percent for developed countries and 20 percent for emerging countries. The second result—the one we focus on here—is that the ratio of the standard deviation of residuals for emerging and developed economies is remarkably stable to the introduction of these fundamentals.

Figure 2 summarizes these results. We show the standard deviations of the residuals as well as the ratio of standard deviations for all the

4. The regressions are balanced, in the sense that we only use observations for which all control variables are available; the number of observations is therefore the same in all specifications. We obtained the same results when we included the GDP growth rate and the growth rate of the terms of trade instead of levels.

5. In principle, to compute the standard deviation of capital flows for the countries in each group, we would not need to include a constant term for each country. However, in this case the standard deviation of the residual would reflect both the time series volatility within each country and the cross-sectional variation across countries. The latter, however, does not usually figure in what is understood as capital flow volatility. Consequently, we always include country fixed effects, and the fixed-effects regression is the benchmark against which we compare all the other regressions.

6. We also estimated specifications including unemployment. We decided to exclude those specifications, however, because including unemployment reduced the sample significantly and did not change the results at all. Results are available on request.

7. This is more informative than R squared since, given our focus on volatility, we are not interested in the fraction of the variance explained by fixed effects.

Table 2. Statistics on Capital Flows: Domestic Macroeconomic Variables[a]

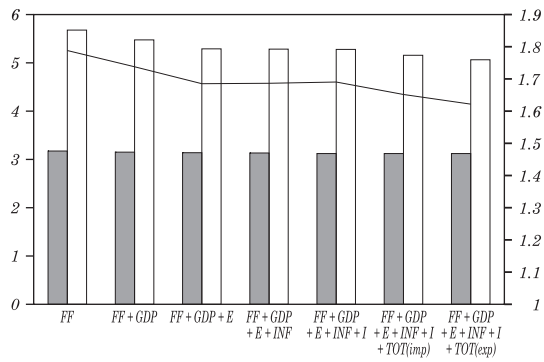
	Developed countries			*Emerging countries*			*Ratio*	
Control variables included in regression	R^2 (%)	*Standard deviation*	*Skewness*	R^2 (%)	*Standard deviation*	*Skewness*	*Standard deviation*	*Skewness*
FE	0.0	3.175	–0.502	0.0	5.677	–0.760	1.788	1.516
FE + GDP	1.5	3.151	–0.504	7.0	5.476	–0.653	1.738	1.295
FE + GDP + E	2.3	3.138	–0.510	13.2	5.289	–0.658	1.685	1.291
FE + GDP + E + INF	2.6	3.134	–0.499	13.3	5.285	–0.639	1.686	1.28
FE + GDP + E + INF + I	3.2	3.123	–0.513	13.5	5.279	–0.659	1.690	1.286
FE + GDP + E + INF + I + TOT(imp)	3.3	3.122	–0.508	17.5	5.158	–0.682	1.652	1.342
FE + GDP + E + INF + I + TOT(exp)	3.3	3.122	–0.511	20.4	5.064	–0.760	1.622	1.486

Source: Authors' calculations.

a. The macroeconomic control variables are as follows: FE: fixed effects; GDP: per capita GDP (in logs); E: exchange rate depreciation; INF: inflation rate; I: domestic interest rate; TOT(imp): terms of trade measured by import prices (in logs); and TOT(exp): terms of trade measured by export prices (in logs).

specifications. As the figure illustrates, the standard deviation of residuals for emerging countries is reduced by around 10 percent, while the ratio of the standard deviations is reduced from 1.788 to 1.622.

Figure 2. Standard Deviation for Each Group and All Specifications[a]



Source: Authors' calculations.
a. Ratio of standard deviations is measured on the right hand axis. The gray bars indicate developed countries; the clear bars emerging countries.

This exercise demonstrates that even though domestic macroeconomic variables may have some explanatory power for capital flows, they contribute little to explaining the ratio of standard deviations across groups. Moreover, the skewness of the residuals is only slightly affected by the introduction of macroeconomic variables. It is interesting that the skewness associated with exchange rate depreciations is unable to explain the skewness in the data. One of the most obvious reactions to the stylized facts in the previous section is that crises might be an important component for explaining the skewness and volatility of capital flows to emerging countries. However, our results suggest that the skewness and volatility in macroeconomic variables cannot account for these effects. We come back to this point later. In summary, the higher volatility and skewness of capital flows to emerging countries cannot be accounted for by a different behavior of, or different response to, macroeconomic variables.

2.1 External Factors

Apart from domestic factors, capital flows should also depend on international factors, such as international interest rates. In this section, we control for the U.S. real interest rate, constructed as the difference

between the U.S. short-run nominal interest rate and U.S. inflation.[8]

The results are summarized in table 3. We run the same specifications as before, where we first introduce the real interest rate in the regression and then add each of the macroeconomic variables in turn. The table only presents the results of the first and last of these regressions. We compare them to the benchmark and to the regression with all the macroeconomic variables.

External factors have very little explanatory power: the R squared is only 1 percent for emerging countries and 0.2 percent for developed economies. A comparison of the third and fourth rows further indicates that international interest rate movements are already included in some of the macroeconomic variables that we considered in the previous exercise. Once we account for domestic factors, the U.S. interest rate increases the R squared by less than 0.1 percent. This suggests that some of the explanatory power of domestic variables for emerging countries actually reflects the (limited) response to international interest rates.

Including other external factors—such as output and inflation in G7 countries or output, the nominal exchange rate, and inflation of the major trading partners—also has almost no effect on the R squared and the relative standard deviations. We included these variables in the specification one at a time, and the U.S. interest rate performed best in terms of R squared.

In summary, adding external factors to the regression does not significantly affect the standard deviation of capital flows, either the levels or the ratio between emerging and developed countries. The skewness of residuals is not affected, either.

2.2 Nonlinearities

A third alternative worth exploring is the possibility that capital flows respond to shocks to fundamentals nonlinearly. Such a response may account for both higher volatility and skewness. To explore this possibility, we introduced nonlinear terms in the regression. We introduced each of the macroeconomic variables in the regressions with a quadratic term to test for convexities and with an absolute value to

8. The possibility of contagion may also be considered an external factor, but in the absence of a clear fundamental counterpart, we consider contagion in the next section on statistical properties of capital flows. However, several theories of contagion imply that contagion should be reflected in international interest rates; hence, the introduction of the U.S. short-term interest rate is also controlling for contagion.

Table 3. Statistics on Capital Flows: Domestic and External Macroeconomic Variables[a]

	Developed countries			*Emerging countries*			*Ratio*	
Control variables included in regression	R^2 (%)	*Standard deviation*	*Skewness*	R^2 (%)	*Standard deviation*	*Skewness*	*Standard deviation*	*Skewness*
FE	0.0	3.175	–0.502	0.0	5.677	–0.760	1.788	1.516
FE + RIUS	0.2	3.172	–0.500	1.0	5.648	–0.752	1.781	1.505
FE + GDP + E + INF + I + TOT(exp)	3.3	3.122	–0.511	20.4	5.064	–0.760	1.622	1.486
FE + RIUS + GDP + E + INF + I + TOT(exp)	3.3	3.122	–0.512	20.4	5.064	–0.759	1.622	1.484

Source: Authors' calculations.

a. The macroeconomic control variables are as follows: FE: fixed effects; RIUS: U.S. real interest rate; GDP: per capita GDP (in logs); E: exchange rate depreciation; INF: inflation rate; I: domestic interest rate; and TOT(exp): terms of trade measured by export prices (in logs).

test for asymmetries. We performed this exercise with each of the macroeconomic variables in each of the specifications. Nonlinearities improved the R squared values very little, and they never reduced the ratio of the standard deviations bellow 1.612.[9]

2.3 The Role of Fundamentals: Summary

Once we account for domestic and international macroeconomic variables and nonlinear effects, we are able to explain very little of the volatility of capital flows to emerging markets. In particular, we explain very little of the difference in the standard deviation and skewness of capital flows between emerging and developed countries. We began by stating that capital flows to emerging countries are 78.8 percent more volatile than those to developed economies; this ratio fell to 62.2 percent when we controlled for all these shocks. Moreover, we are probably overestimating the explanatory power of these variables since we are ignoring endogeneity and omitted variables in the specifications.

Since we cannot explain why capital flows to emerging countries are more volatile using fundamentals, in the next section we explore some statistical properties of capital flows to help determine where the answer may lie.

3. Statistical Properties of Volatility: Crises, Persistence, and Contagion

In this section we study the residuals from a different perspective. We assume that a sizeable proportion of the volatility is nonfundamentally driven, and we study three possibilities: the role of outliers (or what we identify as crises), the role of persistence (or lags), and the role of contagion. Notice that all these effects are in addition to the crises, persistence, and contagion that are already reflected in interest rates, exchange rates, inflation, output, and terms of trade.

3.1 Crises

The previous sections showed that capital flows to emerging countries are both more volatile and more left skewed than capital

9. We do not report the results of these regressions because nonlinearities made very little difference. Results are available on request.

flows to developed countries. It seems reasonable that emerging country crises may have a role in accounting for both observations. In this section, we analyze this possibility by looking at the effect of excluding outliers from the residuals of the regressions in the previous section. In particular, we define an outlier as a residual that is more than two standard deviations away from zero, where the standard deviation is calculated country by country. We look at the effect of excluding residuals on the R squared values, the standard deviation of residuals, and skewness. The variance, standard deviation, and skewness are calculated on the residuals that remain after we exclude the outliers.

The results are presented in table 4. We report the results for two specifications: the pure fixed effects (our benchmark) and the fixed effects plus the macroeconomic controls including the U.S. real interest rate. For each specification, we compare the standard deviation of all the residuals to the standard deviation of the residuals that remain after we exclude the outliers.

The elimination of the outliers reduces the standard deviation in both samples significantly. The R squared values are all above 45 percent. The most surprising result is that the ratio of the standard deviations is almost unaffected by this procedure. The ratio of standard deviations only falls from 1.788 to 1.754 and from 1.622 to 1.599, respectively, in the two specifications. This procedure, however, does eliminate the skewness in the data, from an average absolute value of 0.5–0.7 to roughly 0.1 or less.

Although not reported, this procedure also reduces kurtosis, from between 5 and 6 to close to 3. The outliers thus explain the nonnormal behavior of the distribution of residuals, but they do not account for the higher volatility of capital flows to emerging countries. These results are robust to all the previous specifications described so far.

3.2 Persistence

We now examine the possibility that shocks have different persistence in emerging and developed countries. Persistence is not a typical fundamental included in theories on capital flows, which is why we think of persistence as a statistical property of capital flows. We study the issue of persistence by adding lags to two specifications: fixed effects and all macroeconomic controls excluding outliers. We first add the lag of the capital flows alone, and then include the lags of the macroeconomic variables as well.

Table 4. Statistics on Capital Flows: Domestic and External Macroeconomic Variables, Excluding Outliers[a]

	Developed countries			*Emerging countries*			*Ratio*	
Control variables included in regression	R^2 (%)	*Standard deviation*	*Skewness*	R^2 (%)	*Standard deviation*	*Skewness*	*Standard deviation*	*Skewness*
FE	0.0	3.175	–0.502	0.0	5.677	–0.760	1.788	1.516
FE	0.0	3.175	–0.502	0.0	5.677	–0.760	1.788	1.516
FE + RIUS + GDP + E + INF + I + TOT(exp)	3.3	3.122	–0.512	20.4	5.064	–0.759	1.622	1.484
No outliers + FE	46.9	2.313	0.023	48.9	4.058	–0.144	1.754	N/A
No outliers + FE + RIUS + GDP + E + INF + I + TOT(exp)	48.6	2.276	–0.025	58.9	3.639	0.007	1.599	N/A

Source: Authors' calculations.
a. The macroeconomic control variables are as follows: FE: fixed effects; RIUS: U.S. real interest rate; GDP: per capita GDP (in logs); E: exchange rate depreciation; INF: inflation rate; I: domestic interest rate; and TOT(exp): terms of trade measured by export prices (in logs).

Table 5. Statistics on Capital Flows: Domestic and External Macroeconomic Variables, with Lags[a]

	Developed countries			*Emerging countries*			*Ratio*	
Control variables included in regression	R^2 (%)	*Standard deviation*	*Skewness*	R^2 (%)	*Standard deviation*	*Skewness*	*Standard deviation*	*Skewness*
FE	0.0	3.175		0.0	5.677		1.788	
No out. + FE + RIUS + GDP + E + INF + I + TOT(exp)	3.3	3.122		20.4	5.064		1.622	
Lag(KF) + FE	24.6	2.757	0.483	41.4	4.346	0.646	1.576	1.336
Lag(KF) + No out. + FE + RIUS + GDP + E + INF + I + TOT(exp)	65.4	1.867	0.475	82.3	2.389	0.607	1.258	1.278
Full lags + No out. + FE + RIUS + GDP + E + INF + I +TOT(exp)	65.0	1.877	0.481	81.6	2.437	0.578	1.298	1.201

Source: Authors' calculations.
a. The macroeconomic control variables are as follows: FE: fixed effects; RIUS: U.S. real interest rate; GDP: per capita GDP (in logs); E: exchange rate depreciation; INF: inflation rate; I: domestic interest rate; TOT(exp): terms of trade measured by export prices (in logs); lag(KF): lag of capital flows only; and full lags: lags of all included macroeconomic variables.

Table 5 summarizes the results.[10] Since the skewness was entirely accounted for by excluding outliers, we no longer report this statistic. Instead, we report the coefficient on the lag of the capital flows. The first row is our benchmark; the second row is our regression with all the macroeconomic variables and excluding outliers. The regression reported in the third row only controls for fixed effects and the lag of capital flows. The fourth row is the specification with the lag, all the macroeconomic variables, and no outliers. The last row also includes the lags of all the right-hand-side variables.

Persistence accounts for a large fraction of capital flow volatility. The R squared of the regression including just the lag of capital flows is 41 percent for emerging countries and 25 percent for developed countries. Once we account for macroeconomic controls and outliers, the R squared increases to 65 percent for developed countries and 82 percent for emerging countries.

Contrary to the effect of excluding outliers, accounting for persistence not only increases the explanatory power of our regressions, but also substantially decreases the ratio of standard deviations. This is reflected in the different coefficients of lag capital flows, which are quite higher for emerging countries than for developed countries; this implies that capital flows are more persistent in emerging than in developed countries. The coefficient on the lag in emerging countries is usually higher than 0.60, while it is below 0.50 for developed countries.

Before, the exclusion of outliers had little effect on the ratio of residuals, but it does have a significant effect on this ratio once we account for different persistence. The combined effect of accounting for persistence and excluding outliers is to reduce the ratio of standard deviations from 1.788 to 1.298.[11]

3.3 Contagion

The last statistical property of capital flows we analyze is the comovement of flows across countries that is not explained by

10. As in the previous sections, we performed the same test for all the possible specifications and here only report the most pertinent.

11. We do not know why the effect of excluding outliers on the ratio of standard deviations is more important once we account for persistence. One possibility is that crises in emerging countries follow periods of high capital inflows more than in the case of developed countries. Accounting for persistence therefore increases the expected inflow right before the crisis in emerging countries more than in developed countries, increasing the relative size of the negative innovation.

macroeconomic variables. We denote this comovement as contagion. We construct a common component of capital flows for different groups of countries and study the extent to which these common components explain capital flows in each group. The groups are Latin America, Asia, Eastern Europe, other emerging countries, and developed countries. We use two methodologies to construct the common component. First, we consider a true common component computed by the first principal component. The problem with this measure is that we do not have a long enough time series, so not all countries can be included to form the principal component. This clearly underestimates the common factor. As a result, the common component in our second methodology is simply the average capital flows for the group in each year. For each methodology, we add the principal component to the right-hand side of our regressions.

The results are summarized in table 6. The third and fifth rows present the results of adding the principal component constructed with the first methodology (PC), while the fourth and sixth rows present the results of adding the principal component constructed with the second methodology (PCAVE). The results of the third and fourth rows clearly suggest that the principal components may explain a substantial fraction of capital flows volatility, especially for emerging countries. However, this depends very much on the methodology used to construct the principal components, and it is not clear which one should be preferred.[12] The results of the fifth and sixth rows, in turn, indicate that the principal components also have some explanatory power when we consider persistence and outliers for the case of emerging countries, although not for the case of developed countries. As a result, the ratio of standard deviations is further reduced to below 1.2.

Capital flows to emerging countries are more correlated than capital flows to developed countries. Consequently, when we add common components to the regressions, we reduce the relative volatility of capital flows to emerging countries. One shortcoming of this exercise is that we cannot determine whether this result is due to contagion or to an unobserved common determinant of capital flows to emerging countries. Regardless of the explanation for the result, we can say that common external conditions must play a significant role in explaining capital

12. If we had a longer time series, we would have more faith in the results of the regressions in which the principal components are constructed in the traditional way; however, such data are not available to us. The main problem is that estimating principal components requires as many time observations as series to be included. This is impossible for the Eastern European countries, for which we have at most ten years of information.

Table 6. Statistics on Capital Flows: Domestic and External Macroeconomic Variables, with Lags and Common Components[a]

	Developed countries			*Emerging countries*			*Ratio*	
Control variables included in regression	R^2 (%)	*Standard deviation*	*Lag coeff.*	R^2 (%)	*Standard deviation*	*Lag coeff.*	*Standard deviation*	*Lag coeff.*
FE	0.0	3.175		0.0	5.677		1.788	
Lag(KF) + No out. + FE + RIUS + GDP + E + INF + I + TOT(exp)	65.0	1.877	0.481	81.6	2.437	0.578	1.298	1.201
PC + FE + RIUS	2.6	3.132		4.1	5.559		1.775	
PCAVE + FE + RIUS	4.6	3.100		39.0	4.433		1.430	
PC + Lag(KF) + No out. + FE + RIUS + GDP + E + INF + I + TOT(exp)	65.5	1.864	0.491	84.5	2.237	0.586	1.200	1.194
PCAVE + Lag(KF) + No out. + FE + RIUS + GDP + E + INF + I + TOT(exp)	61.8	1.961	0.509	83.9	2.277	0.573	1.161	1.127

Source: Authors' calculations.

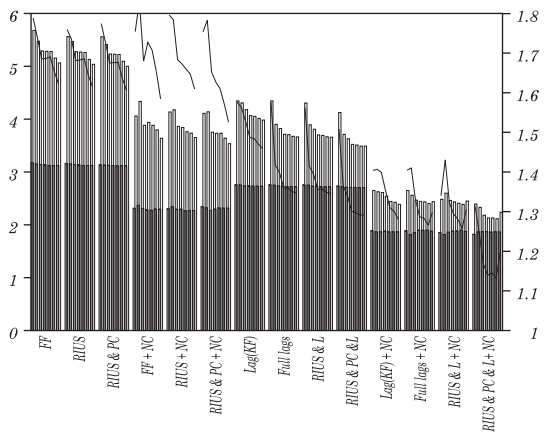
a. The macroeconomic control variables are as follows: FE: fixed effects; RIUS: U.S. real interest rate; GDP: per capita GDP (in logs); E: exchange rate depreciation; INF: inflation rate; I: domestic interest rate; TOT(exp): terms of trade measured by export prices (in logs); lag(KF): lag of capital flows only; PC: true common component computed by the first principal component; and PCAVE: common component constructed as the average capital flows for the group in each year.

flows to emerging countries and that these common external conditions have little to do with international interest rates.

3.4 Summary

Figure 3 shows the ratio of standard deviations of capital flows to emerging countries relative to developed countries for most of the specifications we ran. The x-axis includes all the regressions in which we control for domestic macroeconomic variables, international interest rates, outliers, persistence, and contagion. The bars represent the standard deviation of the residuals (measured on the left vertical axis), and the line shows the ratio of standard deviations (measured on the right vertical axis). A measure of the explanatory power is to compare the size of the bars to the first one on the left, which corresponds to our benchmark.

Figure 3. Standard Deviation for Each Group and All Specification, Excluding Outliers and Including Lags and Common Components[a]



Source: Authors' calculations.
a. Ratio of standard deviations on the right hand axis. The gray bars indicate developed countries; the clear bars, emerging countries.
L: lags. NC: no crisis.

As we argued above, macroeconomic controls and international interest rates have a small effect on the volatility of residuals and almost no effect on the ratio of standard deviations. This is despite the fact that endogeneity and omitted variables suggest that what little they explain is probably an overestimation of the actual effect of these variables.

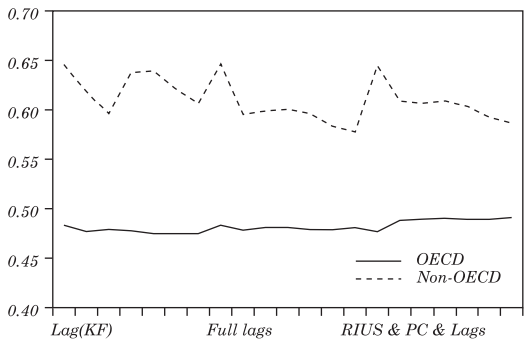
When we examined whether the statistic properties of capital flows can shed light on possible explanations for the volatility of capital flows to emerging countries, we found three properties that account for almost all the excess standard deviation. Capital flows to emerging countries are more frequently affected by crises, are more persistent, and are more correlated with capital flows to similar countries than are capital flows to developed countries. Once we control for these differences, the ratio of standard deviations of residuals drops from 1.788 to 1.161.

The fact that domestic macroeconomic variables cannot account for crises, together with the fact that capital flows to emerging countries are quite correlated, suggests the importance of external, or supply, factors in explaining such flows.[13] Interestingly, international interest rates have very little explanatory power, suggesting that it is not the "representative world consumer" who supplies capital to emerging countries. In other words, the market for capital to emerging countries is probably somewhat segmented, subject to shocks unrelated to domestic macroeconomic conditions, and characterized by contagion. While these conclusions might not be surprising in themselves, we are struck by how much of the excess volatility of capital flows to emerging countries these characteristics can account for, especially considering the negligible effect of domestic macroeconomic variables and world interest rates.

Another important finding is that capital flows to emerging countries are substantially more persistent than those to developed countries. Figure 4 presents the autoregressive coefficient of capital flows for different specifications. The coefficient is quite stable across specifications, at around 0.60 for emerging countries and 0.49 for developed countries. These coefficients imply a half-life of capital flow shocks of 16.3 months for emerging countries and 11.7 months for developed countries. The difference in the persistence of shocks explains a large part of the ratio of standard deviations between emerging and developed countries. As far as we know, no theories currently explain this different degree of persistence.

13. Broner, Lorenzoni, and Schmukler (2004) present evidence on emerging countries' sovereign debt that suggests the importance of these supply factors. See this paper and Caballero and Krishnamurthy (2003) for models in which supply-side considerations play a major role in emerging economies' access to international capital markets.

Figure 4. Autoregressive Coefficient



Source: Authors' calculations.

4. Volatility and Country Characteristics

The previous sections showed that capital flows to emerging countries are much more volatile than capital flows to developed countries. We also showed that macroeconomic variables had little explanatory power to account for this phenomenon, which was characterized instead by a set of statistical properties not obviously related to any fundamentals. In this section, we take a step back and analyze whether fundamentals can explain, if not the time series behavior of capital flows, at least its unconditional standard deviation. Our previous results indicate that the level of economic development should be a good predictor for this volatility, but it is not clear which aspect of economic development is most relevant. We thus consider three variables that are correlated with economic development but that reflect different economic characteristics of countries: per capita income, financial development, and quality of institutions.

For per capita income, we take the average real income per capita from Penn World Table for the period 1985–89. For financial development, we use the ratio of private domestic credit to GDP and the ratio of liquid liabilities to GDP in 1989 (from Loayza, Fajnzylber, and Calderón, 2005). For institutional quality, we use the first principal component of indicators on the prevalence of law and order, the quality of bureaucracy, the absence of corruption, and the accountability of public officials in 1989 (from the International Country Risk Guide). We regress capital flow volatility during the period 1990–2003 on these country characteristics. We begin our

study of capital flow volatility in 1990 so as to minimize the problem of reverse causality, namely, that country characteristics in 1989 be the result of past capital flow volatility.

Table 7 shows the main results. We find that higher per capita GDP, a higher level of financial development, and a higher level of institutional quality are all associated with less volatile capital flows. The results for financial development are especially interesting. While a high level of private credit is associated with less capital flow volatility, the result is weaker for the level of liquid liabilities. The reason is probably that while the two measures reflect both financial development and, to some degree, financial vulnerability (for example, leverage), the level of liquid liabilities probably reflects financial vulnerability to a larger extent than does the level of private credit. This interpretation is reinforced by the result of the regression including both measures (regression 4). In this case, the coefficient on private credit increases in size, while the coefficient on liquid liabilities becomes positive. Given the small number of observations and the high correlation between the explanatory variables, none of them is significant when included simultaneously. If one is willing to associate *p* values with explanatory power, then financial development appears to retain the most explanatory power, followed by institutional quality and per capita GDP.

Table 7. Volatility Regressions[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
GDP per capita	–0.110**					–0.040
	(0.05)					(0.14)
Financial development:		–0.014*		–0.019		–0.008
private credit		(0.008)		(0.013)		(0.016)
Financial development:			–0.011	0.009		0.007
liquid liabilites			(0.011)	(0.018)		(0.018)
Institutional quality					–0.430**	–0.210
					(0.20)	(0.54)
R^2 (%)	10.8	6.9	2.6	7.5	10.4	11.3
No. observations	53	43	43	43	43	43

Source: Authors' calculations.
* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
a. The dependent variable is the standard deviation of capital flows between 1990 and 2003. The independent variables are as of 1989, except per capita GDP, which is the average for the period 1985–89. Units are as follows: capital flows (for standard deviation) as percentage of GDP; per capita GDP in thousands of dollars; financial development as percentage of GDP (both private credit and liquid liabilities); and institutional quality as an index (in 1990 it ranges from –3.26 for Zaire (not in our sample) or –2.06 for Nigeria (in our sample) to 3.47 for Canada). Standard errors are in parentheses.

We also tried controlling for the volatility of the explanatory variables to make sure they do not affect the volatility of capital flows through their effects on the main equations. The results are in table 8. We would have liked to control for the volatility of the control variables in the 1980s, since the volatility of both controls and capital flows in the 1990s could be affected by unobserved variables. However, we only have data on volatility in the 1980s for per capita GDP, so for the other controls we could only use volatility in the 1990s. We find that controlling for the volatility of the control variables does not qualitatively affect the results of table 7, in the sense that the estimated coefficients are not statistically different. The one possible exception is institutional quality, for which the magnitude of the coefficient seems to increase. Again, when we include all four controls simultaneously, they all become insignificant. Again, if one is willing to associate p values with explanatory power, both financial development and institutional quality have a bit more explanatory power than per capita GDP.[14]

5. Final Remarks

This paper has provided a number of stylized facts about capital flows to emerging and developed countries. First, capital flows to emerging countries are much more volatile than capital flows to developed countries. Second, fundamentals, in the form of domestic and foreign macroeconomic variables, explain very little of the dynamics of capital flows. Third, fundamentals, in the form of country characteristics, explain a substantial amount of the unconditional volatility of capital flows across countries: financial development, good institutions, and high per capita income are all associated with lower volatility. Finally, although we cannot explain the dynamics of capital flows, the high volatility of capital flows to emerging countries reflects three statistical properties of capital flows: relative to developed countries, flows to emerging countries have fatter left tales (that is, emerging countries are more subject to crises), shocks to capital flows are more persistent in emerging countries, and capital flows to emerging countries are more correlated across countries.

Although our evidence is more suggestive than conclusive, it points to the importance of supply-side factors in explaining capital flows to emerging countries. The fact that domestic macroeconomic variables

14. This is the case for regression 5, but not for regression 10. Regression 5 is the one in which all four controls enter symmetrically.

Table 8. Volatility Regressions Controlling for Volatility in Explanatory Variables[a]

Explanatory variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GDP per capita	–0.18***				–0.01	–0.17*				–0.22
	(0.05)				(0.15)	(0.09)				(0.18)
Financial development:		–0.018**			–0.011		–0.014			–0.011
private credit		(0.008)			(0.017)		(0.011)			(0.016)
Financial development:			–0.016		0.013			–0.007		0.006
liquid liabilities			(0.011)		(0.019)			(0.012)		(0.018)
Institutional quality				–0.83***	–0.92				–0.58*	0.04
				(0.28)	(0.59)				(0.30)	(0.56)
Standard deviation:	1.02**				0.71					
GDP 1990s	(0.47)				(0.63)					
Standard deviation:		0.079*			0.063					
private credit		(0.045)			(0.048)					
Standard deviation:		0.081		0.029						
liquid liabilities		(0.050)		(0.063)						
Standard deviation:				–3.29*	–3.23					
institutional quality				(1.72)	(1.88)					
Standard deviation:						1.00	0.01	–0.52	0.66	1.99
GDP 1980s					(1.13)	(0.87)	(0.76)	(0.96)	(1.38)	
R^2 (%)	18.4	13.6	8.6	18.0	30.9	12.1	6.9	3.8	11.5	16.0
No. observations	53	43	43	43	43	46	43	43	43	43

Source: Authors' calculations.

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

*** Statistically significant at the 1 percent level.

a. The dependent variable is the standard deviation of capital flows between 1990 and 2003. The independent variables are as of 1989, except per capita GDP, which is the average for the period 1985–89. Units are as follows: capital flows (for standard deviation) as percentage of GDP; per capita GDP in thousands of dollars; financial development as percentage of GDP (both private credit and liquid liabilities); and institutional quality as an index (in 1990 it ranges from –3.26 for Zaire (not in our sample) or –2.06 for Nigeria (in our sample) to 3.47 for Canada). Standard errors are in parentheses.

have little explanatory power indicates that demand factors cannot account for much of the dynamics of capital flows to emerging countries. The importance of a common component of capital flows also suggests that external factors play an important role in explaining capital flows to emerging countries. Furthermore, the fact that crises are more important in emerging countries suggests that these external factors are subject to sudden changes. These observations are consistent with a world in which emerging countries are not fully integrated into global capital markets, but rather participate in a somewhat segmented market subject to sudden shifts in the supply of capital.

It would be wrong to conclude from this evidence that emerging countries cannot do anything to avoid being subject to very volatile capital flows. Even though fundamentals explain little of the dynamics of capital flows, they do account for a substantial fraction of the unconditional volatility of flows. Our evidence suggests that emerging countries can reduce the volatility of capital flows by improving their financial markets and institutions.

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