

The Effects of Global Financial Shocks on Output in Latin America

Financial risks continue to loom over the world economy, raising questions about the potential impact on Latin America. This chapter takes an in-depth look at the question of how global financial shocks affect output in this region and other emerging economies by examining the country features that influence their impact, with a special focus on financial integration and fundamentals linked to external and fiscal sustainability. We find that external sustainability, especially exchange rate flexibility, plays a key role in mitigating the effect of global financial shocks. Moreover, the mitigation or amplification effect of deeper financial integration greatly depends on the flexibility of the exchange rate regime.

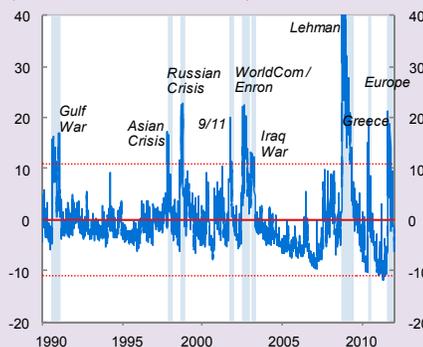
Episodes of Global Financial Stress

The S&P 500 Chicago Board Options Exchange Market Volatility Index (VIX) has recently gained acceptance as a summary indicator of global uncertainty or financial stress.¹ According to this indicator, during the past two decades the world has experienced periods of global financial stress every 2½ years, on average (Figure 1). Whether they originated in advanced economies (e.g., the 9/11 attacks or the collapse of Lehman Brothers) or emerging market economies (e.g., the Asian or Russian financial crises), their global repercussions affected many emerging market economies (EMEs) and small advanced economies (Figure 2), through two types of shocks or “knock-on” effects:

Note: Prepared by Gustavo Adler and Camilo E. Tovar, with research assistance from Andresa Lagerborg.

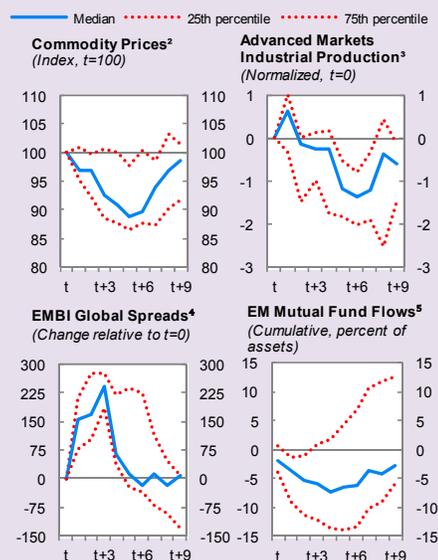
¹ The exact interpretation of spikes in the VIX is still a matter of debate in the academic literature. Bloom (2009), however, shows that the VIX is strongly correlated with measures of uncertainty, including from financial variables. This lends support to its use as a measure of global financial stress. See also Carrière-Swallow and Céspedes (2011).

Figure 1. Global Financial Shocks, 1990–2011¹
(Deviations of VIX from its trend)



Sources: Haver Analytics; and IMF staff calculations.
¹ An episode is identified if the value exceeds its mean by 1.65 standard deviations (as in Bloom, 2009). Episode window starts and ends when the value crosses the one standard deviation threshold.

Figure 2. Key Variables during Episodes of Global Financial Shocks, 1990–2011¹



Sources: Haver Analytics; IMF, *International Financial Statistics*; and IMF staff calculations.

¹ Months reported on horizontal axis. $t=0$ is start of the episode as identified in Figure 3.1. Percentiles across episodes are reported.

² Broad IMF commodity price index, in real terms, adjusted for exchange rate valuation effects (see Adler and Sosa, 2011).

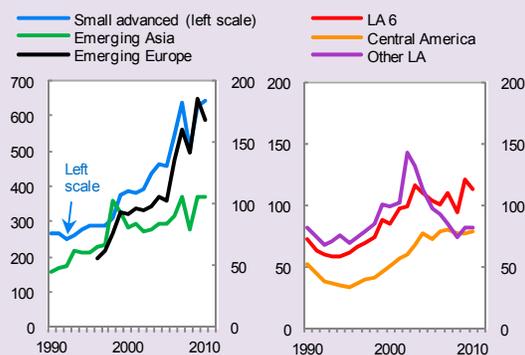
³ Change in cyclical component of industrial production.

⁴ EMBI = Emerging Market Bond Index. Excludes Gulf War and Asian crisis events, due to lack of data.

⁵ Flows to emerging market (EM) equity and bond mutual funds, in percent of total assets under management. Excludes episodes prior to 2000 due to lack of data.



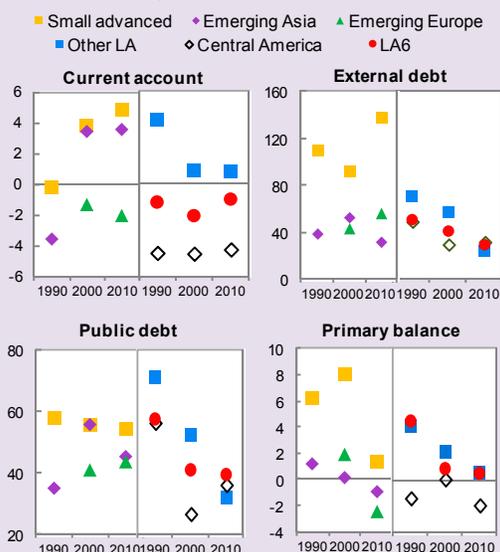
Figure 3. Financial Integration, 1990-2010¹
(Percent of GDP)



Source: Updated and extended version of the Lane and Milesi-Ferretti (2007) database; and IMF staff calculations.

¹ Foreign assets plus foreign liabilities net of international reserves and official external debt.

Figure 4. Macroeconomic Fundamentals, 1990-2010¹
(Percent of GDP)



Sources: IMF, *World Economic Outlook*; and Lane and Milesi-Ferretti (2007).

¹ Five-year moving averages over sample averages.

- *Trade shocks (price and quantity)*. Excluding those episodes linked to geopolitical tensions in the Middle East, all episodes of global financial stress were accompanied by sharp falls in commodity prices. Most episodes were also followed by softer external demand (proxied by economic activity in large advanced economies).
- *Financial shocks*. Episodes of global financial stress also were accompanied by a sizable re-pricing of sovereign risk—that is, a widening of Emerging

Market Bond Index (EMBI) spreads—and an abrupt slowdown or reversal of capital inflows.

Both channels are likely to have played a role in the transmission of global shocks to EMEs. Trade shocks have an evident impact on Latin America—given its dependence on commodities—and have been the subject of previous study.² Thus, this chapter will study only the financial channel and its effects on output fluctuations.

Financial Integration and Macroeconomic Fundamentals: Opposing Forces?

The impact of global financial shocks on any economy depends primarily on two factors: (1) the *degree of financial integration* of that economy with the rest of the world—which would, other things equal, increase sensitivity to those shocks;³ and (2) the *strength of macroeconomic fundamentals*—which would help to mitigate the effect of the shock on the real economy both by lessening capital outflows, and by buffering the economic impact of a given shock to the capital account.

However, financial integration and macroeconomic fundamentals are not time invariant and have changed significantly in the last two decades in all EMEs and particularly in Latin America.

Latin America has been at the forefront of financial and capital account liberalization, especially between 1985 and 2000, and today stands, with Eastern Europe, as one of the emerging market regions with

² For an analysis of the effects of terms-of-trade shocks, see the October 2011 *Regional Economic Outlook: Western Hemisphere* (IMF, 2011c), and Adler and Sosa (2011).

³ Financial integration is an elusive concept that has been studied from different angles. Two aspects of financial integration are relevant for our discussion: (i) its short- versus long-run effects; and (ii) its measurement. This chapter focuses on short-term vulnerabilities to external financial shocks arising from higher integration, rather than long-term effects—e.g., risk sharing and long-term economic growth. Financial integration is measured as the sum of foreign assets and liabilities (relative to GDP). This allows capturing both the degree of arbitrage between external and domestic financial markets and the potential impact of external shocks on the domestic economy.

the fewest barriers to financial flows.⁴ Liberalization has resulted in deeper financial integration with the rest of the world (i.e., a growing stock of foreign assets and liabilities), particularly in the second half of the 1990s (Figure 3).

At the same time Latin American countries have strengthened their macroeconomic fundamentals significantly in the last decade, particularly on the external and fiscal fronts (Figure 4). Macroeconomic fundamentals also improved in emerging Asia during this period, but this was not the case in emerging Europe.

Progress on these two fronts has likely had opposing and non-negligible implications for the transmission of global financial shocks to emerging market economies. Deeper financial integration may have increased the sensitivity of output to global shocks, whereas better macroeconomic fundamentals would have tended to lessen the impact of such shocks on domestic activity. Thus, assessing the effect of these shocks on output therefore requires a multivariate approach that separates the effect of these two opposing time-varying factors.

Impact of Global Financial Shocks on Domestic Output

We assess the impact of global financial shocks on domestic output of individual economies using a cross-section estimation.⁵ The cross section is constructed with quarterly observations for a sample of 49 EMEs and ‘small’ advanced economies, during seven episodes of global financial stress since 1990.⁶

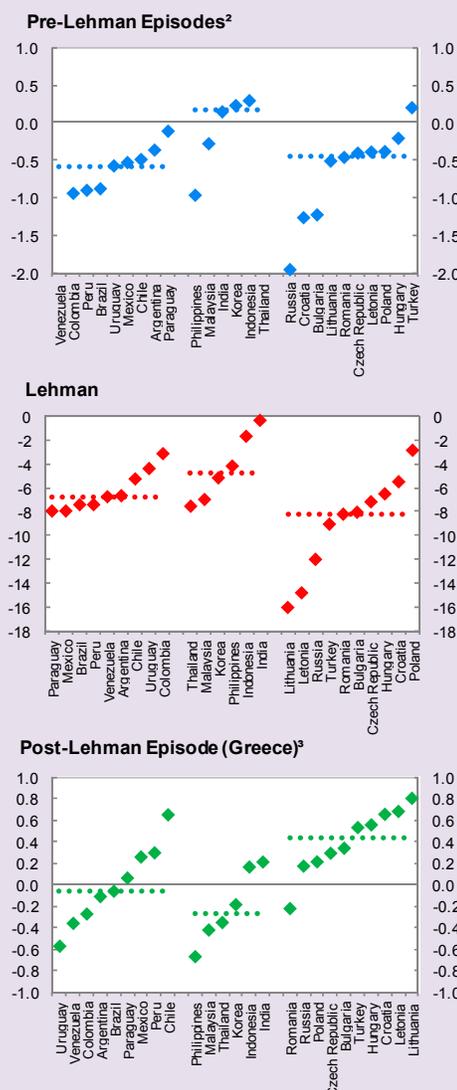
⁴ Countries in LA6 (Brazil, Chile, Colombia, Mexico, Peru and Uruguay) and in Central America have set the pace for integration within the region, whereas other countries in South America have moved in the opposite direction.

⁵ Our approach is somewhat different from most of the literature, because it focuses on VIX shocks and strips out associated trade effects to isolate the financial disturbance. As in Calvo and others (2004); Calvo and Talvi (2005); IMF (2007); and Ocampo (2012), we study the role of fundamentals in determining the impact of such shocks.

⁶ Of the nine episodes identified in Figure 3.1, those for Enron and the Iraq War are treated as one, because of their close proximity. In

(continued)

Figure 5. Output Performance during Global Financial Shocks, 1990–2011¹
(Cumulative)



Source: IMF staff calculations.
¹ Cumulative change in the cyclical component of GDP, in percent of (potential) GDP. Dotted lines reflect regional medians.
² Average of different episodes, excluding cases of identified idiosyncratic events: Asian countries (1997), Russia (1998), Brazil (2002), and Uruguay (2001–02).
³ Greece event of May 2010. The European episode of mid-2011 is not included, because comprehensive GDP data were not available at the time of publication.

The estimation has three distinctive features. First, it defines the dependent variable as the cumulative change in the cyclical component of output (GDP) of every economy in each episode. This measure

in addition, the last event (associated with the European crisis) is dropped because of insufficient data for all the regressions.

Table. Main Results of Cross-Section Estimation¹

Dependent Variable:		Output Performance ²		
	Basic model	Main	Robustness	
Level				
VIX	-0.176*** (0.018)	-0.047*** (0.017)	0.010 (0.028)	0.008 (0.034)
Trade shock		0.117*** (0.019)	0.113*** (0.020)	
Terms of trade				7.637** (3.553)
World GDP				0.945*** (0.207)
Interaction of VIX with:				
Financial integration			-0.077+ (0.049)	-0.123** (0.049)
Current account balance			0.001+ (0.001)	0.001 (0.001)
Exchange rate flexibility			-0.096** (0.046)	-0.117** (0.050)
External debt			-0.000+ (0.000)	-0.000 (0.000)
Interaction of VIX with financial integration and:				
Current account balance				
Exchange rate flexibility			0.190*** (0.070)	0.235*** (0.074)
External debt				
Constant	15.757*** (1.756)	4.015** (1.619)	3.229* (1.674)	4.976*** (1.819)
Observations	337	337	268	268
R-squared	0.418	0.562	0.641	0.571
F	98.24	68.37	23.94	18.98

Robust standard errors in parentheses.

*** p < 0.01, ** p < 0.05, * p < 0.10, + p < 0.15

¹ See footnote 8 for an explanation on how to derive the amplification effect of a given fundamental from these estimated coefficients.

² Cumulative change of cyclical component of GDP, in percent of trend.

captures both the depth and duration of each episode (Figure 5) and allows us to put aside the question of the long-term relationship between country fundamentals and long-term growth.⁷ Second, it uses a specification that tests the link between output performance and global financial shocks, while controlling for any effect arising from terms-of-trade and external demand shocks. This is accomplished by including as a regressor a variable that measures the cumulative loss of exports (relative to trend) during the episode.^{8,9}

⁷ The cumulative change in cyclical output is calculated for the duration of the episode and the following two quarters (as long as there is no overlap with a subsequent event), to capture possible lagged effects. The measure encompasses both transitory (cyclical) and permanent (trend) effects. For an analysis of the latter see Cerra and Saxena (2008).

⁸ The benchmark model is:

$$y_{i,j} = \beta_0 + \beta_1 \text{Exp}_{i,j} + \beta_2 \text{GFS}_{i,j} + \beta_3 \text{FI}_{i,j} * \text{GFS}_{i,j} + \beta'_4 \mathbf{X}_{i,j} * \text{GFS}_{i,j} + \beta'_5 (\mathbf{X}_{i,j} * \text{FI}_{i,j}) * \text{GFS}_{i,j} + \varepsilon_{i,t}$$

(continued)

Third, the specification allows the global shock to interact with each country's measure of financial integration as well as with its macroeconomic fundamentals. Moreover, because these two variables may have intertwined effects, the model incorporates an interaction of each of these variables with the VIX.

The macroeconomic fundamentals used as regressors (evaluated at the beginning of each episode) are:¹⁰

- degree of exchange rate flexibility (following the 'de facto' exchange rate regime classification of Ilzetzki, Reinhart, and Rogoff, 2008);
- measures of external position (current account balance, external debt, net foreign assets and international reserves, as percentages of GDP);
- measures of the fiscal position (public debt and primary balance, as percentages of GDP); and
- deposit dollarization, from Levy Yeyati's (2006) database (augmented for this analysis from various sources).

The results, summarized in the table, suggest that global financial shocks have a non-linear and significant effect on domestic output that, as conjectured, can be amplified or mitigated by the joint effect of financial integration and macroeconomic fundamentals. Exchange rate flexibility and external sustainability variables appear to be particularly important. Fiscal

in which *i* and *j* denote country and episode respectively; $\text{Exp}_{i,j}$ is the cumulative change in de-trended exports; GFS_j is the global financial shock (VIX); $\mathbf{X}_{i,j}$ is the vector of macroeconomic fundamentals at the beginning of each episode; and $\text{FI}_{i,j}$ denotes financial integration. The amplification effect of a given fundamental (*x*) is, thus, given by $\partial^2 y_{i,j} / \partial \text{GFS} \partial x = \beta_{4,x} + \beta_{5,x} * \text{FI}_{i,j}$.

⁹ Because exports are not entirely exogenous, the inclusion of this variable may result in "over-controlling." For robustness, the regressions were also run with terms-of-trade and world GDP as regressors. The results were qualitatively and quantitatively similar.

¹⁰ Other country features (e.g., maturity of external debt, exchange rate misalignment, measures of strength of the financial system, macroprudential policies, and the like) may also play a role, but data limitations preclude their inclusion in the econometric exercise.

variables and measures of dollarization, however, were not found to be statistically significant.

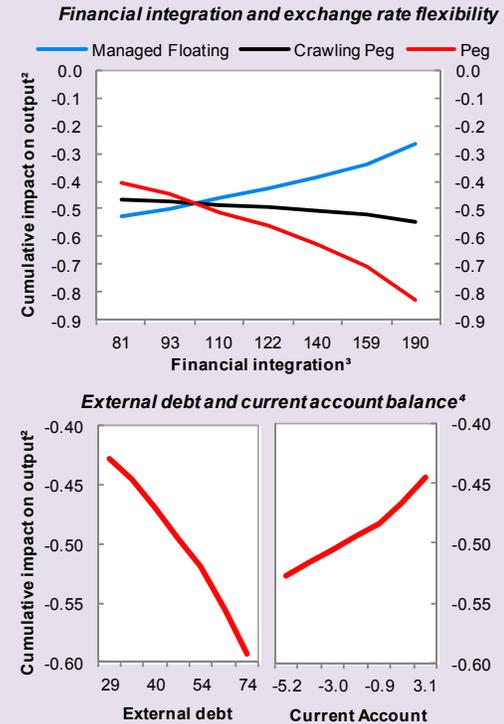
To illustrate the importance of each variable and their interactions, we use the estimated coefficients from the main regression to predict the impact of a global shock for different degrees of financial integration and fundamentals (Figure 6).

This exercise shows the following:

- The role of financial integration in mitigating or amplifying financial shocks greatly depends on the country’s exchange rate regime. Greater financial integration amplifies the shock under fixed rate regimes but mitigates it under floating regimes.
- At the same time, for most levels of integration, greater exchange rate flexibility reduces the output cost of the global shock. Such mitigation effect is particularly pronounced for high levels of financial integration.
- As would be expected, larger current account deficits make a country more vulnerable, although the effect is of small magnitude.
- Similarly, high levels of external debt make a country more vulnerable to financial shocks, irrespective of the level of financial integration.

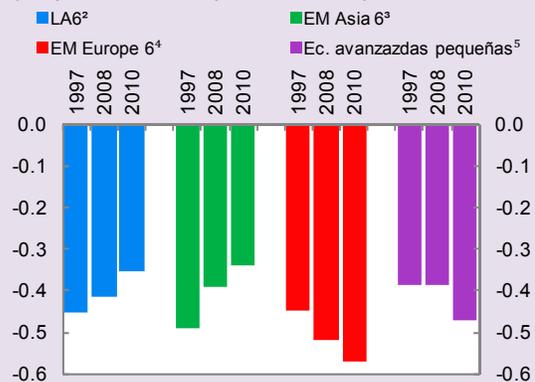
Overall, these results support the notion that financially integrated emerging economies with strong fundamentals (especially exchange rate flexibility) are better equipped to cope with global financial shocks than countries where fundamentals are weak or that have fewer financial linkages. Although not analyzed in detail here, because of data limitations, the buffering effect provided by strong fundamentals probably operates in two ways: first, by mitigating capital outflows if an adverse global shock were to occur (Box 1); and second, by lowering the economic impact of any resulting capital outflows.

Figure 6. Macro Fundamentals and the Impact of Global Shocks¹



Source: IMF staff calculations.
¹ Impact of 10-point VIX shock for different levels of financial integration and fundamentals (other variables unchanged, at median EM value).
² Cumulative deviations from trend output in percent of trend.
³ Total foreign assets plus total foreign liabilities, as percent of GDP. Reported levels correspond to deciles 20–80.
⁴ Percent of GDP. Levels correspond to deciles 20–80.

Figure 7. Impact of Global Shock¹
(Output effect of a 10-point VIX shock)



Source: IMF staff calculations.
¹ Estimated impact, evaluated for value of fundamentals before Asian crisis, Lehman crisis and Greece event. Median value of fundamentals for each group is used.
² Brazil, Chile, Colombia, Mexico, Peru, and Uruguay.
³ India, Indonesia, Korea, Malaysia, Philippines, and Thailand.
⁴ Bulgaria, Czech Republic, Hungary, Poland, Romania, and Russia.
⁵ Australia, Canada, Finland, Hong Kong, Israel, New Zealand, Norway, Singapore, and Sweden.

Simulation Analysis

We use the parameters of the main regression in the table on page 4 to illustrate the differences in the impact across regions and time (Figure 7). These simulations take as input the values of macroeconomic fundamentals and financial integration corresponding to 1997Q2 (just before the Asian financial crisis), 2008Q2 (just before Lehman), and 2010Q1 (just before the Greek event).

The simulations show that, although still large, output costs of global financial shocks in Latin America seem to have declined in the past 15 years. This increased resilience is broadly in line with the results obtained for other emerging market regions. The exception is eastern Europe, where countries seem to have become more vulnerable to global financial shocks.

Conclusions

Our results show that, although Latin America is still vulnerable, the impact of external financial shocks on the region appears to have declined somewhat over time. Improved macroeconomic fundamentals seem to have offset the effect of deeper financial integration with the rest of the world.

Macroeconomic fundamentals related to external sustainability, especially exchange rate flexibility, appear to be particularly important in mitigating the effect of global financial shocks, both by discouraging capital outflows and by buffering the economic impact of any resulting capital account shock (see Box).

Box: Macroeconomic Fundamentals and Balance-of-Payments Pressures

Strong macroeconomic fundamentals can help buffer the impact of global financial shocks on domestic output, on the one hand, by mitigating capital outflows, and, on the other hand, by helping the economy adjust smoothly to the capital account shock.

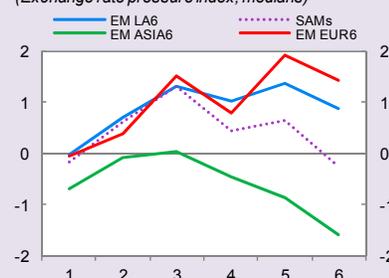
To gauge the importance of the first effect, we construct a measure of exchange rate market pressure (EMP)—comprising changes in central bank’s net foreign assets and in the nominal exchange rate vis-à-vis the U.S. dollar—and assess, using the same cross-section of countries and episodes considered in the main text and a similar specification, whether macroeconomic fundamentals can explain differences in balance-of-payment pressures (as proxied by the EMP, after controlling for the effect of associated trade shocks) during periods of global financial stress.

Fundamentals and BOP Pressures ¹	
Dependent variable: EMP ²	
Variable	
VIX	-0.10 (0.016)
Trade shock	-0.041*** (0.010)
Interaction of VIX with:	
Financial integration	-0.010+ (0.012)
Current account balance	-0.001** (0.000)
Capital account openness	-0.003+ (0.002)
International reserves	-0.001** (0.000)
Constant	2.198* (1225)
Observations	313
R-squared	0.195
F	7.865

¹ Econometric result of a model similar to the one explained in footnote 8 of the main text, but using EMP as dependent variable. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10, + p < 0.15

² Higher values of the EMP index indicate stronger depreciation pressures.

Exchange Rate Pressures during Global Financial Shocks, 1990-2011¹
(Exchange rate pressure index, medians)



Source: IMF staff calculations.
¹ Medians across countries and episodes, excluding idiosyncratic crises. Months from the beginning of episode are reported on horizontal axis. See Adler and Tovar (forthcoming) for further details. Country groupings same as in Figure 3.7.

We find evidence that economic fundamentals play a role in mitigating capital account pressures following global shocks. In particular, countries with stronger fundamentals, especially those related to external sustainability (current account balance, capital account openness, international reserves), appear to face less pressure.