



Paraguay

August 2012

Selected Issues

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PARAGUAY

Selected Issues

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Approved by the Western Hemisphere Department

June 8, 2012

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I. CREDIT BOOMS: RELAXING CONSTRAINTS DURING CAPITAL INFLOW BOOMS¹

A. Introduction

1. **In emerging markets, periods of capital inflows booms are associated with large credit expansions.** Strong capital flows to emerging economies usually reflect through sharp expansions in domestic credit, as those funds are intermediated to the private sector. In these events, countries could be also prone to potential very high credit growth and asset bubbles that could end in boom-bust cycles.² The latter are exacerbated if countries lack sufficiently deep financial markets, which constraint the ability of firms to finance investment projects. Oftentimes these effects are amplified: in the presence of rigid exchange rate arrangements, the banking system would be inclined to lend in foreign currency, usually causing currency mismatches as they transfer the currency risk to borrowers.

2. **Against this background, using firm-level data and econometric techniques, this paper shows that during capital inflows booms:**

- *Easier credit conditions relax firms' financial access, facilitating higher investment—especially in emerging markets.* We show that firms in emerging economies are financially constrained. To this end, we build a 17 emerging countries-panel for the period 1990-2009. We find strong evidence of firms' reliance on cash flow to finance investment projects—as opposed to investment being explained by the Q-theory of investment only, which would suggest no financial constraints. This effect is particularly strong in Latin America. The explanation lies in that not only credit grows fast during capital flows bonanzas, but also that capital flows increase the ability of firms to raise its leverage as the debt-to-equity ratio diminishes on the back of lower financing costs.
- *The relaxation of firms' financial constraints is larger (i) under less flexible exchange rates, and (ii) for producers for non-tradable goods.* The paper shows that less flexible exchange rate arrangements tend to depict stringent financial frictions, which result in a larger relaxation during capital inflows booms. Furthermore, this effect is stronger in firms producing non-tradable goods, which lack the ability to pledge FX income as collateral. Intuitively, rigid exchange rates are associated with a perceived lower currency risk, which drives borrowers into larger risk-taking in the presence of easy financing. Furthermore, lenders support this process to the extent that they transfer the currency risk to borrowers—only keeping the credit risk.

¹ Prepared by Nicolas E. Magud. The paper draws on a separate piece being prepared jointly with Armando Armenta, Herman Kamil, and Sebastian Sosa.

² See Magud, Reinhart, and Vesperoni (2012) for a recent reference. They document these type of episodes and suggest some specific policies to reduce the probability of such cycles

3. **These results suggest that exchange rate flexibility contributes to mitigating credit cycles.** Capital inflows contribute to a rapid expansion of private credit, exacerbating credit and business cycles. These effects are stronger under more rigid exchange rate arrangements and in economies that are more closed to trade. Therefore, oftentimes the benefits of increasing financing opportunities and relaxing credit constraints brought about by capital flows—much needed in developing countries—could be offset by the rigidity of the exchange rate regime. The results in this note suggest that exchange rate flexibility helps minimizing these offsetting effects.³

4. **A separate analysis of Paraguay’s most recent event of high capital inflows is also presented.** This shows that credit, consumption, and investment grew above trend on the back of strong capital inflows prior to the global financial crisis. Other macro variables (output, current account, and real exchange rate) behaved in a similar fashion, also when compared to emerging economies in the panel data. Although firm-level data is not available, the macroeconomic evidence for Paraguay would suggest local firms might have been exposed to similar effects to those in the panel countries, including by experiencing a relaxation of credit constraints during the high capital inflows phase.

5. **Organization of the paper.** The next section describes the data and the econometric methodology. Section III presents the results, while Section IV analyzes the case of Paraguay. Section V concludes.

B. Data and Methodology

Some stylized facts

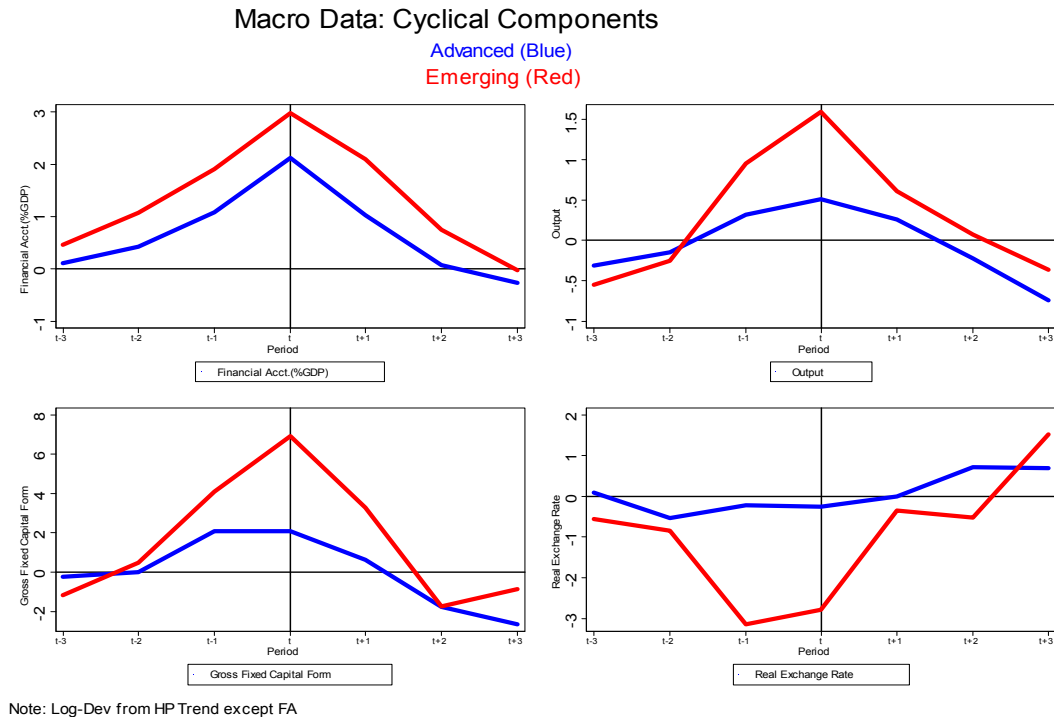
6. **Figure 1 presents peaked-centered six year-event windows of capital inflow booms for developed and emerging economies.** The top left panel shows capital flows during the boom as the average country deviation from the Hodrick-Prescott trend of the financial account relative to GDP.⁴ Even though emerging economies experience a larger increase of capital inflows during these periods, the difference is, on average, close to one percent of GDP. The top right panel shows that output increases more during periods of capital inflow booms in emerging economies, and falls back to its long-run trend after two years. The bottom left panel shows a significantly different response of investment during periods of capital inflow booms for emerging economies and developed economies. For the latter, investment is close to two percent higher during capital inflow booms, whereas for emerging economies this increase is over three times larger, close to seven percent. The bottom right panel shows how the real exchange rate appreciates rapidly during periods of

³ These results are consistent with Dell’Ariccia et al (2012), Mendoza and Terrones (2008), and Magud et al (2012).

⁴ Results are the same if we use the centered 10 year moving average instead of the HP-trend.

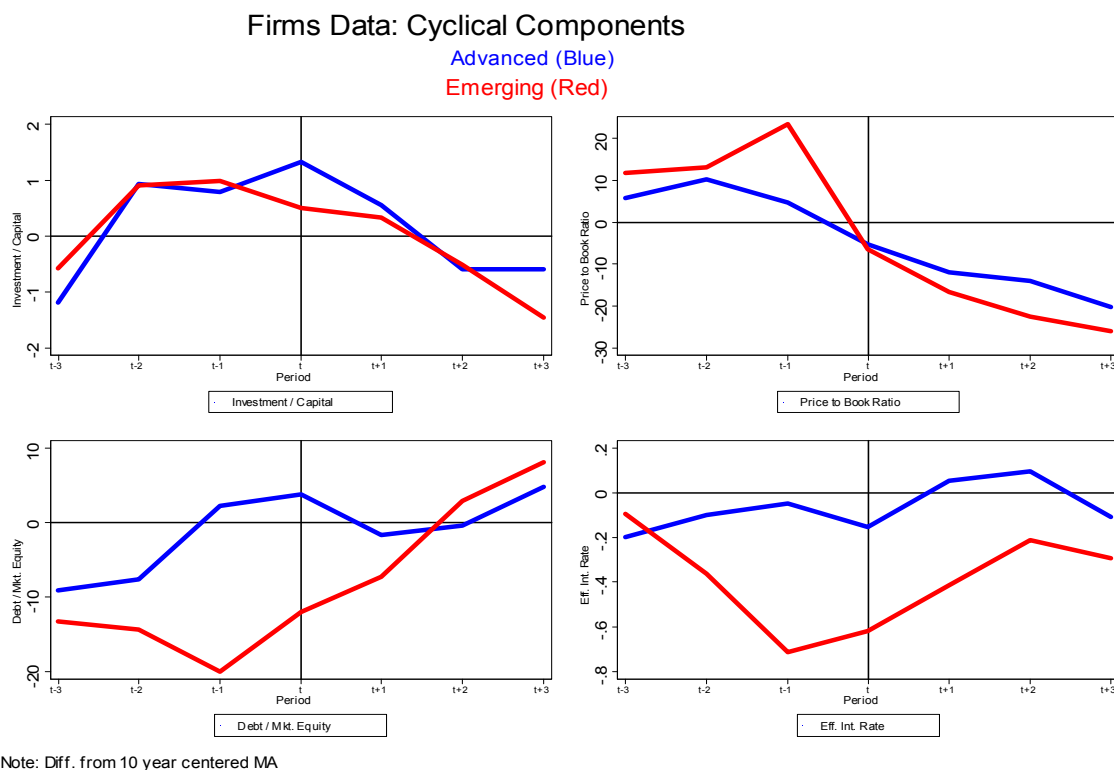
capital flow bonanzas in emerging economies, but it does not significantly change in developed economies.

Figure 1



7. **Figure 2 presents firm-level data related to these episodes.** Deviations from the medium trend (computed as the centered ten-year moving average) are calculated, and then averaged for each of the years of the event window for developed and emerging economies. The top left panel shows that firm-level investment increases similarly for both groups of countries during periods of capital inflow booms. However, the behavior of the average firm valuation differs; firms in emerging economies experience larger increases in valuations during capital flow bonanzas (top right chart). The bottom left panel shows how the leverage ratio, measured as the total debt of firms to the market value of their equity, is below trend for emerging economies during periods of capital inflow booms, and rapidly increases once capital flows recede. In developed economies, this behavior is not as clearly observed. The bottom right panel shows how the behavior of the effective interest rate is similar to the one described by the leverage ratio; for emerging economies it is significantly below trend during periods of capital inflow bonanzas, unlike developed economies. This can be interpreted as preliminary evidence suggesting that during capital inflows bonanzas, borrowing costs for firms in emerging economies fall, which in turn contribute to lower the leverage ratio, thus increasing firms' equity valuation. The next section tests this hypothesis and extends it to understand the channels and mechanisms driving it.

Figure 2



C. Econometric Methodology

8. **The first hypothesis to be tested is whether borrowing constraints are relaxed during periods of large capital inflows.** A neoclassical model predicts that marginal q , the marginal benefit from an extra unit of investment, should be a sufficient statistic to explain investment behavior. A positive and significant coefficient for financial variables like cash flow has been used as evidence to reject the efficient markets hypothesis. Moreover, the size of this coefficient has been employed as a measure of the degree of financing constraints that firms face.⁵

9. **There are two main challenges to the use of the relation between cash flow and investment decisions to determine financing constraints.** The first one is that a change in cash flow may be related to changes in the profitability of investment—either at the firm or country level—and a positive and significant coefficient may be partly picking up this change in the marginal productivity of capital. The second one belongs to the proxy used for

⁵ See Fazzari, Hubbard, and Petersen (1988), Blanchard et al. (1994), Fazzari, Hubbard, and Petersen (2000), and Gan (2007), among others.

the new investment opportunities. With standard assumptions on functional forms, the (unobservable) marginal productivity of capital, that is denoted as marginal q , equals average q , the (observable) market-to-book ratio of a firm.

10. **Despite these caveats, periods of capital inflows boom provide a chance to identify how the relation between investment and variables in the financial side of the firm change.** This is because the common component that represents increases in the marginal productivity of capital does not tend to be homogeneous across firms for a country experiencing a capital inflows boom. Any change in the relation between investment and the cash flow of the firm can then be attributed to a relaxation of financing conditions. Using periods of large capital inflows, as proxies of exogenous decreases in aggregate financing constraints, we are able to unveil the relationship between the investment rate and the financial state of the firm, controlling for the investment opportunities of the firm. The specification of the regression equations is given by (1). This specification is derived from the standard Q-theory of investment, and it adds a dummy variable for years when countries experienced a capital inflows boom, and the interaction of this dummy with the ratio of cash flow to capital.

$$\frac{I_t}{K_{t-1}} = \beta_0 + \beta_1 q_t + \beta_2 \times \frac{CashFlow_{ict}}{K_{ict-1}} + \beta_3 \times KI\ Boom_{ct} + \beta_4 \times KI\ Boom_{ct} \times \frac{CashFlow_{ict}}{K_{ict-1}} + \tau_t + \alpha_i + \varepsilon_{ict} \quad (1)$$

where i represents firms, c stands for country and t denotes year. The variable τ_t represents year fixed effects to isolate common macroeconomic shocks to the investment-capital ratio. Using firm-level fixed effects, represented by α_i , which accounts for the time specific heterogeneity among firms. The specification allows for heteroskedasticity at the country-time dimension to correct standard errors.

11. **Main hypothesis being tested.** The first hypothesis can be summarized by finding $\beta_2 > 0$, implying that investment opportunities are related to the ability of financing them through the firm's cash flow. More importantly, one of the main results would be to find that $\beta_4 < 0$, i.e. that the dependence of the firm level investment to cash flow decreases during periods of large capital inflows. In other words, it would show that the financial constraint relaxes. It will also be analyzed whether the absolute value of β_4 is proportionally larger under fixed or flexible exchange rates (macro variable), and for the tradable/non-tradable sector (micro variable) by splitting the sample. For a stronger result, the regression also tests for the exchange rate regime byway of a triple interaction, as represented in (2).

$$\begin{aligned}
\frac{I_t}{K_{t-1}} = & \beta_0 + \beta_1 q_t + \beta_2 \times \frac{CashFlow_{ict}}{K_{ict-1}} + \beta_3 \times KI\ Boom_{ct} + \\
& \beta_4 \times KI\ Boom_{ct} \times \frac{CashFlow_{ict}}{K_{ict-1}} + \beta_5 \times Fixed + \beta_6 \times Fixed \times \frac{CashFlow_{ict}}{K_{ict-1}} + \quad (2) \\
& \beta_7 Fixed \times KI\ Boom_{ct} + \beta_8 Fixed \times KI\ Boom_{ct} \times \frac{CashFlow_{ict}}{K_{ict-1}} + \tau_t + \alpha_i + \varepsilon_{ict}
\end{aligned}$$

12. **In the latter, the interpretation of β_8 is of special importance.** If β_8 is negative and significant, it would imply that the financial constraint is further relaxed in the presence of capital inflows if the country has a more rigid exchange rate arrangement—given that the dummy *KI Boom* equals one when the country experiences inflows bonanzas and *Fixed* equals one under fixed exchange rate regimes.

D. Data

13. **Micro-level data.** The firm-level data source is Worldscope. The variables used are investment, fixed capital, average Q, total debt, the market value of equity, and the effective interest rate. Given data availability, the focus is on 17 emerging market countries through 1990-2009.⁶ Table 1 defines these variables.

Table 1. Variables' Descriptions

Variable	Description
Capital Expenditure	Funds used to acquire fixed assets
Capital	Property, plant, and equipment (net)
Average Q	Price to book ratio of equity
Debt	All interest bearing obligations
Interest expense	Service charge for the use of capital
Common equity	Common shareholders' investment
Price	Closing price of the company's stock.
Cash flow	Funds from operating activities.

14. **To avoid the presence of outliers and coding errors that would bias the estimation,** observations with non-consistent data,⁷ are dropped from the sample. Then, the

⁶ The emerging countries covered include Argentina, Brazil, Chile, Colombia, Egypt, India, Indonesia, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, South Africa, Thailand, Turkey, and Venezuela. One set of regressions for developed countries is also presented for comparison purposes (see Table 2).

⁷ For example, negative book values for the capital stock, debt or the price to market value of equity.

country specific distribution for each of the variables is calculated and the bottom and top 5 percent of each variable's observations is excluded from the analysis.

15. **Macro-level data.** Data on the components of the balance of payments, as well as macroeconomic aggregates, are from the IMF's *International Financial Statistics* and the *World Economic Outlook*. Periods of capital inflow booms are defined similarly to Reinhart and Reinhart (2009), as years when the ratio of the financial account to GDP exceeds the 80th percentile of the country specific distribution, conditional on the year having net inflows. To classify exchange rate flexibility, the *de facto* classification from Reinhart and Rogoff (2002) is used. This classification is superior to the *de jure* classifications given that it incorporates policy responses that in many cases limit fluctuations in the nominal exchange rate, distorting the expected returns of investment opportunities.

E. Results

16. **Financial constraints matter, especially in emerging markets.** Table 2 shows that cash flow is consistently positive and significant for all the specifications. Thus, firms are financially constrained, as their cash flow helps explaining their investment. Furthermore, the magnitude of the coefficient is about nine times larger in emerging countries, implying more stringent financial frictions in emerging markets—especially in Latin American countries. One possible interpretation—to be tested—is the lack of sufficiently developed financial markets.

17. **In emerging markets, firms' financial constraints relax during periods of capital inflows booms.** Table 2 also documents that capital inflows booms periods help increase investment in emerging economies, and that for these countries financial constraints are relaxed during events of capital inflows bonanzas. The interaction term is significant for these countries, but not for developed markets. Intuitively, during capital inflows booms, the financial system is able to channel more funds to the private sector, which relaxes its reliance of cash flow to finance investment projects.

	Developed		Emerging		Emerging	
	Developed	Emerging	Developed	Emerging	LATAM	Asia
Avg Q	0.043*** [0.003]	0.034*** [0.002]	0.043*** [0.003]	0.034*** [0.002]	0.032*** [0.003]	0.027*** [0.003]
Cashflow	0.006*** [0.002]	0.048*** [0.005]	0.006*** [0.002]	0.052*** [0.006]	0.076*** [0.009]	0.115*** [0.013]
KI boom			0.005 [0.005]	0.020*** [0.005]	0.027*** [0.007]	0.003 [0.013]
Cashflow x KI boom			0.000 [0.003]	-0.014** [0.006]	-0.031* [0.017]	-0.032** [0.013]
Observations	113,151	26,875	113,151	26,875	5,247	17,489
Number of firms	18,338	5,202	18,338	5,202	812	3,581

18. **Relaxation of financial constraints during capital flows bonanzas is stronger in fixed exchange rate regimes.** Either by splitting the sample in fixed vs. flex, or running (2) and focusing on the interaction term β_8 , we observe that under fixed exchange rate arrangements the relaxation of the financial constraints is larger. Table 3 shows that the coefficient for the interaction of capital inflows booms and cash flows is larger in absolute value under fixed exchange rate arrangements. Based on the latter regressions, Table 4 documents that the relaxation of this coefficient is proportionally larger under fixed exchange rate regimes, as by the ratio β_4/β_2 . Given that the error distribution of these series might differ when splitting the sample, we run (2) to avoid this potential problem. The triple interaction term in Table 5 is a more robust proof that if economies experience capital inflows bonanzas, the financial constraint is relaxed, and that this is exacerbated under less flexible exchange rate regimes. Fixed exchange rate regimes usually reduce the expected uncertainty (*ex-ante*), partially acting as an implicit insurance. This enables the financial system to amplify the availability of financing through credit. Furthermore, Magud, Reinhart, and Vesperoni (2012) document how the banking system does depict higher credit growth during periods of capital flows bonanzas by transferring the currency risk to borrowers and just keeping the credit risk in their portfolios.

19. **In the non-tradable sector, firms' reliance on cash-flow to finance investment decreases in the presence of large capital flows to the country.** Splitting the sample from a more microeconomic perspective, namely whether firms produce tradable or non-tradable goods, is also interesting. Table 6 shows that the interaction coefficient is

	Flexible	Fixed
Avg Q	0.033*** [0.003]	0.010** [0.005]
Cashflow	0.054*** [0.007]	0.067*** [0.013]
KI boom	0.018*** [0.006]	0.058*** [0.016]
Cashflow x KI boom	-0.017** [0.006]	-0.054* [0.028]
Observations	23,129	2,587
Number of firms	5,102	723

	β_2	β_4	β_4/β_2
Flexible	0.052	-0.016	↓30%
Fixed	0.049	-0.024	↓49%
Tradables	0.048	-0.009	↓19%
Non Tradables	0.06	-0.025	↓42%

Avg Q	0.032*** [0.002]
Cashflow	0.056*** [0.006]
KI Boom	0.019*** [0.006]
Fixed	0.010 [0.008]
Cashflow x KI Boom	-0.017*** [0.006]
Cashflow x Fixed	-0.010 [0.015]
KI Boom	0.022 [0.018]
Cashflow x KI Boom x Fixed	-0.060** [0.030]
Observations	25,716
Number of Firms	5,170

	Tradables	Non-Tradables
Avg Q	0.032*** [0.003]	0.036*** [0.003]
Cashflow	0.048*** [0.007]	0.060*** [0.007]
KI boom	0.014** [0.006]	0.030*** [0.007]
Cashflow x KI boom	-0.009 [0.006]	-0.025*** [0.009]
Observations	16,665	10,210
Number of firms	3,395	1,807

larger for firms in the non-tradable sector. Table 4 shows that this effect is proportionally more important in the non-tradable sector. Financing for the latter tends to be more expensive and scarce given the lower degree of pledgeability of its sales/profits. Thus, periods of substantial capital flows that the financial system needs to pass-through to domestic firms would tend to relax the financial friction on firms in this sector to a larger extent than on firms in the tradable goods sector.

20. **Firms' relaxation of cash-flow requirements to finance investment does not depend on the threshold fixed vs. flex exchange rate arrangement.** For robustness, alternative thresholds of fixed versus flexible exchange rate regimes are used. Table 7 shows that the results remain despite the definition of the threshold.

	Flexible	Fixed	Flexible	Fixed	Flexible	Fixed
Avg Q	0.033*** [0.003]	0.010** [0.005]	0.035*** [0.003]	0.021*** [0.006]	0.034*** [0.003]	0.026*** [0.006]
Cashflow	0.054*** [0.007]	0.067*** [0.013]	0.050*** [0.006]	0.049*** [0.007]	0.048*** [0.006]	0.070*** [0.009]
KI boom	0.018*** [0.006]	0.058*** [0.016]	0.018*** [0.006]	0.014 [0.009]	0.023*** [0.005]	0.021** [0.009]
Cashflow x KI boom	-0.017** [0.006]	-0.054* [0.028]	-0.015** [0.006]	-0.024** [0.011]	-0.016** [0.007]	-0.020** [0.008]
Observations	23,129	2,587	23,157	3,718	21,053	5,822
Number of firms	5,102	723	4,995	1,155	4,671	1,767

21. **The increased ability of firms to finance investment during capital inflows bonanzas resists robustness tests.** Additional robustness checks are presented in Table 8.

Among them, the sample is constrained to countries that did not experience financial reforms during the time period analyzed, or that lack country-specific investment opportunities (such as privatization, etc.), as these might be driving the results. They do not, however, as the results remain in these alternative specifications. There are also controls for the effective interest rate. Table 9 shows that these results are also robust to the type of capital flow (net, gross, or financial capital flows).

	Emerging	No Fin. Reform	Eff. Int. rate	Inv. opport
Avg Q	0.034*** [0.002]	0.034*** [0.002]	0.033*** [0.002]	0.034*** [0.002]
Cashflow	0.052*** [0.006]	0.052*** [0.006]	0.059*** [0.007]	0.052*** [0.006]
KI boom	0.019*** [0.006]		0.021*** [0.005]	0.021*** [0.005]
Cashflow x KI boom	-0.016*** [0.006]		-0.020*** [0.007]	-0.014** [0.006]
Output boom	0.007 [0.006]			
Cashflow x Output boom	0.005 [0.006]			
KI boom (no financial reform)		0.021*** [0.005]		
Cashflow x KI boom (no fin. ref.)		-0.014** [0.006]		
Effective interest rate			-0.087*** [0.017]	
Avg Q x KI				-0.001 [0.004]
Observations	26,875	26,875	24,091	26,875
Number of firms	5,202	5,202	4,926	5,202

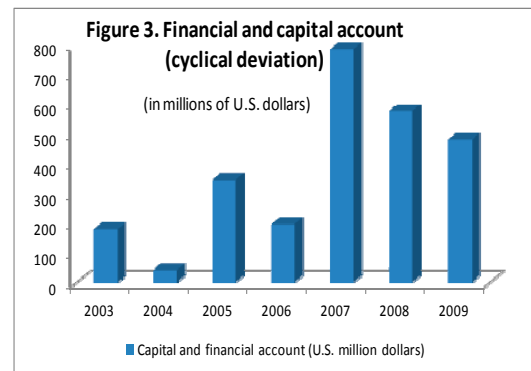
	Net KI	Gross KI	Financial KI
Avg Q	0.034*** [0.002]	0.034*** [0.002]	0.034*** [0.002]
Cashflow	0.052*** [0.006]	0.051*** [0.006]	0.051*** [0.005]
KI boom	0.020*** [0.005]		
Cashflow x KI boom	-0.014** [0.006]		
KI boom (Gross KI)		0.012** [0.005]	
Cashflow x KI boom (Gross KI)		-0.010** [0.005]	
KI boom (Financial KI)			0.012** [0.005]
Cashflow x KI boom (Financial KI)			-0.010** [0.005]
Observations	26,875	26,875	26,875
Number of firms	5,202	5,202	5,202

F. The Case of Paraguay

22. **Against the above evidence, this section presents some basic macroeconomic evidence from Paraguay.** Ideally, microeconomic data would be preferred. However, given the lack of it, we focus on a few key macroeconomic variables. The behavior of these, however, might suggest how capital inflows and credit growth could have affected firms' ability to finance investment.

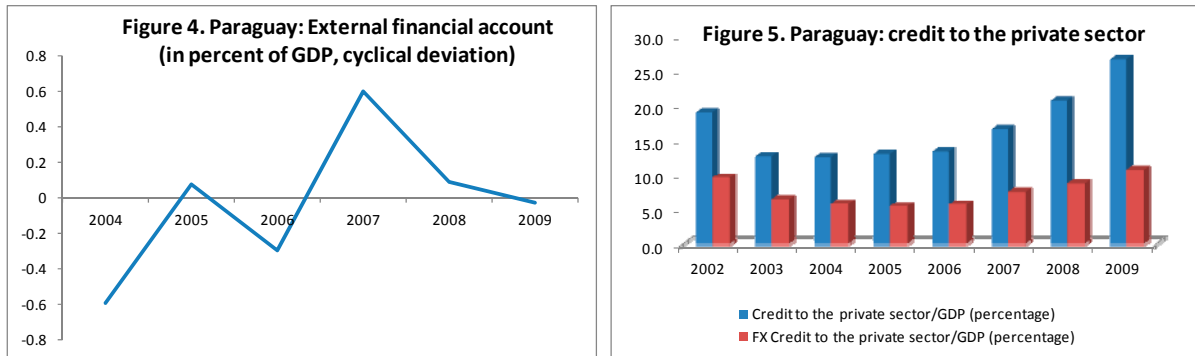
23. **We focus on the expansionary period prior to the global crisis.** In line with Figure 1 above, we look at cyclical deviations of certain macroeconomic series during the three years before the crisis. Due to data availability, we compute Hodrick-Prescott filters of the series, and focus on cyclical deviations.⁸ We add current projections to reduce the "end-of-period bias" which always affect HP-filters.

24. **Capital inflows were above trend in the years before the crisis.** Figure 3 depicts the external financial account balance, in millions of U.S. dollars, where persistent capital inflows are observed in the run up to the global crisis and especially since 2007. Figure 4 shows cyclical deviations of the external financial account balance with respect to its HP-trend. It shows that before the 2009 crisis, the external financial account was above trend starting in 2007, with a strong reversal



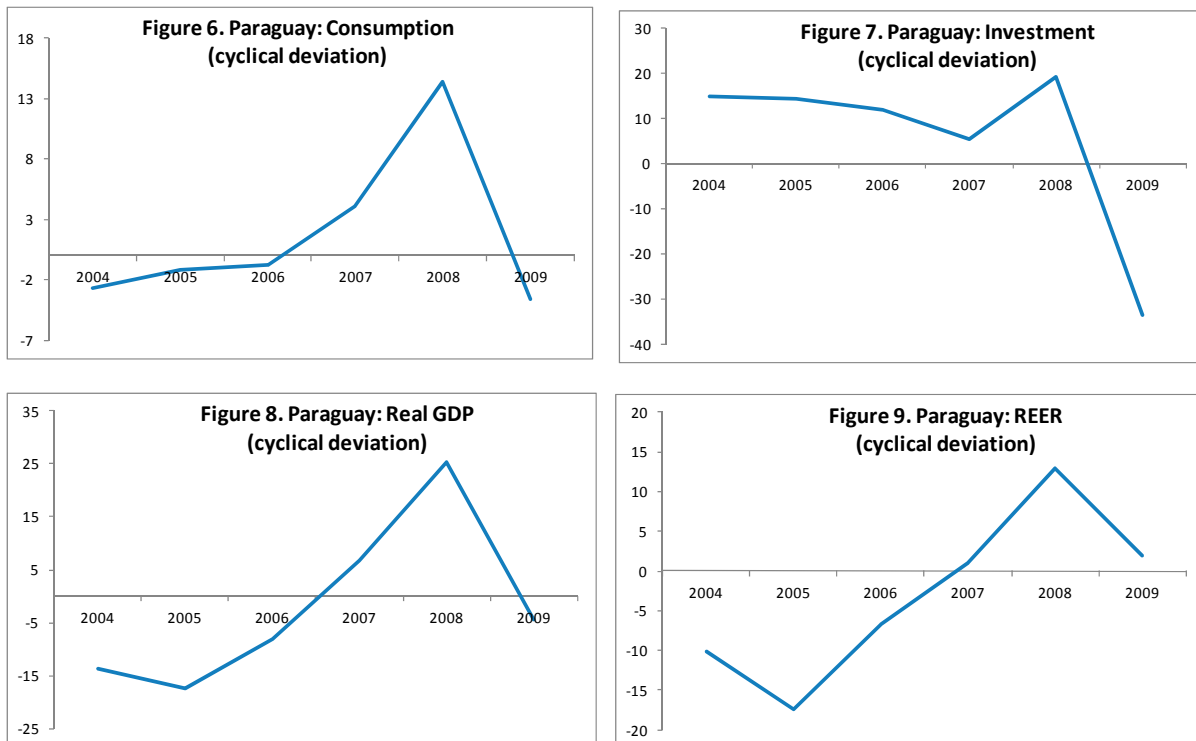
⁸ The HP-trend was computed using data for the 1991-2017 period. IMF staff projections were used for the period 2012-2017. Given annual data, we use a λ of 100.

in 2009. In turn, this is consistent with a strong credit expansion that accelerated in 2007, as shown in Figure 5.



25. **In the buildup to the global crisis, key economic activity variables were also above trend.** Figures 6 and 7 show that, after de-trending, cyclical components of consumption and especially investment were above trend, as FX inflows helped finance the boom of the economy. In line with this, real GDP started growing above trend in 2007 (Figure 8), in the context of an appreciating real exchange rate (Figure 9), given strong demand growth.

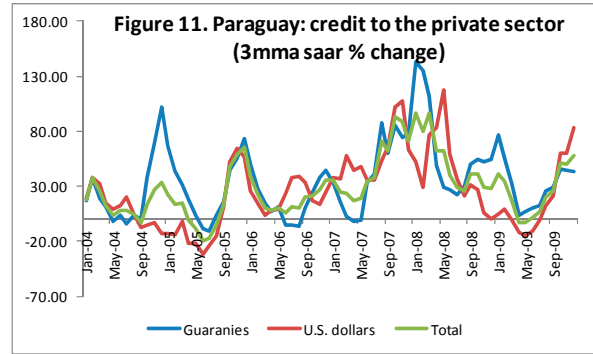
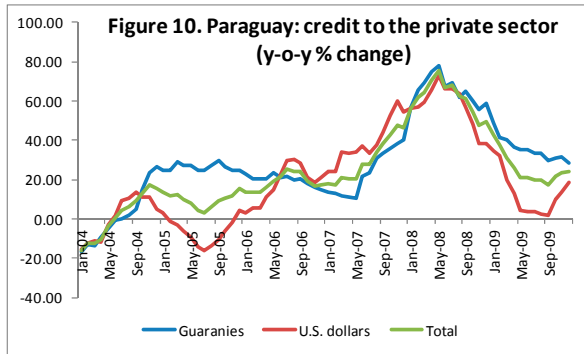
The credit expansion during the buildup to the crisis was strong. Given Paraguay's relatively less developed financial markets—which implies lower use of forward contracts—strong capital inflows, mostly intermediated by the banking sector, would contribute to relax firms' financial constraint. The macro data would suggest that credit constraints did relax during the years before the 2009 crisis. Figures 10 and 11 show how credit to the private



sector accelerated starting in 2007, consistent with the strong capital inflows and the above trend expansion of investment and output.

G. Concluding Remarks

26. **Capital inflows booms relax financial constraints.** Using firm-level data, this paper



shows that during capital inflows booms, easier credit conditions relax firms' financial access, facilitating higher investment—especially in emerging markets. It also shows that the relaxation of firms' financial constraints is larger (i) under less flexible exchange rate regimes, and (ii) for producers for non-tradable goods. Less flexible exchange rate arrangements tend to depict stringent financial frictions, which result in a larger relaxation of financial constraints during capital inflows booms. Furthermore, this effect is stronger in firms producing non-tradable goods, which lack the ability to pledge FX income as collateral. Intuitively, rigid exchange rate regimes are associated with a perceived lower currency risk, which drives borrowers into larger risk-taking in the presence of easy financing. Furthermore, lenders support this process to the extent that they transfer the currency risk to borrowers—only keeping the credit risk. However, the stronger credit expansions are, the larger the likelihood of a hard contraction. Against this background, these results suggest that exchange rate flexibility would contribute to mitigating credit cycles

27. **Paraguay's data seems consistent with macroeconomic evidence for emerging economies in the sample.** The evolution of key macroeconomic variables during the last episode of high capital inflows is consistent with the evidence presented for emerging economies above (Figure 1) in similar circumstances. Consumption, investment, and output grew above trend on the back of a strong credit growth supported by large capital inflows, while the real exchange rate appreciated. The unavailability of microeconomic data prevents from testing for Paraguay-specific relations at a firm level. However, the macroeconomic evidence would suggest effects on firms similar to those from the panel regressions for emerging economies.

REFERENCES

- Armenta, A., H. Kamil, N. Magud, and S. Sosa (2012), “Firms’ Financing Constraints during Capital Inflows Booms: Micro-evidence for Emerging Markets,” forthcoming (Washington: International Monetary Fund).
- Dell’Ariccia, G., D. Igan, L. Laeven, and H. Tong, with B. Bakker and J. Vandenbussche (2012), “Policies for Macroeconomic Stability: How to Deal with Credit Booms,” IMF Staff Discussion Note, forthcoming, (Washington: International Monetary Fund).
- Magud, N. C. Reinhart, and E. Vesperoni (2011 and 2012), “Capital Inflows, Exchange Rate Flexibility, and Credit Booms,” IMF Working Paper 12/41, (Washington: International Monetary Fund).
- Mendoza, E. and M. Terrones (2008), “An Anatomy of Credit Booms: Evidence from Macro Aggregates and Micro Data,” NBER Working Paper No. 14049

II. EXTERNAL FINANCIAL SHOCKS: HOW IMPORTANT FOR PARAGUAY?¹

A. Introduction

1. **Paraguay has important economic linkages with the rest of the world.** Trade linkages are well-known and play an important role, given the high degree of trade openness of the Paraguayan economy. Financial linkages have been less documented, partly because Paraguay is seen as not being well-integrated financially with the rest of the world, given that local financial markets are little developed. However, external financial linkages are also present and play a role in the domestic economy, mainly through the banking system. The influence of changes in external financial conditions on the Paraguayan economy is both direct and indirect. Direct effects operate through credit standards of branches and subsidiaries of foreign banks established in Paraguay, as well as through the terms and availability of cross-border foreign bank lending. The indirect influence of external financial conditions comes from their impact on external demand and world prices, and may reinforce or offset trade effects originating somewhere else.

2. **This paper documents financial linkages in Paraguay and quantifies the importance of external financial shocks for Paraguay.** The paper assesses quantitatively financial linkages using a structural VAR (SVAR) model. The model's specification controls for standard trade linkages involving external demand and the terms of trade, as well as for the role domestic policy-related variables, such bank credit and interest rates. The key findings can be summarized as follows:

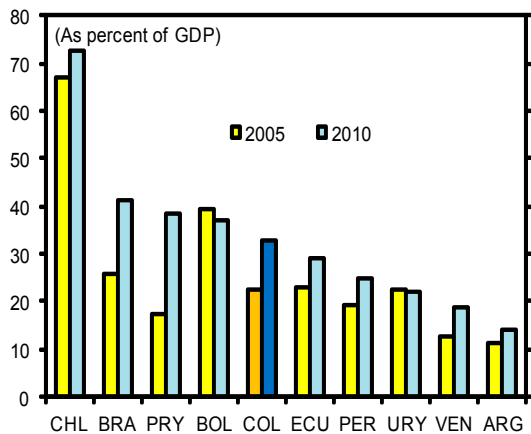
- External financial factors account for the majority of the effect of the shocks on non-agro GDP growth. They are also the longest lasting channel of transmission. This finding remains robust across various regressions. The external financial channel accounts on average for about two-thirds of total variations in non-agro GDP growth.
- The trade channel is also important, but less so than the financial channel. The trade channel appears robust to all model specifications considered, although its importance is quite sensitive to the model specification. Generally the trade channel accounts for about one-fifth of variations in non-agro GDP growth.
- Domestic financial conditions impact non-agro growth on their own while also transmitting part of the external financial shocks. Alternative specifications with real credit growth and the interest rate show a significant transmission of external financial shocks through these variables.

¹ Prepared by Jiri Podpiera and Volodymyr Tulin.

B. Channels of Spillovers

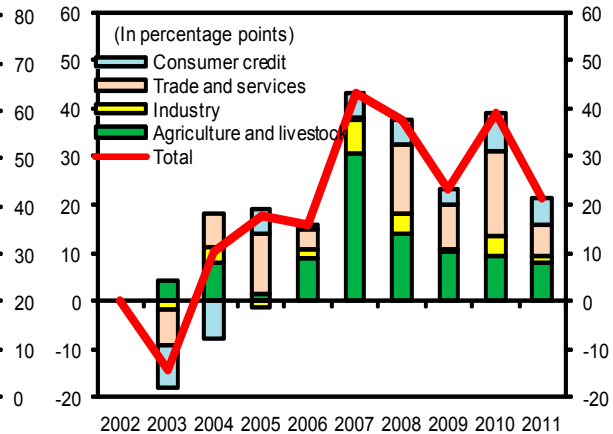
3. **The Paraguayan financial system expanded rapidly during the last few years.** Over the last 5-6 years, the financial system recovered from the deep banking crises of the 1990s and early 2000s. It has grown in size and widened its reach to the non-agricultural sectors of the economy (Figures 1 and 2). Banks play a dominant role in financial intermediation in Paraguay, supporting economic growth. Foreign banks have contributed to the expansion of credit to the domestic private sector and represent an important transmission channel of external financing conditions.

Figure 1. Banking System Credit to Domestic Non-Financial Private Sector



Sources: IFS; WEO; and Fund staff calculations.

Figure 2. Contribution by Industry to Growth of Private Sector Credit

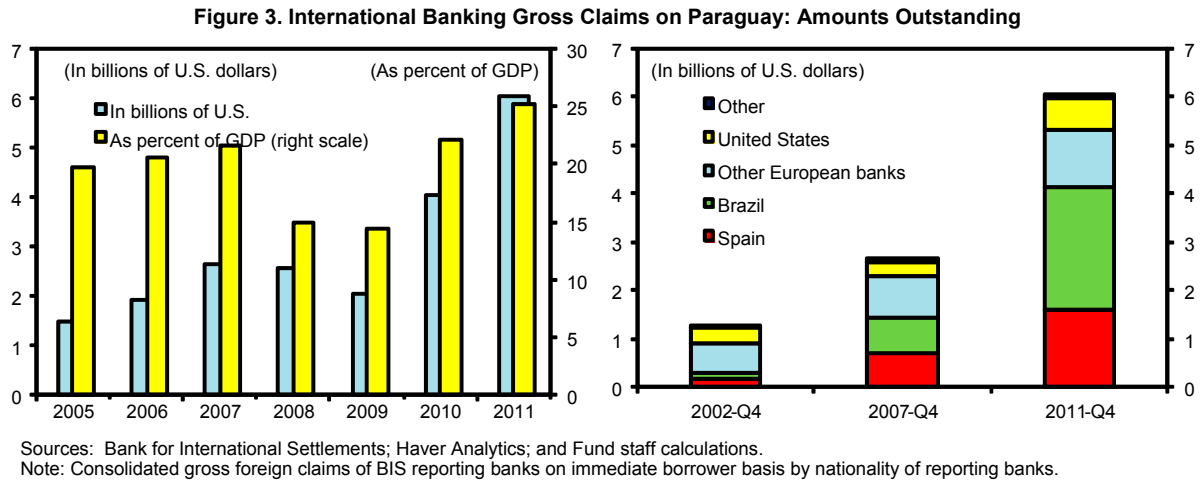


Sources: Central Bank of Paraguay; and Fund staff calculations.

4. **Paraguayan banks are part of the global banking system.** Branches and subsidiaries of important foreign banks account for an important share of the domestic banking system. At end-2011, local offices of foreign banks accounted for 45 percent of domestic bank credit to the non-financial private sector. Although on a net basis (i.e. including domestic liabilities), foreign bank exposure to Paraguay is negative, overall gross exposure (which includes domestic loans and holding of other local financial assets, and provides a better measure of the significance of international financial linkages and their potential to affect the Paraguay economy) amounts to about 25 percent of Paraguayan GDP. Ninety percent of international bank claims on Paraguay are held by European (primarily Spanish) and Brazilian banks (Figure 3). To the extent that foreign banks lending policies (credit standards) are usually determined at the banking group level, global financial conditions can affect bank lending in Paraguay and thus economic activity.

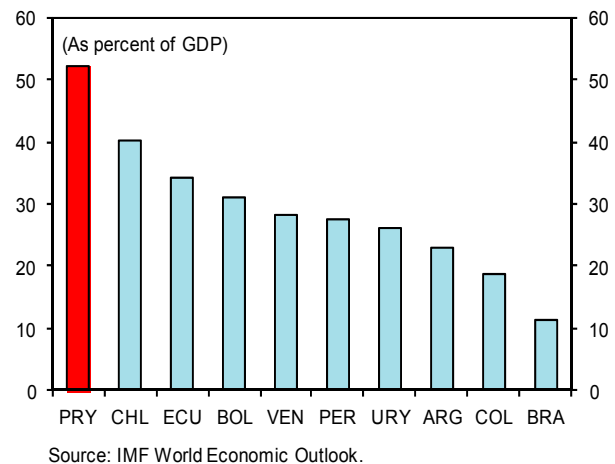
5. **Cross-border lending by foreign banks augments the transmission of foreign external financial conditions.** A sizable part of foreign bank financing comes via direct cross-border lending and is thus not reflected in the credit extended by local affiliates of foreign banks in Paraguay. Local banks have established credit lines with foreign private financial corporations, in addition to financing agreements with multilateral financial institutions. External financing of multinational companies makes Paraguay dependent on

global financial conditions. International banking claims data suggest that claims on non-resident corporations operating in Paraguay are significant.



6. Global financial conditions also affect Paraguay indirectly through their impact on trade flows. To the extent that changes in external financial conditions affect economic growth in Paraguay's trading partners and world commodity prices, they can have an indirect effect on the Paraguayan economy. With a ratio of exports to GDP of over 50 percent, Paraguay is the most open economy in South America (Figure 4). At the same time, Paraguayan exports are concentrated in agricultural products and beef, the prices of which are determined in the world markets.

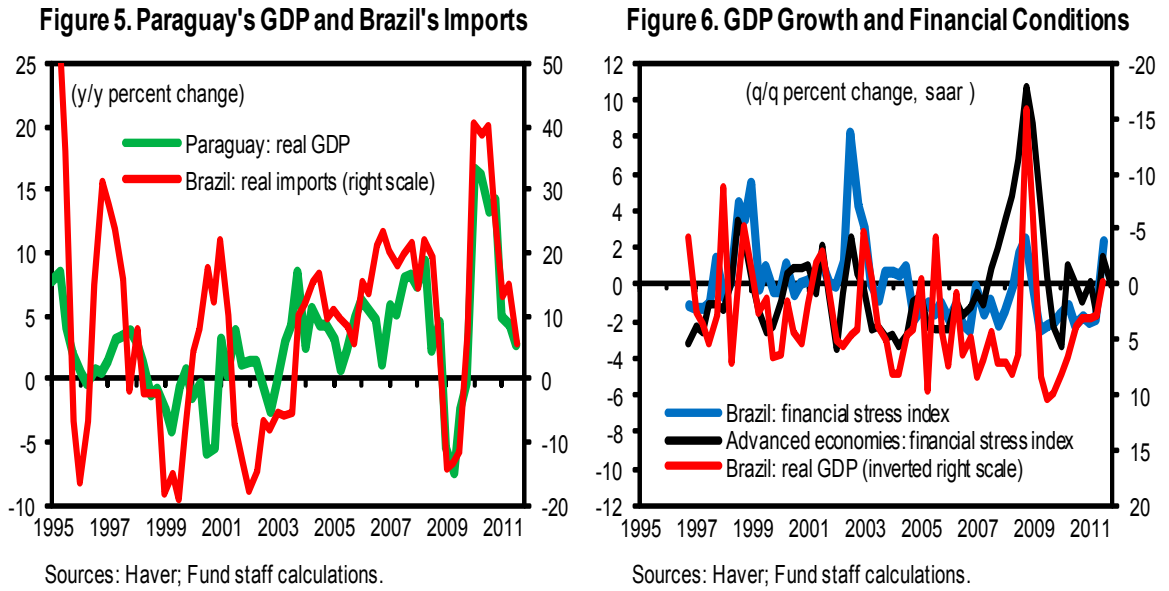
Figure 4. Exports of Goods and Services, 2011



7. The effects of global financial conditions on Paraguay are partly transmitted through Brazil, a key trading partner. Paraguay trades significantly with its Mercosur neighbors (which account for about half of Paraguay's trade) and especially with Brazil, which in the last 15 years absorbed close to one-third of exports. The synchronization of Paraguayan business cycle with that of Brazil—an economy nearly 100 times larger—is very strong (Figure 5).² At the same time, Brazil's economic growth appears to be linked to

² See also Adler and Sosa (2012), who estimate spillovers from Brazil to Paraguay using a VAR framework.

financial conditions in advanced economies (Figure 6). Paraguay is therefore also indirectly affected by changes in global financial conditions through Brazil's demand for its products.



C. Methodology and Data

8. **External financial linkages in Paraguay are quantified using impulse responses from a SVAR model.** The model consists of two blocks. The external-environment block captures relationships in the rest of the world involving economic activity, financial conditions, and commodity prices. The domestic-economy block contains Paraguayan variables. Two model specifications are used—a basic version focused on external variables and with non-agricultural GDP growth and the real exchange rate as the only endogenous domestic variables; and an extended model version that includes also domestic financial variables that can be influenced by economic policies, namely bank credit and the money market interest rate. Developments in the external environment are treated as exogenous for Paraguay. The external and domestic blocks are thus linked in the SVAR model through block exogeneity constraints, which essentially restrict Paraguayan variables from affecting external variables.³

9. **More formally, the overall model structure comprises the following set of equations:**

$$Y_t^{Prt} = A_0 + \sum_{t=1}^L A_t Y_{t-L}^{Prt} + \varepsilon_t \quad (1)$$

³ Similar methodologies are widely used to analyze external macro-financial linkages. For example, Klyuev (2008) uses such a set-up to investigate links between Canada and the United States, and Sosa (2008) for identifying business cycle synchronization between Mexico and the United States.

$$Y^{Prt} = \{GDP_{growth}^{Prt}; FoodCommodityPrice_{growth}; FinancialStressIndex^{Prt}\} \quad (2)$$

$$Y_t^{Pry} = B_0 + \sum_{t=1}^L B_t Y_{t-L}^{Pry} + \sum_{t=1}^L C_t Y_{t-L}^{Prt} + \sum_{t=0}^L D_t X_{t-L}^{Pry} + \vartheta_t \quad (3)$$

$$Y^{Pry} = \{non_agroGDP_{growth}^{Pry}; RealExchangeRate_{change}^{Pry}; FinancialVariable^{Pry}\} \quad (4)$$

$$X^{Pry} = \{ExogenousSoyYield^{Pry}\} \quad (5)$$

Equation (1) provides the general relationship in trading partner's economies (subscript *prt*) for the set of variables described by equation (2). Equation (3) represents the specification for the model's domestic block, with the set of endogenous domestic variables described by expression (4). The domestic block also includes agricultural growth as an exogenous variable (see below).

10. Estimates for the effects of global financial conditions on Paraguayan growth focus on the non-agricultural sector, with agriculture treated as exogenous.

The agricultural sector is excluded as its output is often critically affected by weather conditions. The focus is thus on the part of domestic economy that is more prone to exhibit business cycle dynamics, including in relation with foreign real and financial factors. However, given the importance of the agricultural sector in Paraguay (it accounts for over one-fifth of GDP), its potential impact on the rest of the economy needs to be explicitly accounted for. To ensure exogeneity, agricultural output is proxied by a Paraguay-specific crop yield.⁴ Agricultural effects in the model are restricted to Paraguayan variables.

11. External financial conditions are measured through a financial stress index (FSI). The index follows the methodology developed in Balakrishnan et al. (2009). Financial stress is defined as a period when the financial system of a country is under strain and financial intermediation is impaired. The financial stress index relies on price movements relative to past levels or trends to proxy for the presence of strains in financial markets or intermediation. An index of zero implies neutral financial market conditions, while positive values indicate financial strain. One unit of the index is equivalent to one standard deviation from average conditions.

12. FSIs for emerging and advanced economies are aggregated based on country weights in Paraguay's exports. More specifically, the weights are based on Paraguayan export data for the last 15 years, which yield shares of 80 percent and 20 percent for

⁴ The series corresponds to the annual soy crop yield per hectare from the United Nation's Food and Agriculture Organization, extrapolated to the quarterly frequency using total agricultural output. This exogenous variable is included in all VAR specification and is restricted to affect only Paraguayan variables.

emerging and advanced economies, respectively.⁵ Financial conditions indices are available for individual emerging market and advanced countries, and are constructed as follows:

- The index for emerging market economies (EM-FSI) comprises five components which capture three financial markets segments: banking, securities markets, and exchange rate markets. The components are: the banking-sector beta, stock market returns, time-varying stock market volatility, sovereign debt spreads, and an index on exchange market pressures. The overall index is a composite measure of these subindices and captures price changes in these markets relative to past trends.
- The index for advanced economies (AE-FSI) comprises seven variables, which capture the same three financial market segments as the emerging markets index.⁶ The additional AE-FSI components are the TED spread, the inverted term spread (both of which reflect strains in the banking sector),⁷ and an index that includes corporate debt spreads relative to government bond yields.

D. Empirical Results

Basic specification

13. **External real and financial shocks have a significant effect on Paraguay's economic growth.** Figure 7 contains impulse responses for the basic specification of the model. The following results are worth highlighting:

- *External financial conditions.* One unit increase in partners' FSI leads to a decline in Paraguay's non-agro GDP growth by about 0.8 percent over the next year, with a much stronger effect in the first two quarters. The effect fades away slowly after 2 years. As will become more apparent when results from the extended version of the model are discussed below, the effect of changes in external conditions is transmitted partly through the domestic banking system, with the remaining portion likely transmitted, at least to some extent, through changes in confidence.
- *Trading partners' growth.* A one percentage point positive shock to trading partners' GDP growth rate increases non-agro growth in Paraguay by $\frac{1}{4}$ percent over the next

⁵ These shares are also used in the paper's measure to aggregate trading partner's GDP. Among emerging economies, the main export markets are Brazil (one-third), Uruguay (20 percent), and Argentina (15 percent). Among the advanced economies, exports are concentrated in Europe (15 percent), and the United States (4 percent).

⁶ It excludes the sovereign debt spread, an indicator included in the emerging market's index.

⁷The TED spread is defined as the 3-month Libor or commercial paper rate less the short-term government rate. The inverted term spread is defined as the government short-term rate minus government long term rate.

year. As in the case of the FSI variable, the effects are stronger during the initial quarters. In the current case, however, they dissipate more rapidly. On the other hand, the impulse response functions are now somewhat weaker statistically compared to the shocks coming from external financial conditions.

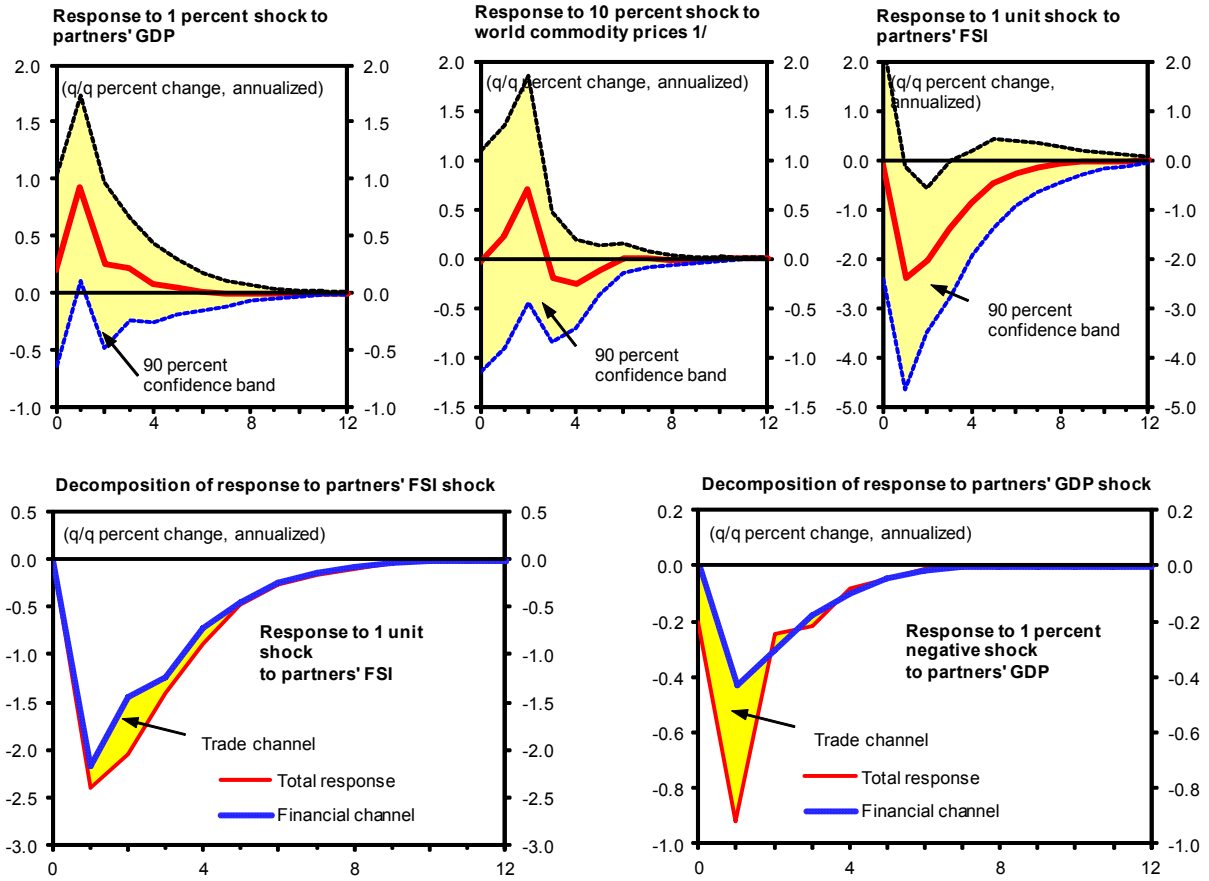
- *Commodity prices.* Global food commodity prices also tend to affect Paraguay's non-agro output but in a much weaker fashion. A 10 percent increase in global food commodity prices (relative to the consumer price index of the United States) leads to about 0.1 percent increase in Paraguay's non-agro growth over the next year. Though with the correct sign, the estimated response is statistically weak.
- *Agricultural growth.* The response of non-agricultural GDP to an exogenous shock to agricultural output, proxied by the soy crop yield, implies an elasticity of about 10 percent.⁸
- Overall, the estimates suggest that the shocks that originate in the global financial system generate not only pronounced but also statistically strong effects on Paraguay's non-agricultural economy. Furthermore, external financial stress spreads into the Paraguayan economy through the financial channels more firmly than through the trade channel.

14. **The direct financial channel appears to account for most of the effect of the external financial shock.** From the decomposition of the financial shock into the direct and indirect (trade) effect (Figure 7, lower level), it follows that the direct financial channel dominates the trade channel. This is also confirmed when the specification is extended for the exchange rate transmission channel and isolating the impact through global food commodity prices, which allows a more refined decomposition of economy's response to global financial strains (Figure 8).⁹ Weaker terms of trade account for a small part of the negative effect from global financial strains, although most of it appears to be cushioned by the depreciation of the real exchange rate. Overall, the financial channel continues to explain most of the non-agricultural GDP response, a result that is also confirmed by variance decomposition analysis.

⁸ The impact of the agricultural sector on the non-agricultural economic activity is consistent with previous Fund staff estimates, which find the elasticity of the non-agricultural GDP growth of about 8-10 percent with respect to the agricultural sector. The estimate is statistically significant.

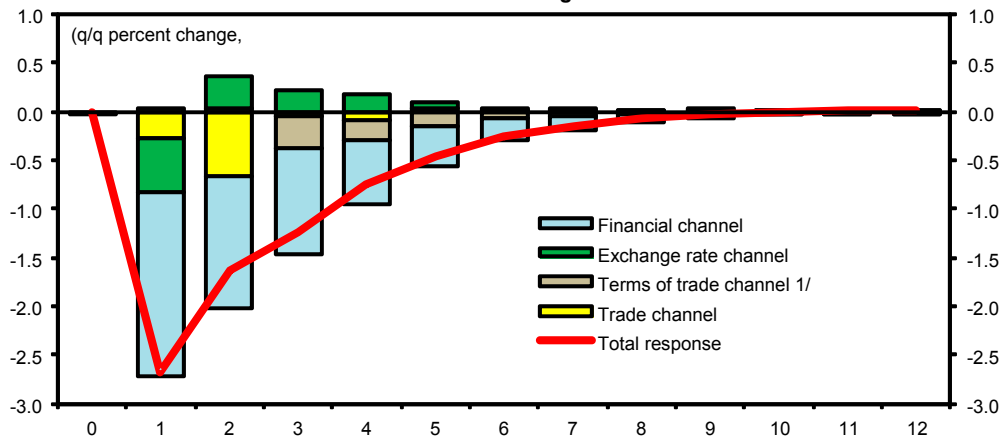
⁹ Each of the transmission channels corresponds to estimated responses of Paraguayan GDP using the full SVAR dynamics, but with the GDP equation coefficients on variables corresponding to all other transmission channels set to zero.

Figure 7. Impulse Responses of Paraguayan Non-Agricultural GDP to Shocks to Trading Partners' Variables and Global Commodity Prices



Source: Fund staff estimates.
 1/ World food commodity price index deflated by U.S. CPI.
 Note: FSI denotes financial stress index.

Figure 8. Decomposition of Response of Paraguayan Non-Agricultural GDP to Financial Conditions in Trading Partners



Source: Fund staff estimates.
 1/ Terms of trade signify world food commodity price index deflated by U.S. CPI.

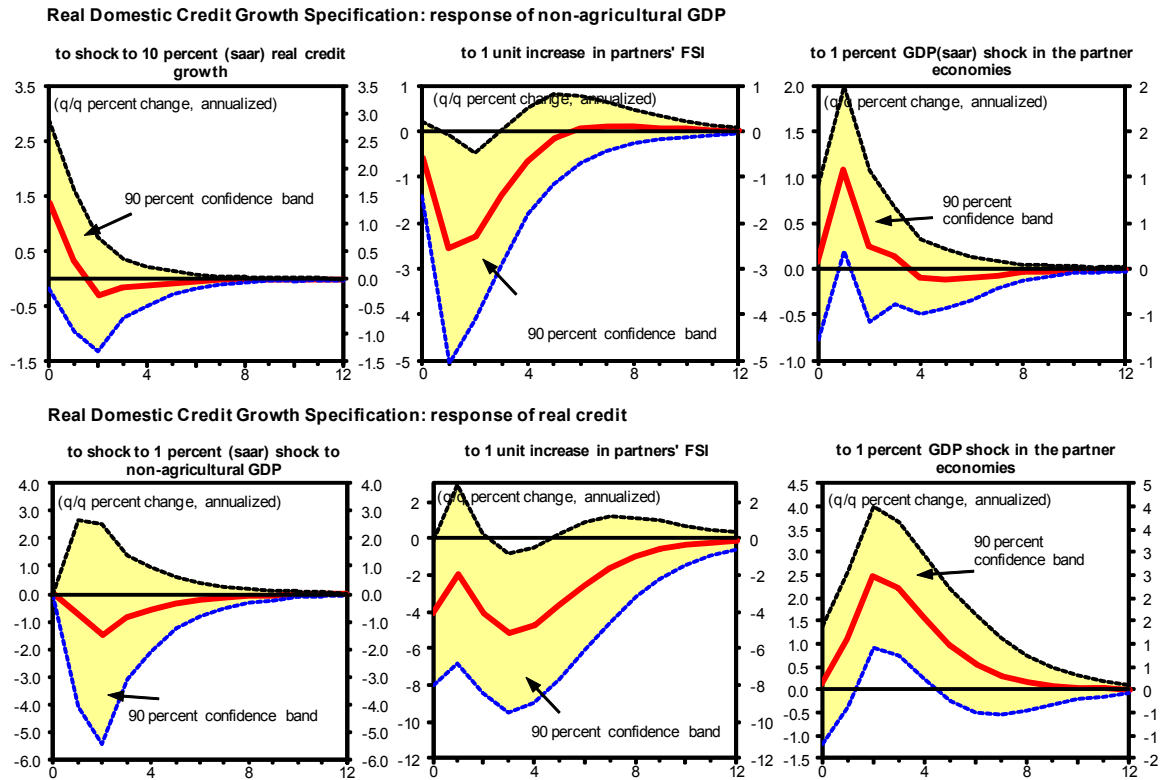
15. **The financial channel appears to transmit a large portion of real external shocks.** From the decomposition of the response to partners' GDP shock into the financial and the trade transmission channels (Figure 7, lower level), it follows that trade shocks have strong direct impact on Paraguay's real economy. However, a large part of the transmission is attributed to the financial channel. Specifically, trade and financial channels contribute about equally to the $\frac{1}{4}$ percent decline in GDP growth over the first year. Finally, the impact of the financial channel seems to be more protracted compared to that from a trade shock. The results are also consistent with a variance decomposition analysis.

Adding policy-related variables: real credit growth and the money market interest rate

16. **The domestic growth response to external shocks looks very similar to that under the basic specification when domestic policy variables are included.** The key response functions are shown in Figures 10 and A1. Real credit growth and the money market interest rate are used as alternative domestic policy-related variables. Changes in these are referred to below as changes in domestic financial conditions. Shocks to external financial conditions continue to have a stronger impact on non-agro GDP growth than trade or domestic financial variables. Their estimated effect also remains solid statistically. The response to shocks to trade and domestic financial variables is small and not very strong in statistical terms. These results also suggest that shocks to external financial conditions are transmitted domestically through confidence, at least to some extent.

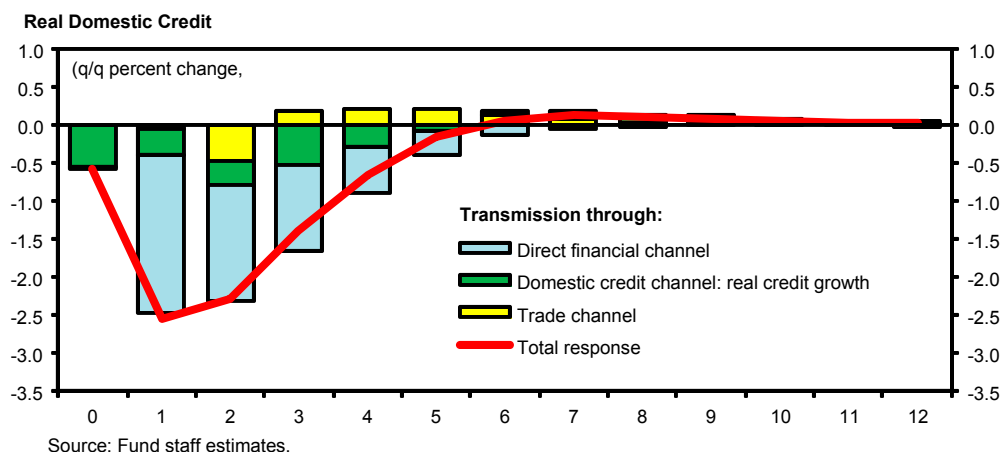
17. **Domestic financial variables tend to respond strongly to external shocks, including to financial conditions** (Figure 9 and A1). External financial stress has an adverse effect on domestic financial conditions, with credit growth slowing down and interest rates rising. This, in turn, reduces economic growth. Estimates also show that a decline in commodity prices leads to a worsening of domestic financial conditions, which is unsurprising given strong reliance of Paraguay's economy on commodity exports. Stronger foreign economic growth also tends to lead to stronger real credit growth in Paraguay, probably reflecting positive confidence effects.

Figure 9. Selected Impulse Response Functions from the Extended Models with Domestic Credit Channels



18. **The domestic financial system accommodates a substantial part of external financial stress.** Figures 10 and A2 presents a decomposition of the impact of external financial stress using credit growth and the money market interest rate as gauges of domestic financial intermediation. In both cases, the domestic financial system takes on a significant part of foreign financial stress transmission. Nevertheless, the remaining impact of external financial channel may still be spreading out through the domestic credit channel. This to the extent that tightening of domestic credit supply is usually only partially achieved through credit pricing measures, such as interest rates. Non-price measures, involving, for example, stricter credit standards can exacerbate the effect. The consequences of such changes to bank credit policies would thus be incorporated in the remaining financial channel impact. In most cases, the domestic financial system responds to external financial shocks in the same period (quarter), although the bulk of the impact takes place in the remainder of the first year. Overall, the external financial shock is almost fully transmitted within first six quarters, and in some cases some minimal credit relaxation follows in the second year, partially offsetting earlier credit cutbacks. The results are also consistent with a variance decomposition analysis.

Figure 10. Decomposition of Response of Paraguayan Non-Agricultural GDP to Financial Conditions in Trading Partners: Role of Domestic Credit Channels



E. Concluding Remarks

19. **Contrary to common perceptions, Paraguay's financial linkages with the rest of the world are significant.** These linkages operate mainly through the banking system, where foreign banks account for almost one-half of total assets. To the extent that lending policies (credit standards) by foreign banks are usually determined at the banking group level, global financial conditions can affect bank lending in Paraguay. Cross-border lending by foreign banks also play a role in the Paraguayan economy, including via financing to multinational companies operating in the country. At the same time, foreign bank gross claims on Paraguay are sizeable, reflecting primarily credit extended by local affiliates, which accounts for nearly half of domestic banking system credit to the private sector.

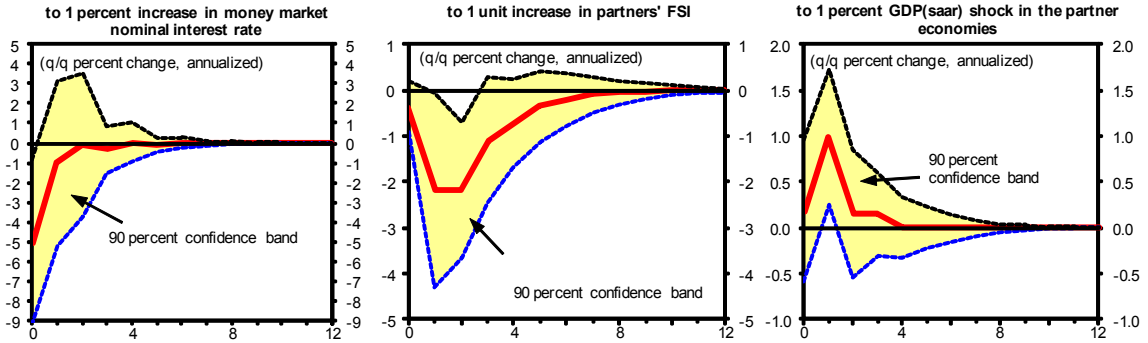
20. **Financial external shocks appear to have a strong impact on the Paraguayan economy.** Model results suggest that shocks to financial external conditions have a stronger impact than trade shocks on domestic non-agricultural GDP growth, with most of their effect seemingly transmitted through confidence. Estimates indicate that a one standard deviation shock to external financial conditions leads to 0.8 percent decline in annual non-agricultural GDP growth over one year. Of this, two-thirds can be attributed directly to financial variables, with the remainder transmitted mainly through the trade channel and domestic financial conditions. Finally, real exchange rate depreciation in response to external financial shocks provides some cushioning to the economy, partially offsetting weakened terms of trade.

REFERENCES

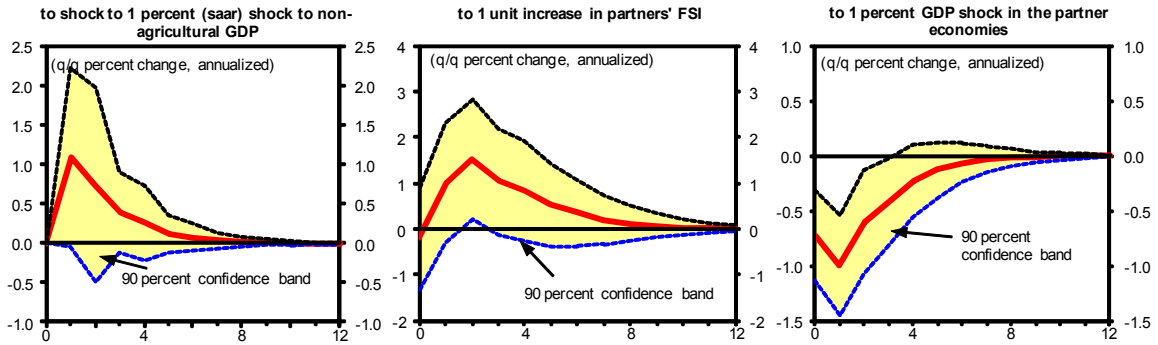
- Adler, G., and S. Sosa (2012), “Spillovers from Large Neighbors in Latin America.” *Regional Economic Outlook, Western Hemisphere*, April (Washington: International Monetary Fund).
- Balakrishnan, R., S. Danninger, S. Elekdag, and I. Tytell, 2009, “The Transmission of Financial Stress from Advanced to Emerging Economies”, IMF Working Paper 09/133 (Washington: International Monetary Fund).
- Klyuev, V., 2008, “Real Implications of Financial Linkages Between Canada and the United States”, IMF Working Paper 08/23 (Washington: International Monetary Fund).
- Sosa, S., 2008, “External Shocks and Business Cycle Fluctuations in Mexico: How Important are U.S. Factors?” IMF Working Paper 08/100 (Washington: International Monetary Fund).

Figure A1. Selected Impulse Response Functions from the Extended Models with Domestic Credit Channels

Nominal Money Market Interest Rate Specification: response of non-agricultural GDP



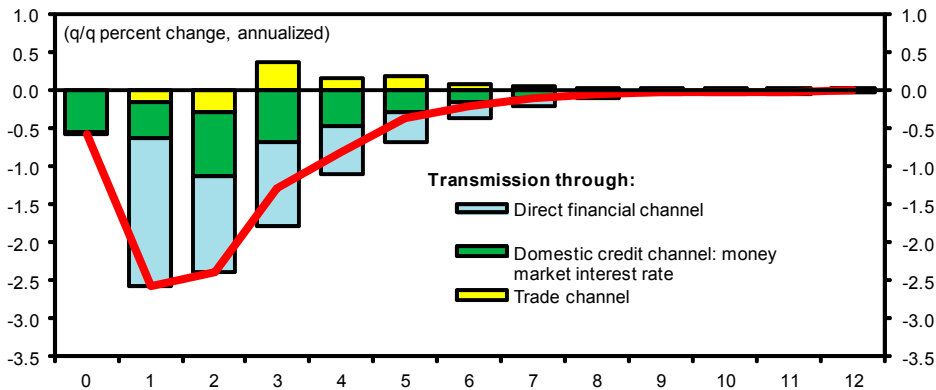
Nominal Money Market Interest Rate Specification: response of domestic interest rate



Source: Fund staff estimates.
 Note: Growth rates annualized, unless mentioned otherwise.

Figure A2. Decomposition of Response of Paraguayan Non-Agricultural GDP to Financial Conditions in Trading Partners: Role of Domestic Credit Channels

Nominal Money Market Interest Rate Channel



Source: Fund staff estimates.