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Loyal Lenders or Fickle Financiers: Foreign Banks in Latin America

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Abstract[1]

We suggest that foreign banks may represent a trade-off for their developing country hosts. A portfolio model is developed to show that a more diversified international bank may be one of lower, overall risk and less susceptible to funding shocks but may react more to shocks that affect expected returns in a particular host country. Foreign banks have become particularly important in Latin America where we find strong support for these theoretical predictions using a dataset of individual Latin American banks in 11 countries. Moreover, we find no significant difference between the size of the response of foreign banks to a negative liquidity shock and a positive opportunity shock: in both cases the market share of foreign banks in credit increases.

Keywords: Foreign Banks, Credit Volatility, Portfolio Choice, International Financial Markets

JEL Codes: G11, G15, G21

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1. Introduction

Foreign banks play an extremely important role in developing economies. According to BIS data, foreign banks through direct lending and through their local subsidiaries and branches, had lent some US$1.6 trillion as of December 2003.[2] To put this in context, Martínez Peria, Powell and Vladkova (2003) calculate that BIS reporting banks account for some 31 percent of total domestic credit in the developing world and for more than 50 percent of domestic credit in Latin America and Eastern Europe. Crystal, Dages and Goldberg (2002) highlight the dramatic increase in the foreign ownership of local banks noting that foreign banks control majority market shares in nearly all of the larger Latin American financial markets, the exceptions being Brazil and Colombia. In this paper, we employ a dataset covering financial institutions (foreign owned and their national competitors) in Latin America.[3] This data suggests that some 42 percent of domestic credit from private banks to the private sector is accounted for by the branches and subsidiaries[4] of foreign banks in the region, ranging from a low of 6 percent in El Salvador to 65 percent in Mexico.[5]

Given the rise in importance of foreign banks, a lively debate has developed focusing on whether foreign banks imply greater stability in credit intermediation. In favor of greater stability is the idea that internationally active banks from G10 countries, through their global reach and diversification, may have lower default risks and lower funding costs, and they may be less prone to shocks in the costs of funding from a particular country, including the extreme case of depositor runs. However, there is also a view that foreign banks may bring instability. In particular, and the focus of this paper, is the idea that they may be more fickle than domestic lenders.[6] Fickleness is defined here as being more sensitive to opportunity shocks (shocks to

[2] The BIS data refer to BIS reporting bank claims on developing countries including both loans and securities and is the addition of international claims (i.e., cross-border lending plus local lending in foreign currency) and local claims in local currency. The figure does not include offshore centers including Hong Kong. See Bank for International Settlements (2004)

[3] We therefore capture all local lending in foreign and local currency. We do not consider direct lending from the foreign parent to local companies.

[4] For convenience we will use the word subsidiary but hereafter this is understood to include both subsidiaries and branches. Our definition of a subsidiary is a local entity where more than 50 percent of ownership is accounted for by a single parent financial institution from a G10 country. We do not elaborate here on the differences between the two legal forms of subsidiaries and branches.

[5] In pre-crisis Argentina, the figure was higher at some 72 percent.

[6] Foreign banks may also import instability from their home countries or from other countries where they operate. Previous papers on these issues include Crystal et al (2002), Dages et al. (2000), Goldberg (2001), De Haas and van Lelyveld (2003), Martínez Peria, Powell and Vladkova (2003), Peek and Rosengren (2000a, 2000b) and van

expected returns) in the host countries in which they operate. In the extreme they may pack up and leave.[7]

In this paper, we employ a portfolio model of banking as developed by Pyle (1971).[8] This type of model has been used to illustrate a number of results. First, an unregulated bank with a wider universe of potential assets will have a lower probability of default for a given required rate of return on capital or a greater expected return for the same probability of default. Second, in the case of a regulated bank, where Basel I-type risk weights bind, a bank with a wider universe of potential assets may or may not be a less risky bank (Kim and Santomero, 1988). The potential perverse result comes from the Basel I constant risk weights across assets of different risks[9] and the incentive to invest in riskier, higher expected-return assets and divest those assets where the capital requirement does not bind. Third, if the bank takes its own limited liability into account, Rochet (1992) shows that a bank with higher capital levels will be a safer bank.[10] With limited liability, the option-like nature of the returns implies a decrease in the incentives to take risk as bank capital rises.[11] This result provides an additional argument, over and above diversification, why a larger international bank may be a safer bank. In what follows, we will work with a relatively simple portfolio approach, but still one capable of illustrating the main trade-offs that are the focus of the paper.[12]

However, we also use the portfolio model to show that when banks are more diversified across nations, and suffer a shock to expected returns in a particular host country, they may cut

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Ricjkeghem and Weder (2000). Several of these papers suggest that while foreign banks may import instability, they may also stabilize credit during a negative shock in the host country. Our results suggest that that this depends on the nature of that shock.

[7] In the case of the Argentine crisis, three international banks did precisely that: Scotia Bank of Canada, Credit Agricole of France and Intesa of Italy withdrew in one form or another. However, it should be noted that the larger foreign players did not withdraw, and indeed put in more capital during 2002.

[8] See also Hart and Jaffee (1974), Kim and Santomero (1988) and Rochet (1992). Freixas and Rochet (1999) provides an excellent review.

[9] Basel I does employ different risk weights for categories of assets. However, the categories are very broad and in particular uncollateralized corporate lending attracts an 8 percent capital requirement irrespective of the risk of the company.

[10] Indeed, the author argues that higher levels of capital rather than just risk-related capital may be required to reduce default probabilities efficiently.

[11] This is equivalent to the result when a theta of a call option falls as the option is further out of the money.

[12] We present results assuming a Basel I type minimum capital regulation but our main results would also follow for an unregulated bank or one where the Basel capital constraint does not bind. As our results do not depend on changes in the dispersion of the distributions but only on shocks to expected values, our results would be largely unchanged by the introduction of risk-related capital rules such as those proposed for Basel II. We also work with the non-perverse case where the diversification effect of a wider universe of assets dominates the possibility of arbitraging Basel I rules as in the KS-perverse case.

back on local lending more rapidly than a less diversified (national) bank. The result mirrors that of Calvo (1998) on the globalization of mutual funds. The Calvo (1998) paper was extended by Calvo and Mendoza (2000a) to a model with imperfect information and this is also discussed in Calvo and Mendoza (2000b). We work here with the full-information version of the model,[13] but whereas Calvo considers only assets, and the case of independent asset returns, we extend the basic model to include liabilities as well and consider correlated asset returns and funding costs across countries. The theory suggests that the presence of international banks represents a trade-off. On the one hand, diversification may lead to greater sensitivity to expected return (opportunity) shocks. On the other hand, diversification of risk is likely to lead to safer banks with lower funding costs; moreover, shocks to funding costs in a particular host country may lead to reduced effects on credit intermediation in the host. However, the model also suggests various nuances to this trade-off.

International banks must comply with local capital regulations as well as the capital regulations of their main or lead supervisors on their consolidated balance sheets. However, if capital in a host country is recognized by the home regulator at the level of the international (consolidated) bank, it is unlikely that this will result in further restrictions. Moreover, a host country regulator may recognize long-term liabilities of the subsidiary held by the parent as capital. An international bank generally then has flexibility in how to satisfy the set of capital requirements that it is normally subject to. Potentially more important are restrictions on the use of local deposit funding. Several countries attempt to restrict the use of banks' local funding. Argentina provides a case in point where, by law, local deposits may only be used to fund local assets.[14] This represents a set of extra restrictions on the asset allocation of international banks, and we explore the implications on the basic trade-off outlined above.

In the third section of the paper we turn to the empirical evidence. We employ a rich dataset of quarterly data on individual banks from 1993 to 2002 across 11 countries in Latin America. This yields over 3,500 observations with considerable time and cross-section variation and constitutes the largest dataset at the individual bank level that we are aware of that has been used to analyze these issues. We first consider descriptive statistics to illustrate the role of

[13] This implies an assumption that there is a shock to expected returns or funding costs with no updating of the assumed variances and covariances.

[14] The only foreign assets banks may purchase, funded by local deposits, are those authorized by the central bank and consistent with liquidity regulations.

foreign banks in the region and then turn to a more formal statistical and econometric analysis. The use of standard regression techniques to analyze credit is problematic due to issues of variable endogeneity and identification. However the predictions of the theoretical model suggest an innovative way forward in this case. In particular, we identify periods of funding and opportunity shocks in the eleven countries over time using aggregate movements in deposits and credit. We then test whether foreign banks behave differently to national banks during these different episodes. We find support for the theory suggesting that foreign banks may indeed represent a trade-off for their hosts. Section 4 concludes with a brief discussion of the policy implications.

2. A Simple Model of an International Bank

The model presented is formally similar to that of Pyle (1971), but we extend the basic model to J countries with deposits and assets in each. Let us assume that a bank chooses a risky loan portfolio in each country. The bank must seek funding through deposits and own capital. We assume the bank pays the market deposit rate of each country where deposits are raised but assume that the loan portfolio is of a longer maturity than deposits, that must then be rolled over at market rates, or equivalently that the bank contracts deposits at a variable interest rate. Asset returns and funding costs are then both risky.

First consider a symmetric case. The bank raises a total of D deposits, the expected return on all country loans is equal to ρ_L and the expected deposit rate in all countries is ρ_D. Let the standard deviation of all loan returns and deposit rates to be paid be σ, the covariance between the loan rate and the deposit rate within each country be equal to $COVLD$, all covariances between loan returns between countries, as well as between deposit rates, equal to COV, and the covariance between the loan returns in country i and the deposit rates in country j is equal to $COVLD_{IJ}$ where i and j refer to two different countries. We would generally expect these covariances to be positive and that those within countries to be greater than those between countries. We posit that the covariance between asset returns and between funding costs (COV) would be greater than the covariance between asset returns in *i* and funding costs in *j* ($i \neq j$). In other words, we expect ($COVLD_{IJ} < COVLD < COV$). The bank would raise

D/J deposits in each country and invest $(K+D)/J$ in each country. Assuming, without loss of generality that the bank has one unit of capital, the expected return, μ, and the variance, VAR, of the bank's return may then be written as:

$$\mu = (1+D)\rho_L - D\rho_D \qquad (1)$$

$$VAR(\Pi) = \frac{(1+D)^2}{J}\sigma^2 + \frac{D^2}{J}\sigma^2 - 2COVLD\frac{(1+D)D}{J} + COV\frac{(J-1)}{J} + 2(COV - COVLD_{IJ})\frac{(J-1)}{J}(1+D)D \qquad (2)$$

respectively. It is easy to check that as J increases, the variance decreases,[15] and as J tends to infinity, the variance of the portfolio tends to $(COV + 2(COV - COVLD_{IJ})(1+D)D)$, the covariance of returns on assets and liabilities across the J different countries and if $COV = COVLD_{IJ}$ then the limit is simply COV. These results mirror that of portfolio theory that the risk of a well-diversified portfolio is the systemic risk represented by correlations rather than variances. Note that in this symmetric case, the same result follows if we add a Basel I capital constraint that might be written as:

$$\sum_{j=1}^{J} \alpha_j L_j \leq K = 1 \qquad (3)$$

where L_j are loans and α_j the Basel I risk weight for loans extended in country j. In this simple symmetric case, assuming α is the same for each countries' assets, and a bank invests $(1+D)/J$ in each country this reduces to:

$$\alpha(1+D) \leq 1 \qquad (4)$$

Assuming a mean-variance type utility function and maximizing utility subject to this constraint with the symmetric expected returns and variances results in a portfolio of equal shares across countries and the result: that risk will decline with greater diversification across countries.

[15] This is true for $\frac{COV}{\sigma^2}$, $\frac{COVLD}{\sigma^2}$, $\frac{COVLD_{IJ}}{\sigma^2} < 1$ or in other words when betas are on average less than one, a standard condition that diversification leads to lower risk.

However, globalization may also make investors more fickle. Following Calvo (1998) we call the first country the host and let all countries be symmetric in terms of variances and covariances, but allow the host country to suffer a change in expected returns (opportunity shocks) and a change in deposit rates (funding shocks). As before, let the international bank invest $(1+D)$ in risky assets around the globe in J different countries and fund these assets by raising D deposits and again we normalize capital to unity. Let the bank invest θ in the $J-1$ countries excluding the host and $(1-\theta)$ in the host country. Let the bank raise $(1-\eta)$ deposits in the host country and η in the other $J-1$ countries. Let the expected return on loans in the host country be s_L and the expected cost of deposits in the host country be s_D. Assuming a Basel I type capital requirement, the maximization problem faced by the bank with mean variance preferences can then be represented as:[16]

$$P1 : Max\left\{\mu - \frac{1}{2}\gamma VAR\right\} \; subject\ to\ (1+D) \leq 1 \tag{5}$$

where μ and VAR are defined in Appendix 1. If the capital constraint is binding this yields a solution for θ that can be written as follows:

$$\theta = \frac{J-1}{J}\left[1 - \frac{\alpha}{\gamma\sigma^2}\frac{(s_L-\rho_L)(1-\beta)-(s_D-\rho_D)(\beta_2-\beta_3)}{(1-\beta)^2-(\beta_2-\beta_3)^2}\right] \tag{6}$$

where $\beta = COV/\sigma^2$, $\beta_2 = COVLD/\sigma^2$ and $\beta_3 = COVLD_{IJ}/\sigma^2$. The solution has some intuitive properties. Note that the three β terms are akin to correlation coefficients as the denominator of each is in fact the standard deviation of loan returns multiplied by that of funding costs. This implies $-1 \leq \beta, \beta_2, \beta_3 \leq 1$. Given the arguments above we will assume that $1 \geq \beta_2 > \beta > \beta_3 \geq 0$ and hence that $(1-\beta)^2-(\beta_2-\beta_3)^2 > 0$. Hence, as the expected return in the host, s_L, increases, θ declines and the bank will shift out of the other countries

[16] We assume the Basel 1 capital constraint binds and that $0 < \theta < 1, 0 < \eta < 1$. This implies a set of restrictions on the parameters and most obviously that $\rho L, sL > \rho D, sD$. Indeed, following Pyle we could present the model without differentiating between assets and deposits except by their expected returns and have banks endogenously determining to "short deposits" and go "long assets." We present a set of simulations below

and into the host. If funding costs in the host, s_D , rise, θ increases, that is, the bank will shift out of the host and into other countries.

Note that if $\beta_2 = \beta_3$, the solution for θ will not depend on funding costs. In this case raising deposits in the host country or any other country are perfect substitutes and hence a change in funding costs in the host will have no impact on the assets an international bank would wish to hold in that particular jurisdiction. If $\beta_2 = \beta_3$, then the solution reduces to $\theta = \frac{(J-1)}{J}\left[1 - \frac{\alpha(s_L - \rho_L)}{\gamma\sigma^2(1-\beta)}\right]$. If, in addition, $\beta = 0$ then the solution reduces to that in Calvo (1998). Finally, if $\rho_L = s_L$ and $\rho_D = s_D$ (there is no difference between the host country expected returns and funding costs), then the solution reduces to $\theta = \frac{J-1}{J}$ and we are back to the symmetric case.

Taking the derivative with respect to the expected return, s_L, to investigate how the optimal portfolio changes given an opportunity shock in the host country, we find:

$$\frac{d\theta}{ds_L} = -\frac{J-1}{J}\frac{\alpha(1-\beta)}{\gamma\sigma^2\left[(1-\beta)^2 - (\beta_2 - \beta_3)^2\right]} \quad (7)$$

Assuming the case where expected returns and funding costs are equal, as J increases country investment shares decline to zero, but the limit of this derivative clearly does not. Hence globabilization aggravates fickleness. A more diversified bank in a particular host country will pull assets out relatively more quickly than a less diversified one if the host suffers a negative opportunity shock. Moreover, as β increases from a low value towards unity, then the derivative and the limit above become more negative. This is easy to see for the case where $\beta_2 = \beta_3$. There is then an interaction between globalization and positive return correlations. Higher positive correlations between countries make the fickleness effect of globalization worse. Calvo's original case of independent asset returns was in fact only a mild version of the problem.[17] The intuition is clear. If country asset returns are more positively correlated then

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consistent with these assumptions.

[17]A higher β makes the fickleness effect of globalization work as

they are closer substitutes and the benefits of diversification are diminished, hence if one country suffers a negative shock that affects expected returns, then an international bank will shift out of the assets of that country more rapidly.

The literature has also stressed the idea that credit from international banks may be less sensitive to funding shocks as they have access to a global pool of liquidity. A rise in funding costs in the host country will reduce the amount of deposits raised in that country and indeed analogous results to the above can be obtained to illustrate that the sensitivity of the amount of deposits raised in a particular country to the funding cost in that country also rises with globalization. However, of more interest is how an internationally diversified bank may adjust its lending portfolio given an increase in funding costs in a particular host. To analyze this, consider the derivative of θ with respect to the cost of funding in the host country, s_D :

$$\frac{d\theta}{ds_D} = \frac{J-1}{J} \frac{\alpha(\beta_2 - \beta_3)}{\gamma\sigma^2((1-\beta)^2 - (\beta_2 - \beta_3)^2)} \quad (8)$$

In general we note that the optimal level of international bank assets in a host country is not immune to liquidity shocks. However, this depends critically on the relation between β_2 and β_3 . We suggested above that we might expect $\beta_2 > \beta_3$ or, in other words, that as monetary conditions in the host vary and exchange rates fluctuate, it is likely that deposit and loan returns within the host move more together than asset returns in the host and funding costs in other countries. In an extreme case, where asset returns drop due to widespread loan defaults or intervention by the authorities, foreign banks may also expect their funding costs to be lowered in the sense that interest payments on deposit obligations might be forcibly reduced.[18] If foreign banks think of deposits raised in a particular country as a better hedge against the assets that they have in that country, than deposits raised in other jurisdictions, then the perception of the bank is precisely that $\beta_2 > \beta_3$. As β_2 increases from β_3 towards unity, the limiting elasticity $Lim_{J\to\infty}\left[\frac{d\theta}{ds_D} * \left(\frac{s_D}{(1-\theta)}\right)\right]$ becomes more positive such that increases in funding costs would lead

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$$d\left(\frac{d\theta}{dsD}\right)/d\beta = -\frac{\alpha(J-1)\left[(1-\beta)^2+(\beta_2-\beta_3)^2\right]}{\gamma J\left[(1-\beta)^2-(\beta_2-\beta_3)^2\right]^2} < 0.$$

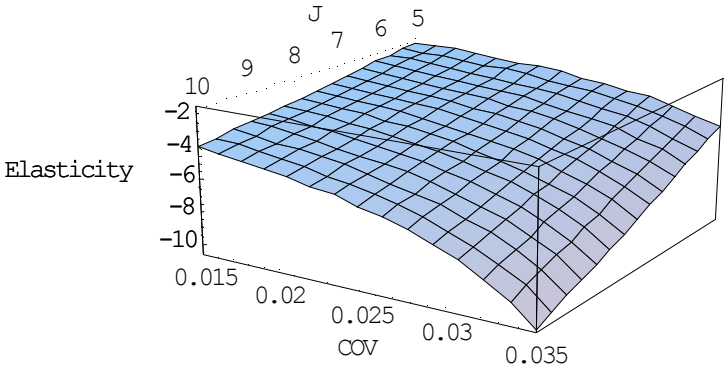
[18]A recent example is the case of Argentina, where dollar assets and deposits were forcibly converted into local pesos, albeit at different exchange rates.

a foreign diversified bank to reduce assets in the host (reduce $1-\theta$) more quickly. The intuition is that if funding costs rise then deposits in the host $(1-\eta)$ will be reduced, the hedge against local assets is then reduced and the bank will retrench assets more aggressively. On the other hand as noted, if $\beta_2 = \beta_3$, then a change in funding costs in the host will have no effect on the optimal amount of assets in the host at all: in this case deposits in any country are as good a hedge against assets in the host.

To illustrate these results further, consider the following simulations. Figure 1 plots the elasticity of loans in the home country to the expected return in the home country (henceforth "elasticity," and defined as $(d\theta/ds) * (s_L/(1-\theta))$) on the z axis for a set of base parameters, varying the number of countries, J, and the covariance of asset returns across countries, COV. With $COV = 0$, the negative effect on the elasticity is clearly visible. However, as can be seen there is an interesting interaction between COV and J. As the covariance between the countries increases the globalization effect on fickleness becomes worse.

Figure 1: Positive Correlations Exacerbate the Fickleness Effect of Globalization

Parameter Values: ρ_L=0.2, s_L=0.2, α=0.08, σ=0.3, γ=0.75, r=0.1, ρ_D=0.2, s_D=0.05, COVLD=0.06, $COVLD_{IJ}$=0.015

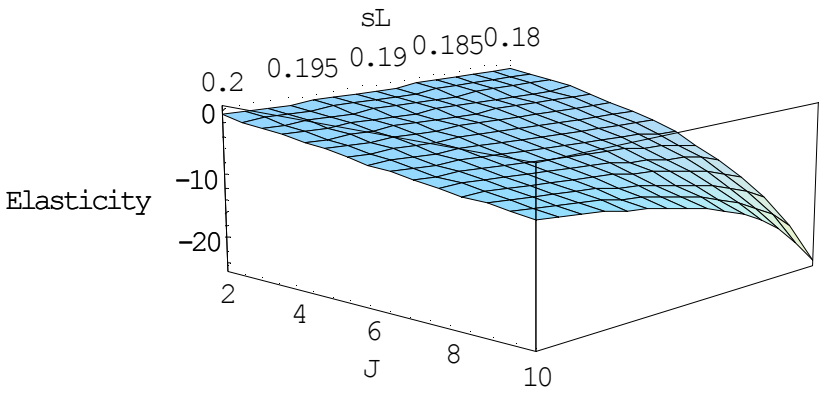


In this base case we set the $\rho_L = s_L$. But it is also interesting to consider what happens as $s_L < \rho_L$, or in other words, with successive expected return or opportunity shocks as say the situation in a host country deteriorates. In Figure 2, we plot $(d\theta/ds)(s_L/(1-\theta))$ on the z axis,

varying the number of countries, J, and the initial host country expected return, s_L. As can be seen, the potential deleterious effect of globalization also interacts with the initial level of s_L. This implies that as the situation in the host country deteriorates the effect of is highly non-linear. A more diversified bank pulls out faster as expected returns decline.

Figure 2: Fickleness Increases with Successive Opportunity Shocks

Parameter Values: ρ_L=0.2, α=0.08, σ=0.3, γ=0.75, r=0.1, ρ_D=0.2, s_D=0.05, COVLD=0.06, COV=0.03, $COVLD_{IJ}$=0.015



The above results were obtained from the portfolio model subject to a Basel I-type capital restriction that limits bank leverage. In practice some countries also place limits on the use of local deposits.[19] In Appendix 2 we derive another solution for a similar problem in which we restrict local deposits to fund local assets only. Results are similar to the ones above, implying that even under these restriction, the fickleness effect of globalization remains. We find that this kind of restriction does not completely protect countries against the potential deleterious effects of globalization, but it may protect countries from the extra impact of positively correlated expected returns across countries.

In this section we argue that globalization may imply safer banks from the point of view of aggregate default risk but also banks that may react more aggressively to bad (or good) news regarding expected returns (opportunity shocks) in a particular country. We also find that this potential instability of globalization of banking is aggravated across countries if the correlation

[19] Argentina is a case in point where domestic deposits must be used to fund domestic assets. The only exception is

between countries is higher. At the same time, however, and especially if foreign banks do not consider local host deposits as a particularly good hedge against local assets, credit from foreign banks will be more stable given a funding shock in the country concerned.

3. Testing the Relative Stability of Foreign vs. Domestic Banks

The Data

Over the 1990s foreign bank branches and subsidiaries have become increasingly more important as local lenders to Latin America´s private sector. The data we work with come from the balance sheets of local financial institutions that report to the appropriate regulatory agency in 11 countries in the region (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Guatemala, Honduras, Mexico, Peru and El Salvador) and run from 1993 to 2002, with some differences depending on the country. In most countries balance sheets are presented on a monthly basis. However, we find that monthly data is volatile and suspect that the signal to noise ratio is low and hence we work with quarterly information.

For the purposes of this paper we define foreign banks as a bank with ownership of more than 50 percent from a G10 country.[20] As shown in Table 1, all of the countries in our sample have such foreign banks. The table depicts the average number of foreign banks throughout the sample and the share of credit supplied by foreign banks with respect to total credit supplied by privately owned banks in each country. Our definition of credit does not include any form of indirect lending through securities purchases; i.e. it only includes direct lending by banks.[21] We do not include public banks in this table nor in the regressions to follow.[22]

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through the central bank's liquidity regulations.

[20] In some of these countries banks from other countries in the region operate. For the purposes of this study we focus on the G1o banks and not regional banks. In tests, not reported here, we find that the regional banks behave more like local banks.

[21] It is worth noting that in some cases it includes some credit to the public sector and to other financial intermediaries. Ideally we would like to have a precise measure of credit to the private sector, but this data would only be available for less than half of the countries in the sample given variations in country definitions.

[22] We feel that public bank behavior is a separate and distinct topic, not to be confused with the behavior of profit-maximizing local or foreign banks.

Table 1: Share of Credit in Domestic and Foreign Banks

	Quarter		Domestic	Foreign
ARG	28	Share	45%	55%
		Avg. Banks	55.6	28.2
BOL	31	Share	97%	3%
		Avg. Banks	14.5	1.0
BRA	36	Share	67%	33%
		Avg. Banks	129.8	51.6
CHL	35	Share	61%	39%
		Avg. Banks	16.9	13.3
COL	31	Share	80%	20%
		Avg. Banks	22.2	8.2
CRI	34	Share	92%	8%
		Avg. Banks	19.0	2.0
GTM	34	Share	97%	3%
		Avg. Banks	29.0	2.0
HND	34	Share	98%	2%
		Avg. Banks	18.9	2.0
MEX	36	Share	72%	28%
		Avg. Banks	15.9	14.6
PER	40	Share	68%	32%
		Avg. Banks	13.2	7.1
SLV	34	Share	93%	7%
		Avg. Banks	11.7	2.3
All		Share	79%	21%
		Total Bank obsv	11731	4490

Source: Bank Superintendencies of Latin America
Notes: Foreign banks are defined as banks with at least 50% of foreign ownership from G10 countries. State owned banks are not included in the sample.

From Table 1 it is clear that there is considerable heterogeneity in Latin America. The average share of credit from foreign banks is 21 percent of total credit. While in Bolivia, Guatemala and Honduras the share of foreign bank credit is particularly low, in Argentina, Brazil, Chile, Peru, and Mexico foreign banks play a very significant role in providing credit. In virtually all cases there is a significant increase in loans, deposits and the share of foreign banks during the 1990s. As many countries' economies stagnated during the latter half of the decade loan growth subsided and in many cases the share of foreign banks stabilized. In the case of Argentina, Brazil and Mexico, we see decreases in loans towards the end of the sample.

The case of Argentina is a particularly interesting one where the share of foreign banks rose very strongly over the 1990s with the entry of new foreign banks purchasing existing large Argentine banks. As the recession kicks in, in late 1998 through 2000, domestic private banks and foreign banks reduce credit but, if anything, the latter's share of lending continues to rise slightly. Considering deposits, foreign banks clearly increased their share of deposits over the period including the period leading up to the crisis. In the case of Brazil, there is an increase in

the market share of foreign banks, especially over 2000-2002, again featuring the purchase of several domestic institutions by large international players. The last few observations show a very rapid decline in loans of both foreign and domestic banks with foreign banks marginally losing market share of deposits and loans. The market share of foreign banks in Mexico and Peru also increased dramatically over the sample with the entry of foreign banks as they bought domestic banks. Mexico also appears to experience a slight reduction in the share of foreign loans and deposits at the end of the sample.

This overview raises an important issue, which is that foreign bank entry has largely taken place through the medium of acquisition rather than start-ups. Indeed, the market share of foreign banks in credit in Mexico or Peru shows dramatic step jumps as a particular foreign bank acquisition is effected. In considering the stability of foreign bank intermediation, it is then important to consider the appropriate treatment of these events. In this study we chose to control for all acquisitions, including foreign purchases, and for exits. This implies that our tests relate to the relative stability of foreign bank credit intermediation, conditional on the foreign bank having entered and continuing to operate in the host country concerned. We discuss this further below.

Statistical and Econometric Tests

In this section we present a set of statistical and econometric tests to attempt to investigate more precisely whether foreign banks are more or less stable credit intermediaries, relative to domestic institutions, and in particular whether they respond to the types of shocks as suggested by the theory. We have data on all regulated financial institutions that report to the relevant banking regulator; in our econometric specifications, however, we restrict our analysis to banks that have a share of at least 2 percent of total assets in the country's banking system. We limit the sample in this way, as we suspect that the data quality of the smaller institutions in some countries is low. Moreover, the heterogeneity of financial institutions tends to increase as size falls. The small financial institutions named as banks in some countries may be performing very different roles in different locations. Credit from these institutions constitutes a very small share of total credit, and that credit tends to exhibit large variations over a small base, simply reducing the power of our tests or even biasing the results.[23] Our interest, however, is a comparison between

[23] We also ran many of the specifications using the complete sample. Our results are similar to those obtained using

the larger and more comparable domestic banks and the larger foreign banks within host countries.[24]

In each country we investigated the major mergers and acquisitions. Our rule was that each acquired (or merged) bank becomes a new bank in our data. This includes foreign banks as well. When a foreign bank enters a country by purchasing an existing bank we define the purchased bank as a new one. In all of the statistics and tests reported we drop the observations where a new institution appears. Hence, we drop from the sample observations of entry, exit and major mergers and acquisitions. Our statistics and tests are conducted on changes in credit and hence the change is calculated only where the "same institution" existed in both periods to calculate the relevant first difference. Hence our tests are conditional on the foreign bank having entered and having not exited. This we feel gives the fairest picture of actual changes in credit intermediation.

Our variable of interest is credit growth, and in Table 2 we present the unconditional volatility of this variable in each country on a quarterly basis considering the non-weighted restricted sample. We find that, credit from foreign banks is more volatile than that of domestic institutions in virtually all cases. In the cases of Bolivia, Chile, Honduras and El Salvador the differences are more pronounced than in the other countries where the figures are similar.

Table 2: Standard Deviation of Credit Growth

	Domestic	Foreign
Argentina	5.5%	6.0%
Bolivia	5.3%	5.4%
Brazil	7.8%	9.3%
Chile	3.9%	7.5%
Colombia	3.5%	5.2%
Costa Rica	7.9%	10.3%
El Salvador	3.1%	9.1%
Guatemala	5.8%	5.6%
Honduras	6.4%	12.8%
Mexico	7.0%	7.7%
Peru	5.3%	4.9%

Source: Bank Superintendencies of Latin America. Notes: Foreign banks are defined as banks with at least 50% of foreign ownership from G10 countries. State owned banks are not included in the sample. Only private banks with asset share larger than 2% of the system's assets are included.

the restricted sample and are available upon request.

[24] In some specifications, we also weight each bank observation by the relative size in the banking system of that institution.

These unconditional standard deviations, however, tell us only a limited amount. For example, it may be that foreign banks increase credit more strongly than domestic ones. Moreover, here we do not test statistical significance; nor do we control for bank-specific factors or country common time effects that may affect these statistics.

Moreover, the theory developed above tells us that foreign banks may respond more to some types of shocks but less to others. In particular, the theory suggests that foreign banks may respond less to shocks that affect deposits (as foreign banks are perceived as safer and can shift from traditional domestic financing to other sources of funding more easily than domestic institutions), but may respond more to shocks that affect expected returns in host countries. One way to consider these differential impacts of different shocks is to analyze the behavior of the different types of institutions in different scenarios corresponding to positive and negative shocks to opportunities and positive and negative shocks to deposits or the supply of domestic funds which we refer to as "liquidity" shocks.

In the following 2*2 matrix, we then depict four scenarios depending on whether total credit in a particular country is growing or contracting and whether deposits are growing faster or slower than credit. In the first quadrant (NW), credit is growing and is growing faster than deposits. In this situation we expect to see credit growing mostly because profitable investment opportunities are available rather than because new funds might be entering the system. This we refer to as a positive opportunity shock and our hypothesis, following the theory outlined in the first section, is that foreign banks would increase credit faster than their domestic counterparts. The second (NE) quadrant corresponds to a positive liquidity shock. Here credit is growing but not as fast as domestic deposits. The growth of credit, as opposed to the first quadrant is not driven by profitable opportunities but rather by the expansion of available funds. Here we would expect foreign bank credit to expand less fast than the credit of their domestic counterparts. The third quadrant (SW) represents the classic deposit crunch where credit is falling, but deposits are falling faster. Here we would expect foreign banks' credit to be falling less quickly than that of domestic banks. Finally, in quadrant four (SE), we have credit falling and falling faster than deposits. We refer to this as the negative opportunity shock and again we would expect foreign banks' credit to be falling faster than that of domestic banks during this scenario.

Figure 3.- 2x2 Matrix of "Opportunity" and "Liquidity" Shocks

	Δ Credit - Δ Deposits > 0	**Δ Credit - Δ Deposits < 0**
Δ Credit > 0	**Positive Opportunity Shock** Foreign Banks (+)	**Positive Liquidity Shock** Foreign Banks (-)
Δ Credit < 0	**Negative Liquidity Shock** Foreign Banks (+)	**Negative Opportunity Shock** Foreign Banks (-)

Using our data set, we then divide our sample into these four quadrants and track the change in the share of credit of each type of bank.[25] We then aggregate across all banks and countries and present the results in Table 3 in terms of the change in the share of each type of bank during each quarter in our sample, with the quarters classified into the four quadrants as indicated. The results need to be interpreted with respect to the other quadrants rather than in absolute value. With this in mind, it is worth noting that the results tend to follow the theoretical predictions with the foreign bank share rising more in quadrants 1 and 3 (Positive Opportunity Shock and Negative Liquidity Shock) with respect to the other two quadrants. In quadrants 2 and 4 (Positive Liquidity Shock and Negative Opportunity Shock), credit rises less. Quadrant 2 shows a contraction in the foreign bank's share, and for quadrant 4 the change in the share of foreign banks is zero to two decimal places. Perhaps of most interest, is that the largest change in share occurs with the Negative Liquidity Shock where foreign banks increase their market share by some 0.12 percent per quarter on average when credit falls and deposits fall faster than credit.

[25] Country aggregated deposits and loans are de-meaned and their growth rates are computed using the filtered versions of these variables. We do this since it is not obvious whether the quadrants should be defined with credit falling or growing or growing faster or slower than the average growth rate of credit in the country concerned. This procedure is used throughout the paper. Results using non de-meaned deposits and loans to classify countries in quadrants do not vary significantly and are available on request.

Table 3: Change in the Loans Share of Foreign Banks (in percentage points)

-number of quarters in each quadrant-

	Δ% Credit - Δ% Deposits > 0	**Δ% Credit - Δ% Deposits < 0**
Δ% Credit > 0	0.06% 117	0.00% 44
Δ% Credit < 0	0.11% 45	-0.02% 122

Source: Bank Superintendencies of Latin America. Notes: Foreign banks are defined as banks with at least 50% of foreign ownership from G10 countries. State owned banks are not included in the sample. Only private banks with asset share larger than 2% of the system's assets are included.

However, these statistics are essentially descriptive and hence, we turn to more formal econometric tests. Following the idea that foreign banks may respond differently to domestic banks depending on the nature of the shocks, we conduct a series of regressions that attempt to test whether foreign banks behave differently under the four different scenarios. We note that this technique sidesteps the endemic problems of endogeneity and identification that tend to plague this type of analysis. For example, a regression of credit on the underlying economic variables such as GDP, economic activity, country risk, interest rates, and country rating, together with bank deposits, is subject to the standard criticism that these variables may not be exogenous to bank credit or to bank deposits. Thus using such regressions to test whether foreign banks bring stability tends to be problematic. We use the overall annual movement of credit and deposits in each country to identify the type of shock: opportunity shock (positive or negative) and liquidity shock (positive and negative). Apart from telling us about statistical significance levels, the results may also differ from the tables above due to the set of further controls that we introduce. First, we control for time effects to ensure our results are not driven by some other systemic event. Second, as we have 11 countries, we allow the time dummies to differ across countries as well; we thus in effect have country-time effects. Third, we conduct unweighted and weighted regressions where the regression weights depend on the relative size of each banks in total country bank assets. Fourth, we use specifications with and without bank fixed effects. Formally, we estimate the following regression:

$$\begin{aligned} \Delta loans_{ijt} = {} & \alpha_1 \Delta loans_{ijt} + \alpha_2 \Delta loans_{ijt} * Foreign_{ij} \\ & + \alpha_3 I_{jt}^{\Delta l - \Delta d > 0} * Foreign_{ij} + \alpha_4 Foreign_{ij} + \mu_{jt} + \epsilon_{ijt} \end{aligned} \quad (9)$$

where $\Delta loans_{ijt}$ is the quarterly growth rates of bank i 's loans, in country j in period $t, Foreign_{ij}$ is a dummy variable taking value of 1 when the bank is owned by a G10 bank (otherwise it is zero), μ_{jt} is a country quarter effect, and $I_{jt}^{\Delta l - \Delta d > 0}$ an indicator variable taking value of 1 when country wide credit is growing faster than deposits and -1 in the opposite case. An interaction between the bank being foreign owned and the $I_{jt}^{\Delta l - \Delta d > 0}$ indicator variable, is the relevant term for our purposes, and it refers to the first (NW) and the third (SW) quadrants of the $2 * 2$ matrix above. A test on the significance of the coefficient of this interaction term then indicates whether foreign banks behave differently under the scenario of either a positive opportunity shock or a negative liquidity shock. In both scenarios, we would expect that foreign banks increase their share of credit relative to domestic banks. The coefficient on the foreign bank dummy in the specification above captures any possible trend in foreign banks that is not present in privately owned domestic banks across the four scenarios. The coefficient on the interaction indicates changes relative to such specific behavior of foreign banks when aggregate loans grow more than aggregate deposits or vice versa. We also include a lagged dependent variable to allow for loan dynamics,[26] and also include an interaction between the lagged dependent variable and the foreign property dummy to allow the possibility that dynamics may be different for foreign banks.

Table 4 presents several results based on the specification above. In the first column we include country time effects only and do not use weights in the estimation. We have 3,673 observations and find the interaction variable to be significant at the 1 percent level. This means that foreign banks gain market share during periods of positive opportunity shocks or negative liquidity shocks, relative to domestic privately owned banks, and lose market share in the case of negative opportunity shocks and positive liquidity shocks. In this regression the dummy on foreign banks (without the interaction terms) captures the trend in foreign bank share. Our results suggest that foreign bank credit growth exhibits a trend that is statistically different than that of domestic institutions.[27] More importantly, the results support the theory presented in the model in

[26] Given the length of our sample, our estimations do not require using dynamic panel techniques such as Arellano and Bond (1991). Judson and Owen (1999) show that for samples with more than 30 periods, these techniques are not necessary to correct the bias of including a lagged dependent variable.

[27] This result is not however significant at standard levels across all specifications.

section 2: Foreign banks gain market share during positive "opportunity shocks" and "negative liquidity shocks."

In columns 2-4 we perform the same regression but weighting the regression (column 2), including bank fixed effects (column 3) and both weighting the regression and with bank fixed effects (column 4). The results do not change. Column 4 represents the most robust version where the regression (a) is weighted, (b) includes bank fixed effects and (c) includes country quarterly time effects. We continue to find that the foreign bank interaction effect is significant at the 1 percent level. The coefficient is 0.009, such that the regression suggests that, whenever credit is growing faster than deposits (either due to a negative liquidity shock or a positive opportunity shock), on average foreign bank credit grew 0.9 percent more than domestic bank credit per quarter and when credit grows less fast than deposits (positive liquidity shock or negative opportunity shock), foreign bank credit grew 0.9 percent slower than that of national banks. In columns 3 and 4 we drop the foreign bank dummy as we include bank fixed effects.

Table 4: Foreign and Domestic Banks Behavior under Positive Opportunity Shocks and Negative Liquidity Shocks

Dependent Variable: $\Delta \log(loans_{ijt})$				
	(1)	(2)	(3)	(4)
$\Delta \log(loans_{ijt-1})$	0.293	0.267	0.210	0.201
	(0.021)***	(0.020)***	(0.022)***	(0.021)***
$\Delta \log(loans_{ijt-1}) * Foreign_{ij}$	-0.196	-0.181	-0.210	-0.221
	(0.031)***	(0.031)***	(0.034)***	(0.034)***
$I(\Delta loans - \Delta dep > 0)_{jt} * Foreign_{ij}$	0.009	0.008	0.010	0.009
	(0.003)***	(0.003)***	(0.003)***	(0.003)***
$Foreign_{ijt}$	0.006	0.005		
	(0.003)*	(0.003)*		
Observations	3673	3673	3673	3673
R-squared	0.3254	0.3954	0.3966	0.4535
Country Quarter Fixed Effect	Yes	Yes	Yes	Yes
Bank Fixed Effect	No	No	Yes	Yes
Weight	No	Yes	No	Yes

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Note: I(Dloans - Ddep>0) is an indicator variable taking value 1 when aggregate credit - aggregate deposits are positive and -1 otherwise. Mergers as well as changes in ownership as considered as new banks. Only banks accounting for more than 2% of the banking system's total assets in the initial period are included. State owned banks are not included in the sample.

In these regressions we not distinguish between the opportunity and liquidity shocks, we only show that relative to domestic banks, foreign banks growth faster during positive

opportunity shocks and/or negative liquidity shocks, but we do not differentiate between these two shocks. In other words, while we distinguish between whether aggregate deposits are either growing faster or slower than credit, we did not distinguish between positive and negative credit growth. In the following regression results, presented in Table 5, we distinguish both types of shocks. We do this by adding an additional term to the regression above. In particular, we add an indicator dummy to characterize liquidity shocks. We define a "liquidity shock" indicator variable which takes on the value of 1 if aggregate deposits (country wide) are growing and growing faster than credit (positive deposit shock) and -1 if deposits are shrinking and shrinking faster than credit (negative deposit shock). In the previous set of regressions (Table 4) we were able to identify that foreign banks react differently to positive opportunity shocks and negative liquidity shocks (quadrants 1 and 3) with respect to negative opportunity shocks and positive liquidity shocks. By adding the additional interaction them in the regression we are able to identify if there is a differential effect between the impact of the positive opportunity shock and the negative deposit shock. To do so, we formally estimate:

$$\begin{aligned}\Delta loans_{ijt} = {} & \alpha_1 \Delta loans_{ijt} + \alpha_2 \Delta loans_{ijt} * Foreign_{ij} + \alpha_3 I_{jt}^{\Delta l - \Delta d > 0} * Foreign_{ij} \\ & + \alpha_4 I_{jt}^{\Delta l > 0 \ \& \ \Delta l - \Delta d < 0} * Foreign_{ij} + \alpha_5 Foreign_{ijt} + \mu_{jt} + \epsilon_{ijt}\end{aligned} \tag{10}$$

where $I_{jt}^{\Delta l > 0 \ \& \ \Delta l - \Delta d < 0}$ indicates periods when liquidity shocks are present.

Table 5: Foreign and Domestic Banks Behavior under Positive Opportunity Shocks and Negative Liquidity Shocks including Liquidity Shocks Interaction

Dependent Variable: Δ log(loans$_{ijt}$)				
	(1)	(2)	(3)	(4)
Δ log(loans$_{ijt-1}$)	0.291	0.267	0.208	0.200
	(0.021)***	(0.020)***	(0.022)***	(0.021)***
Δ log(loans$_{ijt-1}$) * Foreign$_{ij}$	-0.193	-0.180	-0.206	-0.218
	(0.032)***	(0.032)***	(0.034)***	(0.034)***
I(Δloans - Δdep >0)$_{jt}$ * Foreign$_{ij}$	**0.008**	**0.008**	**0.007**	**0.007**
	(0.004)**	**(0.003)****	**(0.004)***	**(0.004)****
I(Δloans>0 & Δloans - Δdep <0)$_{jt}$ * Foreign$_{ij}$	**-0.004**	**-0.001**	**-0.007**	**-0.004**
	(0.006)	**(0.006)**	**(0.007)**	**(0.007)**
Foreign$_{ij}$	0.006	0.005		
	(0.003)*	(0.003)*		
Observations	3673	3673	3673	3673
R-squared	0.3255	0.3954	0.3967	0.4536
CQ FE	Yes	Yes	Yes	Yes
B FE	No	No	Yes	Yes
Weight	No	Yes	No	Yes
Test (Prob > F) on joint signif. of interactions	**0.0043**	**0.0078**	**0.0067**	**0.0113**

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Notes: I(Δloans - Δdep>0) is an indicator variable taking value 1 when aggregate credit growth - aggregate deposits growth is positive and -1 otherwise. I(Δloans>0 & Δloans - Δdep<0) is an indicator variable taking value 1 when deposits are growing and are growing more than credit, and -1 when deposits are falling and are falling more than credit.Mergers as well as changes in ownership as considered as new banks.

The first column then reports a regression (unweighted and without bank fixed effects but with a country- quarterly time effect) of the percentage change in credit of bank i on the foreign bank dummy, interaction terms between this and the indicator variables: $I_{jt}^{\Delta l-\Delta d>0}$ and $I_{jt}^{\Delta l>0 \ \& \ \Delta l-\Delta d<0}$ as described above, and the lagged dependent variable and its interaction with the foreign dummy. We find that the additional (second) interaction term is not significant. This suggests that there is no evidence of a differential effect between opportunity shocks and liquidity shocks. In other words, we cannot distinguish statistically between the magnitude of the impact of a positive (negative) opportunity shock and a negative (positive) liquidity shock in regards to the response of foreign banks. However a joint significance test on the coefficients α_3 and α_4, as reported in the F test at the bottom of the table, shows that they are statistically different from zero, suggesting that there is clearly a differential impact between foreign and domestically owned banks, as also suggested by Table 4. This result holds throughout all specifications.

An alternative way to test whether opportunity shocks and liquidity shocks have differential effects is to define indicator variables for each type of shock separately and test the significance of the estimated coefficients. Formally we define a new indicator variable to capture opportunity shocks which we label $I_{jt}^{\Delta l>0 \ \& \ \Delta l-\Delta d>0}$. This indicator variable takes value 1 when aggregate loans are growing and grow faster than deposits (positive opportunity shock) and -1 when aggregate loans are falling and fall faster than deposits. Formally we estimate the following equation:

$$loans_{ijt} = \alpha_1 \Delta loans_{ijt} + \alpha_2 \Delta loans_{ijt} * Foreign_{ij} + \alpha_3 I_{jt}^{\Delta l>0 \ \& \ \Delta l-\Delta d>0} * Foreign_{ij} + \alpha_4 I_{jt}^{\Delta l>0 \ \& \ \Delta l-\Delta d<0} * Foreign_{ij} + \alpha_5 Foreign_{ijt} + \mu_{jt} + \epsilon_{ijt} \quad (11)$$

where a_3 is the coefficient on the interaction of the foreign bank dummy and the opportunity shock indicator and a_4 is the coefficient on the interaction of the foreign bank dummy and the liquidity shock indicator. According to the theory depicted above we would expect a_3 to be positive and significant, implying that foreign banks are more sensitive to opportunity shocks than domestic banks, and a_4 to be negative and significant, indicating that foreign banks are less sensitive than domestic banks to liquidity shocks. A test on $a_3 = -a_4$ indicates whether there is a differential effect between both types of shocks.

Table 6 presents the results of these estimations. Column 1 presents estimations without weights and without bank fixed effects. Column 2 reports the results including weights, and columns 3 and 4 replicate 1 and 2 including bank fixed effects. The results are virtually the same across specifications. Both the interactions of the foreign bank dummy with the liquidity and the opportunity shock indicators are significant and with the signs suggested by theory. We cannot reject the hypothesis that foreign banks react differently to these different shocks relative to domestic banks. In absolute values, the coefficient on the liquidity shock is higher than that of the opportunity shock indicator, nonetheless the test on $a_3 = -a_4$ reported in the table suggests that we cannot reject that the impact of each type of shock is the same.

Table 6: Foreign and Domestic Banks Behavior under Opportunity and Liquidity Shocks

Dependent Variable: Δ log($loans_{ijt}$)				
	(1)	(2)	(3)	(4)
Δ log($loans_{ijt-1}$)	0.291	0.267	0.208	0.200
	(0.021)***	(0.020)***	(0.022)***	(0.021)***
Δ log($loans_{ijt-1}$) * $Foreign_{ij}$	-0.193	-0.180	-0.206	-0.218
	(0.032)***	(0.032)***	(0.034)***	(0.034)***
I(Δloans>0 & Δloans - Δdep >0)$_{jt}$ * $Foreign_{ij}$ $_a$	**0.008**	**0.008**	**0.007**	**0.007**
	(0.004)**	**(0.003)****	**(0.004)***	**(0.004)****
I(Δloans>0 & Δloans - Δdep <0)$_{jt}$ * $Foreign_{ij}$ $_b$	**-0.012**	**-0.009**	**-0.014**	**-0.011**
	(0.005)**	**(0.005)***	**(0.006)****	**(0.005)****
$Foreign_{ij}$	0.006	0.005		
	(0.003)*	(0.003)*		
Observations	3673	3673	3673	3673
R-squared	0.3255	0.3954	0.3967	0.4536
CQ FE	Yes	Yes	Yes	Yes
B FE	No	No	Yes	Yes
Weight	No	Yes	No	Yes
Test (Prob > F) on a = -b	**0.5148**	**0.8826**	**0.3265**	**0.5503**

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Notes: I(Δ loans>0 & Δloans - Δdep>0) is an indicator variable taking value 1 when loans are growing and growing more than deposits, and -1 when loans are shrinking and shrinking more than deposits.I(Δloans>0 & Δloans - Δdep<0) is an indicator variable taking value 1 when deposits are growing and are growing more than credit, and -1 when deposits are falling and are falling more than credit.Mergers as well as changes in ownership as considered as new banks.

To summarize the methodology and results, as motivated by the theory and given the serious problems of endogeneity that plague standard regressions in this area, we employ aggregate movements in credit and deposits in each country to identify four scenarios related to opportunity and liquidity shocks. We then analyze the relative behavior of foreign and domestic banks in these different scenarios. Considering unconditional changes in market share (controlling for entry, mergers and acquisitions and exit), we find that the changes in market share follow those as expected by the theory. In particular, we find that foreign banks tend to increase market share when there is a negative liquidity shock or a positive opportunity shock and decrease market share when there is a negative opportunity shock or positive funding shock.[28] We find the same results when we model those changes in market share using regression analyses. These results are robust to including bank specific and country-time specific dummies

[28]In a sense our results are consistent with Morgan and Strahan (2004) who, using aggregate state data for the United States and aggregate cross country data, find that shocks to bank capital tend to produce less volaility and shocks to the net wealth of firms tend to generate more volatility where cross-border financial integration is high relative to where it is low.

and whether we run unweighted or weighted regressions. Moreover, we find no significant difference between the size of the response of foreign banks to a negative (positive) liquidity shock and a positive (negative) opportunity shock: in both cases the market share of foreign banks in credit increases (decreases).

4. Conclusions

In this paper we have suggested that playing host to foreign banks may imply a trade-off. The theoretical model expounded suggests that well diversified foreign banks may be less sensitive to liquidity shocks. As such banks may be viewed as safer by depositors and hence less prone to deposit runs and if deposit runs do occur then their access to a global pool of liquidity may imply more stable credit formation. This result is qualified if foreign banks consider local deposits in a host country as a hedge against local assets in that country. On the other hand, we have found a fickleness effect of globabilization such that a well-diversified foreign bank may increase (or decrease) its assets more aggressively in a particular country if that country suffers a positive (negative) opportunity (expected return) shock. Moreover, the fickleness effect of globalization appears to be exacerbated by positively correlated asset returns across countries. Finally, we find that although imposing a regulation that local deposits must be used to fund local assets may protect countries partially, especially in cases where foreign banks operate in a large number of countries and asset returns are positively correlated, it does not protect countries against the basic effect of globabilization on fickleness.

In order to test these findings empirically, and taking into account the very serious problems of endogeneity in standard regression analyses, we used the change in aggregate credit and total deposits in each of eleven countries to define periods corresponding to positive and negative "opportunity" and "funding" shocks. The hypothesis from the theory is then that foreign banks will increase (decrease) their market share relative to domestic banks when there is a negative (positive) liquidity shock or a positive (negative) opportunity shock. We did indeed find strong evidence in favor of this hypothesis. Moreover, we found that we could not distinguish between the magnitude of the negative (positive) liquidity shock and a positive (negative) liquidity shock.

These results have some strong policy conclusions. Host countries should be aware that inviting foreign banks to enter may bring rewards in terms of greater stability with respect to

shocks that affect funding costs in a host country, but potential costs in terms of instability in the face of host opportunity shocks. Moreover, we have found that rules limiting the use of domestic deposits to fund only domestic assets afford limited protection in theory. Some authors have suggested that foreign banks may act as a lender of last resort for their hosts (see, for example, Calvo and Mendoza, 2000b). Our results support this view, to some extent, considering the results regarding liquidity shocks; the results on opportunity shocks, however, illustrate that foreign banks should certainly not be considered as credit-intermediation stabilizers under all circumstances. If shocks affect expected returns, then local credit intermediation with global banks may be more rather than less volatile. A preliminary conclusion is then that a judicious combination of domestic and foreign banks may be an optimum for host countries so that there is not too much exposure to the volatility of foreign banks in the face of opportunity shocks nor the volatility of domestic institutions when confronted with liquidity shocks.

Appendix 1

The foreign bank maximizes:

$U = \quad E \quad \Sigma_j(L^j r_L^j - D^j r_D^j) - \frac{1}{2}\gamma VAR(\Sigma_j(L^j r_L^j - D^j r_D^j))$ subject to $1 = \Sigma_j(L^j - D^j)$ and $\Sigma_j \alpha_j L^j \leq 1$.

Under the assumptions regarding the variance covariance matrix of $P1$ detailed in the text we can write the expected value and the variance of the bank's balance sheet as:

$$\mu = (1+D)(\theta\rho_L + (1-\theta)s_L) - D(\eta\rho_D + (1-\eta)s_D)$$

$$\begin{aligned} VAR = \sigma^2 \Bigg\{ & (1+D)^2 \left[\frac{\theta^2}{J-1} + (1-\theta)^2 \right] + D^2 \left[\left(\frac{\eta^2}{J-1} + (1-\eta)^2 \right) \right] \Bigg\} \\ & + 2COV \Bigg\{ \frac{J-2}{2(J-1)} [((1+D)\theta)^2 - (D\eta)^2] \\ & + [(1+D)^2\theta(1-\theta) + D^2\eta(1-\eta)] \Bigg\} \\ & - 2(1+D) \Bigg[DCOVLD \left\{ \frac{\theta\eta}{J-1} + (1-\theta)(1-\eta) \right\} \\ & + COVLDIJ \left\{ \frac{J-1}{2(J-2)}\theta\eta + \eta(1-\theta) + \theta(1-\eta) \right\} \Bigg] \end{aligned}$$

Appendix 2

In this appendix we solve a problem similar to that in Section 2, but adding an additional restriction, namely that local deposits may only be used to fund local assets.[29] In the following program we then include a second restriction, namely that an international bank affiliate in the host country must have local assets at least as large as local deposits:

$$P2: Max\left\{\mu - \frac{1}{2}\gamma VAR\right\} \; Subject\ to: \alpha(1+D) \leq 1 \; and \; (1+D)(1-\theta) \geq D(1-\eta)$$

The constraint implies that the international bank is limited in how much of its global pool of liquidity it can invest in all countries except the host. In particular it implies that $\theta < \frac{1+\eta D}{1+D}$. It can be shown that the constraint binds if the number of countries, J, is above a critical value that depends on the other parameters:

$$J^c = 1 + \gamma\sigma^2 \frac{(1-\beta) + (\beta_2 - \beta_3)}{(\rho_L - s_L) + (\rho_D - s_D)}$$

For the base case, where the expected returns and funding costs are the equal, the critical value is infinity and hence the constraint never binds. This must be the case, as the bank would have a symmetric portfolio and the positive capital of the bank would fund assets in excess of deposits in equal proportion across all countries. However, if the expected return in the host country declines then the critical value of countries, J^c, falls quickly.[30] We assume in what follows that $J > J^c$ such that the constraint binds. The following equation gives the solution for θ in this case:

$$\theta = \frac{J-1}{J} + \frac{\alpha}{2J}\left[1 - \frac{(J-1)((s_L - \rho_L) - (s_D - \rho_D))}{\gamma\sigma^2((1-\beta) - (\beta_2 - \beta_3))}\right]$$

[29]In Argentina, local banks (national and foreign bank branches and subsidiaries) may only buy foreign assets as authorized through the Central Bank's liquidity regulations.

[30]For the base case in the simulation presented in the main text, if the expected return in the host falls to 19% (from 20%), then keeping all the other parameters constant, $J^c = \ ,8.875$ and if the expected return in the host falls to 18%, then J^c falls to 4.9375 ignoring integer constraints.

Differentiating with respect to local returns we find:

$$\frac{d\theta}{ds_L} = -\frac{\alpha(J-1)}{2\gamma\sigma^2 J((1-\beta)-(\beta_2-\beta_3))}$$

which again does not go to zero as J increases to infinity. The fickleness effect of globalization will then tend to remain. Indeed a diversified bank will reduce both deposits and assets in order to comply with the constraint. However computing the limit of the elasticity, we find that

$$Lim_{J\to\infty}\left(\frac{d\theta}{ds_L}\right)\frac{s_L}{(1-\theta)} = -\frac{s_L}{(\rho_L - s_L)-(\rho_D - s_D)}$$

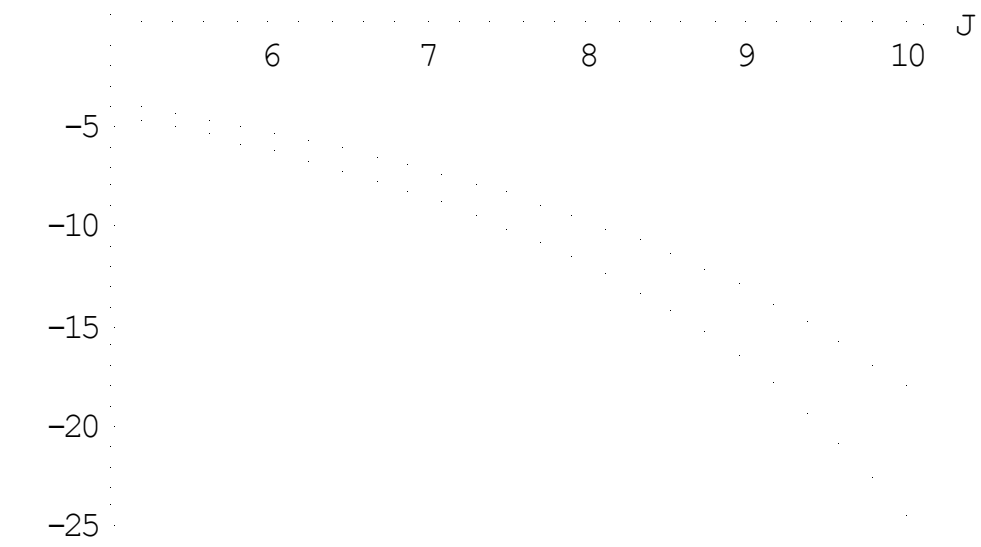
which is negative for $(\rho_D - s_D) < (\rho_L - s_L)$ (e.g., in the case of a negative opportunity shock where we would expect asset returns in the host county to fall relatively more than deposit rates relative to other countries), and which, in contrast to the limit of the elasticity in the previous maximization $P1$, does not depend on the covariances. One interpretation of this result is that although the fickleness effect of globabilization remains, as the number of countries becomes large and the deposits constraint becomes binding, the additional impact of positive correlations is reduced.

In simulations we find that, while this type of regulation does not eliminate the fickleness effect of globalization, it may reduce that. To illustrate, in Figure A1 we compare the elasticity of a host country with and without the regulation in force. The parameters are the same as in the above simulations, except that the return in the host country is set equal to 18% and all other countries have expected asset returns of 20%. This implies that if the number of countries where the bank operates is at least five, then the regulation binds. As can be appreciated from the graph, the elasticity in the country with the regulation in force is quantitatively smaller [31].

[31]The regulation will also impact on the effect of a funding shock. In general, foreign banks operating in a host country where such a regulation binds, will tend to behave more like local banks - both in terms of opportunity and liquidity shocks.

Figure A.1: A Regulation on Local Deposits Affords Partial Protection Against Fickleness

Parameter Values: ρ_L=0.2, s_L=0.17, α=0.08, σ=0.3, γ=0.75, r=0.1, ρ_D=0.2, s_D=0.05, COVLD=0.06, $COVLD_{IJ}$=0.015



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