Risk Sharing, Finance and Institutions in International Portfolios*

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Abstract

The paper shows that consumption risk sharing is prevalent even among economies with poor institutions, in particular those with serious expropriation risk, limited enforceability of contracts, high corruption and poor property rights. If institutions are poor, however, the country must be open to international markets for risk sharing to be possible. We argue this reflects the fact that expropriation and other taxes imposed on foreign capital are particularly costly in open economies, where dynamic retaliation is possible. Thus, even if institutions are such that contract repudiation or confiscation are possible de jure, borrowing economies that are open will rarely practice them de facto. Foreign

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investors anticipate this, and act to diversify risk. By contrast, the remaining capital flows headed for closed economies with poor institutions are designed and constrained so as to limit the cost incurred in case of expropriation. Diversification motives may still be present, but they take second stage. We confirm this conjecture showing that all classes of assets, but especially FDI display a strong non-linear relation with the institutional environment. Institutions are crucial in attracting capital for closed economies, but are barely relevant in open ones.

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1 Introduction

Where do individuals choose to hold capital? Using what class of assets? What does their strategy achieve? These questions have pervaded international finance for decades. Typical answers almost unanimously show that the international allocation of capital depends on the institutional and regulatory context, and observed investment does not seem to achieve much by way of diversification. The extent of international risk sharing appears to remain minimal, and, according to Karen Lewis (1999), largely driven by de jure restrictions to international capital flows. In this paper we argue that these conclusions, while true, obscure empirical regularities implying *conditional* relations between the regulatory environment, institutions, effectively observed international investment and the extent of risk sharing.

We stress two results. First, international risk sharing is present even in countries that are categorized as having poor institutions, a priori deterrent of international capital, such as serious expropriation risk or limited contract enforceability. Second, we show that a substantial amount of income insurance can be achieved provided these countries are open to international markets.[1] In other words, openness and the quality of institutions are substitutes in favoring international risk sharing. Closed economies tend to experience less risk sharing, but it is only when this is complemented by poor institutions that measured income insurance drops significantly.

How does risk sharing continue to be possible within closed *or*, say, corrupt economies? We argue it is only in closed *and* corrupt economies that no asset remains available to reliably contract international income insurance. Good institutions or liberalized markets are each sufficient for there to be (at least) one asset available to international investors seeking to diversify risk. The intuition is straightforward. It is well known that economies with poor property rights, limited contract enforceability or more generally poor institutions receive on the whole less foreign capital. It is however intensely debated how (and whether) the composition of incoming capital across different asset classes is affected, if at all. The bone

[1] This paper takes consumption risk sharing, income insurance and risk diversification as synonymous. We focus on short term risk, rather than long term differences in marginal returns to capital. Further, we discuss international opportunities to diversify uncertainty, rather than domestic risk sharing and the importance of potential credit constraints.

of contention rests on whether some classes of investment are more easily expropriable than others. Foreign Direct Investment (FDI) is particularly relevant to the question. At one end of the spectrum, FDI is construed to be more likely to be confiscated by rogue governments, because unlike equity or even bank loans, installed physical assets can readily be claimed by local authorities. FDI is then especially inappropriate as a vector of investment to countries with poor institutions. At the other end of the spectrum, the value of FDI is argued to actually reside in the know-how versed into it, but that will vanish in case of expropriation. In this case, FDI is especially attractive when considering investment to economies with poor institutions. Albuquerque (2003) and Daude and Fratzscher (2006) offer supportive evidence of the latter, whereas Wei (2006, 2000) and Faria and Mauro (2004, 2006) present supportive evidence of the former.

In either case, FDI is a special kind of asset, one for which risk sharing motives may well be dominated by other concerns, e.g. hands-on control or expropriation. We offer an explanation that accounts for the diversity in empirical conclusions, and rehabilitates FDI as a potential vector of risk sharing, on an equal footing with alternative asset classes - provided the right environment is there. We argue that alienability is endogenous to the possibilty of retaliation: economies that are open to international markets expose themselves to dynamic retaliation if they choose to expropriate foreign capital. Closed economies, in contrast, benefit from relative impunity, though they of course also receive less foreign capital. In open economies therefore, the expropriation risk that plagues Foreign Direct Investment is muted, even if institutions are poor: FDI may become a vector for international diversification on par with other assets. In closed economies, on the other hand, the sensitivity of FDI to the institutional environment (one way or the other) is particularly prevalent and direct investment patterns are governed by concerns that are orthogonal to international diversification motives.

In our empirical analysis, we find that limited enforceability of contracts, expropriation, repudiation risk or poor property rights all act to lower capital inflows. This holds across all asset classes we observe, namely the stocks of portfolio investment, FDI, and bank loans. But these effects are significantly different depending on whether the borrowing economy is open or not: they are muted in open economies, indeed to the extent that institutions barely have any significant overall effects. This supports the hypothesis that poor institutions deter incoming investment in general, but to an extent that is mitigated in open economies, where

presumably the confiscation of foreign capital is more costly.

Our conjecture is that these non-linearities be strongest for direct investment. Alienability is a question that is by definition relevant mainly to forms of capital where the decision to suddenly revert investment implies more than just a scriptural electronic operation, i.e. participations in local physical capital. Official information on direct investment is but an imperfect proxy, since it simply isolates ownership above a ten percent threshold. But the existence of a differential effect specific to a type of investment thus measured suggests the threshold, though arbitrary, is not meaningless. Joint ventures or similar agreements do after all typically involve participations above ten percent. Our data imply that the institutional environment affects the *share* of FDI in overall portfolio with a strong non-linear feature: direct investment falls as a *share* of international capital when destined to corrupt economies. But the effect is strongest in closed economies and muted in open ones, so much so that it is difficult to sign with satisfactory confidence the unconditional effect of poor institutions on the prevalence of FDI in international portfolios.

The existence of these non-linearities suggests institutions are particularly deterrent to a type of capital that cannot easily be repatriated, but also that expropriation is particularly costly - and thus effectively seldom implemented - in open economies. This finding is broadly consistent with the work by Gourinchas and Jeanne (2006), who show that openness can function as a disciplining device on a country's institutional quality. The finding also implies that sampling is crucial from an empirical standpoint. A dataset focused on open or closed economies is likely to yield estimates at opposite ends of the spectrum, because the putative alienability of direct investment is endogenous to and conditioned by openness to international markets.[2]

The paper brings to bear an exhaustive dataset with information on bilateral asset holdings between up to 42 economies, listed in the Appendix. We break total bilateral holdings down into three main components, portfolio, direct investment, and bank loans. We describe

[2] And indeed, Albuquerque (2003) is focused on countries where credit ratings are available, which may not be irrelevant to the link between FDI and corruption he seeks to evaluate. Our purpose here is not to settle the question of the end effects of, say, corruption on FDI, a question tackled upfront in Daude and Fratzscher (2006). Rather, we seek to establish the endogeneity of foreign capital alienability to openness, via appropriately specified non-linearities.

data sources in the next section. These data open the door for three refinements relative to the existing literature on international finance and risk sharing. First, we are able to control for some of the push and pull effects known to affect international investment, as we include fixed source and random destination intercepts.[3] Second, we are able to decompose bilateral holdings into their components, which may all respond differently to the institutional environment, and enable international risk sharing to a varying extent.

Third, we extend the classical analysis of risk sharing due to Lewis (1996). Like her, we measure the extent of income insurance by the responsiveness of local consumption to idiosyncratic local output shocks. But unlike her we condition our estimations on de facto measures of capital intensity, as well as its composition, and thus pinpoint what type of capital appears to be responsible for risk sharing. Further, we extend her multi-lateral approach to a bilateral context. Under full risk sharing, pairwise international differences in consumption (or income) should be unrelated to pairwise international differences in output. But it is possible that consumption plans be identical between two countries even though no risk sharing occurs bilaterally, but rather with a third party. We introduce an estimation strategy that implies zero risk sharing in case there is no incentive to trade bilaterally, i.e. in case fluctuations in output are perfectly synchronized. The estimation entails that bilateral risk sharing is characterized by perfectly correlated consumption plans but imperfectly correlated fluctuations in output.[4] We use the approach to verify whether bilateral asset holdings affect the measured extent of risk sharing, and through which types of capital.

The paper is organized as follows. The next section introduces our data, and reviews the relevant literature. Section 3 presents our methodology to assess (bilateral and multilateral) consumption risk sharing, and discusses the results implied by our data. We spend time discussing the roles of different types of capital in delivering consumption risk sharing in different institutional and regulatory environments. Section 4 presents our evidence that the alienability of foreign capital is endogenous. We show that, just as the extent of risk sharing, the composition of international portfolios depends on both institutions and the degree of

[3]This is slightly different than Daude and Fratscher (2006), who have both source and host fixed effects. See Lane and Milesi-Ferretti (2004) for a seminal description of push and pull effects in international capital flows.

[4]The approach was first used in Imbs (2004).

openness. Section 5 concludes.

2 Data and Related Literature

We now introduce our data and briefly discuss the related literature.

2.1 Data

We build a comprehensive database of bilateral capital stock holdings across a broad set of mature and emerging market economies. We inform all three categories of the capital account - FDI, portfolio investment, and bank loans. The data pertaining to FDI stem from information released by UNCTAD, and detail bilateral FDI flows and stocks between large sets of both industrialized and developing countries. The data are annual from 1980, in US dollars, and cover capital held by about 90 reporting countries in virtually the complete universe of destinations. We omit missing observations, and in particular exclude country pairs without observations over the past ten years.

Data on global equity and bond holdings are taken from the IMF's Coordinated Portfolio Investment Survey (CPIS) for the years 2001, 2002 and 2003. CPIS provides information about foreign portfolio investment for around 70 reporting countries. Portfolio investment is broken down between equity and debt, with information on the residence of the issuer and the destination of the investment. The CPIS also provides a breakdown between short-term and long-term debt securities, which we do not exploit in this paper..

CPIS data are not perfect. For instance, they do not provide a currency breakdown of bilateral investments, and nor do they identify domestic security holdings. As with any unique data source, it is impossible to ascertain whether low values reflect reality or merely reporting omissions: there is nothing to compare these data with. This is particularly problematic for Emerging Markets or Developing Economies. But CPIS is simply the most comprehensive and indeed unique survey of bilateral portfolio investment holdings there is.

Information on Bank Loans are taken from the International Locational Banking Statistics (ILB) database constructed by the Bank of International Settlement (BIS). The data comprise

an aggregate of the assets and liabilities of all banks in 32 reporting countries, vis-à-vis borrowing and lending institutions in more than 100 partner countries. Assets and liabilities capture mostly loans and deposits, but may also include other transactions that fall under portfolio or direct investment. See BIS (2003) for details. To minimize this overlap, we focus on inter-bank claims only, that is on the assets and liabilities pertaining to investments between banks only. The number of reporting countries is smallest in these database. We make use of the availability of both assets and liabilities data to partly make up for this limitation, and use liability information in reporting countries to approximate (bank) assets held in non-reporting countries.

Data collection is generally based on the residence principle, which may imply that countries report asset holdings in their direct counterpart, but not in the country where the asset is ultimately invested. This will give enormous predominance to financial centers, but not reflect true bilateral holdings. Like most of the literature making use of these data, we therefore exclude financial hubs.[5]

Even though data definitions are the same across all sources, our combining data from such different origins raises the question of their compatibility. We note that most of the results in this paper in fact do not combine data sources; it is only when computing portfolio shares that merging becomes necessary. We focus on a cross-section of bilateral capital holdings, measured as an average over 1999-2003. This is likely to help smooth out yearly fluctuations in international capital flows, and in particular high frequency fluctuations in asset values. This is undoubtedly a limitation of our approach, but data availability prevents any alternative. We have complete information covering all bilateral holdings between 42 rich and emerging economies. They are listed in Appendix A.

We use a broad set of indicators for the institutional quality of countries, focusing in particular on those measures proxying expropriation and corruption. We draw from the World Bank's Doing Business database, information put together by Transparency International and the International Country Risk Guide (ICRG), and the indexes constructed by La Porta et al. (1998). Appendix B lists our variables and their definitions. In Figure 1, we present a few scatterplots illustrating the relations between institution quality, effective capital stock

[5] See for instance the seminal work of Lane and Milesi-Ferretti (2004).

holdings (as a proportion of GDP), and the extent of risk sharing. We seek to establish the existence of robust (unconditional) positive relations between institution quality and capital linkages on the one hand, and between institutions and income insurance on the other. Most importantly, the Figure suggests these are not driven by a few outliers.

2.2 Related Literature

This paper lies on the intersection between two strands of the literature on capital flows. First, we participate to the discussion on the role of institutions in driving international capital flows. Second, we are part of the research effort seeking to quantify the extent of international consumption risk sharing in the data, and whether it relates to assets trade.

There is a broad consensus that poor institutions reduce the size of capital flows.[6] But it remains hotly debated how institutions affect the composition of cross-border investment. On the one hand, several recent studies have linked poor institutions to a high share of FDI (and accordingly to low shares of other types of investment such as equity). Albuquerque (2003) reasons that FDI is hardest to expropriate, because it contains more intangible assets whose value would vanish with confiscation. It should therefore be a privileged vector of investment in economies likely to expropriate foreign investment. He uses the argument to explain why FDI is directed in particular at developing economies, and presents some evidence that countries with low credit ratings tend to be recipients of larger FDI flows. In support of Albuquerque's argument, Hausmann and Fernandez-Arias (2000) confirm that a higher share of FDI seems to go to poorer countries and often ones with weaker institutions. Along the same lines, Daude and Fratzscher (2006) use information on FDI, portfolio investment and loans to find that countries with poor institutions are mostly recipient of FDI, rather than portfolio investment or bank loans. The relevant institutions appear to consist in high expropriation risk, poor enforcement of contracts and rampant corruption.

On the other hand, FDI is often argued to be most likely to be confiscated by local authorities because of its physical nature, certainly more than equity or bank loans. As a

[6] For instance, Kho, Stulz and Warnock (2006) show that poor institutions and worse governance in host countries increase the home bias vis-à-vis these countries. Related evidence is presented in Fidora, Fratzscher and Thimann (2006).

result, FDI would become less attractive as a vehicle of investment in countries with poor institutions. Wei (2000, 2006) and Faria and Mauro (2004, 2006) all provide empirical support for this argument. For instance, Wei (2000) finds that corruption affects FDI most strongly, but more weakly once controls for government attitudes towards FDI are included. Faria and Mauro (2004) show that good institutions attract more FDI to a country, and thereby may reduce the likelihood of financial crises among developing countries. Kraay et al. (2004) argue that FDI is harder to repossess than loans in the event of a default and hence developing countries choose bank loans rather than FDI. According to this argument, it is sovereign risk that explains the prevalence of loans in developing economies' portfolios.

A closely related literature focuses on the link between the composition of capital flows and information asymmetries and transaction costs. Razin, Sadka and Yuen (1998) argue that FDI is the preferred form of financing in the presence of information frictions because it provides hands-on control on the investment, thus alleviating somewhat imperfect information. Portfolio debt and equity do not. With the additional hypothesis that FDI entails a fixed cost, Goldstein and Razin (2005) show that countries with lower information asymmetries (and better institutions) receive more portfolio investment and relatively less FDI. Finally, Portes, Rey and Oh (2001) find that information frictions matter less for standardized financial assets such as treasury bonds, than for information-intensive equity or corporate bonds. Related evidence for a broader set of financial assets is also presented in Daude and Fratzscher (2006).

There is overwhelming evidence against international consumption risk sharing. Backus, Kehoe and Kydland (1994) famously coined the low values of international consumption correlations as a "quantity puzzle", spurring an enormous literature. Lewis (1999) proposed two main explanations for the lack of consumption risk sharing in the data, which she related to the home bias in asset holdings. She pointed to the importance of separability of preferences between traded and non-traded goods and barriers to free-flowing international capital . Once both were controlled, she found significant evidence supporting perfect income insurance.[7] Brandt, Cochrane and Santa Clara (2003) use asset prices rather than observed quantities to approximate the marginal utility of consumption, and conclude that the extent of risk

[7] See also Tesar (1993), Stockman and Tesar (1995), Ravn (2003) and most recently Engel and Matsumoto (2006).

sharing may well be more substantial than previously thought.

In this paper, we bridge both literatures. We do not directly evaluate the effects of institutions on capital flows, nor indeed do we quantify precisely the extent of international risk sharing. Rather, we show the two are related. Appropriate institutions affect the composition of capital flows, in a way that suggests the alienability of capital is not a given characteristic of one class of asset versus another. And they affect the extent of risk sharing. In particular, we do not seek to establish the absolute level of income insurance in the data. Rather, we pinpoint the determinants of its cross-section; institutions are one of them.

3 Risk Sharing

What does cross-border investment achieve in terms of risk sharing? In this section, we discuss how we measure the extent of consumption insurance. Our approach finds inspiration from Karen Lewis's insight that income insurance unhinges consumption from output. We first introduce and motivate our estimations for the standard, multilateral definition of risk sharing, and then move towards discussing our bilateral results and their robustness.

3.1 Multilateral risk sharing

In a panel of countries i, Lewis (1996) estimates

$$c_{it} = \alpha_t + \beta\ y_{it} + \varepsilon_{it} \tag{1}$$

where c_{it} and y_{it} denote the cyclical components of consumption and output, respectively, in country i at time t. The time specific intercept α_t ensures the estimation focuses on the idiosyncratic component of output which, under perfect risk sharing, should be uncorrelated with consumption. We call this a test for "multilateral" risk sharing because its findings say nothing about which partner a particular economy shares risk with. Lewis obtains significant estimates of β in her sample of 72 countries, and in each G7 economy taken in isolation. Once she controls for legal restrictions to capital flows (as well as consumption in non-traded goods), β becomes insignificant. Thus, an important reason why risk sharing is hardly apparent in the data appears to be the existence of de jure impediments to the international flow of capital.

Estimates of equation (1) do not provide any information through what channels risk sharing obtains. Our first contribution is to extend Lewis's results in that direction. We perform estimations of equation (1) over sub-samples characterized by either de jure or de facto openness to international capital. In particular, we contrast estimates of β obtained in samples focused on economies whose gross stock of investment abroad represents a relatively large proportion of GDP, and ones obtained in samples of relatively closed economies. We decompose these holdings into the three types of financial assets we observe, portfolio or direct investment, and bank loans. We also reproduce Lewis's approach using standard de jure measures of financial openness, focusing in particular on those compiled by Kaminsky and Schmukler (2003) for coverage reasons.

Table 1 shows our findings based on estimating equation (1) for a variety of sub-samples drawn from a total of 42 source economies. The estimation does not make use of the bilateral dimension of our data, and aggregates up asset holdings across host countries. We focus on a panel of lending countries where we observe the sum of all gross foreign capital holdings, and how it decomposes in its various components.[8] We use two approaches to investigate the importance of portfolio composition. First, we normalize holdings of FDI, portfolio investment or bank loans by GDP in the owner's country, i.e.

$$Yk_i = \frac{k_i}{GDP_i}$$

where $k = \{fdi, pi, loans\}$ (the "holdings" measures). Second, we compute the shares of each asset into overall capital, i.e.

$$Sk_i = \frac{k_i}{fdi_i + pi_i + loans_i}$$

where $k = \{fdi, pi, loans\}$ (the "share" measures). Both capture the importance of a given asset type in countries' international investment; the former normalizes foreign holdings by the size of the investing economy, whereas the latter focuses directly on portfolio composition,

[8] All our measures of international investment are time-invariant, for reasons of data availability. We compute averages over 1999-2003, the longest period with consistent information, in the hope that a five-year average will help smooth short run fluctuations arising for instance from valuations issues, and extract instead the cross-section we are interested in. There is simply no way in which we could observe a similar cross-section as of the beginning of the period over which risk sharing is analyzed, so we simply rely on the extreme persistence in international investment patterns. See for instance Portes and Rey (2005) or Lane and Milesi-Ferretti (2004).

and is thus scale independent. Observations on "holdings" are computed from one data source only, and thus do not conflate putative measurement errors arising from one dataset or the other.

Table 1 suggests that income insurance is imperfect among the 42 countries forming our sample; estimates of β are positive and significant on the basis of the whole sample. But as in Lewis (1996), conditioning on the degree of financial openness has a direct impact on β, which is not different from zero in a panel of countries that are open. In contrast, consumption risk sharing is estimated to be virtually non existent in the sample of closed economies, with an estimate of β undistinguishable from unity. These two panels in Table 1 confirm Karen Lewis's conclusions in our sample.[9] Interestingly, a sample split along the lines of total capital holdings confirm the contrasting results implied by de jure openness measures: estimates of β are undistinguishable from 1 for countries that are little invested abroad, but insignificant for economies with relatively large holdings. This vindicates the possibility that Lewis's findings indeed obtained because financially open economies invest more abroad, for the purpose of diversifying risk.

But it remains silent as to which class of asset achieves such diversification. The lower six panels in Table 1 answer this question. Both "holdings" and "shares" measures imply the same intriguing conclusion as regards the special status of Foreign Direct Investment. Whereas the analysis suggests that risk sharing is prevalent whenever portfolio investment is large, either as a share of GDP, or as a share of total investment, the same is not true of FDI. The second and third rows of Table 1 suggest that it is if anything when FDI holdings are large that income insurance is imperfect. The estimates of β are large and significant when $Yfdi$ or $Sfdi$ are larger than their median value across countries. They are barely significant for small FDI holdings, as if it were there that income insurance were most prevalent.

When measured as a share of GDP, bank loans also seem to deliver significant risk sharing, but not when measured as a share of total investment. Portfolios heavy in bank loans seem to deliver little risk sharing, as per the last panel of Table 1. This might be an artefact of

[9] To be precise, Lewis (1996) also controls for non-tradability so as to find evidence supportive of perfect income insurance. Our country coverage makes that decomposition empirically impossible. What is more, we cannot reject perfect risk sharing amongst the open economies in our sample; controlling for consumption in non-tradable goods would presumably only reinforce this conclusion.

the way the dependent variable is computed. Sk_i sum to one by definition. For instance, portfolios with a large share of loans may mechanically be ones with little equity investment, and thus ones with little risk sharing as a result. This illustrates the difficulty in interpreting results implied by portfolio shares, which are not independent across asset types.

Table 1 stresses that the extent of consumption insurance is heterogeneous across countries, in a way that correlates with financial openness. We reproduce Karen Lewis's seminal result, and show it is not only because of legal restrictions to capital flows that risk sharing is limited in the data. In fact, the countries that are most invested abroad are also those that achieve what we estimate to be perfect income insurance. On the basis of a cross-section of investing economies, we find that Foreign Direct Investment has a special status amongst the classes of assets we observe. While portfolio investment is unambiguously associated with risk diversification, the opposite tends to be true of FDI. We next unleash the full bilateral dimension of our data to verify how our results depends on recipient countries characteristics. Given our data sources, the cross-section of borrowing economies is by construction substantially broader than lender heterogeneity

3.2 Bilateral risk sharing

Risk sharing does not lend itself easily to pairwise analysis. Two countries engaging in bilateral risk sharing should have perfectly synchronized fluctuations in consumption. The residual uncertainty in consumption corresponds to the component of the fluctuations in local production that is common to both countries, and thus not insurable via bilateral capital flows. But on the other hand, perfect pairwise correlation in consumption does not necessarily mean a high degree of bilateral risk sharing. It may well happen via third countries. As a result, a direct extension of equation (1) to pairwise variables is unsatisfactory.

However risk sharing is presumably motivated by those idiosyncratic fluctuations in local output that can be insured away in the partner economy. In other words, a metric for the desirability of risk sharing between two regions should decrease in the extent of co-fluctuations of output between them. Two regions with perfectly correlated consumption plans do presumably engage in risk sharing, but there will be no reason to do so with each

other if output fluctuations are also perfectly correlated. Following this insight, we introduce a measure of bilateral risk sharing given by estimates of γ in

$$(y_{it} - y_{jt}) - (c_{it} - c_{jt}) = \gamma \ (y_{it} - y_{jt}) + \varepsilon_{ijt} \tag{2}$$

where y_{kt} and c_{kt} denote the cyclical components of output and consumption in country k, respectively.

The intuition is as follows. If countries i and j choose to share risk, not with each other but solely with the rest of the world, and if they do so perfectly, then $\gamma = 0$. Indeed, then, the differential in consumption $c_{it} - c_{jt}$ is zero, but so is presumably $y_{it} - y_{jt}$ since otherwise direct bilateral risk sharing would be desirable. But if it is bilaterally that i and j share risk, it should hold that $\gamma = 1$ since then equation (2) regresses (non-zero) output growth differentials on themselves. Finally, if neither multilateral nor bilateral risk sharing occurs, the dependent variable in equation (2) is akin to noise, as consumption tracks output fluctuations in both economies. Then, $\gamma = 0$. Estimates for γ capture the extent of bilateral risk sharing, at least under the hypothesis that income insurance is motivated by the intensity of the bilateral synchronization in business cycles.

Measurement error is a potentially damaging issue in estimating equation (2), where a bilateral dimension is of the essence. Suppose data in country i is mis-measured: the corresponding error will affect all country pairs where i is involved, and thus create heteroskedasticity of a kind that standard techniques are unable to address.[10] We follow two avenues. First, we allow for clustered standard errors, along the ij dimension. Second, we include country fixed effects, i.e. unobserved country-specific factors. This will soak up precisely the kind of heteroskedasticity measurement error may create in equation (2).[11] Note further that no common trend needs to be included in equation (2), since the component of the fluctuations in consumption or in output that is common across countries cancels in international differences.

[10] Under specific assumptions on the nature of uncertainty, it is possible to use GMM to tackle the issue of heteroscedasticity. See Clark and vanWincoop (1999). Their approach is however not applicable to the present context.

[11] See Spolaore and Wacziarg (2006) for a detailed exposition of the argument.

An analogy may be useful in gaining intuition. If rather than consumption, c_{it} denotes Gross National Income (GNI), the dependent variable in equation (2) is the difference between interest payments on net foreign assets paid by country i and by country j. A positive value would mean that interest payments originating from country i are larger. Estimates of γ in equation (2) then evaluate to what extent these payments correspond to a temporarily high realization of output in country i. If i and j are sharing risk, capital should flow from i to j whenever production is relatively high in country i, so that consumption plans be perfectly synchronized. This is the key mechanism of international risk sharing. In what follows we use data on aggregate consumption to measure c_{it} in our data, but discuss results based on GNI in our robustness section..

3.2.1 Risk Sharing and International Investment

We subject equation (2) to samples splits akin to those discussed in the previous section. To take advantage of the bilateral dimension characterizing this sample, we perform our splits on the basis of three measures, which are now all based on effective capital cross-holdings. All three measures focus on the cross-section of borrowing economies, and we reduce the sample of source lenders to the OECD only. First, we compute the total stock of assets held between source country i and host country j, as a proportion of source GDP. Second, we introduce a measure of the effective allocation of capital across available destinations, and compute

$$Ak_{ij} = \frac{k_{ij}}{\sum_j k_{ij}}$$

where $k = \{fdi, pi, loans\}$. This "allocation" measure highlights the cross-section of destinations where a given type of asset is invested. We normalize bilateral holdings of a given asset class by the total investment using that same asset held in the source country. The measure underlines how heterogeneity in the characteristics of recipient economies within a given asset class affects its international allocation.

But it ignores composition issues across asset types, which is the focus of our third measure. We compute

$$Sk_{ij} = \frac{k_{ij}}{fdi_{ij} + pi_{ij} + loans_{ij}}$$

where $k = \{fdi, pi, loans\}$. This simply extends our "share" measure to a bilateral context. Sk_{ij} now sheds light on how portfolio composition is affected by the characteristics of the

borrowing economy. As earlier, Sk_{ij} is scale independent, but might conflate measurement error present in different datasets.

Table 2 presents the estimates of equation (2) for a variety of sub-samples. Note that γ is now a direct index of risk sharing, i.e. $\gamma = 1$ corresponds to full income insurance. The upper panel of Table 2 suggests that income insurance, albeit not perfect, is present between our sampled 21 investing and 53 borrowing countries. In the whole sample, the estimate of γ is significantly positive, though also significantly different from one. Interestingly, risk sharing is significantly more prevalent when the total stock of asset cross-holdings is high, albeit still below unity.

The lower two panels in Table 2 split our sample according to the medians values of Ak_{ij} and Sk_{ij}, for all values of k. In contrast with Table 1, the conclusions now depend somewhat on the measure used to split the sample. The "share" based sample splits continue to confer a special status to FDI, as it appears that it is mostly amongst countries with portfolio *low* on FDI that risk sharing obtains. Although estimates of γ are significant in both sub-samples, they are significantly larger for low values of $Sfdi$. Portfolio investment continues to be associated with large estimates for γ. But the sample splits based on Ak paint a different picture. There, the countries that are the bigger recipients of OECD investment unanimously appear to achieve significant risk sharing, no matter the type of asset used. In particular, estimates of γ are always significantly larger for the sub-samples with high values of $Afdi$, *Api* and *Aloans* - though they continue to be significantly different from zero in the rest of the samples.

Taken together, these results suggest that the extent of risk sharing increases with the magnitude of effective investment, as would be expected. Borrowing capital in the form of FDI does not seem to hamper diversification motives any more than borrowing on equity markets or from banks. The countries that are high recipients of OECD foreign direct investment, equity investment or bank loans achieve significant risk sharing, of comparable amounts. Of course, the identities of these countries might be similar across asset classes. After all, portfolio investment, FDI and bank loans may all be headed to overlapping sets of borrowing countries.

By definition, the "share" measures Sk isolates different sets of borrowing countries,

and thus lends itself to investigating putative differences between types of assets.[12] In both Tables 1 and 2, FDI seems to have a special status, in that portfolios heavy in foreign direct investment achieve little diversification, whether from the lender or the borrower's standpoint. In particular, portfolios that are biased in FDI achieve significantly less consumption risk sharing than those with low values of $Sfdi$. We later argue this stems from the institutional and regulatory characteristics of the economies that borrow in FDI.

3.2.2 Risk Sharing and Institutions

This paper's main contention is that the diversification potential of FDI is endogenous. In specific regulatory or institutional environments, the patterns of Foreign Direct Investment become dominated by issues of expropriation rather than simple diversification strategies. We argue these are the circumstances when estimates of γ get close to zero (and those of β get close to one) even though the share of FDI in investment is high. The rest of this section establishes the importance of the legal environment for risk sharing.

In Table 3, we split our sample according to the measures of institutional quality we deem relevant to issues of expropriation of foreign investment. We measure corruption using the variable compiled by the World Development Index, repudiation risk as implied by the International Country Risk Guide, and enforcement of property rights as implied by the index developed by the Heritage Foundation. Since our data now focuses on the heterogeneity in the characteristics of borrowing economies, we split our samples according to median values of each index across host countries. Table 3 paints a clear picture: less than median institutional quality significantly hampers consumption insurance. In all three cases, γ is significantly larger in samples with good institutions. Interestingly however, risk sharing continues to be possible even with borrowers with less than median institutions, as γ continues to be significantly non zero in these samples. Repudiation risk appears to be the most detrimental to income insurance, but some risk sharing still prevails even when contract enforceability is deemed a serious issue by ICRG. How is this possible?

We argue it is the conjunction of poor institutions and closedness to international markets

[12] A country cannot borrow mostly both in FDI and in equity. This is the flip side of the issue that the Sk measures sum to unity.

that makes risk sharing truly impossible. Poor institutions in open markets barely prevent diversification, because expropriation, though possible in principle, is rarely exacted in practice lest retaliation on international markets occurs. Table 4 shows this to be the case in our data. We now split our data in four quadrants in the space formed by openness to international markets and institutional quality. We first distinguish open from closed economies using the index proposed by Kaminsky and Schmukler (2003). In each thus selected sub-sample, we estimate equation (2) on panels formed by countries of contrasted institutional quality. The median institutional quality used for the second split is identical to what was used in Table 3, to facilitate comparison.[13]

Table 4 illustrates how, in our sample, the only countries where consumption risk is barely diversified at all are ones where institutions are poor *and* financial markets are closed. Elsewhere, and in particular where institutions are poor *but* financial markets are open, consumption risk sharing is present, significant, and estimates of γ are all higher than 0.5. They are even higher within closed economies endowed with good institutions, where, in fact γ is not significantly different from its value in samples regrouping open economies with good institutions. Unsurprisingly, the quality of institutions does affect estimates of γ, and, holding openness constant, they are higher for good institutions.

In Table 5, we verify that a sample split along the openness dimension does not separate our data into samples with fundamentally distinct institutions. In other words, we check that openness incorporates information that is different from mere institutional quality. In fact, Table 5 suggests the absence of any significant differences in institutions across closed and open economies - across the four indexes we use in Table 4. In other words, isolating closed (or open) economies is different from focusing on countries with poor (or desirable) institutions.

In short, Tables 4 and 5 provide strong support for the conjecture that the quality of institutions and openness are substitutes in enabling risk diversification. Financial assets continue to be available to investors willing to diversify risk in corrupt (say) economies that are open; it is only when they are closed that diversification effectively plummets in the data. We now turn to the question whether this happens because of the specific response of Foreign

[13] Although some observations are dropped going from Table 4 to 5, because of missing data on openness.

Direct Investment to the legal environment.

3.3 Some Robustness

Our measure of bilateral risk sharing is novel. It is important to ensure our results are robust to alternative samples and assumptions. Here we investigate the importance of three alternatives. First, we address the possibility that cycle synchronization itself be endogenous in equation (2). Second, in order to clarify what drives our results, we focus on sub-samples pertaining to countries of a certain income level (while preserving the heterogeneity of interest, i.e. in host countries institutional quality and openness). We also perform our estimations on shortened time series corresponding to periods of globalization or otherwise. Finally, we replace aggregate consumption with series on Gross National Income. Both measures have merit, in that smoothing consumption presumably works through fewer fluctuations in income. But Gross National Income is rigged with more measurement issue in international data. We verify how our results stand.

3.3.1 Endogeneity

A potential issue in estimating equation (2) stems from the possible endogeneity of output fluctuations to financial integration, and in particular to the nature of capital flows. This may drive a spurious correlation between $y_{it}-y_{jt}$ and k_{ij} in the various sub-samples where equation (2) was estimated. The correlation would however act against our results. Suppose output fluctuations become internationally more synchronized between economies where bilateral investment is high. We would then conclude that estimates of γ are low between countries with high realizations of k_{ij}, since their output fluctuations would be more synchronized bilaterally. Endogeneity will only explain our results away if different types of capital have different effects on the international synchronization of output fluctuations.[14] This seems rather unlikely.

Nevertheless, we augment equation (2) with a second expression meant to capture the putative autonomous determinants of $y_{it}-y_{jt}$, and estimate the resulting system using three-

[14] In particular, it would have to be true that bilateral investment in equity lowers cycle synchronization, but FDI increases it.

stage least squares (3SLS). Luckily an enormous literature is available when choosing the other determinants of the international correlation of business cycles.[15] We include the most robust and uncontroversial of them all, namely a measure of bilateral trade, and estimate jointly

$$\begin{aligned} (y_{it} - y_{jt}) - (c_{it} - c_{jt}) &= \gamma \ (y_{it} - y_{jt}) + \varepsilon_{ijt} \\ y_{it} - y_{jt} &= \lambda_1 \ k_{ij} + \lambda_2 \ t_{ij} + \eta_{ijt} \end{aligned} \tag{3}$$

for all values of $k_{ij} = \{fdi, pi, loans\}$. Estimates of λ_1 - and the end effect they have on γ - test whether the channels between k_{ij} and γ are indeed what the previous section has made them to be. TO BE COMPLETED

3.3.2 Coverage

TO BE COMPLETED

3.3.3 Income

TO BE COMPLETED

4 Openness, Institutions and International Investment

This paper's argument links risk diversification, the intensity and characteristics of international investment and institutional quality in borrowing economies. The previous section established a significant relation between diversification and international portfolio on the one hand, and between diversification and institutions on the other. In this section, we discuss the remaining link, between international investment patterns and institutions. This is an increasingly well-charted area, and we do not propose to have the definite word on how institutional quality affects the magnitude and composition of international capital flows.[16]

[15] A lengthy discussion is out of order here. For a detailed discussion, including of the relevance of 3SLS in this context, see Imbs (2004).

[16] We refer the interested reader to contributions by Lane and Milesi-Ferretti (2004), Faria and Mauro (2004) or Daude and Fratzscher (2006).

Our purpose is more focused: we seek to establish whether the intensity and composition of capital flows depends non-linearly on the quality of institutions. In particular, do institutions affect investment patterns identically irrespective of openness to world markets?

The question is especially relevant for Foreign Direct Investment, which may be particularly sensitive to the risk of expropriation because of its physical nature. But expropriation entails dynamic costs, in that international markets can decide to sanction and ostracize a guilty party, by excluding it from world trade. A large literature is dedicated to evaluating the costs of such an exclusion.[17] But one thing is for sure. A closed economy cannot be further ostracized, and thus might hesitate less when choosing to expropriate FDI, holding the quality of institutions constant. In other words, for a given value of an index of institutional quality, the likelihood of expropriation is endogenous to openness.

If this mechanism is indeed present in our data, it stands to reason that capital invested in economies that are both closed and have poor institutions reflects motives different from mere diversification strategies. If finance towards such parties does not disappear altogether, whatever remains must be determined at least in part by the prospect of expropriation. Both how much capital flows to closed, corrupt economies, and the type of asset used, must differ substantially from what they would be if risk diversification was the only motive for investment. In contrast, if expropriation effectively ceases to be a credible threat for investment in open (yet corrupt) economies, diversification motives may once again take front stage.

The mechanism can account for the fact that risk sharing continues to be possible in corrupt yet open economies, and indeed that portfolios long in FDI tend to deliver little risk sharing. That would be the case if investment to corrupt and closed economies were not governed by diversification motives. We now formally verify this to be the case. In doing so, we refer to the empirical approaches that have been tried and tested in the literature on the determinants of international capital flows. In particular, we follow Wei (2000, 2006) and Lane and Milesi-Ferretti (2004), and estimate in pure cross-section

$$Ak_{ij} = \alpha_i + \tilde{\alpha}_j + \delta_1 \ \left[\phi_j \ . \ I_j\right] + \delta_2 \ \phi_j + \delta_3 \ I_j + \delta' X_{ij} + \varepsilon_{ij} \tag{4}$$

where X_{ij} denotes a vector of controls for bilateral investment patterns between lending country i and borrowing country j. ϕ_j denotes the index of financial openness compiled by

[17] See among many others chapter 6 in Obstfeld and Rogoff (1996).

Kaminsky and Schmukler (2003) (which takes value one in open borrowing economies) and I_j is an index of institutional quality. We control for source specific intercepts, and destination specific random effects.[18] We estimate the equivalent of equation (4) using a measure of portfolio composition, i.e.

$$Sk_{ij} = \alpha_i + \tilde{\alpha}_j + \delta_1 \ \left[\phi_j \ . \ I_j\right] + \delta_2 \ \phi_j + \delta_3 \ I_j + \delta' X_{ij} + \varepsilon_{ij} \tag{5}$$

A large literature has taken interest in the signs of δ_2 and δ_3; we are here mostly interested in the sign of δ_1.

Table 6 presents a first set of results pertaining to all three measures of Ak_{ij}, where I_j corresponds to the corruption index proposed by the World Development Report, whose value increases with corruption. Several results deserve mention. First, it is always significantly true that δ_1 and δ_3 have opposite signs. The direct effect of corruption on capital is muted in open economies. This is particularly true of $Afdi$, where δ_1 is both largest in magnitude and most significant. In our data, δ_3 is significantly negative after appropriate conditioning. Holding openness constant, corruption deters foreign capital, of any type. The second column in Table 6 suggests a crucial conditioning variable is per capita GDP in the borrowing economy, which might capture the marginal return to capital. We stress our main conclusion regarding the sign and significance of δ_1 holds irrespective of the conditioning set - and indeed whether per capita GDP is included or not. As discussed in Wei (2000) or Daude and Fratzscher (2006), this is not necessarily true of the estimates of δ_3.

What is more, the significance of δ_1 suggests sampling is of the essence when it comes to assessing the effects of corruption (or, more generally, institutional quality) on international investment. A sample biased towards open economies (for instance ones where credit ratings are available) is more likely to deliver positive estimates of δ_3, especially if the specification is linear. The end effect of institutions on capital has to do with the relative magnitudes of the estimates for δ_1 and δ_3, along with average realizations of I_j and ϕ_j.[19] We leave a precise answer to this question to the literature concerned more directly with it, but stress the non-linearity we document does not contradict existing estimates.

[18] Given that we focus on the cross-section formed by borrowing economies, this is the most we can control for. See Daude and Fratzscher (2006) for a more general setting.

[19] The same is true of the end effects of financial liberalization on the international allocation of capital, though estimates of δ_2 are weakly significant at best in Table 6.

Table 6 shows the effect of corruption on foreign investment is muted in open economies, and it is for all the kinds of financial assets we observe. This is as such already consistent with our conjecture that capital is invested in corrupt yet open economies, and thus that risk diversification remains possible there. Table 7 presents the estimated coefficients on the basis of equation (5), i.e. whether the shares of different types of assets in overall investment are affected non-linearly by institutional quality. They would not be if the non-linearities were identical across FDI, portfolio investment and bank loans. Table 7 confirms the special status of FDI, as suggested by the differing point estimates of δ_1 in Table 6. Estimates of δ_1 and δ_3 imply a picture where corruption induces a portfolio reallocation away from FDI and towards portfolio investment. Most importantly, this reallocation is only significant in closed economies, where portfolio investment seems preferable possibly on grounds that, unlike FDI, it can be instantaneously reverted. In open economies, our estimates suggest barely any reallocation occurs.[20]

Taken together, Tables 6 and 7 show that corrupt and closed economies have difficulties borrowing relative to open ones. Given a level of corruption, capital goes prioritarily to open economies. This is particularly true of FDI, which appears to shun closed and corrupt borrowers. That is consistent with the conjecture that FDI is particularly sensitive to expropriation risk, so that investors avoid at all costs countries where institutional quality can not be mitigated by putative market sanctions. It is also consistent with the conjecture that whatever investment remains headed towards corrupt and closed economies, it may be governed by other motives than portfolio diversification.

In Table 8, we report estimates for δ_1, δ_2 and δ_3 for different values of I_j. In particular, the corruption index we used in Tables 6 and 7 may well embed a variety of different characteristics. Here, we zoom in onto the institutional defects that we deem likely to reflect the possibility that foreign investment be confiscated. We focus on four measures, some of which were used earlier. The first two are proposed by the International Country Risk Guide, and

[20] Once again, we do not seek to assess the end impact of corruption on FDI. We note however once more the crucial importance of per capita GDP as a conditioning variable, as exemplified by estimates of δ_3 changing signs between the first and subsequent specifications. Our final conclusion on the presence of non-linearities does not depend on the inclusion or otherwise of per capita GDP (nor indeed of any other controls included in X_{ij}).

capture the ease of repudiation of government contracts, and a direct index of expropriation risk. The third index measures the enforcement of property rights as computed by the Heritage Foundation. The last one quantifies the quality of the regulatory environment index introduced in La Porta et al (1998).

Institutional quality has non linear effects across all four indexes, but most unanimously on bilateral Direct Investment. In particular, while the direct effects of institutions on k_{ij} (δ_3) are not always significant, they are always significantly mitigated by the extent of openness (δ_1) when it is the holdings of FDI that are explained.[21] Unlike in Table 6, "allocation" measures now point to a special status for FDI, which we find to be particularly sensitive to *both* openness to world markets *and* institutional quality. In other words, while Table 6 suggested that corruption in general had deterrent effects on all asset classes, with a slight edge for FDI, we now conclude that contract repudiation and expropriation risk affect mostly Direct Investment. Indexes of institutional quality that focus on the expropriation question yield estimates of δ_1 in equation (4) that are only significant for FDI. By contrast, poor regulatory environment and, to a lesser extent, poor property rights matter significantly (and still non-linearly) for all three classes of assets.

This section provides evidence of a significant relation linking international investment patterns to the interaction of institutional quality and openness. Institutions matter when attracting capital, but poor institutions lose most of their deterrent in open economies, where a market sanction becomes possible. This is particularly true of FDI, and particularly true of institutions that pertains to the expropriation of foreign capital. We conclude standard diversification strategies may continue to motivate international investment towards countries with poor institutions, provided they are also open. If they are closed, expropriation concerns take over, and prevent consumption risk sharing.

5 Conclusion

International risk sharing is far from perfect in the data. But this fact averages important differences away. Lewis (1996) taught us that diversification was hampered by de jure

[21] Good institutions correspond to *high* values of both ICRG indexes and the measure of the quality of the regulatory environment.

restrictions to international capital flows. We show this extends to effectively measured investment: countries that trade financial assets are also diversified, in that they manage to unhinge domestic consumption from domestic production, in some cases perfectly. Surprisingly, economies with low institutional quality still achieve a high degree of risk diversification, though we show that they must also be open to international markets. It is only in closed economies with poor institutions that risk sharing is virtually absent.

Thus, openness and institutions are to an extent substitutes when it comes to attracting capital for the purpose of risk diversification. We conjecture this corresponds to the credible threat of retaliation that open countries have to internalize when deciding to confiscate foreign capital. Closed countries cannot be excluded from anything, and engage in expropriation more readily. Investors anticipate this. Whatever capital still goes to closed, corrupt economies achieves little diversification, for these investments are now constrained to avoid or prepare for the event of confiscation.

If the mechanism were indeed prevalent, international investment should respond to institutional quality in a non-linear manner, that depends on the borrowing country's openness to world markets. In particular, the deterrent impact of poor institutions should be muted in open economies. That should be particularly true of the type of asset that is easiest to confiscate, Direct Investment, and it should be particularly true of institutions that pertain to expropriation risk or contract enforceability. We show these predictions are all borne out in a dataset detailing bilateral investment patterns between more than forty economies, that comprises information on cross-holdings of Direct Investment, portfolio investment, and bank loans.

References

Adam, Klaus, Tullio Jappelli, Mario Padula and Marco Pagano, 2002. *Analyze, Compare, and Apply Alternative Indicators and Monitoring Methodologies to Measure the Evolution of Capital Market Integration in the European Union*, European Commission, Directorate General for Internal Affairs, February.

Alfaro, Laura, Sebnem Kalemli-Ozcan, and Vadym Lolosovych, 2003. *Why Doesn't Capital Flow from Rich to Poor Countries? An Empirical Investigation*, Harvard Business School Working Paper Series No. 04–040.

Albuquerque, Rui, 2003. *The Composition of International Capital Flows: Risk Sharing Through Foreign Direct Investment*, Journal of International Economics, 1(2), 353–83.

Artis, Michael and Mathias Hoffmann, 2004. *Financial Globalization, International Business Cycles and Consumption Risk Sharing*, Mimeograph, European University Institute and University of Dortmund.

Baxter, Marianne and Robert King, 1999. *Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series*, Review of Economics and Statistics, 81, 575-593.

Bordo, Michael and Thomas Helbling, 2003. *Have National Business Cycles Become More Synchronized?*, NBER Working Paper No. 10130.

Bulow, Jeremy and Kenneth Rogoff, 1989. *Sovereign Debt: Is to Forgive to Forget?* American Economic Review 79(1), 43-50.

Clark, Todd and Eric vanWincoop, 2001. *Borders and Business Cycles*, Journal of International Economics, 55, 59-85.

Daude, Christian and Marcel Fratzscher, 2006. *The pecking order of cross-border investment*, ECB Working Paper No. 590, February 2006.

Doyle, Brian and Jon Faust, 2003. *Breaks in the Variability and Co-Movements of G-7 Economic Growth*, Mimeograph Federal Reserve Board

Engel, Charles and Akito Matsumoto, 2006. *Portfolio Choice in a Monetary Open-Economy DSGE Model*, mimeo, University of Wisconsin, Madison.

Faria, André Linde de and Paolo Mauro, 2004. *Institutions and the External Capital Structure of Countries,* IMF Working Paper No. 04/236, December 2004.

Faria, André Lince de, Paolo Mauro, Martin Minnoni, Aleksandar Zaklan, 2006. *The External Financing of Emerging Market Countries: Evidence from Two Waves of Financial Globalization,* IMF Working Paper No. 06/205, September 2006.

Fidora, Michael, Marcel Fratzscher and Christian Thimann, 2006. *Home bias in global bond and equity markets: the role of real exchange rate volatility*, mimeo, April 2006.

Fisman, Raymond and Inessa Love, 2003. *Financial Development and Growth in the Short- and Long-Run*, BREAD Working Paper No. 051.

Goldstein, Itay, and Assaf Razin, 2005. *Foreign Direct Investment vs. Foreign Portfolio Investment*, NBER Working Paper No. 11047.

Griever, William, Gary Lee and Frank Warnock, 2001. *The US System for Measuring Cross-Border Investment in Securities: A Primer with a Discussion of Recent Developments*, Federal Reserve Bulletin, 87, 633-650.

Gourinchas, Pierre-Olivier and Olivier Jeanne, 2006. *The Elusive Gains from International Financial Integration,* Review of Economic Studies 73(3), July 2006.

Hausmann, Ricardo and Eduardo Fernández-Arias, 2000, *Foreign Direct Investment: Good Cholesterol?* Inter-American Development Bank Research Department Working Paper No. 416.

Heathcote, Jonathan and Fabrizio Perri, 2002. *Financial Globalization and Real Regionalization*, NBER Working Paper No. 9292.

Hellwig, Christian and Guido Lorenzoni, 2006. *Bubbles and Self-Enforcing Debt,* NBER Working Papers: 12614.

Imbs, Jean, 2004. *Trade, Finance, Specialization and Synchronization*, Review of Economics and Statistics, 86, 723-734.

Imbs, Jean, 2005. *Is There a Quantity Puzzle Within Countries: An Application Using U.S. and Canadian Data*, Bank of Canada's Thirteenth Annual Monetary Policy Conference Volume. Lawrence Schembri Ed.

Imbs, Jean, 2006. *The Real Effects of Financial Integration*, Journal of International Economics, March 2006, 68(2).

Kalemli-Ozcan, Sebnem, Bent Sorensen and Oved Yosha, 2001. *Economic Integration, Industrial Specialization and the Asymmetry of Macroeconomic Fluctuations*, Journal of International Economics, 55, 107-137.

Kalemli-Ozcan, Sebnem, Bent Sorensen and Oved Yosha, 2003. *Risk Sharing and Industrial Specialization: Regional and International Evidence*, American Economic Review, 93.

Kaminsky, Graciela, and Sergio Schmukler, 2003. *Short-Run Pain, Long-Run Gain: The Effects of Financial Liberalization*, IMF Working Paper No. 34.

Kehoe, Patrick and Fabrizio Perri, 2002. *International Business Cycles with Endogenously Incomplete Markets*, Econometrica, May.

Kho, Bong-Chan, René M. Stulz and Francis E. Warnock, 2006. *Financial Globalization, Governance, and the Evolution of the Home Bias*, NBER Working Paper No. 12389, July 2006.

Kose, Ayhan and Kei-Mu Yi, 2002. *The Trade Co-Movement Problem in International Macroeconomics*, New York Federal Reserve Staff Paper No. 155.

Kose, Ayhan, Eswar Prasad and Marco Terrones, 2003. *How Does Globalization Affect the Synchronization of Business Cycles?*, American Economic Review Papers and Proceedings, 93, 57-62

Kraay, Aart et al 2004

Lane, Philip and Gian Maria Milesi-Ferretti, 2004. *International Investment Patterns,* Institute for International Integration Studies (IIIS) Discussion Paper No. 24, June 2004.

Lane, Philip, 2001. *Do International Investment Income Flows Smooth Income?*, Weltwirtschaftliches Archiv 137(4), 714-736.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny, 1998. *Law and Finance*, Journal of Political Economy, 106(6), 1113-1155.

Lewis, Karen, 1996. *What Can Explain the Apparent Lack of International Consumption Risk-Sharing?*, Journal of Political Economy, 104, 267-297.

Lewis, Karen, 1997. *Are Countries with Official International Restrictions "Liquidity Constrained"?*, European Economic Review, 41, 1070-1109.

Lewis, Karen, 1999. *Trying to Explain Home Bias in Equities and Consumption*, Journal of Economic Literature, 36, 571-608.

Obstfeld, Maurice, 1994. *Risk-Sharing, Global Diversification and Growth*, American Economic Review, 84, 1310-1329.

Portes, Richard, Hélène Rey and Yonghyup Oh, 2001. *Information and Capital Flows: The Determinants of Transactions in Financial Assets*, European Economic Review 45, 783–96.

Portes, Richard and Hélène Rey, 2005. *The determinants of cross-border equity flows,* Journal of International Economics 65, 269 – 296.

Quinn, Dennis, 1997. *The Correlates of Change in International Financial Regulation*, American Political Science Review, 91, September, 531-551.

Rajan, Raghuram and Luigi Zingales, 1998. *Financial Dependence and Growth*, American Economic Review, vol 88, 559-586.

Razin, Assaf, Efraim Sadka and Chi-Wa Yuen, 1998. *A pecking order of capital flows and international tax principles*, Journal of International Economics 44, 45 – 68.

Spolaore and Wacziarg, 2005.

Stockman, Alan and Linda Tesar, 1995. *Tastes and Technology in a Two-Country Model of the Business Cycle: Explaining International Co-Movements*, American Economic Review, 85, 168-185.

Tesar, Linda, 1993. *International Risk Sharing and Non-Traded Goods*, Journal of International Economics, 35, 69-89.

Razin, Assaf, Efraim Sadka, and Chi-Wa Yuen, 1998. *A Pecking-Order of Capital Inflows and International Tax Principles*, Journal of International Economics 44(1), 45–68.

Wei, Shang-Jin, 2000, *How Taxing Is Corruption on International Investors?* Review of Economics and Statistics 82(1), 1–11.

Wei, Shang-Jin, 2006.

Appendix A: Country sample

Emerging Market Economies		Mature Economies	
Argentina	Malta	Australia	Japan
Chile	Mauritius	Austria	Netherlands
Colombia	Mexico	Canada	New Zealand
Costa Rica	Pakistan	Denmark	Norway
Cyprus	Philippines	Finland	Portugal
Egypt	Poland	France	Spain
Hong Kong	Singapore	Germany	Sweden
Hungary	South Africa	Greece	Switzerland
Indonesia	Uruguay	Iceland	United Kingdom
Israel	Venezuela	Ireland	United States
Korea		Italy	

Appendix B: Variable definitions and sources

Variable definition:	Source:
Bilateral FDI stocks – FDI asset holdings of source country *i* in host country *j* in million US dollar	UNCTAD
Bilateral portfolio equity and portfolio debt stocks – average 2001-2003 holdings of source country *i* in host country *j* in million US dollar	Coordinated Portfolio Investment Survey (CPIS), IMF
Bilateral loans – aggregate assets and liabilities of banks in reporting countries vis-à-vis banking and non-banking institutions in host countries	International Locational Banking Statistics (ILB), BIS
Distance – log bilateral great circle distance in miles between economic centers of source country and host country	Andy Rose's website
Common language – dummy equal to one if both countries speak the same language and zero otherwise	Andy Rose's website; CIA World Factbook
Property rights – index that goes from 0 to 5, with higher values representing bad protection of property rights	Heritage Foundation
Expropriation risk – index goes from 0 to 10, with high values = low risk	ICRG – PRS
Repudiation risk – index goes from 0 to 10, with high values = low risk	ICRG – PRS
Days of enforcement –the time of dispute resolution—in calendar days—counted from the moment the plaintiff files the lawsuit in court until settlement or payment.	World Bank – Doing Business Database
WDR corruption – index goes from 1 to 8, with higher values indicating higher levels of corruption	World Bank (Wei, 2000)
TI corruption – value of index goes from 0 to 10, with higher values indicating higher levels of corruption	Transparency International (Wei, 2000)

Table 1: Risk Sharing - Multilateral Approach

	All	De Jure		Total Capital Holdings	
		Closed	Open	Small	Large
Output	0.4536*	0.9877***	0.3735	0.9831***	0.0477
	(1.71)	(47.26)	(1.38)	(63.60)	(1.05)
Source Effects	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes
Obs.	1,385	395	750	703	682
	FDI Holdings		Portfolio Holdings		Loans Holdings	
	Small	Large	Small	Large	Small	Large
Output	0.4378	0.7172***	0.9833***	0.0491	0.9832***	0.0505
	(1.62)	(6.96)	(62.72)	(1.05)	(64.31)	(1.01)
Source Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	718	667	703	682	703	682
	FDI Share		Portfolio Share		Loans Share	
	Small	Large	Small	Large	Small	Large
Output	0.3634	0.9626***	0.9535***	0.3464	0.3544	0.9493***
	(1.34)	(22.61)	(30.25)	(1.28)	(1.30)	(28.29)
Source Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	714	671	725	660	697	688

Notes: The dependent variable is the cyclical component of consumption, and "Output" denotes the cyclical component of output. All regressions include Source and Year effects, and standard errors are clustered by Source country. "De Jure" reflects average financial openness in the Source economy as implied by the index compiled by Kaminsky and Schmukler (2003). "Holdings" are measured in proportion of Source country GDP, "Shares" are measured as a proportion of total holdings. All samples (except "De Jure") are split around the corresponding median value. A significant coefficient indicates lack of risk shar-

Table 2: Risk Sharing - Bilateral Approach: De Facto Measures

	All	Total Capital Holdings	
		Small	Large
Output	0.6127*** (8.40)	0.4381*** (4.18)	0.8623*** (19.09)
Pair Effects	Yes	Yes	Yes
Obs.	11,516	5,672	5,844

	FDI Allocation		Portfolio Allocation		Loans Allocation	
	Small	Large	Small	Large	Small	Large
Output	0.4418*** (4.19)	0.8527*** (17.89)	0.3328*** (3.06)	0.9171*** (37.31)	0.5053*** (5.20)	0.8351*** (14.42)
Pair Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	5,749	5,767	5,758	5,758	5,750	5,766

	FDI Share		Portfolio Share		Loans Share	
	Small	Large	Small	Large	Small	Large
Output	0.7186*** (8.40)	0.4468*** (3.69)	0.3397** (2.57)	0.7958*** (12.48)	0.7351*** (9.94)	0.3994*** (2.91)
Pair Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	5,725	5,791	5,729	5,787	5,753	5,763

ing.

Notes: The dependent variable is dY-dC, the difference between the international discrepancies in output and consumption. "Output" denotes the international discrepancies in GDP. The sample is reduced to OECD Source countries. All regressions include country-pair effects, and standard errors are clustered by country pairs as well. Total Capital Holdings denote the ratio of all asset holdings relative to source country GDP. "Allocations" are measured in proportion of total Source country holdings in the same asset class, "Shares" are measured as a proportion of total holdings. All samples are split around the corresponding median value. A significant coefficient indicates risk sharing.

Table 3: Risk Sharing - Bilateral Approach: Institutions

	Corruption	
	High	Low
Output	0.5129^{***}	0.8317^{***}
	(5.41)	(13.02)
Obs	5,874	6,476
	Repudiation	
	High Risk	Low Risk
Output	0.2817^{**}	0.9000^{***}
	(5.29)	(33.23)
Obs	4,123	7,393
	Property Rights	
	Poor	High
Output	0.5316^{***}	0.8257^{***}
	(5.76)	(11.89)
Obs	6,576	4,940

Notes: The Table reports estimates of γ in equation (2). All regressions include include country-pair effects, and standard errors are clustered by country pairs. . The sample is reduced to OECD Source countries, and de jure measures pertain to Host economies. Corruption is measured using the index computed by the World Development Report, high corruption means a value above 2.5. Repudiation risk is measured by the index computed by ICRG; high repudiation risk means a value below 9. Property Rights are measured using the index proposed by the Heritage Foundation; poor rights correspond to a value above 1.

Table 4: Differential Effects - Financial Openness

	Closed		Open	
	Low	High	Low	High
Enforcement	0.0869***	0.9112***	0.5311***	0.8970***
	(6.89)	(14.34)	(5.65)	(17.21)
Obs	1,149	941	4,329	2,901
	High Risk	Low Risk	High Risk	Low Risk
Repudiation	0.0694***	0.8937***	0.2335*	0.9148***
	(4.76)	(14.98)	(1.93)	(34.51)
Obs	871	1,779	1,894	5,336
	High Risk	Low Risk	High Risk	Low Risk
Expropriation	0.0898***	0.9207***	0.5108***	0.8504***
	(7.63)	(19.94)	(5.07)	(13.58)
Obs	1,271	1,379	2,381	4,849
	Poor	High	Poor	High
Property Rights	0.0612***	0.9107***	0.5568***	0.7735***
	(4.33)	(17.86)	(5.40)	(6.95)
Obs	787	1,443	3,414	3,497

Notes: The Table reports estimates of XXX in equation (XXX). All regressions include include country-pair effects, and standard errors are clustered by country pairs. . The sample is reduced to OECD Source countries, and de jure measures pertain to Host economies. Financial openness is given by the index compiled by Kaminsky and Schmukler (2003). Enforcement captures enforceability of contracts as implied by the index introduced by La Porta et al. (1998); low enforcement means a value below 8. Repudiation risk is measured by the index computed by ICRG; high repudiation risk means a value below 9. Expropriation risk is measured using the index computed by ICRG; high expropriation risk corresponds to a value below 10. Property Rights are measured using the index proposed by the Heritage Foundation; poor rights correspond to a value above 1.

Table 5: Differential Effects: Summary Statistics

	Closed	Open
Enforcement	7.453	6.702
	(1.391)	(1.734)
Obs	2,090	7,230
Repudiation	9.210	9.088
	(1.042)	(0.941)
Obs	2,650	7,230
Expropriation	9.500	9.584
	(0.727)	(0.740)
Obs	2,650	7,230
Property Rights	1.621	1.697
	(0.897)	(0.785)
Obs	2,230	6,911

Notes: The Table reports average values of institutional quality indexes across relevant sub-samples (and their standard deviation). The sample is reduced to OECD Source countries, financial openness is given by the index compiled by Kaminsky and Schmukler (2003). Enforcement captures enforceability of contracts as implied by the index introduced by La Porta et al. (1998); low enforcement means a value below 8. Repudiation risk is measured by the index computed by ICRG; high repudiation risk means a value below 9. Expropriation risk is measured using the index computed by ICRG; high expropriation risk corresponds to a value below 10. Property Rights are measured using the index proposed by the Heritage Foundation; poor rights correspond to a value above 1.

Table 6: International Allocation:

	FDI	FDI	FDI	FDI	Portfolio	Loans
Interaction				0.0147^{**} (2.11)	0.0095^{**} (2.43)	0.0070^{*} (1.79)
Financial Openness				-0.0529^{*} (−1.76)	-0.0302^{*} (−1.77)	−0.0152 (−0.99)
Corruption	-0.0116^{***} (−3.03)	−0.0012 (−0.32)	−0.0034 (−1.22)	-0.0149^{**} (−2.35)	-0.0094^{**} (−2.07)	-0.0104^{**} (−2.22)
Per Capita GDP		1.4283^{*} (1.77)	−0.3024 (−0.56)	−0.7478 (−1.01)	−0.4894 (−0.87)	−0.6797 (−1.46)
GDP			0.0239^{***} (6.82)	0.0263^{***} (9.01)	0.0320^{***} (17.26)	0.0190^{***} (11.87)
Distance			-0.0193^{***} (−4.13)	-0.0215^{***} (−3.98)	-0.0178^{***} (−3.69)	-0.0248^{***} (−3.91)
Language			0.0294^{***} (3.31)	0.0328^{***} (3.03)	0.0198 (1.63)	0.0206^{*} (1.82)
ER Regime			0.0008 (0.79)	0.0005 (0.48)	−0.0008 (−1.32)	0.0011 (1.53)
Source Effects	Yes	Yes	Yes	Yes	Yes	Yes
(Random) Host Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	877	784	709	631	631	631

Notes: The dependent variable is the share of one particular type of asset between Source and Host countries, relative to the corresponding aggregate held from the Source economy. Corruption is measured by the World Development Report index. Higher values indicate more corruption. Financial openness is captured by the index compiled by Kaminsky and Schmukler (2003). The sample is focused on OECD Source countries. Standard errors are clustered by Host country.

Table 7: Portfolio Shares:

	FDI	FDI	FDI	FDI	Portfolio	Loans
Interaction				0.0480^{*}	-0.0670^{**}	0.0185
				(1.87)	(−2.06)	(0.77)
Financial Openness				-0.1763^{**}	0.2277^{*}	−0.0495
				(−1.96)	(1.74)	(−0.54)
Corruption	0.0658^{***}	−0.0296	−0.0262	-0.0648^{**}	0.0795^{**}	−0.0137
	(4.83)	(−1.64)	(−1.63)	(−2.33)	(2.11)	(−0.54)
Per Capita GDP		-11.656^{***}	-10.415^{***}	-10.777^{***}	12.991^{***}	−2.0586
		(−5.65)	(−5.24)	(−3.63)	(3.30)	(−1.04)
GDP			−0.0093	−0.0011	0.0074	−0.0066
			(−0.78)	(−0.09)	(0.45)	(−0.96)
Distance			−0.0138	-0.0223^{**}	0.0700^{***}	-0.0456^{***}
			(−1.18)	(−2.11)	(4.69)	(−4.55)
Language			0.0662^{**}	0.0603^{**}	−0.0182	-0.0410^{*}
			(2.47)	(2.27)	(−0.47)	(−1.95)
ER Regime			0.0055	0.0040	−0.0105	0.0065^{*}
			(1.18)	(0.77)	(−1.60)	(1.67)
Source Effects	Yes	Yes	Yes	Yes	Yes	Yes
(Random) Host Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	877	784	709	631	631	631

Notes: The dependent variable is the ratio of one particular type of asset relative to total bilateral holdings between Source and Host countries, as given by the sum of FDI, Loan, Equity and Bond Holdings. Corruption is measured by the World Development Report index. Higher values indicate more corruption. Financial openness is captured by the index compiled by Kaminsky and Schmukler (2003). The sample is focused on OECD Source countries. Standard errors are clustered by Host country.

Table 8: What Corruption

	Allocation			Shares		
	FDI	Portfolio	Loans	FDI	Portfolio	Loans
	Repudiation of Government Contracts (ICRG) - High Value, Low Risk					
Interaction	−0.0216*** (−2.90)	−0.0075 (−1.64)	−0.0075* (−1.81)	−0.0868*** (−3.25)	0.1018*** (3.14)	−0.0157 (−0.69)
Openness	0.1867*** (3.04)	0.0683* (1.85)	0.0745** (2.12)	0.7311*** (3.01)	−0.8626*** (−3.09)	0.1387 (0.72)
Institution	0.0044 (1.02)	0.039 (1.16)	0.0040 (0.96)	0.0464* (1.91)	−0.0211 (−0.59)	−0.0240 (−1.00)
	Expropriation Risk (ICRG) - High Value, Low Risk					
Interaction	−0.0230** (−2.11)	−0.0074 (−1.18)	−0.0070 (−1.20)	−0.1022* (−1.86)	0.1350** (2.09)	−0.0330 (−0.86)
Openness	0.2132** (2.16)	0.0723 (1.31)	0.0749 (1.39)	0.9299* (1.77)	−1.2372** (−2.01)	0.3102 (0.87)
Institution	0.0073 (1.19)	0.0015 (0.35)	−0.0009 (−0.16)	0.0528 (0.92)	0.0222 (0.46)	−0.0730* (1.78)
	Enforcement of Property Rights (Heritage Foundation) - High Value, Low Enforcement					
Interaction	0.0161*** (2.84)	0.0086** (2.01)	0.0069 (1.55)	0.0224 (0.66)	−0.0215 (−0.41)	−0.0004 (−0.01)
Openness	−0.0257** (1.96)	−0.0090 (−0.81)	−0.0029 (−0.25)	−0.0419 (−0.54)	0.0473 (0.38)	−0.0066 (−0.09)
Institution	−0.0098** (−1.99)	−0.0085** (−2.29)	−0.0036 (−0.77)	−0.0272 (−0.75)	0.0208 (0.45)	0.0060 (0.20)
	Quality of Regulatory Environment (La Porta et al) - High Value, High Quality					
Interaction	−5.0213** (−2.36)	−3.8888*** (−3.24)	−1.9514 (1.60)	−2.9200 (−0.32)	−4.1270 (−0.36)	7.4330 (0.94)
Openness	0.0130* (1.93)	0.0266*** (2.96)	0.0150** (2.53)	−0.0142 (−0.26)	0.0250 (0.36)	−0.0127 (−0.29)
Institution	5.8288*** (2.72)	4.2538*** (3.28)	2.3701* (1.93)	6.3129 (0.73)	4.9485 (0.49)	−11.679* (1.67)

Notes: All regressions include Source fixed effects, Host random effects and the same battery of controls in Tables 1 and 2 (per capita GDP, GDP, distance, common language and exchange rate regime). The "Allocation" category corresponds to regressions where the dependent variable is the share of one particular type of asset between Source and Host countries, relative to the corresponding aggregate held from the Source economy. The "Share" category corresponds to regressions where the dependent variable is given by the ratio of one particular type of asset relative to the total bilateral holdings between Source and Host countries, as given by the sum of FDI, Loan, Equity and Bond Holdings. Financial openness is captured by the index compiled by Kaminsky and Schmukler (2003). The sample is focused on OECD Source countries. Standard errors are clustered by Host country.

Figure 1: De facto openness, risk sharing and institutions – some examples