Fotopoulos, Georgios; Louri, Helen

Conference Paper

On the Geography of International Banking: a case for spatial econometrics?

50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy", 19-23 August 2010, Jönköping, Sweden

Provided in Cooperation with:

European Regional Science Association (ERSA)

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Georgios Fotopoulos

University of Peloponnese, Department of Economics, Greece,

Bank of Greece, visiting scholar

gfotop@uop.gr

Helen Louri

Bank of Greece,

Athens University of Economics & Business, Department of Economics.

ELouri@bankofgreece.gr

Abstract: The aim of this study is to examine the determinants of international banking. In doing so, it utilizes data from the Bank of International Settlements (BIS) on banks' foreign claims. A review of the literature on international banking and finance would suggest that international banking and finance, and trade and FDI are all intertwined. The second most striking conclusion is, however, that all these activities are geographically confined as far as the significant role of distance is concerned. Banks, in particular, seem to be deterred by distance and to extend not too from their home markets. Geography seems to be important and might even be more significant than the effect of distance on its own would suggest. If spatial dependency is present, then "indirect effects" or financial spillovers might be operating in a fashion that subsequently connects countries beyond those immediately involved in borrowing and lending relationships with each other. Evidence on positive spatial autocorrelation is provided for banks' foreign claims under alternative spatial weights schemes and the geographical aspects of international banking are further explored by a spatial autoregressive gravity model. The results obtained support that spatial lag is just as important as the "indirect effects", thus suggesting significant financial spillovers. Apart from the GDP of origin and destination countries, cultural similarity, in-phase business cycles and lower political risk in the recipient country all positively affect international banking. In contrast,

international banking is hindered by the distance between countries and higher bilateral exchange rate volatility.

Keywords: international banking, financial spillovers, spatial econometrics

1. Introduction

The aim of this study is to examine the determinants of international banking. Although the empirical investigation of the determinants of international banking is interesting in its own right, the main distinguishing feature of the present study is its emphasis on the geographical aspects of international banking. These will be explored by the means of testing for spatial autocorrelation in an initial exploratory data analysis level before moving on to econometric analysis using spatial autoregressive regression (SAR) models.

To the best of our knowledge there is no other study that tries to assess the role of geography as an essentially multidirectional factor. This is in definite contrast to the treatment of geography as a one-dimensional feature through distance. The norm has been to use distance as an inverse information-proximity proxy. However, the prominent role of distance–as it has been revealed in studies examining aspects of international banking and finance as well as (interrelated) aspects of international economics—has been a major motivation for the present study. Determinants of foreign claims will be searched for in two strands of the economics literature. The first strand explores the determinants of what might be broadly termed as “international banking and finance activities” whereas the second regards the determinants of bank expansion in foreign markets. The difference between the strands is that the latter uses less aggregated data than the former and often utilizes data seeking to define determinants at the individual bank level.

The proposed study also differs from other studies using Bank of International Settlements (BIS) consolidated statistics on banks' foreign claims in terms of its country and time coverage. The study is organized as follows: in Section 2 the role of geography in an international banking context is discussed, whereas in Section 3 the use of spatial econometrics techniques for the analysis of the role of geography in international banking is discussed in light of recent progress in analyses of foreign direct investment. The determinants of international banking are further discussed in Section 4 providing additional justification for the approach followed by the present research.

Spatial dependency in international banking in a context of spatial interaction data is explored in Section 5. In penultimate Section 6, spatial econometrics methods used are presented and the estimation results are discussed. Section 7 offers some concluding remarks.

2. Why Geography?

2.1 Geography I: The Role of Distance in International Banking and Finance activities

A number of studies examine the determinants of international banking and finance activities in conjunction with other facets of economic integration as foreign direct investment (FDI) and trade. Distance as a one-dimensional expression of geography has emerged as a significant factor in a number of related research contexts.

Buch (2005) provides evidence for the continued importance of distance as a determinant of international banking. This is taken as a manifestation of the importance of information costs that has not diminished despite technological progress in banking (Berger and Young, 2006). Portes et al (2001) study international transaction in financial assets using a gravity model and find that there is a strong negative effect between asset trade and distance. Portes and Rey (2005) explore a panel data set on bilateral gross cross-border equity flows between 14 countries in the 1989–1996 period. Commenting on the negative effect on distance, they maintain that "*we view our empirical work as strong evidence that there is a very important geographical component in international asset flows. International capital markets are not frictionless: they are segmented by informational asymmetries or familiarity effects"* (p. 271). In Buch (2004), information costs are proxied by geographical distance as well as by variables capturing cultural similarity (common language, common legal system) and found to be the main factor segmenting international financial markets. Lane and Milesi-Feretti (2008) study international investment patterns (bilateral portfolio equity holdings) and find that these are—to a great extent—determined by bilateral trade in goods and services as well as by proxies of informational proximity. The location of a country greatly determines its access to international financial markets, while its remoteness can hinder its development prospects (Wolf and Ghosh, 2000). Indeed, according to Papaioannou's (2009) findings, distance together with poorly performing institutions may explain why banking capital flows are not directed from rich to poor countries.

In a very interesting recent study, Sarisoy Guerin (2006), maintaining that theoretical and empirical work on the effects of geography in international finance is limited, explores the role of geography

in three aspects of economic integration, namely foreign direct investment, trade, and portfolio investment flows. The evidence produced suggests that geographical factors have a significant role in explaining the spatial allocation of all three and that the significance of geographical variables on financial flows hold even after controlling for the macroeconomic fundamentals.

As pointed out by Wolf and Ghosh (2000), one of the most prominent stylized facts regards the effect of distance on trade and, as it is well known that FDI and trade reinforce each other, it would not be unreasonable to expect financial links to depend on FDI and trade. Serge and Micu (2002) examining the determinants of international bank lending to Asian and Latin American countries, find bilateral trade between lending and borrowing countries to be a significant explanatory factor. This, according to these authors, suggests that a strong trading relationship encourages lending through a reduction in informational costs. Voinea and Mihaescu (2006), who study the determinants of foreign bank activity (foreign claims) in South East Europe, find a significant role for trade and (less so) for FDI, but not for distance. In contrast, Heuchemer et al (2008), focusing on European cross-border banking, find that distance and borders together with cultural differences and different legal origins are important for financial integration.

2.2. Geography II: the role of distance on Bank International Expansion

This section briefly reviews distance as an emerging prominent factor in studies set to answer why banks expand and where they expand abroad.

Follow your client (or defensive expansion)*:* According to this theory *"the growth in multinational banking is due to foreign direct investment abroad by corporations. Banks respond to the expansion of their clients abroad to defend their client-bank relationship. If the banks do not accompany their client abroad, the client will establish a banking relationship that could expand to supplant any domestic banking relationships… This expansion may not be aimed at generating profits in the new location, but is instead considered...as aimed at preventing losses in some pre-existing activity"* (Williams, 1997, p. 86). As FDI is spatially moderated the same might be expected of bank expansion following this motive.

In their study of the determinants of U.S. banking activity abroad, Goldberg and Johnson (1990) find that both trade and FDI are important factors affecting the expansion of U.S. banks abroad. On the other hand way around, Gross and Goldberg (1991) find foreign bank activity in the U.S. to be positively associated with the parent country's trade with U.S. and its FDI in the U.S.

Brealey and Kaplanis (1996) extend the literature by considering the location of overseas bank offices across 37 parent and 82 host countries and producing evidence that reveals a significant relationship between the pattern of bank location, trade and FDI. Similar evidence has also been produced for German banks (Buch, 2000). Focarelli and Pozzolo (2005), exploring a sample of 260 major banks of OECD countries, provide explicit evidence suggesting that banks are less likely to expand in distant foreign countries.

One of the modes in which banks accomplish foreign expansion is through cross-border mergers and acquisitions (M&A). Here there is evidence that suggests that distance (together with cultural integration and regulation) is a significant determinant (Buch and Delong, 2004; Focarelli and Pozzolo, 2008).

2.3. Geography III: Geography and Financial Contagion, Regional Feedback and Spillover effects

Curry et al. (1998) maintain that "adverse economic events in one nation may spill over to, and compound problems for, that nation's trading partner(s) [which, in turn] influence the ability of borrowers in these nations to repay loans to foreign creditors". From a financial geographer's point-of-view (Wojcik, 2009), the role of geography in financial crises has not been given the attention it deserves.

However, the role of the banking system in financial contagion has been the subject of a recent wave of research. A channel for the transmission of shocks, through the banking system, is that of international lending. this, as it was shown earlier, is geographically confined. As explained by Sbracia and Zaghini (2003), if a bank has been lending to firms in a country in crisis and the resulting increase in non-performing loans affects its value at risk, then in order to meet binding capital adequacy constraints, capital may need to be withdrawn from other countries. This is often called *common lender effect* and reflects a situation where two countries (A and B) borrow from a third country (C). If a crisis hits A, then C faces defaults on its loans to A and—as a reaction to meet its constraints— it withdraws capital from B. The authors develop a number of indices measuring a country's exposure to risk through the common lender effects. These indices have been taken on by Avrai et al (2009) who analyze regional financial interlinkages and contagion in Europe as the identification of regional spillovers has been a priority for the IMF's surveillance work. In the literature on contagion there has been evidence for the regional component and efforts have made to spatially model the contagion (Kelejian et al. 2006).

In van Rijckeghem and Weder (2001), a measure for the competition for funds from a common lender is constructed and evidence is provided in support of the role of spillovers, through the common lender effects, when transmitting crises. Sbracia and Zaghini (2003) point out that "the common lender might have had a better knowledge of the borrowers' economies, given their past relationship or because of geographical proximity". In van Rijckeghem and Weder (2003), their main finding is that spillovers caused by the exposure of banks to a crisis country help predict flows in third countries. In a somewhat related context, Dahl and Logan (2007) study bank-specific data on overdue loans of UK banks to borrows in 17 borrowing countries and obtain results that indicating how repayment in one country is affected by exports to—and economic activity in—other countries linked through trading relationships.

As both international lending and international trade are spatially confined, the aforementioned discussion has profound geographical implications.

3. Why Spatial Econometrics?

Spatial analysis deals with non independent observations in the sense that values observed in one location (region, country) depend on values of neighboring observations at nearby locations. This phenomenon called spatial dependence "is determined by a notion of relative space or relative location, which emphasizes the effect of distance" (Anselin, 1988 p. 8). Spatial dependence is the source of spatial autocorrelation, a concept somewhat analogous to autocorrelation in time-series analysis. It should be emphasized, however, that spatial autocorrelation is "primarily a result of the multidirectional nature of dependence in space, which, as opposed to a clear one-directional situation in time, precludes the application of may simplifying results and necessitates the use of a different methodological framework" (ibid. p.9). Spatial autocorrelation may be positive or negative.

Geography seems to be the driving force that gets international trade, FDI and international banking and finance intertwined as "location drives trade, which in turn drives FDI and financial integration" (Wolf and Ghosh, 2000). In international trade literature, spatial dependency has been modeled in a context of gravity model (see next section) by Porojan (2001) who draws attention to the fact that the spatial econometrics estimation of the gravity model changes the perspective on results reported in the literature.

More recently there has been a number of studies on FDI that rely on spatial econometrics as they opt to examine whether FDI flows between two countries are affected by flows to third countries (Abreau and Melendez 2006; Baltagi et al 2007; Blonigen et al 2007; Garretsen and Peeters 2008; Hall and Petroulas 2008). "Third-country" effects appear to be significant and such spatial econometric explorations draw motivation from recent development in the theory of multinationals (Yeaple 2003, Ekholm et al 2007) where 'complex multinationals' can produce intermediate inputs in different countries and export to them in third countries or where multinational firms choose to locate in one country and from there to export to a third country ('export platform'). These studies deal with one origin and multiple destinations (FDI host countries), the exceptions being Abreau and Melendez (2006) and Petroulas and Hall (2008) who have multiple origin and destinations. Note however that the treatment of spatial dependency differs in these studies

To the best of our knowledge a spatial econometrics approach has not been applied to the analysis of international banking activities. The role of geography in international banking and finance activities, trade and (non-banking) FDI as well as the intertwining of the latter three has motivated our effort.

The BIS data on foreign claims allow us to have data on 30 reporting countries and a multiple of host countries. Data as such qualify as spatial interaction data and what is relevant in terms of spatial dependency is the relation between dyads of countries (regions) in space. Each dyad refers to a country origin-destination pair and its relation to other dyads is of interest. This adds some possibilities in the ways in which distance between dyads of countries can be modeled. The relevant distance might be between the destinations of the dyads considered (especially when the pairs have the same origin), in this case the spatial dependency is said to be destination driven. Alternatively, spatial dependency may be modeled as origin driven. Here the relevant distance between country pairs is that which exists between their origins (especially when pairs have the same destination). It is, however, possible apart from those *direct distance* effects, to additionally include *cross-distance* (see Bolduc et al 1992) effects in the sense that the relevant distance might be that which exists between one pair's origin and another's destination. As noted by LeSage and Pace (2008), in the case of origin-destination flows, "neighboring regions include neighbors to the origin, neighbors to the destination, and perhaps a link between neighbors of the origin and

neighbors of the destination region". Fischer and Griffith (2008) point out that "while a voluminous literature exists for spatial autocorrelation with a focus of interest on the specification and estimation of models for cross-sectional attribute data, there is scant attention paid to its counterpart in spatial interaction data". Notable exceptions are the work of Brandsma and Ketellapper (1979), Griffith and Jones (1980), Bolduc et al (2002), and, more recently, the work of LeSage and Pace (2008) and Fisher and Griffith (2008). From the recent FDI papers including multiple origin and destinations countries, the above mentioned possibilities are explored only in Abreau and Melendez (2006).

Griffith and Jones (1980, p. 190) suggest that flows from an origin are "enhanced or diminished in accordance with the propensity of the emissiveness of its neighboring origin locations." They also state that flows associated with a destination are "enhanced or diminished in accordance with the propensity of attractiveness of its neighboring destination locations."

In terms of our variable, exploring spatial dependency in the ways described above may be seen in the context of competing destinations where countries compete for capital flows from the same origin (destination driven spatial dependency) and are thus subject to common lender effects in the advent of crisis in one of them. Or it may be the case that spatial dependency relates to competing origins (banking systems) over the same destination financial market within an--as seen before--geographically confined range. Finding evidence on spatial dependency crucially depends on the way in which spatial dependency is formulated.

In modeling spatial dependence within the context of an econometric model the analysis will first resort to the so called spatial autoregressive model in the context of spatial interaction data (LeSage and Pace, 2008). [1] The spatial lag model is given our consideration as we are primarily interested in financial spillovers. A spatial lag of the variable of interest is constructed with the assistance of a spatial weights matrix using an average of values from neighboring regions. As noted by LeSage and Pace (2009, p. 19) in models containing spatial lags the partial derivative

[1] Spatial error models (spatial dependency is hypothesized to reside in the error term) in a context of spatial interaction data have been used in Bolduc et al (1992), in Abreau and Melendez (2006), and in Fischer and Griffith (2008).

interpretation of the estimated coefficient no longer holds. The operation of spatial lags allows for cross partial derivatives where change in the jth observation (location, country or region) of the kth explanatory variable has an impact on the change of the ith observation of the dependent variable. The existences of the cross partial derivatives produces indirect of spillover effects that accompany direct effects.

In our case this could mean that changes in the economy fundamentals of another origin (*BIS* reporting country), or host (destination country) affect the foreign claims in a particular origin destination pair. In this sense, spatial dependency modeled in this manner would offer valuable information about the changes in the magnitude of foreign claims that are expected in a particular country pair due to changes in the magnitude of the explanatory variables in other locations (origins or destinations).

4. Determinants of International Banking: two strands of literature

Our research on the possible determinants of international banking as it is here proxied by foreign claims draws on two related strands of literature. The first strand of literature explores the determinants of what might be broadly termed as "international banking and finance activities" whereas the second relates to the determinants of bank expansion in foreign market. The latter strand uses less aggregate data than the former and often utilizes data seeking to define determinants at the individual bank level.

Starting first from the second strand of literature, according to Focarelli and Pozzolo (2005) three are the major factors explaining bank internationalization: economic integration, institutional characteristics, and profit opportunities.

Bank internationalization is closely related to integration between the parent (where the bank headquarters are located) and the host country (the location of a bank's foreign affiliates). Integration is not only related to economic aspects such as bilateral trade and FDI flows (Goldberg and Johnson 1990; Brealey and Kaplanis, 1996; Buch 2000; Focarelli and Pozzolo, 2005) but also to non-economic aspects such as linguistic and cultural proximity (Focarelli and Pozzolo, 2005). Institutional environment and regulatory restrictions (Buch, 2000; Buch, 2003; Focarelli and Pozzolo, 2005; Buch and Lipponer, 2007) are also important. According to these authors, the most important factor is the existence of profit opportunities. The latter relates in turn to bank-specific characteristics, characteristics of the country of origin, and characteristics of the host (destination)

country. The size of a bank seems to be one its most important characteristics in relation to its internationalization. This is because a larger bank may have larger and more internationalized customers so the "follow your client" motive discussed earlier becomes relevant. The larger bank may have a stronger need for the international diversification of its activities in order to take advantage of the asynchronous fluctuations in loans and deposits. A bank's growth opportunities in a foreign country are usually proxied by that country's GDP (Goldberg and Johnson 1990; Brealey and Kaplanis, 1996; Buch 2000). However, according to Focarelli and Pozzolo (2005) this use of GDP may problematic on the grounds that bank profits are more likely to be lower in more developed countries, when at the same time—in an economic convergence context—countries that are poorer may grow faster than their wealthier counterparts. Bank profitability may also be related to a country's growth prospects and not to its current level of development. Thus, it is assumed that countries with lower initial output, lower inflation and higher levels of schooling and more developed financial markets are more likely to have faster future growth prospects. The characteristics of the banking sector of host countries are also relevant (concentration, efficiency and profitability proxies). Buch and Lipponer (2007) include a composite host country risk variable and Buch (2000) adds exchange rate volatility as a proxy of risk involved.

Grosse and Goldberg (1991) are interested in the characteristics of parent countries in determining the foreign expansion of banks. These country characteristics relate to foreign direct investment and portfolio investment emanating from the parent country and are directed towards the host country (U.S. in their research), bilateral imports and exports, whereas they hypothesize further that the larger the host country's financial sector the more foreign banking is attracted to that country. Relative country risk is also taken into account.

The role of distance has been also accounted for in this strand of literature (Grosse and Goldberg, 1991; Focarelli and Pozzolo, 2005; Buch and Lipponer, 2007; Focarelli and Pozzolo, 2008). However, as the role of distance in international banking and finance has been extensively discussed earlier, it does not concern us here.

The major modeling vehicle in the first strand of literature is that of the gravity model. This has been widely used in empirical studies in international trade. It is a simple model that explains the size of international trade between countries and has a remarkably consistent history of success. Based on Newton's theory, the core form of the gravity model predicts that the bilateral trade of

two countries is positively related to the product of their GDP and negatively related to the distance between them. Economic theory justification and related empirical evidence has been put forward by Anderson (1979), Anderson and Van Wincoop (2002) and Bergstrand (1985). Gravity models belong to the family of spatial interaction models dealt with in regional science (see Fotheringham and O'Kelly, 1989)

In two influential papers, Portes et al (2001) and Portes and Rey (2005) argue that the gravity model does as a good job in explaining international transactions in financial assets (equities, corporate and government bonds) as well as for international trade. In their basic gravity model formulation, the place of mass variables in both origin and destination is taken by market capitalization variables. These are accompanied by a distance measure in order to complete the basic formulation. The latter is augmented by the inclusion of control variables such financial market sophistication in the origin country, a covariance measure of stock returns in the pair countries, telephone call traffic between the countries involved, and the degree of insider trading in the destination country's stock market. Ghosh and Wolf (2000) estimate gravity models to account for trade and four types of capital flow (FDI, bank lending, portfolio debt, and portfolio equity) between G7 countries and a number of recipient counties. Their gravity formulations—apart from mass and distance—include variables capturing common language and border (adjacency) and more interestingly a remoteness variable that is a GDP weighted average distance of a country to the G7.

More relevant to the proposed research is the study of international banking by Buch (2005). Buch emphasizes on the role of distance and uses BIS data on assets and liabilities on five reporting countries (France, Germany, Italy, UK, and US) in 50 host countries for the years 1983-1999. Apart from GDP in both origin and destination countries and the distance between them, other variables include the correlation of GDP growth rates of the countries in origin-destination country pair, and the exchange rate volatility to capture possible portfolio considerations as they relate to diversification and risk respectively. The existence of major financial centre and capital controls are also taken into consideration. In Papaioannou (2009), BIS data on assets and liabilities for 19 reporting countries and 50-140 recipient countries were used in an augmented gravity model that focused on the quality of institutions in the recipient and various type of risks associated with them (political, financial, repudiation of contracts by governments, risk of expropriation of private

investment). Other controls included population density, average years of schooling, life expectancy and legal system origin. The findings of this paper highlight the importance of institutions in determining international financial flows. Heuchemer et al (2008) share a similar focus with Papaioannou (2009) as they are particularly interested on the effect of political but also cultural factors on cross-border banking, having, however, a much limited geographical coverage, that of Europe. Thus, apart from the mass and distance variables of the basic gravity formulation, a plethora of variables relating to cultural and political features are included (common legal family, common language, political risk, control of corruption, government effectiveness, political stability and absence of violence, rule of law, voice and accountability coming primarily from World Bank datasets). It is interesting to note that this study uses indices of financial development in both origin and destination countries such as credit to the private sector as percentage of GDP, market share of foreign banks, deposit insurance coverage in euro and per depositor, and variables based on Euclidean distance measuring similarity in credit to the private sector and foreign bank shares between paired countries.

Voinea and Mihaescu (2006) use, as a dependent variable, foreign claims as reported by BIS and focus in claims of 12 reporting countries in South-East European and Central-East European countries (Bulgaria, Croatia, Romania, Serbia and Montenegro, Czech Republic, Hungary, Poland, Slovakia, Slovenia, Russia, Ukraine, Cyprus and Turkey). In their augmented gravity model the authors include trade, FDI, real interest rate differentials between reporting and recipient country as well a corruption index for recipient countries. As trade and interest rate differentials were found to be significant in all alternative formulations it is argued that foreign banks follow their customers and exploit profit opportunities.

5. Spatial autocorrelation in international banking activity

Having reviewed the relevant literature on international banking and finance the first conclusion that can be drawn is that international banking and finance on the one hand and trade and FDI on the other are all intertwined. The second most striking conclusion is that all these activities are geographically confined as far as the significant role of distance makes it clear. Banks in particular do not seem to extend too far from their home markets. Geography seems to be important and might be even more significant than the effect of distance. The novelty of this study is to explore and model possible spatial dependencies in bank foreign claims data. If spatial dependency is

present, and there are strong indications in the literature that this might be the case, accounting for it would reveal possible indirect channels in which borrowing from and lending to foreign countries through international banking might be affecting the risks that the banking system of a country is exposed to. The keyword here is “indirect effects” or financial spillovers that might be operating in a fashion that subsequently connects countries beyond those immediately involved in borrowing and lending relationships with each other.

In analyzing international banking the present study utilizes data from the Bank of International Settlements (BIS). In particular, the primal variable of interest is drawn from BIS Consolidated Statistics (see BIS 2008 for a detailed description and McGuire and Wooldridge 2005 for a discussion of structure and uses of this data set) and is defined as the sum of “international claims” (cross border claims & local claims of foreign affiliates in foreign currencies) plus “local claims in local currency” of bank foreign affiliates (branches and subsidiaries). This sum is called “foreign claims” and inter-office positions are netted out. Whereas cross-border claims may be extended outside of the recipient (i.e. host countries), local claims in both foreign and local currency of bank foreign affiliates involve some form of banking foreign direct investment (Herrero and Martinez Peria, 2007). The way in which a bank’s foreign claims are financed is according to McCaule et al (2002) the feature that distinguishes an international from a global bank. An international bank relies on funds raised in its domestic market in order to finance its foreign claims, whereas a global bank uses funds raised in foreign markets. Herrero and Martinez Peria (2007) provide evidence that countries with a higher share of local foreign claims experience lower total foreign claims volatility.

The BIS Consolidated Statistics data pertain to foreign claims of banks residing in each of the reporting countries (26 reporting countries have been used here-see Appendix) and on residents of a multiple of host (or recipient) countries. The group of reporting countries is a subset of the host countries. However, this data source does not report any liabilities but other than those of foreign affiliates in local currency.

Spatial autocorrelation deals simultaneously with both locational and attribute data information. As Goodchild (1986, p.4) aptly describes it "If features which are similar in location also tend to be similar in attributes, then the pattern as a whole is said to show positive spatial autocorrelation. Conversely, negative spatial autocorrelation exists when features which are close together in space

tend to be more dissimilar in attributes than features which are further apart. An finally the case of zero autocorrelation occurs when attributes are independent of location".

The Moran measure of spatial autocorrelation (Moran, 1948) is positive when nearby areas tend to be also similar in attributes, negative when nearby locations tend to be dissimilar in attributes, and zero when attribute values are arranged independently and randomly in space.

$$I = \sum_{ij} w_{ij} z_{ij} \Big/ s^2 \sum_{ij} w_{ij}$$

where N is the number of spatial units, $s^2 = \left(x_i - \bar{x}\right)^2 \Big/ N$, $z_{ij} = \left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)$, w_{ij} is an element of a spatial weights matrix. If the spatial weights matrix is row standardized, $\sum_i w_{ij} = 1$,then $\sum_{ij} w_{ij} = N$

Here a distance based row standardized spatial weights matrix is used where d_{ij}^{-2} is a typical element if $i \neq j$ and zero otherwise. Distances are taken from CEPII (see Mayer and Zignago, 2006).

Moran's I has been calculated and its statistical significance was assessed under the permutation assumption(see Cliff and Ord, 1983 pp. 63-65). Under this assumption each value is taken to be equally observable at any location. Instead of using a reference distribution for the theoretical mean and standard deviation of Moran's I these are calculated empirically by permuting the values over all locations.[2]

The BIS Foreign Claims data refer to pairs of countries. There are actually 26 reporting countries (where claims originate) and 178 partner countries (fund destinations). The set of countries of origin is a subset of the destination countries set. Since an alternative restricted version of the dataset regarding the composition was also used consisting of 135 countries, Moran's I is reported for both cases. The lists of countries are provided in an appendix. In case where the data refer to pairs of locations(countries in our case), spatial autocorrelation is defined between dyads (country pairs). This creates some possibilities as to which is the relevant. That is, the relevant distance might be between the destinations of country pairs having a common country of origin, or it might

[2] The calculation of Moran's I relevant moments under the permutation assumption was performed by using Bivand's spdep package in R.

be the case that the relevant distance is between countries of origin in pairs having a common destination.

In case the relevant distance is between destinations of dyads with common origin then the spatial weights matrix is a block diagonal $W_d = I_O \otimes W_D$ provided that the data are arranged first by country of origin and then by destination, that is destination is the "faster" index. where I_O is an identity matrix the dimensions of which is given by the number of countries of origin (*O*) and W_D is a row standardized of dimension *D* (number of destination countries) spatial weights matrix based on distances between destination countries. In case that the relevant distance is that between countries of origin in dyads sharing the same destination country $W_o = W_O \otimes I_D$. Such possibilities have been early discussed in the regional science literature on spatial autocorrelation in spatial interaction models (see Brandsma and Keyellapper, 1979; Griffith and Jones 1980).

The typical element of W_D is $w_d(i, j; r, s) = \begin{cases} d_{js}^{-2} \text{ if } i = r \text{ and } j \neq s \\ 0 \text{ otherwise} \end{cases}$. Likewise a typical element of W_O is

$$w_o(i, j; r, s) = \begin{cases} d_{ir}^{-2} \text{ if } j = s \text{ and } i \neq r \\ 0 \text{ otherwise} \end{cases}$$

Let us consider for example a case of 2 countries of origin and 3 countries of destination. Then the origin-centric arrangement of the data becomes:

dyad ID	*origin* ID	*destination* ID
1	1	1
2	1	2
3	1	3
4	2	1
5	2	2
6	2	3

In this example spatial autocorrelation is defined among dyads and since there are six of them the relevant spatial weight matrices become:

$$W_D = \begin{bmatrix} 0 & d(1,2) \\ d(2,1) & 0 \end{bmatrix}, \text{ and } W_o = W_O \otimes I_D = \begin{bmatrix} 0 & 0 & 0 & d(1,2) & 0 & 0 \\ 0 & 0 & 0 & 0 & d(1,2) & 0 \\ 0 & 0 & 0 & 0 & 0 & d(1,2) \\ d(2,1) & 0 & 0 & 0 & 0 & 0 \\ 0 & d(2,1) & 0 & 0 & 0 & 0 \\ 0 & 0 & d(2,1) & 0 & 0 & 0 \end{bmatrix}$$

$$W_O = \begin{bmatrix} 0 & d(1,2) & d(1,3) \\ d(2,1) & 0 & d(2,3) \\ d(3,1) & d(3,2) & 0 \end{bmatrix}, \text{and}$$

$$W_d = I_O \otimes W_D = \begin{bmatrix} 0 & d(1,2) & d(1,3) & 0 & 0 & 0 \\ d(2,1) & 0 & d(2,3) & 0 & 0 & 0 \\ d(3,1) & d(3,2) & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & d(1,2) & d(1,3) \\ 0 & 0 & 0 & d(2,1) & 0 & d(2,3) \\ 0 & 0 & 0 & d(3,1) & d(3,2) & 0 \end{bmatrix}$$

Apart from the matter of selecting the relevant distance concept, the issue of appropriately accounting for relevant size of foreign claims is also an issue. Using levels of foreign claims data it may become the case that foreign claims are greater between larger countries. Whereas in the gravity model used in the next section this is dealt with by using appropriate right hand side variables, in the exploratory stage here there are two options. One is to divide all claims originating from a country by the originating country total, that is $fc_{ij} \Big/ \sum_j fc_{ij}$ (where *fc* stands for foreign claims). The other is of course to divide all claims raised against a destination country by this country's total foreign liabilities (as opposed to claims), that is $fc_{ij} \Big/ \sum_i fc_{ij}$

The results presented in Table 1 provide evidence for positive spatial autocorrelation in all years considered. The spatial autocorrelation parameter is however larger when the like concepts are used for both normalization of foreign claims and the spatial weight matrix. That is, when normalization by origin total is used together ($fc_{ij} \Big/ \sum_j fc_{ij}$) with origin based spatial weights (W_o), and when normalization by destination total is used along with destination based spatial weights (W_d). Using origin-based normalization with destination-based spatial weights also produces significant but quite smaller Moran's I statistics, whereas the reverse has produced insignificant results. All in all spatial

dependence is evident in foreign claims data and the research proceeds in accounting for spatial autocorrelation in a Spatial-Lag Gravity Model of international banking in the next section.

Table 1: Spatial Autocorrelation in International Banking: Moran's I

		Foreign Claims		Spatial Weights Matrix		Number of Countries
year	Moran's I	$fc_{ij} \Big/ \sum_j fc_{ij}$	$fc_{ij} \Big/ \sum_i fc_{ij}$	W_o	W_d	
2004	0.5415***	√		√		178
2006	0.4897***	√		√		178
2008	0.4431***	√		√		178
2004	0.4088***		√		√	178
2006	0.3589***		√		√	178
2008	0.3748***		√		√	178
2004	0.1019***	√			√	178
2006	0.0952***	√			√	178
2008	0.1056***	√			√	178
2004	0.5357***	√		√		135
2006	0.4837***	√		√		135
2008	0.4355***	√		√		135
2004	0.4394***		√		√	135
2006	0.4237***		√		√	135
2008	0.4045***		√		√	135
2004	0.0965***	√			√	135

2006	0.0908***	√			√	135
2008	0.1017***	√			√	135

*** significant at 1% based on pseudo p-values (see Cliff and Ord, 1981, pp. 63-65) using 1000 permutations

6. A Spatial-Lag Gravity Model for Banking Foreign Claims

The spatial lag model may be described as:

$$y = \rho W y + X\beta + \varepsilon$$

$$y = (I_n - \rho W)^{-1} X\beta + (I_n - \rho W)^{-1}\varepsilon$$

$$\varepsilon \sim N(0, \sigma^2 I_n)$$

The main attraction of the spatial autoregressive model is that it offers itself for analyzing spatial spillovers and hence also financial spillovers. The data generating process of the SAR model can be written as (LeSage and Pace, 2009, p. 18) as

$$y = \sum_{k=1}^{h} S_k(W) X_k + (I_n - \rho W)^{-1}\varepsilon$$

where *k* denotes explanatory variable *k.*

The dependent's variable expectation is given by $E(y) = \sum_{k=1}^{h} S_k(W) X_k$, where $S_k(W) = (I_{OD} - \rho W)^{-1}\beta_k$

For two distinct observations *l* and *m* $\frac{\partial E(y_l)}{\partial X_{mk}} = S_k(W)_{lm}$, where $S_k(W)_{lm}$ represents the lmth element of the $S_k(W)$ matrix. It follows in the case of the SAR model the usual interpretation of the regression coefficients such as $\hat{\beta}_k = \partial y / \partial X_k$. For the SAR model the impact of a change in an explanatory variable varies over differ locations and the partial derivatives become of interest: $\partial y_l / \partial X_{lk}$ (own partial derivative) and the cross-derivative $\partial y_l / \partial X_{mk}$ $(l \neq m)$ that measures the impact on y_l from changes in the observation *m* of the explanatory variable *k.*

LeSage and Pace (2009, pp. 36-39) offer definitions and formulas for the calculation of direct, total and indirect effects: a) the own derivative $\frac{\partial y_l}{\partial X_{lk}} = S_k(W)_{ll}$ measures the impact on the dependent variable observation l from a change in X_{lk}. As noted by LeSage and Pace this impact also includes feedback loops where observation l affects observation m and the latter affect back observation l. The average of these impacts, called *average direct impact*, is given by $\frac{1}{n} tr(S_k(W))$ and represents the average response of the dependent variable to a change in the *kth* independent variable over the sample observations (XXX check); b) Average Total Impact to an observation: this is essentially the lth row sum of $S_k(W)$ and represents the total impact on the dependent variable observation y_l by changing all observations of the *kth* independent variable by the same amount. If $c_k = S_k(W)\iota_n$ is the column vector of the n such row sums then the average of these total impacts is $\frac{1}{n}\iota'_n c_k$ and ι_n is a n by one vector of ones; c) average total impact to an observation: this is essentially the sum of the mth column of $S_k(W)$ and represents the total impact *over all* y_l resulting from changing the mth observation of the *kth* explanatory variable. If $r_k = \iota'_n S_k(W)$ is the row vector of n of such sums then an average of these total impacts is $\frac{1}{n} r_k \iota_n$. Note, however that these average total impacts are equal since $\frac{1}{n}\iota'_n c_k = \frac{1}{n}\iota'_n S_k(W)\iota_n = \frac{1}{n} r_k \iota_n$.

From the above the average total, average direct and average indirect impacts may be summarized as follows:

$$\bar{I}(k)_{direct} = \frac{1}{n} tr(S_k(W))$$

$$\bar{I}(k)_{total} = \frac{1}{n}\iota'_n S_k(W)\iota_n$$

$$\bar{I}(k)_{indirect} = \bar{I}(k)_{total} - \bar{I}(k)_{direct}$$

At this point is worth noting that the estimated coefficient by be different from the average direct impact is feedback effects, as previously described, are present. The difference might positive,

indicating positive feedback loop, or negative indicating a negative feedback loop (see LeSage and Pace, 2009 p. 71).

The SAR model log-likelihood function is:

$$\ln L = -(n/2)\ln(\pi\sigma^2) + \ln|I_n - \rho W| - \frac{e'e}{2\sigma^2}$$

$e = y - \rho Wy - X\beta$, $\rho \in \left(\min(\phi)^{-1}, \max(\phi)^{-1}\right)$, where ϕ_n is the eigenvalue vector of W. Further operational issues in the implementation of the model can be found in Anselin (1988, pp. 180-186) and in LeSage and Pace (2009, pp. 46-50).

Our econometric exploration of the determinants of foreign claims employs a gravity model that closely resembles that used by Buch (2005) and to a lesser extent that used by Papaioannou (2009):

$$\ln((fc) = \beta_0 + \beta_1 \ln(GDP\_origin) + \beta_2 \ln(GDP\_destination) + \beta_3 \ln(distance) + \beta_4 growth\_correlation + \\ + \beta_5 Common\_language + \beta_6 volatility + \beta_7 Political\_risk + \varepsilon$$

The logarithmic transformation of the dependent variable in the presence of zero values was made possible by adding the value of one to all observations before taking logs. The variables of GDP for both the origin (reporting) and destination (recipient) countries as well as the distance between them are standard gravity type variables. The GDP data used here come from the IMF IFS database whereas distance and common language come from CEPII databases. The *growth_correlation* refers to GDP growth correlation between the origin and destination countries over a decade before 2006, the year of estimation. For GDP growth correlation the data used come from the latest version of Penn World Tables(PTW). The same source of data was used for calculating exchange rate volatility of bilateral exchange rate between the origin and destination countries. As pointed by Buch (2005) if banks' activities were motivated by portfolio considerations both growth rate correlation and exchange rate volatility should have a negative impact on foreign claims. The inclusion of the variable political risk has also been used by Papaioannou (2009) under the name of institutional quality. The data come from Political Risk Services (PRS) and is essentially a composite variable that takes into account factors such as: government stability, socioeconomic stability. investment profile, internal conflict, external conflict, corruption, military involvement in politics, religion involvement in politics, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. It is worth emphasizing that the larger the value of this index the lower a

country's political risk is. This explained, the effect of this variable is expected to be positive. The results of the maximum likelihood estimation results of the spatial autoregressive model is presented in the Table 2 below.

The standard gravity variables (GDP of origin and destination, distance) have the anticipated signs and they are all statistically significant. Thus both the economic size of the countries in the pairs considered and the distance that separates them are all important determinants of international banking. These results are in line with earlier results in the relative literature. The positive effect of growth rates correlation has also been found in Buch (2005) and Portes and Rey (2001). This suggests that banks expand in countries with in-phase business cycles implying that portfolio considerations might not be that important. On the other hand exchange rate volatility appears to be a significant impediment to international banking. In contrast, cultural similarity as captured by the same official language appears to be an important positive influence on international banking. These variables behave similarly in both samples. Data availability allows the use of political risk only for a smaller set of countries (135). Lower political is associated with higher international banking activity.

What is more important here and distinguishes the present study from earlier is that the spatial lag coefficient is positive, sizeable (about 0.50) and statistically significant. This suggests that the effect of geography on international banking is a multidirectional. Indirect effects account for more than 90 percent of the direct effects and almost 50% of the total effects signifying that international banking spillovers are sizeable. Moreover, the direct effect is larger in magnitude in comparison to the corresponding estimated coefficient reflecting some positive feedbacks.

Finally the results between the two samples appear to be quite comparable, although some differences in coefficient magnitude do exist.

Table 2. Maximum likelihood estimation of Spatial Autoregressive Model (t-ratios in parentheses)								
		178 countries			135 countries			
variable	**Coefficient**	**total**	**direct**	**Indirect**	**Coefficient**	**total**	**direct**	**Indirect**
Constant	-0.1811 (-0.4427)				-5.9106*** (-8.1528)			
GDP origin	0.4739*** (20.0421)	0.9649*** (19.3818)	0.4990*** (19.7219)	0.4659*** (19.3818)	0.5550*** (20.8249)	1.1237*** (20.3959)	0.5850*** (20.5718)	0.5387*** (20.1094)
GDP destination	0.9984*** (58.7637)	2.0342*** (56.0465)	1.0519*** (75.5538)	0.9823*** (53.1871)	0.9251*** (41.6694)	1.8749*** (40.9066)	0.9761*** (41.7271)	0.8988*** (9.3045)
Distance	-0.5646*** (-13.4890)	-1.1506*** (-13.6734)	-0.5950*** (-13.7026)	-0.5556*** (-13.6176)	-0.5876*** (-13.1918)	-1.1898*** (-12.9266)	-0.6195*** (-12.8374)	-0.5703*** (-12.8374)
Growth correlation	0.3511*** (3.3257)	0.7178*** (3.3329)	0.3712*** (3.3335)	0.3466*** (3.33204)	0.5428*** (9.5234)	1.0934*** (5.09474)	0.5693*** (5.0981)	0.5241*** (5.0894)
Common language	1.1296*** (11.4136)	2.3066*** (10.8623)	1.1928*** (10.8509)	1.1138*** (10.8632)	1.1064*** (9.5234)	2.2427*** (9.5831)	1.1676*** (9.5903)	1.0751*** (9.5646)
Volatility	-0.5333*** (-8.6577)	-1.0863*** (-8.8794)	-0.5617*** (-8.8864)	-0.5246*** (-8.8657)	-0.2253*** (-2.6136)	-0.4459 (-2.5908)	-0.2322 (-2.5908)	-0.2137*** (-2.5906)
Institutional quality					1.7874*** (9.6985)	3.6256*** (9.7467)	1.8876*** (9.7581)	1.7380*** (9.7203)
ρ	0.5090*** (320.2833)				0.5060*** (280.8516)			
No. Obs.	4602				3484			
Log-likelihood	-8797				-6600			
R^2	0.6068				0.6101			

*** significant at the 1% level

6. 1 The Zero Claims Problem: A Spatially Autoregressive Tobit Model

One of the possible drawbacks of the previous models in the present application context is that it ignores the consequences that the fraction of zero claims (almost 34% in the smaller sample) might have on estimated model coefficients (downward bias). On somewhat theoretical grounds zero foreign claims between countries might result from international banking costs exceeding some threshold value.

A latent variable presentation of the Spatial Autoregressive Tobit model is given below assuming that censoring occurs at zero (n_1 censored observations) and y_2 is denoting a $n_2 \times 1$ vector of non-censored observations

$$y^* = (I_n - \rho W)^{-1} X\beta + (I_n - \rho W)^{-1} \varepsilon$$

$$y^* = \begin{cases} y_1^* \text{ if } y^* \le 0 \\ y_2 \text{ otherwise} \end{cases}$$

For estimating the spatially autoregressive spatial Tobit model the Bayesian Markov Chain Monte Carlo (MCMC) methods detailed in LeSage and Pace (2009, pp. 299-302) were used.[3]

The relevant model vectors and matrices can be partitioned as follows

$$y^* = \begin{pmatrix} y_1^* \\ y_2 \end{pmatrix},\ W = \begin{pmatrix} W_{11} & W_{12} \\ W_{21} & W_{22} \end{pmatrix},\ X = \begin{pmatrix} X_1 \\ X_2 \end{pmatrix}$$

where subscripts $(1,1),(2,2),(2,1),(2,1)$ denote matrix dimensions of $(n_1 \times n_1),(n_2 \times n_2),(n_1 \times n_2),(n_2 \times n_1)$ respectively. The conditional posterior distribution of n_1 censored observation is assumed to follow a truncated multivariate normal distribution (TMVN), $y_1^* \sim TMVN(\mu_1^*, \Psi_{1,1}^*)$ with mean and variance-covariance

$$\mu_1^* = E\left(y_1^* \middle| y_2, X, W, \beta, \rho, \sigma_\varepsilon^2\right) = \mu_1 - \Sigma_{1,1}^{-1}\Sigma_{1,2}(y_2 - \mu_2)$$

$$\Psi_{1,1}^* = \text{var} - \text{cov}\left(y_1^* \middle| y_2, X, W, \beta, \rho, \sigma_\varepsilon^2\right) = \Psi_{1,1} + (\Sigma_{1,1})^{-1}\Sigma_{1,2}\Psi_{2,1}$$

where

[3] Implementation of these methods was facilitated by using LeSage's Spatial Econometrics Toolbox in Matlab.

$$\Psi_{1,1} = \sigma_{\varepsilon}^{2}\left[\left(I_n - \rho W\right)'\left(I_n - \rho W\right)\right]^{-1}$$

$$\Sigma = \Psi^{-1}$$

$$\mu_1 = \left(I_n - \rho W\right)_{1,1}^{-1} X_1 \beta$$

$$\mu_2 = \left(I_n - \rho W\right)_{2,2}^{-1} X_2 \beta$$

Using MCMC requires sequential sampling from the conditional distribution of model parameters β, ρ, σ^2 as well as the conditional distribution for the zero-valued observations, the latter being essentially treated as additional estimable parameters. Further details on the practical issues regarding the implementation of MCMC Bayesian estimation of spatial Tobit can be found in LeSage and Pace (2009, pp. 299-305). Table 3 presents the results of the estimation of the spatial Tobit. based on 10,000 draws.

As it was anticipated the estimated coefficients of the spatial Tobit are in all cases larger than those of the corresponding estimated my maximum likelihood model. Once again the results suggest positive and significant spatial dependence, sizeable financial spillovers (as suggested by magnitude of the indirect effects), and positive feedback as the direct effect is larger in absolute value when compared with corresponding model coefficient.

Table 3. Bayesian Estimation of Spatial Autoregressive Tobit Model (Std. Deviation in Parentheses)				
	135 countries			
variable	**Coefficient**	**total**	**direct**	**Indirect**
Constant	-5.8754*** (0.7326)			
GDP origin	0.5645*** (0.03177)	1.1248	0.5939	0.5309
GDP destination	0.9284*** (0.0230)	1.8500	0.9768	0.8732
Distance	-0.6005*** (0.0510)	-1.1964	-0.6317	-0.5647
Growth correlation	0.5443*** (0.1054)	1.0848	0.5727	0.5121
Common language	1.1075*** (0.1161)	2.2065	1.1650	1.0415
Volatility	-0.2324*** (0.0880)	-0.4630	-0.2445	-0.2185
Institutional quality	1.7970*** (0.18464)	3.5802	1.8905	1.6897
ρ	0.4977*** (0.01569)			
No. of. Obs.	3484			
No. of censored obs.	1171			
*** significant at the 1% level based on the proportion of draws>0 or <0 depending on the sign of the corresponding coefficient				

7. Conclusions

In reviewing the literature on international banking and finance it becomes evident that international banking and finance, international trade, and FDI are all intertwined. The second most striking finding is that all these activities are geographically confined as far as the significant role of distance is concerned. These findings as well as recent developments in empirical literature of FDI making use of spatial econometrics have motivated the present research.

Spatial dependency in international banking has, for the first time, become systematically evident in the results of the present study revealing significant "indirect effects" or financial spillovers. Further research should elaborate on spatial dependency in international banking and take financial spillovers into consideration in an attempt to better understand the mechanisms of financial crisis transmissions in addition to possibly developing suitable financial- spillovers based surveillance indices.

Confirming the results of earlier studies, the "economic mass" of origin and destination countries, cultural similarity, in-phase business cycles and lower political risk in the recipient country all positively affect international banking. In contrast, international banking is hindered by great distances between countries and higher bilateral exchange rate volatility.

Appendix

Table A1. BIS Reporting Countries

Australia	Denmark	Italy
Austria	Spain	Japan
Belgium	France	Luxembourg
Brazil	United Kingdom	Netherlands
Canada	Greece	Panama
Switzerland	Hong Kong SAR	Portugal
Chile	India	Sweden
Germany	Ireland	Turkey
		Taiwan Province of China
		United States

Table A2. Large Sample Countries

Afghanistan, Rep. of.	Gambia	Niger
Albania	Georgia	Nigeria
Algeria	Germany	Norway
Angola	Ghana	Oman
Argentina	Greece	Pakistan
Armenia	Grenada	Panama
Australia	Guatemala	Papua New Guinea
Austria	Guinea	Paraguay
Azerbaijan	Guinea-Bissau	Peru
Bahamas, The	Guyana	Philippines
Bahrain	Haiti	Poland
Bangladesh	Honduras	Portugal
Barbados	Hong Kong SAR	Qatar
Belarus	Hungary	Romania
Belgium	Iceland	Russia
Belize	India	Rwanda
Benin	Indonesia	Samoa
Bhutan	Iran, Islamic Republic of	Sγo Tomι and Prvncipe
Bolivia	Iraq	Saudi Arabia
Bosnia and Herzegovina	Ireland	Senegal
Botswana	Israel	Seychelles
Brazil	Italy	Sierra Leone
Brunei Darussalam	Jamaica	Singapore
Bulgaria	Japan	Slovak Republic

Burkina Faso	Jordan	Slovenia
Burundi	Kazakhstan	Solomon Islands
Cambodia	Kenya	South Africa
Cameroon	Kiribati	Spain
Canada	Korea	Sri Lanka
Cape Verde	Kuwait	St. Lucia
Central African Republic	Kyrgyz Republic	St. Vincent and the Grenadines
Chad	Lao People's Democratic Republic	Sudan
Chile	Latvia	Suriname
China	Lebanon	Swaziland
Colombia	Lesotho	Sweden
Comoros	Liberia	Switzerland
Congo, Democratic Republic of	Libya	Syrian Arab Republic
Congo, Republic of	Lithuania	Taiwan Province of China
Costa Rica	Luxembourg	Tajikistan
Cтte d'Ivoire	Macedonia, Former Yugoslav Republic of	Tanzania
Croatia	Madagascar	Thailand
Cyprus	Malaysia	Togo
Czech Republic	Maldives	Tonga
Denmark	Mali	Trinidad and Tobago
Djibouti	Malta	Tunisia
Dominica	Mauritania	Turkey
Dominican Republic	Mauritius	Turkmenistan
Ecuador	Mexico	Uganda
Egypt	Moldova	Ukraine
El Salvador	Mongolia	United Arab Emirates
Equatorial Guinea	Morocco	United Kingdom
Eritrea	Mozambique	United States
Estonia	Myanmar	Uruguay
Ethiopia	Namibia	Uzbekistan
Fiji	Nepal	Vanuatu
Finland	Netherlands	Venezuela
France	New Zealand	Vietnam
Gabon	Nicaragua	Yemen, Republic of
		Serbia
		Zambia
		Zimbabwe

Table A3. Small Sample Countries

Australia	Denmark	Italy	New Zealand	Ukraine
Angola	Dominican Republic	Jamaica	Oman	Uruguay
Albania	Algeria	Jordan	Pakistan	United States
UAE	Ecuador	Japan	Panama	Venezuela

Argentina	Egypt	Kazakstan	Peru	Vietnam
Armenia	Spain	Kenya	Philippines	Yemen
Austria	Estonia	South Korea	Papua New Guinea	Serbia & Montenegro
Azerbaijan	Ethiopia	Kuwait	Poland	South Africa
Belgium	Finland	Lebanon	Portugal	Congo, DR
Burkina Faso	France	Liberia	Paraguay	Zambia
Bangladesh	Gabon	Libya	Qatar	Zimbabwe
Bulgaria	United Kingdom	Sudan	Romania	
Bahrain	Ghana	Lithuania	Russia	
Bahamas	Guinea	Luxembourg	Saudi Arabia	
Belarus	Gambia	Latvia	Senegal	
Bolivia	Guinea-Bissau	Morocco	Singapore	
Brazil	Greece	Moldova	Sierra Leone	
Brunei	Guatemala	Mexico	El Salvador	
Botswana	Guyana	Mali	Suriname	
Canada	Hong Kong	Malta	Slovakia	
Switzerland	Honduras	Myanmar	Slovenia	
Chile	Croatia	Mongolia	Sweden	
China	Haiti	Mozambique	Syria	
Cote d'Ivoire	Hungary	Malawi	Thailand	
Cameroon	Indonesia	Malaysia	Togo	
Congo	India	Namibia	Trinidad & Tobago	
Colombia	Ireland	Niger	Tunisia	
Costa Rica	Iran	Nigeria	Turkey	
Cyprus	Iraq	Nicaragua	Taiwan	
Czech Republic	Iceland	Netherlands	Tanzania	
Germany	Israel	Norway	Uganda	

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