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Duesternbrooker Weg 120
24105 Kiel (Germany)

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# Are Banks Different? Evidence from International Data

**by**

**Claudia M. Buch**

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# Evidence from International Data*

Abstract:

Pecking order models of international finance suggest that countries should become less reliant on international bank lending as they develop. Reduced information costs are one of the factors behind this trend towards disintermediation. This paper presents a simple model on the choice between bank debt and bond finance which builds on Rajan (1992), and it uses two new datasets to test the implications, focusing on bilateral cross-border bank claims and bond holdings. We find support for the hypothesis that the state of development of an economy lowers the share of bank finance. However, evidence on the importance of variables which more directly measure information costs is less clear-cut.

Keywords: international bank lending, international portfolio investment
JEL-classification: F3

Dr. Claudia M. Buch
Kiel Fellow at the NBER
c/o National Bureau of Economic Research
1050 Massachussetts Avenue
Cambridge, MA
Phone: + 617 868 3900
Fax: + 617 868 2742
E-mail: cbuch@nber.org

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# 1 Motivation

The structure of international capital flows has been the topic of a number of recent theoretical and empirical contributions in international economics. On a theoretical level, the pecking order theory of financial structure has been applied to an international setting (Razin et al. 1998, Hull and Tesar 2000). These models conclude that the share of bank finance can be expected to fall over the course of economic developments. Empirical research has stressed differences in information costs underlying bank debt and bond finance (Eichengreen and Mody 1999) as well as implications of factors such as trade openness, financial sector development, and the degree of economic development for external financial structures (Lane and Milesi-Ferretti 2000).

This purpose of the present paper is to complement earlier evidence on the structure of international asset holdings in two regards. *First*, it uses a model by Rajan (1992) to analyze the determinants of bank lending versus bond finance. In contrast to Rajan, we assume that firms can raise bonds and bank loans simultaneously from (international) capital markets but have to pay a spread over international interest rates. *Second*, the paper assesses the determinants of banking assets and portfolio debt investments empirically, making use of two novel datasets. One are the statistics of the Bank for International Settlements (BIS) on cross-border asset holdings of commercial banks which recently include also claims on banks *within* the BIS reporting area. The second is the recently published Portfolio Investment Survey of the International Monetary Fund (IMF). These data allow, inter alia, an analysis of the importance of intra-EU asset holdings and of the distance between creditor and debtor country on international asset holdings on the basis of bilateral data.

The structure of the paper is as follows. Section 2 presents a short survey of the theoretical literature on the structure of international capital flows, focusing in particular on the factors driving the share of bank lending versus bond finance. Section 3 presents estimates of the determinants of these two types of asset holdings. Section 4 concludes and summarizes the main results.

# 2 The Choice Between Bank Lending and Portfolio Investment

Generally, determinants of international capital flows are related to the determinants of financial structures in a closed economy. In an international context, however, additional factors need to be taken into account:[1]

- Domestic investors tend to be better informed about local investment conditions than their foreign counterparts.[2]
- Institutional structures differ across countries.
- Property rights are more difficult to enforce internationally than in a national context.[3]
- Exchange rate risks affect international but not domestic investment decisions.

Incidentally, most of these factors are affected by the state of development of an economy. As an economy grows and increasingly integrates into international markets, investors will become better informed. Institutions might converge to a certain extent to internationally accepted standards, and risks, such as exchange rate risks and, particularly, the risk of repudiation are likely to decline. All this can be expected to affect the structure of international capital flows.

Because of the wide variety of factors driving international capital flows, a theoretical framework which is able to explain the entire structure of external finance is largely lacking. While one strand of the literature has focused mainly on the choice between debt and equity (Chen and Khan 1997, Schnitzer 1997), recent contributions have used an asymmetric information framework to model a "pecking order" of international capital flows. According to the original pecking order theory developed in a national context (Myers 1984, Myers and Majluf 1984), firms tend to prefer internal finance. Should external finance become necessary, the safest securities are issued first, i.e. firms start by raising bank loans, then move to bond finance, and place new equity as a last resort only. Applied to an international context, this would imply that the share of bank finance declines as countries develop. Razin et al. (1998), however, stress the special role of FDI in the sense that FDI removes information barriers for foreign investors and that it allows access to superior management skills of the foreigners. As countries develop, information asymmetries are potentially reduced, and imports of technology become less important, hence this advantage of FDI

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1 See Hermalin and Rose (1999) for similar conclusions.

2 Empirical evidence which supports the view that information costs in international financial markets are important and that domestic investors might be better informed is given in Brennan and Cao (1997), Frankel and Schmukler (1996), Portes and Rey (2000), or Kim and Wei (1999).

3 See Fernandez-Arias (1996) and Schnitzer (1997).

tends to become less relevant. The choice between bank debt and bond finance, to the contrary, is not modeled explicitly.

This choice is taken up in Bolton and Freixas (2000) who show that the reliance on bank finance increases whereas the share of portfolio finance declines in the riskiness of firms.[4] The reason for this preference for bank finance for risky firms is that, by assumption, bank loans are easier to restructure than bonds. One of the implications of this model is that, to the extent that projects undertaken in less-developed countries tend to be riskier than projects undertaken by developed countries, the share of bank lending would fall and that of portfolio investment would increase over the course of economic development.

In the following, we use a model by Rajan (1992) with asymmetries information between managers and investors to show the trade off between bank debt and bond finance. In order to focus on information costs, we abstract from other factors affecting international investment decisions such as exchange rate risks. Since we are considering debt finance only, however, this restriction might not seem very relevant. We are, however, capturing differences in institutions across countries in the sense that we assume that foreign investors require a mark-up over international interest rates which is likely to depend on the state of development of the domestic financial system. If, for instance, markets for bonds are relatively developed, if there is a large number of domestic bonds outstanding, and if therefore markets are relatively liquid, bond spreads will tend to be low. Conversely, a low degree of development of the domestic banking system will imply a relatively high spread over the international lending rate.

A three-stage investment process is considered:

$t = 0$: Firms invest $K$ and exert effort $b$.

$t = 1$: The type of the project is revealed. With probability $q$ $(1 - q)$, the project is good (bad). The project can be continued or liquidated at a liquidation value $L$. The probability of success depends both on the effort extended and on an exogenous quality parameter $(q)$ : $q = b^{a} q^{1-a}$ with $0 < a < 1$ and thus $\frac{\partial q}{\partial b} > 0, \frac{\partial q}{\partial q} > 0, \frac{\partial^2 q}{\partial b \partial b} < 0$.

$t = 2$: Project returns are realized. Good projects yield a positive return $X$ with certainty while bad projects return zero with a positive probability $(1 - p_B)$. Returns rank as follows: $X > K \geq L > p_B X$ .

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4 Hull and Tesar (2000) use the same framework to model international investment decisions.

The first-best solution to this investment problem is to close down bad firms, to realize the liquidation value, and to continue operations with good firms only. The expected surplus in this scenario is:

(1) $$PV = q(b,q)(X-K)+[1-q(b,q)](L-K)-b$$

which is optimized at an effort level $b^*$ for which $\frac{\partial q}{\partial b}=\frac{1}{X-L}>0$ and $\frac{\partial^2 q}{\partial b \partial b}<0$ holds.

The difference between bank loans and bond finance is that banks gain access to the firm's books after they extend loans and can thus observe effort and the type of project once revealed. Other outside lenders, in contrast, remain uninformed. This assumption could be motivated by the fact that monitoring costs are high for multiple (arm's length) lenders as opposed to a single bank. Also, we assume that project outcomes cannot be verified ex post through, for instance, court proceedings.

In order to show the trade-off between bank lending and bond finance, Rajan analyzes the borrower's choice of effort under pure bond and loan financing. Because non-bank lenders cannot observe returns after one period, they cannot condition contract terms on project outcomes. Hence, a single contract which specifies a repayment of $(r_B^* + c_B)K_B$ after two periods is offered where $r_B^*$ is the international bond rate, $c_B$ is the mark-up domestic firms have to pay, and $K_B$ is the amount of bond finance raised. For a positive probability of the bad state, effort is less than optimal because some projects are continued in the bad state.

In contrast to arm's length lenders, banks learn about the type of the project after one period. When the good state is reached, continuation is optimal. In the bad state, however, the bank has an incentive to renegotiate with the firm whether to liquidate the project. The surplus over which renegotiation takes place is given by $L - p_B X$ . Depending on his bargaining power $m$, the owner of the project receives the amount specified by the original contract plus his share in the surplus.

Essentially, there is thus a trade-off between ex ante and ex post efficiency.[5] Ex ante, before the project has been started, the incentive system should be such that managers exert optimal effort to increase project outcomes and to reduce the probability that the bad state occurs. This can be achieved most efficiently by granting firms the residual payoff of the project and thus through a high share of bond finance. Since banks are able to extract returns from the firm, high shares of bank finance would diminish incentives to exert effort. Ex post, after returns have been realized, the incentive system should be designed such as to prevent continuation of bad projects. This, in turn, can be achieved best through bank finance because banks are able to monitor and control the firm

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5 I am grateful to Ralph Heinrich for making this point explicit.

and to prevent inefficient continuation of bad projects. Obviously then, if the effort extended has little impact on project returns and/or if the liquidation value is large relative to the return in the bad state, the advantages of bank finance are limited. In addition, if the bargaining power of firms vis-à-vis banks is weak, firms prefer bond finance.

The impact of changes in the exogenous parameters on the financial structure of a given firm finance can be shown by assuming that the representative firm can raise bond and bank finance at the same time. Hence, its profits are given by:

$$\begin{aligned}(2)\qquad \Pi = {} & q\left[X-\left(r_B^*+c_B\right)K_B-\left(r_L^*+c_L\right)K_L\right]+ \\ & (1-q)\left[p_B\left(X-\left(r_B^*+c_B\right)K_B-\left(r_L^*+c_L\right)K_L\right)+\mu\left(L-p_BX+(1-p_B)\left(r_B^*+c_B\right)K_B\right)\right]-\beta\end{aligned}$$

Notice that we assume that domestic firms also have to pay a mark-up over the international lending rate $r_L^*$ by the amount of $c_L$.

If the bad state of the world is reached, the amount over which bank and firm negotiate depends on the seniority of bonds and loans. In order to simplify the analysis, we consider only the case in which the liquidation value is sufficiently large to pay out bond holders. Otherwise, the bank and the firm would be indifferent whether to liquidate or to continue the project. If we furthermore assume that bonds are senior to loans, the surplus from liquidation over continuation becomes:

$$L-\left(r_B^*+c_B\right)K_B-p_B\left(X-\left(r_B^*+c_B\right)K_B\right)=L-p_BX+(1-p_B)\left(r_B^*+c_B\right)K_B.$$

By denoting the share of bank finance by $\gamma$, noting that $K=K_L+K_B=\gamma K+(1-\gamma)K$, and re-arranging terms one obtains:

$$\begin{aligned}(2')\qquad \Pi = {} & q\left[X-\left(r_B^*+c_B\right)(1-\gamma)K-\left(r_L^*+c_L\right)\gamma K\right]+ \\ & \left[q+(1-q)p_B\right]X-\left[(1-q)p_B+\mu(1-p_B)\right]\left(r_B^*+c_B\right)(1-\gamma)K \\ & -(1-q)p_B\left(r_L^*+c_L\right)\gamma K+\mu(1-q)L-\beta\end{aligned}$$

Profits are maximized by choosing the optimal level of effort and the optimal share of bank debt according to the following first-order conditions:

$$\begin{aligned}\frac{\partial\Pi}{\partial\beta} = {} & -1+\alpha\beta^{-1+\alpha}q^{1-\alpha}\left[X-K\left(c_B+r_B\right)(1-\gamma)-K\left(c_L+r_L\right)\gamma\right] \\ (3a)\qquad & -\alpha\beta^{-1+\alpha}q^{1-\alpha}\left[p_B(X-K)\left(c_B+r_B\right)(1-\gamma)-K\left(c_L+r_L\right)\gamma\right] \\ & +\left[L-p_BX+K(1-p_B)\left(c_B+r_B\right)(1-\gamma)\mu\right]=0\end{aligned}$$

$$(3b)\quad \frac{\partial \Pi}{\partial g} = K(c_B - c_L + r_B - r_L)q + (1-q)[Kp_B(c_B - c_L + r_B - r_L) - K(1-p_B)(c_B + r_B)m] = 0$$

We furthermore assume that the following second order conditions are met:

$$(4a)\quad \frac{\partial^2 \Pi}{\partial b \partial b} < 0$$

$$(4b)\quad \frac{\partial^2 \Pi}{\partial g \partial g} < 0$$

$$(4c)\quad \frac{\partial^2 \Pi}{\partial b^2}\frac{\partial^2 \Pi}{\partial g^2} - \frac{\partial^2 \Pi}{\partial b \partial g} > 0$$

As regards the comparative static results, we are particularly interested in the question how exogenous changes project quality $q$, in the probability of reaching the bad state of the nature (i.e. in the riskiness of the project), and in the spreads charged over international interest rates affect the choice between bank debt and bond finance. Keeping the effort level constant and assuming that the individual firm is a price-taker, the following comparative static results are obtained:

$$(5a)\quad \frac{\partial g^*}{\partial q} = -\frac{\Pi_{gq}}{\Pi_{gg}} = -\frac{K(1-p_B)(1-a)b^a q^{-a}[c_B - c_L + r_B - r_L + m(c_B + r_B)]}{PV_{gg}}$$

$$(5b)\quad \frac{\partial g^*}{\partial c_B} = -\frac{\Pi_{gc_B}}{\Pi_{gg}} = -\frac{Kq + (1-q)[Kp_B - K(1-p_B)m]}{PV_{gg}}$$

$$(5c)\quad \frac{\partial g^*}{\partial c_L} = -\frac{\Pi_{gc_L}}{\Pi_{gg}} = -\frac{-Kq - Kp_B(1-q)}{PV_{gg}} < 0$$

$$(5d)\quad \frac{\partial g^*}{\partial p_B} = -\frac{\Pi_{gp_B}}{\Pi_{gg}} = -\frac{K(1-q)[c_B - c_L + r_B - r_L + m(c_B + r_B)]}{PV_{gg}}$$

Since $\Pi_{gg} < 0$, we need to consider the signs of the enumerators in (5a–d) only. While an increase in the margin charged for bank loans over the international interest rate lowers the optimal share of bank finance, the signs of the other effects are undetermined a priori. An increase in the bond spread increases the optimal amount of bank finance only if the bargaining power of the firm $(m)$ is sufficiently small.

The signs of the enumerators in (5a) and (5d) both depend on the interest rates that prevail on international capital markets, the interest rate spreads, and the firm's bargaining power. If $(r_B^* + c_B)(1+m) > r_L^* + c_L$, an increase in project quality raises the optimal share of bank finance and a decline in the probability of reaching the bad state of the world lowers it. Assuming that the net costs of bonds and loans are identical, this condition is always met. The reason for this is that a higher (exogenous) quality of projects reduces the disincentive effects of bank finance. Also, the less likely the bad state of the world is, the less important are the advantages of bank finance in preventing continuation of bad project.

These results imply that there are a number of factors which affect the share of bank finance in total external debt finance as countries develop. Two effects (higher project quality and lower spreads on international bank loans) tend to increase the share of bank-intermediated finance. An reduction in project risk and lower spreads on international bank lending, to the contrary, tend to lower the share of bank finance.

So far, we have not yet endogenized the monitoring decision of banks. This issue is taken up in Diamond (1993) who likewise models the choice between bank and directly-placed debt (bonds). As in the Rajan-model, bond holders rely on public information — such as provided by rating agencies — only whereas banks engage in (costly) monitoring activities. Diamond shows that there is a life-cycle effect as new borrowers rely on bank finance initially but issue directly placed debt later on. Like the pecking order models, this would imply a positive relationship between the state of development of an economy and the share of bond finance.[6]

In summary, this section has argued that the relative importance of bank lending versus portfolio investment (debt) finance should depend on two factors. *First*, as countries develop, the most likely development is a decline in the reliance on bank lending and an increase in securitized bond finance. *Second*, if banks tend to be better informed about their customers and/or monitor them more closely than institutional investors, the relative share of bank lending should be higher for countries for which it is relatively difficult to obtain information. In the following, we briefly review the existing empirical literature on the issue before we turn to some new evidence derived from bilateral data on international asset holdings.

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6 A similar implication can be derived from a model of Yosha (1995) which explains the choice between bilateral (bank) and multilateral (bond) finance.

# 3 Previous Empirical Evidence

Because theories of the structure of international capital flows have been developed relatively recently, in particular as regards the importance of information costs, the empirical evidence is relatively scarce. Most previous empirical studies on international capital flows have focused on the relative importance of push versus pull factors for capital flows to emerging markets or on the prevalence of a home bias in international investment portfolios. Mostly, these studies draw on data for portfolio capital flows of developed market economies and use rates of return and risk characteristics of the underlying assets as explanatory variables. One of the most influential papers in this field is work by Tesar and Werner (1992). They find that the standard mean-variance framework for international portfolio choice would predict an international diversification of asset portfolios to a degree much larger than that observed in actual portfolio choices. This result has been confirmed and refined by a number of further studies, and numerous explanations of the „asset allocation puzzle“ have been offered. Among the most recent ones are Obstfeld and Rogoff (2000) who argue that (relatively small) frictions on international goods markets can help to rationalize the puzzle.

A few studies have also dealt explicitly with the factors driving international bank lending, which, despite the ongoing trends towards a disintermediation of international capital flows, still account for a substantial amount of global capital flows (Eichengreen and Mody 1999).

Moshirian and Van der Laan (1998) analyze the determinants of foreign assets of banks from Germany, the UK, and the US in a portfolio framework on the basis of quarterly data for the years 1985–1995. They find a positive link between foreign liabilities and foreign assets of countries, suggesting that capital in- and outflows are positively related. Also, bond issues appear to substitute foreign bank loans, and banks seems to have substituted foreign for domestic lending.

Hull and Tesar (2000) provide stylized evidence which shows that the importance of bank finance indeed seems to decline as countries develop. For industrialized countries, capital in- and outflows are of a similar magnitude and tend to be reinvested in these countries. This supports the view that portfolio diversification appears to be the main motive for international capital flows. Reflecting the state of development of these economies, bonds are more important than bank loans and equity. Moreover, developing countries with low credit ratings appear to move up the pecking order of international finance as they open up for foreign capital. For these countries, the composition of capital flows tend to be skewed towards equity finance and bank loans. Finally, equity finance tends to dominate for developed markets, indicating that information asymmetries are important.

An important recent contribution towards understanding the structure of international capital flows is a study by Lane and Milesi-Ferretti (2000). They find a positive relationship between the openness of an economy and the state of development, on the one hand, and the amount of external liabilities, on the other hand. While trade openness seems to favor particularly inflows of equity, the state of development of the financial system seems to have a positive impact on portfolio investments. Yet, their work does not focus directly on the share of intermediated finance. They do find, however, that debt liabilities decline in per capita GDP and that they increase in the degree of openness of the host economy.

# 4 Cross-Country Evidence

In this section, we provide empirical evidence on the determinants of cross-border claims of banks and international bond holdings for a number of OECD countries, using two new datasets. More specifically, we use BIS-data on the cross-border claims of BIS reporting banks for December 1999 (BIS 2000). In contrast to earlier BIS-data on cross-border lending, a regional breakdown is given also for claims on countries *within* the BIS reporting area. Hence, the data also allow us to analyze asset holdings among high-income countries and can, inter alia, show the possible impact of EU membership on international bank lending. In addition, results of an international portfolio investment survey recently conducted by the IMF are used (IMF 1999).

The log of total assets of the recipient countries are used as a dependent variable in the following regression:

(6) $y_i = a + x_i b + e_i$

where $y_i$ = log of total assets held by a given reporting country in country $i$, $x_i$ = country-specific explanatory variables, and $e_i$ = error term. In a benchmark regression, we are using (log) GDP per capita as a proxy for the state of development of the host economy. Most likely, as has been argued above, the expected coefficient on this variable is positive. The logarithm of the population is included as a proxy for the size of the host economy, hence the expected coefficient would be positive as well. The ratio of private sector credit over GDP is used to control for the size of the financial — i.e. the banking — system. Again, the expected coefficient would be positive.

In a first step, we have added a country's credit risk rating as a proxy for the risk premium assigned by international capital markets. We are using the rating by Euromoney, which is available for a large number of countries. This index increases as country risk falls. If lenders

prefer to lend to less risky countries, we would thus expect a positive coefficient. In addition, if it is true that portfolio investors are less well-informed than bank lenders, we would expected that they react more strongly to credit ratings than banks, and that the share of bank finance is a negative function of the rating. Notice that because of the high correlation between the rating variable, on the one hand, and the size of the financial system and per capita GDP, on the other hand,[7] we are using the residual of an equation regressing the logged rating on these two variables instead.

In a second step, we have added variables which take explicit account of information costs and financial market regulations. A dummy capturing EU membership has been added because the adoption of the Single Market program and of the Second Banking Directive in 1992 have been intended to level the playing field for financial institutions across Europe. The adoption of the principles of mutual recognition, home country supervision, and minimum harmonization of banking regulations should have eased the provision of financial services abroad. The expected coefficient would thus be positive. Capital account liberalization has not been confined to Europe, however. Rather, the abolition of capital controls can in general be expected to have fostered cross-border asset holdings. Countries having capital controls in place should thus have had more limited access to international financial markets.[8]

In addition, three variables which are intended to capture information costs have been included. Obviously, being physically closer to a country implies that cultural differences may be less pronounced than for geographically remote countries and that information flows more easily. Hence, we would expect a negative coefficient on the (logged) distance between two countries. Sharing a common language and a common legal framework also eases the flows of information and the assessment of the institutional framework of the host economy. The expected coefficient would thus be positive. Close trade links between two countries could likewise be expected to increase the information flow between countries (particularly distance). However, bilateral trade flows have not been included since we can expect a high degree of multicollinearity between trade flows and the remaining explanatory variables. Country-specific dummy variables have been added if necessary to ensure the normal distribution of the residuals.[9] All results are summarized in Tables 1 through 6.

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7 See also Table A2.

8 Note that we are using different dummy variables to account for the presence of controls on financial and commercial credits (for cross-border banking assets) and for controls on investments into capital market securities (for bond holdings).

9 More specifically, the following dummies were used in some but not necessarily all of the equations: Algeria and Ukraine (for the UK), Slovenia, Ukraine, and Zimbabwe (for the US), New Zealand and Sweden for Spain, New Zealand, Equador, Jordan, and New Zealand (for Italy), and Estonia, Chile, and Panama (for Japan).

## 4.1 Determinants of Cross-Border Bank Claims

In order to find the determinants of cross-border banking assets, we use data for a cross-section of up to 75 countries in which the reporting banks held over 95 percent of their international assets.[10] A complete list of the variables used is given in the Appendix (Table A1). Due to missing observations for others, six reporting countries (France, Italy, Japan, Spain, United Kingdom, United States) have been considered only.

The first specification we use performs reasonably well, explaining 60–75 percent of the variation in cross-border banking assets for most reporting countries (Columns 2 and 5 of Tables 1–6). An exception is Spain where the adjusted $R^2$ does not exceed 0.5. In addition, most of the explanatory variables are statistically significant in most of the equations, the elasticity of cross-border lending being larger than one percent with respect to changes in GDP per capita and somewhat below one percent with respect to the size of the population. The ratio of banking credit over GDP entered with a semi-elasticity of about 0.01 percent, which needs to be multiplied with the initial ratio to obtain the true elasticity. These results have also been fairly robust against including additional explanatory variables.

As regards the additional explanatory variables, the picture is quite clear as regards the rating variable which is insignificant in all equations except for Italy where it even enters with a negative sign. The picture is more mixed for the other variables capturing information costs and regulations. Capital controls and EU membership had an insignificant impact in all equations expect for the positive impact of EU membership on claims of UK banks. However, these results may be due to the fact that EU membership and other explanatory variables are correlated. When using the baseline equations and the EU dummy only, there is evidence for a positive effect of EU membership on French, Italian, and Spanish cross-border bank loans and a negative effect for Japanese banks. As regards the magnitude of the EU coefficient, it takes a value of around one, which implies that asset holdings in EU countries are almost three times as high as asset holdings in non-EU countries.[11]

The country for which the information variables, in particular the use of a common legal system and a common language, have had the greatest impact are Spain. Also, this is the only country for

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[10] Notice that these data measure banks' on-balance sheet lending activities. This may include some portfolio asset holdings of banks while it may exclude some important off-balance sheet activities. See BIS (2000) for details on the definition of the data. However, what matters most from the point of view of the present paper is that these assets are held by banks while the bond holdings which we consider next include asset holdings of all groups of investors.

[11] Notice that the dependent variable has been entered in logarithmic form. Hence, the impact of a dummy variable which enters with a coefficient $\alpha$ is calculated as $e^{\alpha}$.

which the information variables substantially raise the explanatory power. Notice, however, that the estimated coefficient on the language is quite high. According to these estimates, Spanish asset holdings in Spanish-speaking countries would be 17 times higher than those in the average non-Spanish-speaking country.

For all other countries, sharing a common legal system has no significant impact. If anything, distance seems a relevant explanatory variable entering with a negative sign for France, Japan, Spain, and the United States. For the UK, to the contrary, the impact of distance is even significantly positive. This effect might be precisely the reverse of the information effect, reflecting the role of London as a financial center. It may be the case that information on countries which are physically remote is pooled in London, thus providing UK-based banks with an information advantage over others.

Overall, these results lend support to the hypothesis that market size and the state of development have a positive impact on cross-border banking assets. Regulations and variables capturing information costs more directly do not seem to be playing a major role. This, however, does not imply necessarily that information costs are unimportant. Rather, it seems to be captured by the general state of development in the sense that a higher level of development makes information more readily available to *all* investors. Country-specific factors which may ease access to information — except for distance — seem to be less relevant.

## 4.2 Determinants of International Bond Holdings

Recently, the IMF has compiled for the first time a survey of international portfolio investments of 29 reporting countries. These investments comprise holdings of equity securities, long- and short-term debt securities, and derivatives. For the purpose of the present paper, we are using the information on debt securities only. So far, data are available for portfolio holdings at the end of 1997 only. Despite the limited time dimension of the data, they yet allow for an analysis of cross-border determinants of portfolio assets similar to the one presented above on foreign banking assets. In order to keep the analysis comparable, we have restricted the analysis to the same group of countries and have included the same explanatory variables.

Results are reported in columns 1 and 4 of Tables 1–6. Generally, the estimation results are quite encouraging. Although the explanatory power is somewhat lower than for banking assets, the equations yet explain well above half of the variation of international bond holdings. For all countries, GDP per capita and population have a significant and positive impact. The magnitude of the coefficients is similar to those for banking assets although the impact of per capita GDP seems

to be larger for bond holdings. The size of the domestic banking system has a negative coefficient for Italy and Spain. Perhaps somewhat surprisingly, the rating variable is insignificant in all equations with the exception of Japan where it enters with a positive sign.

Including additional explanatory variables raises the explanatory power of the equations for Italy and Spain. In the case of Italy, this is due to the fact that EU membership significantly raises while capital controls lowers foreign asset holdings. The EU dummy is furthermore significant for France and Japan while the other information cost variables are mostly insignificant. In two cases (Japan, UK), the legal system enters with a negative sign. Again, the most important variable capturing information costs seems to be distance which lowers foreign bond holdings of Japanese, Spanish, and US investors.

## 4.3 Are Banking Assets Different?

Since we are interested not only in the factors affecting the absolute amount of cross-border banking assets and bond holdings but also in their relative importance, we have used the ratio of bank loans over total debt finance as a dependent variable and ran the same regressions as before (Columns 3 and 6). With the exception of the United States, where we even obtain a negative $R^2$, our approach explains roughly one fourth of the cross-country variation in this ratio.

The first result is that the share of bank finance is a negative function of the state of development of the host economy, a result which is fairly robust across specification and countries. This confirms pecking order theories which state that bank finance should become less important as countries develop. Population size seems (with one exception) not to have a significant impact, which could be interpreted in the sense that population size per se does not improve the information of investors.

Although the size of the domestic banking system was found to be a factor raising both bond and bank finance, its influence falls more than proportionally on bank lending. Hence, there is relatively strong evidence that countries with a large banking system relative to GDP also attract relatively more bank finance. In a sense, preferences and institutional arrangements that favor bank finance domestically thus find their mirror-image also in external financial structures.[12]

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[12] Interestingly, the size of the domestic stock market relative to GDP as an alternative measure of the size of the financial system seems to have no impact on the volume of cross-border bond holdings. It did, however, have a weak negative impact on the share of bank lending in two cases (Italy and Spain), and a positive effect in another two cases (Japan and United Kingdom). It is unclear whether this variable captures the size of the financial system as such or the importance of the stock market.

For two countries (for France and, albeit at a level of confidence of only 20 percent, for Spain) there is evidence that a good credit rating reduces the share of bank finance. This could be taken as weak evidence for the hypothesis that bond holders rely more on outside information than banks do. A positive sign is obtained for the UK which may again be due to the fact that the UK hosts an international financial center and has thus special characteristics.

Few of the other explanatory variables are significant: EU membership enters with a negative sign for France and Japan, distance with a negative sign for Italy but with a positive sign for the UK, a common language with a positive sign for Spain, and a common legal system with a negative sign for the US. Some of these results could be interpreted in favor of the hypothesis that banks have information superior to other investors and are thus less dependent on cultural and physical proximity to a given market. Some, however, would indicate that just the opposite holds true.

In summary then, this section has provided relatively strong support for the notion that bank lending is special in the sense that its importance declines as countries develop. Also, internal financial structures tend to be reflected in external structures. Since more information tends to become available during the process of economic development and if countries start tapping international financial markets, this can be taken as indirect evidence for the hypothesis that banks have superior access to information as compared to institutional investors. After controlling for market size and the state of development, however, we found little evidence for a statistically significant impact of variables measuring information costs more directly on the share of banking assets in external debt finance.

We have tried a number of alternative specifications to test the robustness of these results. A variable capturing openness (share of foreign trade over GDP) if added to the baseline equation has been insignificant throughout, indicating the strong correlation with openness, on the one hand, and the size of the economy and the state of its development, on the other hand. Likewise, the domestic interest rate spread has mostly been insignificant. This would support models which find relatively little support for the standard parameters affecting international portfolio choices, among them the rate of return on foreign assets.

# 5 Conclusions

Increasing tendencies towards a disintermediation of financial markets, in particular in connection with a disintermedation of bank finance, have raised the issue what the special role of banks in financial markets could be. This paper addresses the question in an international context. More specifically, we are trying to seek an answer to the question whether the determinants of cross-

border banking assets and portfolio debt finance differ significantly and, more specifically, whether bank finance is more important for countries in which information costs are high.

One result which has been robust across different specifications is that GDP per capita and population size, as proxies for the state of development and the size of an economy, respectively, have a positive impact on both types of investments. GDP per capita, in turn, tends to be more important for bond holdings, thus supporting theoretical models yielding a pecking order of international capital flows. Also, countries having a relatively large banking system than others tend to rely on external bank finance more heavily.

Other results have been less robust. The importance of regulatory restrictions such as EU membership and the presence of capital controls depend upon the specification used. As regards the importance of information costs for the structure of debt finance, we have found only indirect evidence in the sense that information is more readily available on more developed countries which, in turn, lowers the share of bank lending. Other variables capturing information costs which are relatively unrelated to the state of development (distance, common legal system, language) do not seem to impact upon financing choices to any significant degree. The same holds true for the credit risk ratings assigned to a country. An interesting extension of this paper would be to use data on bilateral holdings of FDI assets to test pecking order models more comprehensively. Also, it would be interesting to analyze whether the results obtained from this paper would be robust over time.

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*Table 1 — Determinants of International Banking Assets and Bond Holdings: France*

| | Specification I | | | Specification II | | |
|---|---|---|---|---|---|---|
| | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance |
| Constant | –12.68*** | –3.43*** | 1.49*** | –11.81*** | –3.81* | 1.49*** |
| | (–7.86) | (–2.71) | (11.38) | (–4.74) | (–1.97) | (7.34) |
| Log GDP per capita | 1.71*** | 0.87*** | –0.08*** | 1.61*** | 1.02*** | –0.06*** |
| | (9.08) | (6.56) | (–4.91) | (7.39) | (6.28) | (–3.15) |
| Log population | 0.97*** | 0.89*** | –0.01 | 1.06*** | 0.91*** | –0.01 |
| | (6.81) | (8.49) | (–1.05) | (6.58) | (8.99) | (–0.74) |
| Credit | 0.00 | 0.01*** | 0.001* | –0.001 | 0.01* | 0.001* |
| | (0.84) | (3.30) | (1.97) | (–0.25) | (1.78) | (1.84) |
| Rating (residual) | 1.73 | –0.45 | –0.16* | | | |
| | (1.43) | (–0.56) | (–1.91) | | | |
| EU membership | | | | 1.69** | 0.46 | –0.14** |
| | | | | (2.48) | (0.99) | (–2.12) |
| Capital controls | | | | –0.38 | 0.50 | |
| | | | | (–0.81) | (1.34) | |
| Log distance | | | | –0.02 | –0.18 | –0.01 |
| | | | | (–0.10) | (–1.25) | (–0.75) |
| Language | | | | 0.82 | 1.17** | –0.01 |
| | | | | (0.82) | (2.11) | (–0.11) |
| Legal system | | | | 0.06 | 0.33 | 0.03 |
| | | | | (0.13) | (0.23) | (0.81) |
| Adjusted R⊘ | 0.72 | 0.69 | 0.30 | 0.74 | 0.78 | 0.30 |
| N | 61 | 75 | 61 | 55 | 62 | 55 |
| Jarque Bera (prob) | 0.41 | 0.30 | 0.37 | 0.38 | 0.35 | 0.49 |
| White (prob.) | 0.52 | 0.09* | 0.04** | 0.39 | 0.04** | 0.05** |

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level. White-heteroscedasticity consistent standard errors are reported for equations with heteroscedastic errors.

*Table 2 — Determinants of International Banking Assets and Bond Holdings: Italy*

| | Specification I | | | Specification II | | |
|---|---|---|---|---|---|---|
| | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance |
| Constant | –12.54*** | –8.28*** | 1.20*** | –13.11*** | –5.35** | 1.77*** |
| | (–6.11) | (–7.17) | (4.69) | (–5.21) | (–2.57) | (4.61) |
| Log GDP per capita | 1.72*** | 1.39*** | –0.05* | 1.79*** | 1.35*** | –0.06* |
| | (7.51) | (10.13) | (–1.89) | (8.09) | (7.35) | (–1.90) |
| Log population | 1.13*** | 0.88*** | –0.03 | 1.42*** | 1.02*** | –0.02 |
| | (6.68) | (7.89) | (–1.35) | (6.72) | (7.12) | (–0.83) |
| Credit | –0.01* | –0.003 | 0.001 | –0.02*** | –0.01 | 0.001 |
| | (–1.90) | (–0.73) | (1.35) | (–4.29) | (–1.32) | (1.34) |
| Rating (residual) | –2.17 | –1.57* | 0.14 | | | |
| | (–1.52) | (–1.69) | (0.79) | | | |
| EU membership | | | | 1.49*** | 0.41 | –0.09 |
| | | | | (3.41) | (0.73) | (–1.01) |
| Capital controls | | | | –1.02* | –0.20 | |
| | | | | (–1.98) | (–0.40) | |
| Log distance | | | | –0.05 | –0.39 | –0.07* |
| | | | | (–0.26) | (–2.19) | (–1.98) |
| Legal system | | | | 0.27 | 0.35 | 0.01 |
| | | | | (0.64) | (1.00) | (0.09) |
| Adjusted R$^2$ | 0.58 | 0.72 | 0.10 | 0.71 | 0.72 | 0.01 |
| N | 55 | 70 | 55 | 51 | 61 | 51 |
| Jarque Bera (prob) | 0.57 | 0.31 | 0.11 | 0.61 | 0.36 | 0.21 |
| White (prob.) | 0.11 | 0.83 | 0.36 | 0.11 | 0.41 | 0.69 |

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level. White-heteroscedasticity consistent standard errors are reported for equations with heteroscedastic errors.

*Table 3 — Determinants of International Banking Assets and Bond Holdings: Japan*

| | Specification I | | | Specification II | | |
|---|---|---|---|---|---|---|
| | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance |
| Constant | –10.73*** | –9.04*** | 1.44*** | 2.95 | 3.99 | 0.88 |
| | (–6.13) | (–7.27) | (4.76) | (0.51) | (1.22) | (1.30) |
| Log GDP per capita | 1.57*** | 1.35*** | –0.12*** | 1.49*** | 1.24*** | –0.07* |
| | (8.75) | (9.37) | (–4.01) | (5.46) | (6.76) | (–1.86) |
| Log population | 0.98*** | 1.13*** | –0.01 | 0.83*** | 1.03*** | 0.01 |
| | (6.44) | (9.87) | (–0.38) | (3.56) | (9.54) | (0.26) |
| Credit | 0.01** | 0.01*** | 0.002*** | 0.001 | 0.01** | 0.002*** |
| | (1.97) | (2.67) | (2.79) | (0.19) | (2.46) | (2.77) |
| Rating | 1.84** | 1.42 | –0.11 | | | |
| | (1.97) | (1.45) | (–0.78) | | | |
| EU membership | | | | 0.98** | –0.10 | –0.20*** |
| | | | | (2.08) | (–0.24) | (–2.83) |
| Capital controls | | | | –0.39 | –0.38 | |
| | | | | (–0.59) | (–0.89) | |
| Log distance | | | | –1.34** | –0.33*** | 0.01 |
| | | | | (–2.59) | (–4.04) | (0.21) |
| Legal system | | | | –1.03* | –0.87 | 0.04 |
| | | | | (–1.72) | (–1.46) | (0.45) |
| Adjusted R² | 0.76 | 0.79 | 0.16 | 0.60 | 0.83 | 0.16 |
| N | 55 | 66 | 53 | 51 | 58 | 49 |
| Jarque Bera (prob) | 0.12 | 0.84 | 0.69 | 0.15 | 0.89 | 0.66 |
| White (prob.) | 0.03** | 0.31 | 0.03** | 0.03** | 0.46 | 0.03** |

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level. White-heteroscedasticity consistent standard errors are reported for equations with heteroscedastic errors.

*Table 4 — Determinants of International Banking Assets and Bond Holdings: Spain*

| | Specification I | | | Specification II | | |
|---|---|---|---|---|---|---|
| | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance |
| Constant | –15.37*** | –7.56*** | 1.22*** | –10.87*** | –4.32* | 1.40*** |
| | (–5.17) | (–4.40) | (5.39) | (–3.15) | (–1.75) | (3.96) |
| Log GDP per capita | 2.06*** | 1.37*** | –0.04* | 2.05*** | 1.36*** | –0.01 |
| | (6.41) | (6.66) | (–1.81) | (7.21) | (7.15) | (–0.52) |
| Log population | 0.67*** | 0.73*** | 0.01 | 0.86*** | 0.97*** | 0.06** |
| | (3.06) | (4.23) | (0.83) | (3.96) | (8.27) | (2.04) |
| Credit | –0.02** | –0.01 | 0.00 | –0.02** | 0.001 | 0.00 |
| | (–2.15) | (–1.51) | (1.67) | (–2.52) | (0.98) | (1.23) |
| Rating (residual) | 0.05 | –0.78 | –0.16 | | | |
| | (0.03) | (–0.55) | (–1.35) | | | |
| EU membership | | | | 1.03 | –0.09 | –0.09 |
| | | | | (1.59) | (–0.19) | (–1.15) |
| Capital controls | | | | 0.52 | –0.32 | |
| | | | | (0.91) | (–0.68) | |
| Log distance | | | | –0.72** | –0.77*** | –0.09 |
| | | | | (–2.21) | (–3.77) | (–1.65) |
| Language | | | | 1.45 | 2.85*** | 0.19** |
| | | | | (1.36) | (4.97) | (2.23) |
| Legal system | | | | –0.32 | 1.34*** | 0.04 |
| | | | | (–0.45) | (3.52) | (0.58) |
| Adjusted R$^2$ | 0.59 | 0.45 | 0.55 | 0.69 | 0.80 | 0.37 |
| N | 31 | 71 | 31 | 31 | 49 | 31 |
| Jarque Bera (prob) | 0.61 | 0.73 | 0.27 | 0.61 | 0.73 | 0.25 |
| White (prob.) | 0.71 | 0.87 | 0.56 | 0.71 | 0.89 | 0.42 |

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level. White-heteroscedasticity consistent standard errors are reported for equations with heteroscedastic errors.

*Table 5 — Determinants of International Banking Assets and Bond Holdings: United Kingdom*

| | Specification I | | | Specification II | | |
|---|---|---|---|---|---|---|
| | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance |
| Constant | –6.76*** | –5.14*** | 0.90*** | –6.36*** | –9.07*** | –0.09 |
| | (–7.21) | (–5.47) | (3.78) | (–3.90) | (–5.25) | (–0.23) |
| Log GDP per | 1.37*** | 1.06*** | –0.06** | 1.23*** | 1.16*** | –0.02 |
| capita | (12.57) | (9.28) | (–2.40) | (9.21) | (8.09) | (–0.54) |
| Log population | 0.81*** | 0.82*** | –0.01 | 0.77*** | 0.87*** | –0.01 |
| | (8.88) | (8.79) | (–0.59) | (7.37) | (9.72) | (–0.22) |
| Credit | –0.004 | 0.01*** | 0.003*** | –0.003 | 0.01* | 0.002** |
| | (–1.26) | (2.74) | (3.21) | (–0.92) | (1.96) | (2.36) |
| Rating | –0.86 | 0.59 | 0.43** | | | |
| | (–1.16) | (0.72) | (2.28) | | | |
| EU membership | | | | 0.61 | 0.68* | 0.06 |
| | | | | (1.53) | (1.80) | (0.67) |
| Capital controls | | | | 0.14 | –0.45 | |
| | | | | (0.45) | (–1.37) | |
| Log distance | | | | 0.09 | 0.40*** | 0.07* |
| | | | | (0.66) | (2.99) | (1.94) |
| Language | | | | 0.85* | 0.71 | –0.01 |
| | | | | (1.75) | (1.59) | (–0.10) |
| Legal system | | | | –0.99** | –0.15 | 0.14 |
| | | | | (–2.24) | (–0.37) | (1.30) |
| Adjusted R² | 0.79 | 0.80 | 0.16 | 0.78 | 0.87 | 0.21 |
| N | 64 | 75 | 64 | 48 | 62 | 56 |
| Jarque Bera (prob) | 0.28 | 0.74 | 0.48 | 0.31 | 0.76 | 0.47 |
| White (prob.) | 0.74 | 0.29 | 0.11 | 0.67 | 0.26 | 0.08* |

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level. White-heteroscedasticity consistent standard errors are reported for equations with heteroscedastic errors.

*Table 6 — Determinants of International Banking Assets and Bond Holdings: United States*

| | Specification I | | | Specification II | | |
|---|---|---|---|---|---|---|
| | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance | Cross-border bond holdings | Cross border bank claims | Share of bank claims in total debt finance |
| Constant | –7.08*** | –5.55*** | 0.59** | 0.53 | 0.01 | 0.88 |
| | (–5.47) | (–6.74) | (2.31) | (0.13) | (0.00) | (1.10) |
| Log GDP per capita | 1.36*** | 1.24*** | –0.02 | 1.22*** | 1.21*** | –0.02 |
| | (8.77) | (12.50) | (–0.51) | (6.63) | (9.54) | (–0.76) |
| Log population | 0.94*** | 0.84*** | 0.002 | 0.95*** | 0.92*** | –0.01 |
| | (7.35) | (10.39) | (0.09) | (7.01) | (11.45) | (–0.28) |
| Credit | –0.002 | –0.002 | 0.00 | –0.002 | –0.001 | 0.001 |
| | (–0.32) | (–0.85) | (0.13) | (–0.40) | (–0.01) | (1.12) |
| Rating | –0.89 | –0.37 | 0.16 | | | |
| | (–0.81) | (–0.54) | (1.18) | | | |
| EU membership | | | | –0.22 | –0.37 | 0.01 |
| | | | | (–0.47) | (–1.21) | (0.18) |
| Capital controls | | | | 0.45 | –0.19 | |
| | | | | (1.15) | (–0.63) | |
| Log distance | | | | –0.79* | –0.67*** | –0.03 |
| | | | | (–1.96) | (–2.79) | (–0.31) |
| Language | | | | 0.60 | 0.74* | 0.10 |
| | | | | (0.94) | (1.92) | (0.99) |
| Legal system | | | | 0.47 | –0.35 | –0.19** |
| | | | | (0.82) | (–1.01) | (–2.15) |
| Adjusted R² | 0.67 | 0.84 | –0.05 | 0.67 | 0.87 | –0.04 |
| N | 70 | 74 | 69 | 59 | 62 | 59 |
| Jarque Bera (prob) | 0.71 | 0.71 | 0.43 | 0.71 | 0.73 | 0.46 |
| White (prob.) | 0.56 | 0.29 | 0.02** | 0.61 | 0.22 | 0.03** |

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level. White-heteroscedasticity consistent standard errors are reported for equations with heteroscedastic errors.

*Table A1 — Data Definitions and Sources*

| Variable | Definition | Source |
|---|---|---|
| Credit | Credit provided by the domestic banking sector in % of GDP | World Bank (2000) |
| Capital controls | Dummy variable set equal to one for the presence of controls on commercial and financial credits (for bank lending) and on capital market securities (for portfolio assets) | |
| Cross-border assets and liabilities of commercial banks | Consolidated international claims of BIS reporting banks on individual countries and vis-à-vis all sectors, in million US-Dollar and converted into constant prices with the US consumer price index | BIS (2000), as well as unpublished data kindly provided by the BIS |
| Distance | computed as the shortest line between two countries' commercial centers according to the degrees of latitude and longitude. | kindly provided by Dieter Schumacher (DIW) |
| EU | dummy variable for EU members (= 0 for non-members, = 1 for members) | |
| GDP per capita | gross domestic product in billion current national currency, converted into US-dollar with the average annual exchange rate of the national currency to the US-dollar (end 1998, if not available - end 1997 converted the respective exchange rate). Population as of 1997. | IMF (2000) and World Bank (2000) |
| Language | dummy variable set equal to 1 if official language is English, German, French, or Spanish | |
| Legal system | dummy variable set equal to 1 if legal system is of English (for UK and US), French (for France and Spain), or German (for Germany and Japan) origin | La Porta et al. (2000) |
| Population | | World Bank (2000) |
| Bond holdings | Short- and long-term portfolio debt securities | IMF (1999) |
| Rating | country-risk rating of Euromoney, increase means better rating, residual of an equation regressing the rating on GDP per capita and M2 over GDP | World Bank (2000) |

*Table A2 — Cross Correlations*

| | Credit / GDP | EU membership | Log (GDP per capita) | Log (population) | Rating |
|---|---|---|---|---|---|
| Credit / GDP | 1.00 | | | | |
| EU membership | 0.42* | 1.00 | | | |
| Log (GDP per capita) | 0.55* | 0.55* | 1.00 | | |
| Log (population) | 0.12 | 0.01 | –0.28* | 1.00 | |
| Rating | 0.65* | 0.64* | 0.91* | –0.08 | 1.00 |
| Stock market capitalization / GDP | 0.35* | 0.04 | 0.27* | 0.26* | 0.31* |

* = significant at the 5% level, significance level calculated from $\pm 2/\sqrt{n}$ for $n = 75$.