The Determinants of International Equity Holdings

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Abstract. We examine the distribution of international equity holdings using a more statistically appropriate model, the quasi-Poisson regression. Our results confirm the negative association of distance with equity investment, even after accounting for destination country equity market characteristics and economic conditions. We are able to identify several factors with high explanatory power that do not appear so using OLS regression. Countries with higher market volatility receive significantly less international investment, but high market correlation is associated with high international investment. Moreover, investment in volatile stock markets increases more as the real GDP growth rate of the source country increases. Lastly, we show that countries with various levels of capital market maturity exhibit different investment patterns.

1 Introduction

It is a well-documented fact that one can predict bilateral trade between countries by applying a gravity model that is originally used to calculate gravitational force in physics. While the gravitational force between two objects is proportional to the product of the mass of each object divided by their distance squared, the gravity model in international trade predicts that the amount of bilateral trade between two countries is positively correlated with the size of each country and negatively correlated with the distance between them.

Although there are many different explanations for this relationship, it should not come as a surprise that there is a correlation between geography and bilateral trading volume. After all, transportation costs do increase with distance, and countries close to each other often form trading blocks that grant lower tariffs to member countries.

Interestingly, there is also a strong correlation between geography and equity investments, although it is not as intuitive why this is the case. Past attempts to explain the geographic patterns of equity investment have led to the repeated observation of home bias. Despite the benefits of diversification, people tend to invest heavily in domestic stocks. French and Poterba (1991) found that more than 98% of the equity portfolio of Japanese investors was held domestically; the analogous percentages were 94% for the U.S., and 82% for Britain in 1990. This pattern has been consistent over the past twenty five years. In the United States, for example, an average U.S. investor's stock portfolio today still consists of 90 percent domestic companies, although U.S. stocks represent about 50 percent of the world market.

Some have attributed this phenomenon to the familiarity effect — people like what is familiar to them (Huberman 2001). This view is also supported by Adhearne et. al. (2002), who found that countries that have more U.S. listed stocks receive less home bias from U.S. investors. Others, including Coval and Moskowizt (1999), found that actively managed mutual funds can earn abnormal returns on local holdings, supporting an information asymmetry argument. Adhearne et. al. (2004) argue that this phenomenon might be caused by the explicit and implicit transaction costs that deter foreign investment.

While the equity home bias literature differentiates between domestic and foreign equity holdings, it is not until recently that the role of physical distance between countries in equity markets has been studied. Unlike the trading of physical goods, cross border equity trading does not have transportation costs, and the variations in transaction costs are not necessarily associated with physical distance either. Therefore, when Portes and Rey (2005) showed the significance of physical distance in explaining cross-border equity flows across the globe, their results spurred an outburst of research attempting to associate distance with cross-border equity holdings.

Portes and Rey argued that distance is a proxy for information asymmetry. They were able to explain 80% of the geographical variations in cross-border

equity flow under the framework of the gravity model, which had until then been mostly used to explain cross-border trade flow. The gravity model predicts that the bilateral trade between two countries is proportional to the country masses, usually represented by GDP, and inversely proportional to their distance. In the context of equity trade, the values of goods imported or exported correspond to the holdings of foreign equities by residents of a country and vice versa, while the country masses are usually represented by the total market capitalization.

In addition to using equity home bias and information friction to explain international equity holdings patterns, some have investigated the role of country characteristics such as institutional quality in international equity holdings. Gelos and Wei (2005) find that emerging market funds systematically invest less in less transparent countries, and they have a greater propensity to exit nontransparent countries during crises. Similarly, Balli, Louis, and Osman (2011) showed that the quality of institutional set up statistically and significantly explain portfolio investments to the Gulf Cooperation Council (GCC) region.

Another branch of literature explores the link between goods trade and asset trade. Lane and Milesi-Ferretti (LMF 2008) proposed a model to predict asset trading using bilateral goods trade and a number of explanatory variables commonly found to be significantly correlated with trade, such as distance, time difference, and common language. They found a very significant correlation between bilateral goods trade and equity holdings. However, this approach may introduce multicollinearity, since explanatory variables for asset trading, such as distance, market capitalization, and real GDP growth, were shown to be highly correlated with bilateral goods trade. To avoid this issue, we include variables that are commonly recognized as significantly correlated with goods trade, but eschew from including goods trade directly as a variable in our model.

Like the trade gravity model, the gravity model for equity trading has appeared empirically successful, but both require further scrutiny. Silva and Tenreyro (2006) pointed out some major issues of running ordinary least squares (OLS) gravity models on international trade data, mostly caused by the prevalence of zero observations in the dependent variable (zero-inflated dependent variable). Since Silva and Tenreyro, many in the trade literature have used alternative regression forms to test the gravity model (Burger, Van

Oort, and Linders 2008, Arvis and Shepherd 2012). However, this trend has not become prominent in the gravity literature for equity holdings, despite the same issues of zero-inflated dependent variable data and heteroskedasticity.

We address the issues of zero-inflated data and heteroskedasticity by using generalized linear regressions to model the foreign equity holdings pattern. Similar to the case for bilateral trade data, there are a large number of zero entries in bilateral holdings data, since many countries do not have foreign equity investors. This has created three main issues. The presence of zeros in the dependent variable, which is bilateral holdings, makes the log-linearized gravity model no longer viable. This situation is further complicated by the fact that most datasets do not distinguish between observations that are actually zeros and observations that are so small that they are rounded to zeros. In addition, the zeros are also partially responsible for creating heteroskedasticity in such models, making the OLS estimates inaccurate. Furthermore, the large number of zeros will bias the OLS estimate results. We will explain in detail the reasons to use generalized linear regressions in Section 2.

We examine the distribution of international equity holdings using a more statistically appropriate model, the quasi-Poisson regression. Results suggest that distance still matters after accounting for destination country equity market characteristics and economic conditions. We are able to identify several factors with high explanatory power that do not appear so using OLS regression. Countries with higher market volatility receive significantly less international investment, but high market correlation is associated with high international investment, pointing towards differing aspects of the risk preferences of international investors. This result suggests that while investors are risk averse on the aggregate level, they are not necessarily following the diversification strategy. Moreover, investment in volatile stock markets increases more as the real GDP growth rate of the source country increases, possibly indicating a greater tolerance of risk due to optimistic economic prospect. Lastly, we show that countries with various levels of capital market maturity exhibit different investment patterns.

Our paper is organized as follows: in Section 2 we provide reasons for using a quasi-Poisson regression and introduce our model. Section 3 gives a summary and description of the data we use. Section 4 reports the results from our model and checks its robustness. Section 5 summarizes the main findings

of this paper.

2 The Gravity Model

We use the gravity model to analyze the level of foreign equity holdings. The benchmark gravity model contains the market cap of investor country, market cap of destination country, and their distance. We run our main model on two groups of variables. The first group is market variables such as market return, volatility, exchange rate volatility, and the correlation between investor and destination country's stock market returns. The second group controls for the economic development levels of the investor countries.

The gravity model views bilateral trade as a function of the two country masses and their distance. It predicts that a larger country mass is associated with a larger volume of trading activities, and a longer distance is associated with less bilateral trade. Furthermore, the closer the two countries are in terms of their country masses, the more trade activities will happen between them. In the context of equity trade, we use a country's market capitalization, the market value of all outstanding stocks in a country's stock market(s), to proximate its country mass. The gravity model is often represented by the following equation:

$$holdings_{ij} = \alpha \frac{M_i^{\beta_1} M_j^{\beta_2}}{D_{ij}^{\beta_3}} \tag{1}$$

The log-linearized version then looks like a standard linear regression model:

$$log(holdings_{ij}) = \alpha + \beta_1 log(M_i) + \beta_2 log(M_j) + \beta_3 log(D_{ij}) \tag{2}$$

Using the log-linearized form, the gravity model above has produced results that appear empirically fruitful. However, one of the requirements of the log-linearized form is that the bilateral holdings all need to be positive. This is certainly a strong assumption, since not all countries have positive investment in all other countries. Indeed, the bilateral holdings data are abundant in zero entries: for example, our data for 2013 records 2762 zeros out of the 5681 observations, even after excluding the countries with no equity investments from foreign countries, as well as countries with no available data.

The zero entries exist for multiple reasons. It could be that one country actually has no investment in another country during a given period, in our case 2013. There might also be rounding errors, since the data are recorded in millions of dollars. In the CPIS data, for example, any holdings less than 0.5 million dollars are being recorded as 0. Since this problem is expected to be prominent among small countries, model misspecification related to the zero entries would likely weight larger countries excessively. Another problem with analyzing a dataset with a significant number of zeros is that a zero-inflated dependent variable often causes heteroskedasticity in the model, which violates one of the basic assumptions of OLS models.

Simply excluding the zero entries would certainly bias the results. Another common practice in the literature is to log transform the data after adding a small number such as 1 to each observation. Whether this approach produces valid results depends on the model specification, but this method generally leads to inconsistency in the parameters. Moreover, the issue of heteroskedasticity remains even after the log transformation. Figure 1 shows the residual plot of the benchmark gravity model after transforming the dependent variable in this manner. Residual variance increases with fitted values of the dependent variable, and the red LOESS curve indicates non-linearity in the data. These evidences suggest that we need to move beyond linear models.

In short, as the trade gravity literature have long recognized, dropping the zero entries and log transforming after shifting up the data produce biased and inconsistent results, rendering ordinary least squares unfit for this kind of data. To address this issue, we apply a quasi-Poisson regression to the equity gravity model.

2.1 Quasi-Poisson Regression Model

The Poisson regression model has several desirable properties that make it an appealing model for zero-inflated data. On one hand, assuming a Poisson distribution does not give too much weight to the zero observations, which are more prone to measurement error and less informative about the curvature of $E(y_i|x)$. On the other hand, the light tail in Poisson distribution gives less weight to larger observations, which are also the observations with higher variances (Silva 2006). Therefore, the Poisson model seems to offer a natural way to incorporate the presence of zeros in our dependent variable.

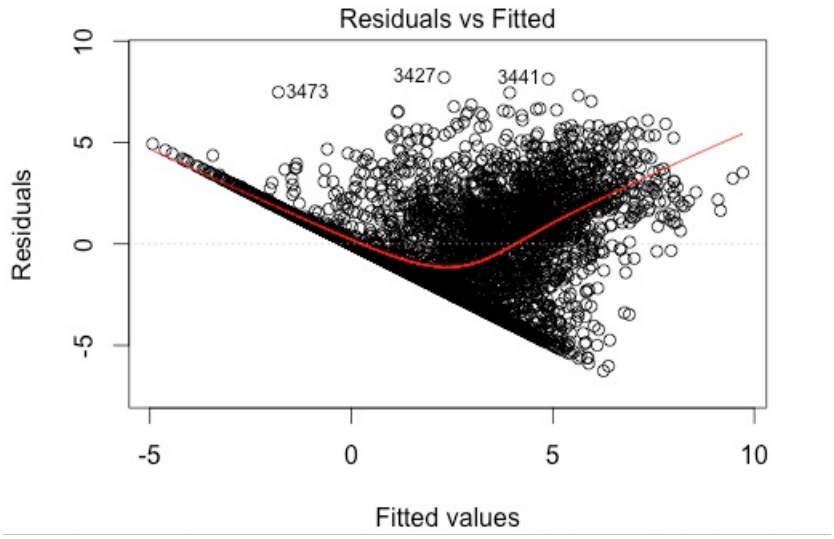

Figure 1: Residual Plot of the gravity model with $log(H_{ij} + 1)$ as the dependent variable

However, Poisson regression assumes that the conditional variance equals to the conditional mean, which can be limiting and hard to satisfy.

$$E(Y_i|X_i) = var(Y_i|X_i)$$

A solution is to use quasi-Poisson regression (or Poisson quasi-maximum-likelihood regression), which relaxes this strong assumption and only requires that the conditional variance be a linear function of the conditional mean. Note that by generalizing the factorial function to the continuous gamma function, the same procedure of calculating quasi-Poisson regression on integers can be applied to non-integer dependent variables. Because of these desirable properties of quasi-Poisson regression, we propose using this regression model to analyze equity holdings.

The prototypical gravity model assumes the following form:

$$E[\text{holdings}_{ij}] = \alpha \frac{M_i^{\beta_1} M_j^{\beta_2}}{D_{ij}^{\beta_3}} \tag{3}$$

Recall that $exp(log(x)) = x$ for $x > 0$. Thus

$$\begin{aligned} E[\text{holdings}_{ij}] &= exp(log(\alpha' \frac{M_i^{\beta_1} M_j^{\beta_2}}{D_{ij}^{\beta_3}})) \\ &= exp(\alpha + \beta_1 log(M_i) + \beta_2 log(M_j) + \beta_3 log(D_{ij})) \end{aligned} \tag{4}$$

The following facts should then be clear from this model:

- If $\beta = 0$, then $exp(\beta X) = 1$ for all explanatory variables X in the gravity model, so $E(holdings_{ij}) = exp(\alpha)$, and $holdings_{ij}$ is not correlated to any variables in the gravity model.
- If $\beta > 0$, then $exp(\beta) > 1$, and the expected amount of $holdings_{ij}$ is $exp(\beta)$ times larger than $exp(\alpha)$. Therefore, a negative estimated coefficient implies a positive correlation between the expected $holdings_{ij}$ and the independent variables.
- If $\beta < 0$, then $exp(\beta) < 1$, and the expected amount of $holdings_{ij}$ is $exp(\beta)$ times smaller than $exp(\alpha)$.Therefore, a positive estimated coefficient implies a negative correlation between the expected $holdings_{ij}$ and the independent variables.

We get the following relationship when we apply natural log to both sides. Note that this will always produce values that are well-defined, since exponential functions always assume positive values.

$$log(E[\text{holdings}_{ij}]) = \alpha + \beta_1 log(M_i) + \beta_2 log(M_j) + \beta_3 log(D_{ij}) \tag{5}$$

On the other hand, the log-linearized OLS model assume a similar, but different form:

$$E[log(\text{holdings}_{ij})] = \alpha + \beta_1 log(M_i) + \beta_2 log(M_j) + \beta_3 log(D_{ij}) \tag{6}$$

2.2 Control variables

To investigate whether countries allocate their foreign investments as predicted by investment theories, we add some market variables to the benchmark model, controlling for the economic maturity of destination markets. In addition to looking at the global investments as a whole, we will also look at results for investors from developed, emerging, and frontier markets to analyze their investment patterns respectively and understand how aggregate investment decisions vary with capital market maturity.

Our first set of control variables are some factors commonly used to predict asset holdings, which we shall call the *market variables*:

- The historical return of the investment, which we approximate using the average return of major stock exchange index in a country from 2011 to 2013 (*mktreturn*).
- The risk of the equity market of a given country, which we approximate using the standard deviation of the daily returns of a country's major stock index from 2011 to 2013 (*mktvolat*).
- The correlation between source and destination stock market price indices, using daily data from 2011 to 2013 (*mktcor*)
- In international equity trading, exchange rates directly affect the return on foreign investments. We approximate this risk using the standard deviation of currency exchange rate between each pair of countries. We also set the value of this variable to zero for country pairs with fixed exchange rates. (*exch*)

We also include the following economic development variables to control for differences in economic conditions:

- Accountability (*account*);
- GDP per capita (*gdp_per_cap*);
- Real GDP growth (*rgdp_growth*);
- Dummy variables that classify countries according to whether they belong to the European Union (*eu_dum2*);

See section 3.1 for a complete description of our variables.

3 Data

3.1 Description of Variables and Sources

Our bilateral equity holdings (*holdings*) data come from IMF Coordinated Portfolio Investment Survey (CPIS). It contains the geographic breakdown of countries' equity portfolio, collected annually from 2001 to 2015. To be consistent with the timing of other variables, we use CPIS data from 2013. The data are in millions of dollars. Any bilateral holdings with less than 0.5 million are recorded as 0. We excluded tax haven countries in our analysis.

Our measure of country mass, in accordance with the literature, is the dollar value of market capitalization. The variable *mktcap1* is the market cap of the source country, and *mktcap2* is the market cap of the destination country. Data for bilateral country distance are from CEPII, measured by the geographic distance between the capital cities of each country.

Our main variables of interest are the stock market charateristics of the destination market. These include market return variables, which are the stock market return, volatility, and the correlation between the stock markets. These data come from the MSCI market index database. Stock market return (*mktreturn*) and volatility (*mktvolat*) are measured by the mean and standard deviation of the country index stock's daily return from 2011 to 2013, respectively. The market correlation between country pairs (*mktcor*) is the correlation between the source and destination countries' stock market daily return from 2011 to 2013. Since the returns from international investment are affected by exchange rates, we also include exchange rate volatility of the destination country from 2011 to 2013 (*exch*), calculated by the standard deviation of the dollar value of a currency.

Economic development variables come from *World Economic Forum: Global Competitiveness Report*. *gdp_per_cap1* and *rgdp_growth1* are the source country's GDP per capita and real GDP growth. *gdp_per_cap2* and *rgdp_growth2* are the investment destination country's GDP per capita and real GDP growth. Accountability (*account*) is a composite index of strength of auditing and reporting standards, efficacy of corporate boards, protection of minority shareholders' interests, and strength of investor protection.

Variables used for robustness checking include common official language dummy (*comlang_off*), common colonizer dummy (*comcol*), contingency dummy (*conting*) and country credit rating (*rating*).

Additionally, we compare estimates of our model's parameters in groups of countries categorized by their equity market maturity. The MSCI market categorization sorts global equity markets into three main categories: developed markets, emerging markets, and frontier markets. Table 1 shows the breakdown of the number of observations in our dataset by these market categories.

We include an EU dummy for a comparison between different types of markets to capture any effect from this cohort of highly similar countries that are also close together. The EU dummy indicates whether the country is a member of the European Union in 2013. Countries in the EU are coded by 1 and 0 otherwise. *EU_dum1* refers to the source, and *EU_dum2* refers to the destination. Table 2 shows a breakdown of data observations by the EU membership of investors and destinations.

See Table 3 for the list of ten country pairs with the highest equity holdings in 2013 and Table 4 for the summary statistics of the variables we use. See Appendix A for a complete list of data sources and descriptions.

4 Regression results

4.1 Benchmark and Control Models Comparisons

Our first result confirms the empirical significance of the gravity model using quasi-Poisson estimation methods. The first column in Table 5 shows the benchmark gravity model under quasi-Poisson regression. All the gravity variables are significant, and the signs are as expected, supporting the observations documented in literature that foreign equity holdings are positively associated with country masses and negatively associated with distance.

The second and third columns in Table 5 compare the control gravity model under OLS and quasi-Poisson. Results from the quasi-Poisson model show that distance still matters after accounting for destination country equity market characteristics and economic conditions. The quasi-Poisson model reveals the significance of a new set of factors that display no significant correlation with the dependent variable using OLS. Countries with higher market volatility receive significantly less international investment, but high market correlation is associated with high international investment, pointing towards differing aspects of the risk preferences of international investors. The sign of exchange rate volatility in the Poisson model becomes negative, which matches our intuition that people are less likely to hold equities from countries with high exchange rate volatility.

The stock market variables suggest that people's portfolio choices are more complex than merely following investment strategies such as diversification.

While people tend to invest in stocks with high market return and are risk averse on the aggregate level, they also seem to prefer equity markets with high stock market correlation with their home equity market. There are two possible explanations. First, this may be due to people's tendency of investing what is familiar, which happens to be countries with high stock market correlations. Thus the familiarity effect outweighs the diversification effect. This phenomenon could also be attributed to financial integration. The various levels of financial integration presents investment opportunities with different degrees of easiness, prompting people to build their portfolio with the most easily obtainable foreign assets. Unsurprisingly, countries with higher degrees of financial integration tend to have high stock market correlations as well.

The destination country's state of economic development also factors in the investment decision, as people are more likely to invest in countries with high level of GDP per capita, and interestingly, lower level of real GDP growth.

A few coefficient in the Poisson model are worth noting. We have observed a positively significant interaction term between real GDP growth of the investor country and the market volatility of the destination country. For a given increment in market volatility, the level of equity investment increases more drastically as the real GDP growth of the source country increases. This suggests that people's risk aversion in investment declines with higher levels of real GDP growth. If a country enjoys a booming economy and people are optimistic about the economic outlook, they could afford to bear higher risk to harvest higher returns. On the other hand, if a country is in recession, people tend to be more reserved with their investments and would resort to a low risk - low return investment strategy.

4.2 Control Model by Source Country Market Maturity

To better understand how market maturity of the source countries is associated with differences in investment patterns, we run the same control model regression on frontier countries, emerging countries, and developed countries respectively, as shown in Table 6.

In all three models, the signs of the gravity variables are as expected. Institutional qualities such as investor protection and rule of law, as measured by a composite index accountability, is significantly and positively associ-

ated with international equity holdings across all investors. Developed source countries are more likely to invest in European Union countries, whereas emerging and frontier source countries are less likely to do so. Investors from emerging countries are most concerned with the accountability of the destination countries, followed by investors from frontier countries, then by investors from developed countries. Compared with investors from developed countries, those from emerging countries value GDP per capita and are less repelled by market volatility of the destination countries.

Notice that the signs of the interaction between market volatility and real GDP growth are different for the three models. For frontier markets, as real GDP growth level increases, people are less likely to invest in stock markets with high volatility. This trend is opposite from that in emerging and developed countries, where people are more likely to buy high volatility stocks when their economy is booming. One possible explanation is that in emerging and developed countries, people are more confident about their economy and are willing to take higher risks; whereas in frontier countries, people are less secure about their economic prospects and the risk aversion becomes the dominant effect.

4.3 Control Model by Destination Country Market Maturity

Table 7 shows results from our model by grouping the observations according to the market type of the destination market for investment.

For investments made in frontier, emerging, and developed countries respectively, distance is still negatively associated with the amount of holdings. However, within each group, there are some interesting discrepancies between the way investment destinations are evaluated. For instance, accountability is positively and significantly correlated with equity investment in both the emerging and developed destinations, but the large difference in coeffecients suggests that investors are more concerned with the accountability of the destination when investing in emerging markets than when they invest in developed markets.
Market correlation is negative and significant for frontier and emerging destinations, suggesting that people who invest in frontier and emerging markets seek diversification. The lack of significance of the market correlation in developed market may be due to two reasons. It could be that many countries that diversify into the developed markets have high stock market correlation

with the destination country. It could also be that those who invest in developed markets are less concerned with market correlatiion and instead value high stock market return and low volatility of the destination country.

In addition, certain investors demonstrate more interest in one type of market than other. For instance, countries with high growth rate of real GDP have a strong propensity to invest in developed markets. Also, compared with other countries, European Union countries are more likely to invest in both emerging markets and developed markets, although not in frontier markets.

4.4 Model Robustness

For robustness checking, we first add a few dummy variables including common language *(comlang_off)*, common colony *(comcol)*, and whether the two countries share a border *(contig)*, as well as an index for the country's credit rating (*ratings*). Column 4 in Table 5 presents results of this regression model for robustness testing. The signs of the gravity variables are still as expected after adding in those robustness checking variables, and the coefficients of most control variables have not changed significantly, although the sign of exchange rate volatility changed from negative to positive.

We use bootstrapping analysis for further robustness testing. Table 8 displays the key statistics. Our bootstrapping process replicates a repeated sampling with replacement process 100 times, where each sample has the same size of the original dataset but virtually zero probability of being identical. A new estimator is calculated for each of these samples; the "bias" column reports the difference between the original estimator and the mean of these estimators obtained in each resampling, while the "std.error" column reports the standard error of the distribution of these estimators. The forth column reports the 95% confidence interval of the bias-adjusted estimators. There is no notable changes in the significance of these estimators. These results provide extra evidence for the robustness of our model.

International equity holdings data is highly varied. Therefore, we also test our model robustness against outliers and influential points. Using the Cook's distance of each point as a reference, we found that almost all of the influential points we identified include the U.S. as either the source or the destination country (the most influential source-destination pairs include China - U.S,

United Kingdom - U.S., and U.S. - Canada). Thus we test our model robustness by excluding observations involving the United States. The second column of table 9 shows model estimations after excluding these observations, and the first column shows estimations using all available observations. Despite expected changes in the magnitude of coefficients, there are no sign flipping or significant changes in the coefficients.

5 Concluding Remarks

We use quasi-Poisson regressions to examine the distribution of international equity holdings. Using a gravity model setup, we test the significance of stock market characteristics controlling for the degree of economic development. Our model is able to explain nearly 90 percent of the variance in international equity holdings.

Turning from OLS regressions to PPML regressions allow us to uncover a robust negative correlation between market volatility and the level of equity holdings. This observation provides supporting evidence for the risk-aversion of international investors on the macro level. On the other hand, the interaction term between real GDP growth of the source country and the stock market volatility of the destination country suggests that for a given increment in market volatility, the level of equity investment increases more drastically as the real GDP growth of the source country increases. Investors from countries with higher real GDP growth level seem to have a higher tolerance of risk.

Our results also concur with findings in the previous literature. The robust positive coefficients of destination market return and market correlation accord with the frequent observations of "return-chasing" behavior and the "correlation puzzle" respectively in the international investment literature. While people tend to invest in stocks with high market return and are risk averse on the aggregate level, they also seem to prefer equity markets with high stock market correlation with their home equity market. This may be due to people's tendency of investing what is familiar or the easiness of investing in highly financially integrated markets. Finally, the gravity variables remain robust under quasi-Poisson regression: bilateral investments tend to be higher between countries with larger capital markets and countries that

are less distant.

Additionally, we found that source countries with varying capital market development levels exhibit different investment patterns, and that countries that invest in frontier, emerging, and developed markets differ in their overall characteristics. Notably, When we divide source countries by their respective market maturity levels, our model actually assumes higher explanatory power.

There are several directions for future research. One straightforward expansion would be to test our model using panel data across a longer time span for more conclusive evidence. Another possibility would be to further investigate the observed significant relationship between equity holdings and destination market volatility. Finally, we would like to examine in greater detail how countries' levels of capital maturity are associated with differences in investment patterns.

Table 1: Number of Country Pairs by Market Development Types

	Frontier Dest.	Emerging Dest.	Developed Dest.
Frontier Investor	2139	1880	1974
Emerging Investor	552	460	504
Developed Investor	506	440	441

Table 2: Number of Country Pairs by EU Dummy

	Non-EU Destination	EU Destination
Non-EU Source	4592	2599
EU-Source	1107	598

Table 3: country pairs with the highest equity holdings

Source-Destination	2013 holdings (millions)
UK - US	899,596
Japan - US	690,227
US - Canada	557,181.4
US - UK	552,394.2
Luxembourg - Italy	447,542.3
Luxembourg - Germany	436,546.9
Ireland - US	419,936
Switzerland - US	410,452
US - Japan	392,253.3
France - US	328,064

Table 4: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Max
holdings	5,681	2,835.154	26,018.14	0	899,596
mktcap1	4,239	623e+09	2.12e+12	135e+06	17.2e+12
mktcap2	5,414	897e+09	2.32e+12	175e+06	17.2e+12
distcap	5,681	6,930.129	4,354.317	59.617	19,772.34
exch	1,515	13.759	128.015	0	2,770.787
mktcor	2,472	0.244	0.269	−0.123	0.962
mktreturn	2,472	−2.67e-06	6.34e-05	−2.22e-04	2.27e-04
mktvolat	2,472	0.002	0.002	0.0001	0.011
account	5,681	4.698	0.577	3.492	6.214
rgdp_growth1	5,567	0.057	0.032	-0.043	0.227
rgdp_growth2	5,681	0.044	0.027	-0.043	0.135
gdp_per_cap1	5,567	19,939.98	23,673.13	259.365	113,726.6
gdp_per_cap2	5,681	28,893.4	21,916.39	954.396	102,910.4
ratings	5,151	67.999	25.543	5	100

Note: We recorded three sig. figs. for mktcap1, mktcap2, and mktreturn

A Main regression results

Table 5: Benchmark and Control Models Comparisons

	Dependent variable:			
	holdings	log(1 + holdings)	holdings	
	glm: quasipoisson link = log	*OLS*	*glm: quasipoisson link = log*	
	(1)	(2)	(3)	(4)
log(mktcap1)	0.741***	0.983***	0.910***	0.888***
	(0.037)	(0.034)	(0.035)	(0.034)
log(mktcap2)	0.980***	0.831***	0.926***	0.846***
	(0.043)	(0.036)	(0.037)	(0.037)
log(distcap)	−0.632***	−1.144***	−0.299***	−0.276***
	(0.052)	(0.071)	(0.040)	(0.061)
log(1 + exch)		0.018	−0.097	0.013
		(0.051)	(0.069)	(0.075)
log(1 + mktcor)		0.209	0.568**	0.529**
		(0.287)	(0.202)	(0.189)
log(1 + mktreturn)		4,017.845***	7,510.867***	7,732.254***
		(929.637)	(875.745)	(840.473)
log(mktvolat)		−0.289	−1.156***	−1.012***
		(0.155)	(0.199)	(0.186)
log(mktvolat):log(1 + rgdp_growth1)		4.765	19.966***	17.948***
		(2.755)	(3.907)	(3.584)
log(account)		3.550***	2.769***	1.009
		(0.565)	(0.587)	(0.603)
log(1 + rgdp_growth1)		37.368	136.252***	121.035***
		(19.635)	(27.174)	(24.873)
log(1 + rgdp_growth2)		13.826***	−10.391***	−22.513***
		(2.558)	(2.796)	(3.404)
log(gdp_per_cap2)		1.620***	0.949***	0.699***
		(0.070)	(0.102)	(0.143)
log(ratings)				0.858
				(0.471)
contig				−0.190
				(0.172)
comlang_off				0.486***
				(0.098)
comcol				1.290**
				(0.489)
Observations	4,049	1,032	1,032	963
R^2	0.678	0.741	0.883	0.895

Note: *p<0.05; **p<0.01; ***p<0.001

B Regression results for countries by market maturity

Table 6: Control Model by Investor Country Market Development Types

	Dependent variable:		
	holdings		
	Frontier Source	Emerging Source	Developed Source
log(mktcap1)	0.186	1.034***	0.691***
	(0.572)	(0.071)	(0.039)
log(mktcap2)	1.099***	0.943***	0.940***
	(0.150)	(0.059)	(0.038)
log(distcap)	−0.708*	−0.331**	−0.190***
	(0.356)	(0.101)	(0.041)
log(1 + exch)	−0.549	−0.233	−0.108
	(0.746)	(0.281)	(0.066)
log(1 + mktcor)	0.301	1.035**	0.065
	(2.624)	(0.332)	(0.215)
log(1 + mktreturn)	93,419.520**	2,731.443	6,983.485***
	(29,062.200)	(1,481.957)	(1,069.478)
log(mktvolat)	4.641	−0.740***	−1.415***
	(3.466)	(0.202)	(0.211)
log(mktvolat):log(1 + rgdp_growth1)	−72.721	13.629**	16.895***
	(54.888)	(4.726)	(3.705)
log(account)	7.878**	9.457***	2.822***
	(2.509)	(1.383)	(0.587)
log(1 + rgdp_growth1)	−592.942	93.523**	110.216***
	(406.591)	(32.737)	(26.714)
log(1 + rgdp_growth2)	−10.331	−13.212*	−9.087**
	(14.159)	(5.976)	(2.809)
log(gdp_per_cap2)	0.684*	1.095***	0.954***
	(0.310)	(0.196)	(0.105)
eu_dum2	−1.000	−0.194	0.197
	(0.522)	(0.185)	(0.111)
Observations	159	446	427
R^2	0.909	0.884	0.907

Note: *p<0.05; **p<0.01; ***p<0.001

Table 7: Control Model by Destination Country Market Development Types

	Dependent variable:		
	holdings		
	Frontier Dest.	Emerging Dest.	Developed Dest.
log(mktcap1)	0.798***	1.230***	0.969***
	(0.126)	(0.219)	(0.043)
log(mktcap2)	−0.279	1.601***	0.819***
	(0.422)	(0.433)	(0.049)
log(distcap)	−0.982***	−0.799**	−0.194***
	(0.245)	(0.275)	(0.053)
log(1 + exch)	0.978*	0.448*	−0.266**
	(0.451)	(0.186)	(0.100)
log(1 + mktcor)	−3.017*	−2.110*	0.181
	(1.341)	(1.063)	(0.262)
log(1 + mktreturn)	14,723.310**	2,853.359	7,139.248***
	(5,222.546)	(5,276.516)	(1,078.199)
log(mktvolat)	−1.112	−1.526	−1.113***
	(0.934)	(1.424)	(0.237)
log(mktvolat):log(1 + rgdp_growth1)	3.853	31.992	19.610***
	(16.978)	(28.254)	(4.786)
log(account)	−14.755	10.863***	2.318**
	(21.480)	(3.205)	(0.790)
log(1 + rgdp_growth1)	21.613	220.654	135.117***
	(122.825)	(199.145)	(33.457)
log(1 + rgdp_growth2)	72.368	22.957	−18.527***
	(76.583)	(11.769)	(4.389)
log(gdp_per_cap2)	2.645	2.167***	0.322
	(1.976)	(0.629)	(0.245)
eu_dum1	0.201	1.399**	0.603***
	(0.551)	(0.492)	(0.128)
Observations	82	497	453
R^2	0.729	0.877	0.886
Note:			*p<0.05; **p<0.01; ***p<0.001

C Robustness Testing Results

Table 8: Bootstrapping Results

	original	bias	std. error	95% conf. interval
log(mktcap1)	0.9103	0.0116	5.313e-02	(0.79, 1.00)
log(mktcap2)	0.9258	0.0079	5.663e-02	(0.80, 1.03)
log(distcap)	-0.2990	-0.0477	8.838e-02	(-0.43, -0.07)
log(1 + exch)	-0.0969	-0.0169	9.780e-02	(-0.28, 0.12)
log(1 + mktcor)	0.5677	-0.0382	2.987e-01	(0.02, 1.88)
log(1 + mktreturn)	7510.8672	184.4835	1.306e+03	(4714.38, 9938.38)
log(mktvolat)	-1.1555	-0.0518	2.938e-01	(-1.69, -0.52)
log(mktvolat) : log(1 + rgdp_growth1)	19.9656	0.3089	5.417e+00	(8.82, 30.49)
log(account)	2.7687	-0.0283	8.326e-01	(1.13, 4.46)
log(1 + rgdp_growth1)	136.2517	2.3653	3.665e+01	(60.59, 207.19)
log(1 + rgdp_growth2)	-10.3912	0.2994	3.894e+00	(-18.48, -2.90)
log(gdp_per_cap2)	0.9490	0.0086	1.093e-01	(0.72, 1.159)

Table 9: Robustness Testing: Excluding U.S.

	Dependent variable:	
	holdings	
	All Countries	Excluding U.S.
log(mktcap1)	0.910***	0.816***
	(0.035)	(0.049)
log(mktcap2)	0.926***	0.673***
	(0.037)	(0.051)
log(distcap)	−0.299***	−0.556***
	(0.040)	(0.055)
log(1 + exch)	−0.097	−0.108
	(0.069)	(0.101)
log(1 + mktcor)	0.568**	0.718**
	(0.202)	(0.239)
log(1 + mktreturn)	7,510.867***	6,635.983***
	(875.745)	(1,166.707)
log(mktvolat)	−1.156***	−1.523***
	(0.199)	(0.228)
log(mktvolat):log(1 + rgdp_growth1)	19.966***	23.566***
	(3.907)	(4.498)
log(account)	2.769***	3.248***
	(0.587)	(0.588)
log(1 + rgdp_growth1)	136.252***	166.224***
	(27.174)	(31.988)
log(1 + rgdp_growth2)	−10.391***	−8.143*
	(2.796)	(3.185)
log(gdp_per_cap2)	0.949***	0.788***
	(0.102)	(0.101)
Observations	1,032	971
R^2	0.883	0.711
Note:	*p<0.05; **p<0.01; ***p<0.001	

D Data Source

Variables	Source	Description
Gravity Model Variables		
Market capitalization	World Federation of Exchanges	Stock market capitalization in US dollar
Distance between capital cities	CEPII	In kilometers
Familarity Variables		
Contiguity dummy	CEPII	1 if two countries are contiguous
Common colony dummy	CEPII	1 if two countries had the same colony
Shared language dummy	CEPII	1 if the two countries share an official language
Economic Development		
GDP per capita	World Economic Forum	In US dollars
RGDP growth rate	World Economic Forum	Growth rate of real GDP in 2013
Accountability index	World Economic Forum	composite index of strength of auditing and reporting standards, efficacy of corporate boards, protection of minority shareholders' interests, and strength of investor protection.
Country credit rating	Trading Economics	0-100 scale index
European Union dummy		1 for EU countries and 0 otherwise
Stock Market Performance		
Historical return	MSCI Price Index	3-year stock market index return from 2011 to 2013
Historical volatility	MSCI Price Index	3-year stock market index volatility from 2011 to 2013
Correlation between stock returns of two economies	MSCI	Correlation coefficient using country returns in U.S. dollars from 2011 to 2013
Exchange rate volatility	IMF	Standard deviation of daily exchange rate in 2013

Table 10: Variables Sources and Descriptions

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