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## FINANCIAL EDUCATION, INVESTOR PROTECTION AND INTERNATIONAL PORTFOLIO DIVERSIFICATION

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# Financial education, investor protection and international portfolio diversification\*

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## Abstract

This paper investigates the tension between regulation and financial education in explaining international portfolio diversification. We show that higher investor's financial education fosters international investment and stronger minority investor protection legislation attracts inward investment. More interestingly, these factors appear to be substitute in enhancing investor's portfolio diversification: the role of financial education is particularly pronounced where information problems and monitoring costs are likely to be more severe, that is in countries where protection of minority shareholders' rights is weaker. We interpret this evidence as supportive of the conjecture that financial education lessens the informational constraints of foreign investors.

*Keywords:* Financial education, Home bias, International Portfolio Investments, Investor Protection Legislation

*JEL Classifications:* G11, G15, G30

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# 1 Introduction

The urgent need to provide adequate protection for investors facing increasingly complex choices in financial markets, has given birth to a lively debate on which is the more appropriate remedy: regulation of financial products and institutions versus investor's financial education. Recent literature has highlighted a significant impact of financial literacy on economic behavior (Lusardi and Mitchell (2007); Guiso and Jappelli (2009); van Rooij et al. (2011); van Rooij et al. (2012)). However, the evidence is much more controversial when turning to evaluation of policies aimed to improve investors' financial knowledge. A recent strand of literature questions the effectiveness of financial education programs (Hathaway and Khatiwada (2008); Willis (2009); Gale and Levine (2010)) and claims the superiority of regulation remedies (Willis (2008); Willis (2011)).

This work aims to contribute to the debate bringing to light the joint contribution of these factors in explaining one of the major failures in investor's optimizing behavior, that is, international portfolio under-diversification. The benefits from international diversification of equity portfolios have been documented long ago (Markowitz (1952); Sharpe (1964); Grubel (1968); Levy and Sarnat (1970); Solnik (1974)) and persist despite increased stock market integration and systemic crises (Santis and Gerard (1997); Das and Uppal (2004)). However, investors actually hold a disproportionately small amount of foreign equities. The evidence of lack of diversification, often referred to as "home equity bias", is documented by many authors (French and Poterba (1991); Tesar and Werner (1995), among others). Several attempts have been made to rationalize this evidence. As reviewed in Lewis (1999) and Karolyi and Stulz (2003), proposed explanations refer to barriers to international investment (Stulz (1981); Tesar and Werner (1995)), hedging of background risk such as inflation risk (Cooper and Kaplanis (1994)) or human capital risk (Baxter and Jermann (1997); Pesenti and van Wincoop (2002)), information asymmetry between domestic and foreign investors, and over-optimism of domestic investors toward domestic assets (French and Poterba (1991); Strong and Xu (2003); Li (2004)). While the first motives have found weak support in recent empirical evidence, the latter two explanations, the one focused on information asymmetry and the other centered on behavioral motives, have benefited stronger support.

A priori, financial education can affect foreign investment because it reduces the costs of gathering information about foreign investment opportunities or because it improves awareness of the benefits and risks of international portfolio diversification thus dampening behavioral biases.

We provide evidence that both regulation and financial education contribute to explain foreign investment: in particular, the role of financial education appears particularly pronounced where information problems and monitoring costs are likely to be more severe, that is in countries with weaker protection of minority shareholders' rights. We interpret this evidence as supportive of the conjecture that financial education lessens the informational constraints of foreign investors, blamed as a major cause of international portfolio underdiversification.<sup>1</sup>

Our findings challenge the standard view spoused by the financial literacy literature: puzzling investing behaviors, such as stock market non participation, lack of portfolio diversification, lack of planning, are often ascribed to behavioral biases mainly related to ignorance or misunderstanding of benefits. Financial literacy is expected to play a significant role in helping the removal of these biases. Our findings about foreign portfolio diversification, point to an alternative channel through which financial education operates: the role of financial literacy appears to be more pronounced in foreign environments featuring weaker corporate governance standards. Since information asymmetries between foreign and local investors are particularly severe with respect to the evaluation of a firm's governance structure (Leuz et al. (2009); Kho et al. (2009)), these findings can be interpreted as supportive of the hypothesis that financial education contributes to international portfolio investment by loosening the informational constraints binding foreign investors.

If financial education permits easier access to foreign firms' specific characteristics, then highly educated investors might be ready to diversify their international portfolio in countries affording lower minority shareholder protection, while investors endowed with a lower financial literacy would avoid those countries demanding excessively high information costs.

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<sup>1</sup>The stylized fact of high turnover in foreign holdings has been interpreted as evidence against international asset holding costs (Tesar and Werner (1995)). More recently, however, Amadi and Bergin (2008) have shown that this argument only applies to costs that are proportional to trade and not to fixed costs of entering the foreign market, such as handling foreign languages and legal codes, and accessing information on a foreign firm. In the present paper we focus precisely on information barrier to explain international portfolio diversification.

van Nieuwerburgh and Veldkamp (2009) model the behavior of investors endowed with a (small) home information advantage who choose what information to learn before they invest. They find that investors profit more from knowing information others do not know: since prices reflect only as much as the average investor knows, when choosing what to learn investors make their information set as different as possible from the average investor's. To achieve the maximum difference, when choosing between domestic and foreign assets, home investors take home assets which they start out knowing relatively more about, and specialize learning even more about them, thus further exacerbating information asymmetry and home bias. In their setting, underdiversification reflects superior information. In our setting, taking as given the portfolio share invested domestically, the choice is among foreign assets and investors endowed with high financial literacy could find more profitable the strategy to learn more about specific foreign firms they have an advantage in, because, in so doing, their information set would be very different from what others know. Highly financially educated investors display in fact a relatively larger investment share in countries affording lower protection to minority shareholders: this evidence is consistent with the superior information hypothesis that predicts these investors have an incentive to deviate from average investor's information set by learning information that others cannot access.

Our results are consistent with basic stylized facts from the literature on the "superior information hypothesis": it holds for "smart" investors (Kumar and Korniotis (2013)), where informational asymmetries between local and non-local investors are largest (Ivkovic and Weisbenner (2005)), that is in economies where firm's governance structure is harder to value (Leuz et al. (2009); Kho et al. (2009)), and when the information is stock or industry specific (van Nieuwerburgh and Veldkamp (2009)), as it allows skilled investors to best exploit their informational advantage (Kumar and Korniotis (2013)).

The remainder of this paper is structured as follow. Section 2 reviews previous contributions on financial education and investor protection that are related to international portfolio diversification issues. After describing the conceptual framework and its main implications in Section 3, we present the data in Section 4 and main descriptive statistics in Section 5. Section 6 shows the results of our

empirical analysis. Section 7 reports further evidence in support of the information-based hypothesis and widely discusses the results. Section 8 summarizes the main findings and concludes.

## **2 Literature and contribution**

### **2.1 Financial education**

The literature has shown that an improved knowledge of notions and products is related to more virtuous financial behavior, such as planning and saving for retirement (Lusardi and Mitchell (2007); van Rooij et al. (2012)), stock market participation (van Rooij et al. (2011)), and portfolio diversification (Guiso and Jappelli (2009); Kimball and Shumway (2010)). Existing contributions on the linkage between financial literacy and portfolio diversification, relying almost exclusively on survey-based information, generally fail in providing any formal test on the causal linkage between financial education and international portfolio diversification. Indeed, the analysis of portfolio diversification has focused either on the comparison between households' portfolios and a benchmark efficient portfolio (von Gaudecker (2015)) or to diversification indexes based on the fraction invested in mutual funds and on the number of individual stocks in portfolio (Guiso and Jappelli (2009)). Calvet et al. (2007) use a dataset with information on the overall wealth of all Swedish resident households to evaluate the risk properties of household portfolios. The data records not only all asset classes (real estate, bonds, stocks, funds and bank accounts) but also portfolio holdings at individual asset level. Notwithstanding the reliable, highly detailed and comprehensive information on the portfolio holdings of the Swedish population, this dataset does not contain information on individual financial knowledge. Financial sophistication is proxied by variables such as wealth, income and education, and results emphasize that less sophisticated households tend to hold less diversified portfolios. Though international portfolio diversification is not the focal issue in Calvet et al. (2007), an indirect linkage between investor sophistication, and international diversification rests on the evidence that households with standard predictors of financial sophistication hold more diversified portfolios of equity

and balanced mutual funds, most of which are internationally diversified.<sup>2</sup>

Kumar and Korniotis (2013) using a demographic-based proxy for smartness,<sup>3</sup> show that portfolio distortions –among which preference for local stocks– of "smart" investors reflect an informational advantage that generate high risk-adjusted returns, while the distortions of "dumb" investors arise from psychological biases, as they experience low-risk adjusted performance.

To our knowledge the present paper is the first one studying the relationship between financial literacy and international portfolio diversification. The working paper by Kimball and Shumway (2010) represents the only exception. This paper exploits a US investors' cross-sectional survey in 2005 to create an index of financial sophistication and correlate it to puzzling investing behaviors, among which home bias.<sup>4</sup> Specifically, they study how financial literacy affects the probability to diversify portfolios by investing in global or international funds. The existence of a correlation between these anomalous behaviors and lack of financial sophistication make the authors conclude that the latter generates misunderstanding of how multiple assets combine to yield a portfolio's overall risk and returns.

Our paper adds to this contribution on several dimensions. First, adopting a macro-level approach and relating country-average financial education to aggregate portfolio holdings, we capture both the extensive and the intensive margin of foreign investment. Second, while the cross-sectional nature of their dataset arises many endogeneity issues that are only tentatively solved, we can exploit the panel dimension to address them. Third, the multinational investment opportunity set allows us to investigate how financial education affects international portfolio investment, that is by reducing behavioral biases or by allowing to gather better information about foreign stocks.

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<sup>2</sup>The disaggregation of Swedish households' foreign portfolio by destination country could potentially be inferred from households' direct stockholdings and international allocation of intermediaries but it is not reported in Calvet et al. (2007).

<sup>3</sup>Kumar and Korniotis (2013) cannot rely upon an index of financial literacy and construct a measure of "smartness" detecting the demographic characteristics strongly correlated with memory, verbal and quantitative abilities.(age, education, social network and income).

<sup>4</sup>Graham et al. (2009) follow a similar perspective studying the effect of self-assessed and objective competence on trading behavior (trading frequency, home bias). Their results indicate that investors who feel more competent about investing in foreign assets are more willing to shift a portion of their assets overseas.

## 2.2 Investor protection legislation

Since domestic sources of outside finance are limited in many countries around the world (Giannetti and Koskinen (2010)), foreign capital has become increasingly important (Bekaert et al. (2002)). International finance literature has emphasized the existence of a role of corporate governance in stimulating external finance by reducing information asymmetry (Leuz et al. (2009); Kho et al. (2009)).

Foreign investors are more vulnerable to information asymmetry than domestic investors. Corporate governance can partially offset this lack of information by signalling the quality of the institutions in terms of rights guaranteed to the investor (La Porta et al. (1998)), and hence can be particularly influential on those investors, the foreign ones, more heavily hit by information costs.

The index of shareholder rights adopted (antidirector rights, ADR) follows the seminal paper by La Porta et al. (1998) (LLSV (1998), henceforth) and measures how strongly the legal system favours minority shareholders against managers or dominant shareholders in the corporate decision making process.<sup>5</sup>

Standard asset pricing models assuming a representative agent predict that differences in observable characteristics of the asset, such as investor rights and financial development of the issuing firm or country, should be capitalized in share prices such that investing in any stock will be a fair investment regardless of the issuer's level of investor protection (Dahlquist et al. (2003)). However, when heterogeneity across investors is accounted for, the equilibrium price discount discloses only the average behavior thus inducing under- or over-investment by those investors for which the price discount is, respectively, too low or too high (Leuz et al. (2009); Giannetti and Koskinen (2010)). In particular, as noted by Leuz et al. (2009), this price discount is likely not sufficient for investors, such as foreign ones, that plausibly face information problems beyond those of domestic investors.

Previous work originating from LLSV (1998) underlines how investor protection affects financial market development, that is, the supply of equity, leaving the demand side mostly unexplored. This

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<sup>5</sup>As discussed below, we consider alternative measures to shareholder rights: the "revised" antidirector rights index (Djankov et al. (2008)) and the "Doing Business" Index of Investor Protection Strength (World Bank). Our results hold under any specifications.

latter perspective becomes relevant insofar as one accounts for heterogeneity across investors. Recent work has highlighted the asymmetric impact of corporate governance on different categories of investors (Leuz et al. (2009); Giannetti and Koskinen (2010); Giofré (2013)). Leuz et al. (2009) investigate the impact of firm-level corporate governance on foreign holdings and find that US investors invest less in foreign firms with poor outsider protection and opaque earnings. In particular, they find that foreign holdings in firms with poor governance are driven by information asymmetry. Their identification strategy relies on comparison across countries with different degree of investor protection: the role of firms' corporate governance within each country is present only where national level institutions are poor. Giannetti and Koskinen (2010) show that investor protection impacts financial market development by influencing the demand for equity, because different classes of investors—specifically controlling shareholders and outside shareholders—can differ in the benefits accruing to them and therefore in their willingness to pay for stocks. Giofré (2013) highlights how laws protecting different interests affect asymmetrically foreign stakeholders. More specifically, foreign shareholders show to appreciate strong creditor rights, which potentially mitigate the riskiness of projects, while bondholders are negatively affected by strong shareholder rights, which might induce firms to engage in excessively risky behavior.

The above-mentioned evidence emphasizes that the same corporate governance rules unevenly affect various categories of investors thus suggesting that their impact may crucially depend on investor's characteristics. Among these, we focus on the role of investors' financial knowledge: our work can contribute to the literature on investor protection by investigating how far heterogeneity in investor financial knowledge can affect the sensitivity of cross-border investment to foreign corporate governance.

### **3 A conceptual framework**

Our theoretical framework relies on equilibrium portfolio allocations in which investors are supposed to face different information costs when investing in various financial markets. Foreign investments

appear on average more risky to domestic investors –leading to an information-based justification to home bias– and portfolios differ among investors depending on their perceived variance-covariance matrix (Gehrig (1993)).

Absent any investor-specific factor, the "unbiased" portfolio holding of an asset depends, as in standard portfolio choice theory, on asset characteristics (risk and return).<sup>6</sup> When considering equilibrium asset holdings without investment barriers, all investors ought to hold the same portfolio, i.e., the value-weighted portfolio, in which each asset is weighted according to its share in world stock market capitalization. The same portfolio is still universally optimal in equilibrium even in the presence of investment barriers, provided that these barriers identically affect all investors. Conversely, heterogeneity in bilateral-specific investment barriers generates a wedge between the investor-specific optimal portfolio and the value-weighted portfolio. This wedge depends, in particular, on the distance between the investment barrier of country  $l$  investing in country  $j$  and the average barrier calculated over all countries investing in asset  $j$ .

The optimal portfolio weight in asset  $j$  ( $w_{lj}$ ) by country  $l$  is

$$w_{lj} = \frac{1}{D_{lj}}MS_j \quad \text{or} \quad \frac{w_{lj}}{MS_j} = \frac{1}{D_{lj}} \quad (1)$$

where  $MS_j$  is the market share of asset  $j$  in the world market capitalization and  $D_{lj}$  captures the relative (to the world average) investment barrier of country  $l$  investing in asset  $j$ .<sup>7</sup> Investors residing in country  $l$  will demand a share of asset  $j$  greater than its market share in proportion to  $\frac{1}{D_{lj}}$ .<sup>8</sup>

We label the ratio  $\frac{w_{lj}}{MS_j}$  as "scaled foreign portfolio share" in asset  $j$  of a representative investor in country  $l$ . A portfolio share  $w_{lj}$  larger than  $j$ 's market share signals that asset  $j$  is over-weighted in country  $l$ 's portfolio, while a ratio lower than 1 signals that country  $j$  is under-weighted.<sup>9</sup>

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<sup>6</sup>Details on the derivation of our stylized model (and its limitations) are available in Appendix A.

<sup>7</sup>Note that if  $D_{lj} = 1$ , i.e., if the investment barrier of country  $l$  in country  $j$  is equal to the average, then  $MS_j$  is optimally held in equilibrium.

<sup>8</sup>Our theoretical framework is equivalent to the return-reducing approach of Cooper and Kaplanis (1994) and Chan et al. (2005): in equilibrium, what matters is the investment barrier relative to the average.

<sup>9</sup>Our stylized theoretical setting ignores relevant factors such as inflation and exchange rate uncertainty, like many other models that focus on barriers to international investment (Dahlquist et al. (2003)). Since these factors are

### 3.1 Estimable equation and testable implications

To estimate (1) we must provide an empirical counterpart to the variable  $D_{lj}$ , which is not directly observable. We estimate the above equation applying standard linear estimation techniques, as follows:<sup>10</sup>

$$\left(\frac{w_{lj}}{MS_j}\right) = \alpha + \sum_{i=1,\dots,I} \beta^i X_{lj}^i + \sum_{n=1,\dots,N} \lambda^n Y_{lj}^n + \sum_{k=1,\dots,K} \theta^k W_l^k + \sum_{h=1,\dots,H} \delta^h Z_j^h + \varepsilon_{lj} \quad (2)$$

Factors that are common to all investors, domestic and foreign, are captured, on the left-hand side, by the market share ( $MS$ ), which is determined jointly with the market price in equilibrium, and that reveals only the *average* perceived variability. Any heterogeneity between foreign and domestic investors in the perception of the same factor creates a wedge between actual positions ( $w$ ) and market shares.

Our regression specification accounts for pair-specific and country specific factors which potentially capture investment frictions.

Among pair-specific variables we include as covariates  $i$  proxies, denoted by  $X_{lj}$  and  $n$  dummy variables  $Y_{lj}$  which are expected to capture investment barriers. If we consider, for instance, the distance between country  $l$  and  $j$  as an indicator of investment cost, we expect a negative sign for the associated coefficient: a higher "relative proxy" (e.g., greater distance between investing country  $l$  and target country  $j$  with respect to average distance) is associated with investor  $l$  biasing her portfolio away from country  $j$  stocks.

The main variables of interest in this paper are instead country-specific and are financial education (investing-country specific) and investor protection legislation (destination-country specific). Finally, to understand the mechanisms through which financial education affects foreign investments, we include an interaction term between investing country's financial knowledge and destination country's corporate governance.

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unlikely strongly correlated with investor protection laws, they are not expected to undermine our results. See Lewis (1999) and Karolyi and Stulz (2003) for a review of the effects of inflation and exchange rate uncertainty on portfolio choice.

<sup>10</sup>See Appendix A for a discussion on the linkage between theoretical model and empirical analysis.

$$\left(\frac{w_{lj}}{MS_j}\right) = \alpha + \sum_{i=1,\dots,I} \beta^i X_{lj}^i + \sum_{n=1,\dots,N} \lambda^n Y_{lj}^n + \sum_{h=1,\dots,H-1} \delta^h Z_j^h + \sum_{k=1,\dots,K-1} \theta^k W_l^k + \delta^H Z_j^H + \theta^K W_l^K + \gamma W_l^K Z_j^H + \varepsilon_{lj} \quad (3)$$

In the above specification,  $W_l^k$  represents generically all investor specific factors but financial education which is labeled by  $W_l^K$ : its coefficient  $\theta^K$  is expected to be positive because higher financial literacy should induce more international portfolio investment.

The variable  $Z_j^h$  refer to all destination-country factors but the investor protection rights' index, which is labeled by  $Z_j^H$ : since corporate governance should help foreign investors reduce the informational gap with respect to local investors, its coefficient  $\delta^H$  is expected to be positive.

Finally, the coefficient  $\gamma$  of the interaction term  $W_l^K Z_j^H$  can have either sign. A positive sign would suggest that the two variables of interest are complement: highly literate investors tilt their portfolio toward countries that better protect minority shareholders' rights. Such a finding can be interpreted as financial knowledge spurring international portfolio diversification by helping the removal of behavioral biases and ameliorating investors' understanding of financial market mechanisms. Specifically, higher financial knowledge would encourage foreign diversification by allowing investors to better appreciate the role of shareholders' rights embedded in corporate governance rules. Conversely, a negative sign would suggest that the two variables of interest are substitute: highly literate investors tilt their portfolio toward countries less protective of minority shareholders' rights. Such a finding might indicate that financial knowledge contributes to foreign portfolio investment by loosening the informational constraints of foreign investors. In such a case, indeed, financial education would enhance portfolio investment in those economies in which information and monitoring costs are more pervasive, that is in those countries featuring weaker investor protection rules.

To estimate the above parameters, we adopt a feasible Generalized Least Squares specification that assumes the presence of time and cross-section heteroskedasticity, and adjust standard errors for two-way clustering at the investing country and year levels, as suggested for finance panel data sets (Petersen (2009)). We follow an instrumental variable (IV) approach to account for possible

sources of endogeneity related to our two main variables of interests, financial education and investor protection.

## 4 Data

### 4.1 Dependent variable

We consider equity portfolio investments by 40 investing countries<sup>11</sup> in 41 destination stock markets<sup>12</sup>, for the period 2001–2008.<sup>13</sup> We adopt the Coordinated Portfolio Investment Survey (CPIS), released by the IMF, a dataset which has been exploited in many recent papers (Fidora et al. (2007); Lane and Milesi-Ferretti (2007); Sorensen et al. (2007); Giannetti and Koskinen (2010); Giofré (2013)). This survey collects security-level data from the major custodians and large end-investors. Portfolio investment is broken down by instrument (equity or debt) and residence of issuer, the latter providing information on the destination of portfolio investment. While the CPIS provides the most comprehensive survey of international portfolio investment holdings, it is still subject to a number of important caveats. The most important is that the CPIS is unable to address the issue of third-country holdings and round-tripping, very frequent in the case of financial offshore centers. Moreover, the survey does not report domestic positions which need to be retrieved from other sources.<sup>14</sup>

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<sup>11</sup>Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Czeck Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Israel, Italy, Japan, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, the United States, Venezuela

<sup>12</sup>Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, the United Kingdom, the United States, Venezuela. Note that there are some countries included as investing ones but not as destination ones, and vice versa, because of relevant variables' data availability. See the footnotes to Table 2 and Table 3 for more details.

<sup>13</sup>The data period is dictated by the availability of the variable capturing financial education (1999-2008).

<sup>14</sup>See [www.imf.org/external/np/sta/pi/datarsl.htm](http://www.imf.org/external/np/sta/pi/datarsl.htm) for more details on the survey.

## 4.2 Main regressors: Financial Education and Investor Protection Legislation

From 1999 to 2008, the IMD World Competitiveness Yearbook (WCY) has published an indicator of financial education. The indicator is computed from a survey of senior business leaders who represent a cross-section of the business community in the countries examined, and merged with data drawn from international organizations. The sample distribution reflects a breakdown of industry by sectors (manufacturing, services and primary) and the sample size is proportional to each country's GDP.<sup>15</sup>

The "education in finance" question asks for an evaluation, on a 0-10 scale, of the statement: "education in finance does meet the needs of the business economy".

The WCY indexes are based on managers and country experts responses, rather than on a standardized survey of individuals. This can cast doubts on the reliability of these indexes. Recent contributions by Jappelli (2010) and Jappelli and Padula (2011) show that the ranking of economies in this survey is largely consistent with the one obtained by SHARE, which provides detailed information on cognitive abilities at the individual level, for 11 European countries. This evidence increases confidence in the WCY index as reasonable indicator of financial education.<sup>16</sup>

The other main variable for the analysis captures the degree of protection of minority shareholders' rights. We adopt the antidirector rights (ADR) index that measures how strongly the legal system favors minority shareholders against managers or dominant shareholders in the corporate decision making process (LLSV (1998)). For robustness, we check the validity of our findings also under alternative specifications of the protection rights index.<sup>17</sup>

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<sup>15</sup>The survey questions are targeted to top and middle managers (about 4,000 overall in 55 countries), nationals or expatriates, located in local and foreign enterprises in the country in question, who generally have an international experience and outlook.

<sup>16</sup>Lo Prete (2013) exploits the WCY survey to investigate the linkage between economic literacy, financial development and income inequality.

<sup>17</sup>For more details on the construction of these indexes and the full set of regressors adopted in the paper, see Table 1.

## 5 Descriptive statistics

Table 2 shows descriptive statistics of the regressors included in our analysis.<sup>18</sup> The first three variables in columns (1)-(3) are investing-country specific variables and are drawn from the IMD World Competitiveness Yearbook. It is worth stressing that these variables are all time-varying. The first variable is the main source-specific variable of interest, that is investor financial education: "economic literacy" and "finance skills" are adopted as alternatives to financial education.<sup>19</sup>

These investing-country specific variables are followed by five destination-country specific variables that capture the investor protection afforded to minority shareholders in the destination country. The ADR index represents the principal destination-specific variable. This is mostly used throughout the paper since largely adopted in the literature. However, for robustness, we test if our results hold under different index specification.

The variables in columns (9)-(11) are meant to capture more generally legal protection. Capital mobility in column (12) is used to proxy financial frictions in capital trading and is referred both to source and destination countries. GDP per capita and exchange rate regime are used as source country specific controls which may influence foreign portfolio investment and be correlated with financial education. Columns (15)-(18), report country-specific variables that capture general country governance, among which the last two variables are time-varying. Finally, the last column shows the dummy variable identifying the legal origin –common law (1) versus civil law (0)– of the destination country.

It is worth stressing that the absolute magnitude of the variables included does not affect per se the size of the associated coefficient since all variables, for consistency with the analytical framework, enter our regression specification in relative terms, that is scaled by their world average.

Table 3 reports descriptive statistics of the dependent variable (by destination country) and of financial education (by investing country). The first column reports the average portfolio share

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<sup>18</sup>We do not report statistics on gravity variables such as distance, common border, common language, colonial linkage, common currency and common legal origin.

<sup>19</sup>The "economic literacy" question asks respondents to evaluate the sentence: "economic literacy among the population is generally high". Finally the "finance skills" question reads: "finance skills are readily available".

invested in country  $j$  by all investing economies in the period 2001-2008. The second column shows the corresponding standard deviation. The magnitude of the standard deviation is quite variable across destination countries, ranging from a value close to the average portfolio share in the United Kingdom to a value almost 4 times larger than the average portfolio share in Malaysia. We report, in the third column, the average market share, that is, the respective investable fraction of world market capitalization if the value weighted portfolio prevailed as optimal portfolio. Dahlquist et al. (2003) estimate the fraction of shares closely held across 51 countries, finding that on average 32 percent of shares are not available for trading and cannot therefore be held by foreign investors. This induces a measurement error in the size of domestic and foreign bias that was neglected by previous literature. Following Dahlquist et al. (2003), we consider the MSCI market share, based on the free-float adjusted market capitalization.

We then derive the average of the dependent variable in our empirical analysis, that is the "scaled foreign portfolio share", computed as the ratio of the average observed portfolio share to market share. To provide an economic interpretation of this measure, consider that a scaled foreign share equal to 1 implies that foreign assets enter portfolios with a weight equal to their stock market share. The pervasive evidence that the average scaled foreign share is almost always below unity –i.e., the evidence that foreign assets are generally underweighted– is the mirror image of the strong home bias reported in the international finance literature.<sup>20</sup>

The scaled foreign share ranges from 0.068 for Canada to 2.822 for Ireland. The result for Ireland stresses the concerns of third-country holdings and round-tripping in the CPIS survey mentioned above, and point to the need to control for offshore financial centers in our empirical analysis. A notable degree of heterogeneity in scaled portfolio shares toward various foreign assets emerges: there might exist destination-specific factors –among which are investor protection laws– making some countries more attractive than others to foreign investors, investing countries' specificities – among which financial education– and/or pair-specific factors inducing differing evaluations of the

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<sup>20</sup>We ignore any direct explanation relative to the home bias phenomenon as we focus on the determinants of foreign positions. Domestic positions, though not explicitly investigated, indirectly impact our analysis: the weight of each foreign stock index in the overall portfolio also depends on the domestic share. See Giannetti and Koskinen (2010) for an extensive discussion of the implications of minority investor rights on home equity bias.

same asset by different investors. This suggests the need to consider both pair-specific and country-specific factors as potential determinants of cross-border investment in our empirical analysis.

The last two columns of the table report mean and standard deviation of financial education, the main time-varying regressor in our analysis. In Table 2, we report overall descriptive statistics for financial education and we learn that the standard deviation of financial education is about 22% of the overall mean. In Table 3, we pinpoint the time variability of financial education, by investing country: it is equal to 8% of the overall mean, about one third of total variability, ranging from 2% for Sweden to 17% for South Africa.

## 6 Results

This paper studies the impact of financial education on cross-border investment, measured by the "scaled foreign portfolio share" ( $w_{ij}/MS_j$ ). Hereafter, for the sake of brevity, we simply refer to "foreign portfolio share" rather than "scaled foreign portfolio share" and drop the adjective "relative" when referring to regressors, keeping in mind that they are all defined in relative terms (with the exception of dummy variables).

### 6.1 Role of financial education

The first column of Table 4 reports the univariate regression of foreign portfolio share on financial education of the investing country  $l$ . The coefficient is positive and statistically significant and financial education explains 2 percent of our dependent variable's variability.

The descriptive statistics of financial education in Table 2 and 3 report its overall variability and its time variability, respectively. In columns (1a) and (1b) of Table 4 we add to financial literacy, alternatively, time dummies and investing country dummies, to identify, within a preliminary regression analysis, the explanatory power of both the time and the cross sectional dimension of the variable. We find, as expected, that the coefficient of financial education is only marginally affected by the inclusion of time dummies while is severely reduced by the inclusion of country dummies: it

confirms the prevalent cross sectional component in the variability of financial education, but also certifies a non negligible role for time variability.

To properly seize the impact of financial education, we set a multivariate regression analysis and control for standard determinants of foreign portfolio investment.

Many empirical contributions find that the cultural and geographic proximity of the market has an important influence on investor stock holdings and trading (Brennan and Cao (1997); Kang and Stulz (1997); Grinblatt and Keloharju (2001); Chan et al. (2005); Portes and Rey (2005)). Column (2) of Table 4 reports the results from a regression including standard gravity variables such as distance, common border, common language, and colonial dummies. The variable distance is measured as the great-circle distance between the capital cities of the destination and investing countries. The common border (language) dummy takes the value 1 if the investing and destination country share a common border (language) and 0 otherwise. The first two variables, distance and common border, simply capture the physical distance between investing and destination country.<sup>21</sup> Since transactions in financial assets are "weightless", a role for distance can be found only if it has informational content (Portes and Rey (2005)). The role of the common language dummy is intuitively interpretable, since foreign languages make collecting information more difficult. Finally, to capture cultural and/or historical ties, we check whether countries are tied by colonial heritage. The dummy common colony variable takes the value 1 if the considered pair of countries shares a similar colonial history. These variables play an economically and statistically significant role in explaining the dependent variable, with a particularly strong impact of the common border dummy (0.505).

Column (2) of Table 4 also include institutional covariates capturing pair-specific linkages: namely, common currency area (EMU), and common legal origin. The EMU dummy takes the value 1 if the investing and destination countries are EMU members and 0 otherwise. The coefficient is positive and significant and its effect is quite large: EMU membership boosts foreign portfolio share by 0.585 compared to non member countries. Our findings are qualitatively consistent with the evidence re-

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<sup>21</sup>A separate role for the border dummy can be found insofar as this variable is considered as "correcting" the distance variable, which is measured as the great circle distance between the capital cities of the destination and investing countries.

ported by Lane and Milesi-Ferretti (2007) and Balta and Delgado (2009), who find, as a result of monetary integration, a notable increase in foreign investments in the Euro area by EMU countries. Finally, sharing the same legal origin might encourage cross-border investment since there is less fear of unknown factors (Lane (2006); Guiso et al. (2009)). We include a dummy variable taking the value 1 if the investing and destination countries share the same legal family (English, French, German or Scandinavian) and 0 otherwise. The coefficient is positive, as expected, but not statistically different from zero.<sup>22</sup> Overall, the inclusion of these pair-specific factors does not modify the quite large economic impact of financial education and notably adds to the explanatory power of the regression, pushing the adjusted-R<sup>2</sup> to 0.18.<sup>23</sup>

Institutional barriers to capital mobility can deter investment in foreign countries. In column (3) of Table 4, we control for inward and outward capital mobility, proxied by an index measuring the restrictions imposed by different countries on capital flows, derived from the Economic Freedom Network (e.g., Chan et al. (2005) adopt the same index). This index ranges from zero to 10 and measures the restrictions countries impose on capital flows, assigning a lower rating to countries with more restrictions on foreign capital transactions. We find indeed that higher capital mobility of the destination country attracts more inward investment, while the effect of capital mobility in the investing country, though positive as expected, is not precisely estimated.

One may legitimately argue that financial education miscaptures other features of investing countries.<sup>24</sup> Therefore, we include, beyond capital mobility, additional investing country factors to control for the effect of other investors' specificities on foreign investment. In column (3) of Table 4, we control for GDP per capita and exchange rate regime. GDP per capita is a measure of economic development, potentially highly correlated with financial education, so that its omission could severely bias coefficients' estimates: its coefficient is positive and statistically different from zero. The exchange-rate regime plays an important role in enabling economies to take advantage of the increasing openness and depth of international capital market. We adopt the IMF Coarse Classification of exchange rate

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<sup>22</sup>The coefficient of the variable "equal legal origin" will gain statistical significance in richer specifications.

<sup>23</sup>Our results are consistent with Vlachos (2004), who shows that cultural and regulatory differences generate a negative impact on cross-country portfolio holdings.

<sup>24</sup>As reported at the bottom of the table, only column (3) includes country dummies.

regime, ranging from 1 to 6, where higher values of the index reflect higher flexibility in the exchange rate regime (Ilzetzki et al. (2008)). Our findings suggest no particular linkage between the exchange rate arrangements and international portfolio investment.

Finally, in column (3) of Table 4, we also control for time variability. Since the period spanned by our sample encompasses the financial crisis, we thought economically more informative a dummy variable capturing the crisis period 2007-2008, rather than a generic year dummy. Moreover, the crisis dummy would also allow to easily detect whether the role of financial education on international portfolio investment has been dampened or enhanced by the crisis. In this specification, neither the financial crisis dummy nor its interaction with financial literacy deliver statistically significant coefficients.<sup>25</sup>

After the inclusion of these controls, the coefficient of the financial education variable is substantially reduced from 0.439 to 0.177, but remains a statistically and economically significant factor explaining foreign portfolio investment.

## 6.2 Role of investor protection

Our analysis has so far focused on bilateral and investing-country specific factors. The descriptive statistics reported in Table 3, however, emphasize a great deal of heterogeneity across destination countries and suggest the need to consider destination specific factors to explain foreign portfolio positions. In particular, corporate governance can be particularly influential on investors more affected by information costs, namely foreign investors, by signaling the quality of institutions in terms of guaranteed investor rights (LLSV (1998)).

The literature has highlighted the effect of corporate governance on foreign investment (Kho et al. (2009); Leuz et al. (2009); Giannetti and Koskinen (2010); Giofré (2014)).

The various indexes of shareholder rights adopted in this paper are related to the antidirector rights (*ADR*) index, which was originally developed by LLSV to measure how strongly a legal system

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<sup>25</sup>We include a dummy crisis which is equal to 1 in the period 2007 and 2008 and 0 otherwise, since portfolio holdings in the CPIS refer to year-end and should already account for the beginning of the crisis in 2007. For robustness checks, we restricted the crisis period to year 2008 only, and results are unaffected.

favors minority shareholders against managers or dominant shareholders in the corporate decision making process.

Column (4) of Table 4, includes the  $ADR$  index of destination country  $j$ . If all investors, foreign and domestic, equally weighed  $ADR_j$ , this factor should be captured by the equilibrium market share. A non null coefficient of  $ADR$  thereby reveals a significant role of investor protection laws in explaining the distance between the foreign portfolio position and what is predicted by market share. The positive and significant coefficient of  $ADR_j$  is qualitatively consistent with recent evidence (Kho et al. (2009); Leuz et al. (2009); Giannetti and Koskinen (2010); Thapa and Poshakwale (2011)).

Beyond corporate governance mechanisms, there are other regulatory barriers to information acquisition by foreign investors. Barth et al. (1999) highlight that foreign investors incur costs in understanding other countries' accounting principles. Bae et al. (2008) propose a measure of country-pair differences in 21 accounting rules based on an international survey of Generally Accepted Accounting Principles (GAAP), in 2001. This measure does not attempt to assess the quality of any given set of accounting rules but the extent to which accounting standards differ between two countries. Bae et al. (2008) suggest that analysts tend to avoid following foreign firms adopting accounting rules that are significantly different from the accounting rules used in their home country, because they incur costs to gain expertise in understanding other countries' GAAP. If this is the case, the "distance" in accounting standards between two countries should decrease bilateral foreign investments. We construct the measure of bilateral distance in GAAP and test its impact on foreign equity portfolio investment. We show in column (5) of Table 4 that indeed more distant accounting principles significantly deter bilateral investment. The inclusion of this proxy of regulatory barrier does not alter, however, the significance and magnitude of the coefficients of either the financial literacy variable or the  $ADR$  index.

Being  $ADR_j$  the only destination country's variable included in the regression, it captures all (time-invariant) destination-country specific factors.<sup>26</sup> To pinpoint the role of corporate governance, in column (6) of Table 4 we add other destination-specific institutional factors which may be corre-

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<sup>26</sup>The regression however includes the (time-varying) covariate seizing the degree of capital mobility in the destination country.

lated with  $ADR_j$ .

Previous literature has documented that fraudulent transactions, bribery, unenforceable contracts, legal and regulation complexity can significantly affect portfolio investment (Gelos and Wei (2005); Leuz et al. (2009)). We include two institutional variables more generally related to country level governance: "control of the risk of expropriation" that seizes government stance toward business, and "accounting standards" that are critical to render company disclosure interpretable.

A solid system of legal enforcement could substitute for weak "law on the books": active and well functioning courts can serve as recourse for investors aggrieved by management (LLSV (1998)). We therefore also control for the role of the efficiency of the judicial system in attracting foreign investments. Overall, the introduction of these control factors increases the impact of  $ADR_j$  from 0.013 to 0.023, and only moderately dampens the impact of financial education.

In column (6a) and (6b) of Table 4, we check the validity of these findings when alternative indicators of investor protection are adopted. In column (6a), the  $ADR$  index (LLSV (1998)) is replaced by its revised version (Djankov et al. (2008)). In column (6b), we adopt, instead, the strength of investor protection rights index released by the World bank (Doing Business).<sup>27</sup> In both specifications, we find a positive impact of financial education and a positive coefficient of the variable capturing investor protection.

### 6.3 Interaction between financial education and investor protection

To enhance international portfolio diversification, the information barriers can be dampened either on the side of the investors who want to internationally diversify their portfolios, or on the side of the destination country which aims to attract inward investment. In this respect, the analysis performed in this paper, can assess the role of investor-specific information –captured by aggregate national level financial knowledge– and destination-specific information – captured by the degree of information disclosure through corporate governance legislation.

Our results, robust to several alternative specifications, have so far highlighted a significant role

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<sup>27</sup>Note that the World Bank index is a time-varying variable. However, the time series starts in 2004 and, more importantly, it displays an almost negligible variability for the countries included in our sample.

of both sources of information in promoting international portfolio diversification.

Financial education can a priori affect foreign investment because it reduces the costs of gathering information about foreign investment opportunities (information channel) or because it helps removing the behavioral biases deterring international portfolio diversification (behavioral channel). The multidimensionality of our investment opportunity set can help discriminate between these two competing channels.

In order to understand the mechanisms through which financial education operates, we include in our regression specification an interaction term between investing country's financial literacy and destination country's regulatory strength.

A positive sign of the interaction term would point to a complementarity relationship between financial education and investor protection in enhancing foreign investments: highly literate investors tilt their portfolio toward countries that better protect minority shareholders' rights. In such a case, higher financial education can be interpreted as helping individuals to better understand diversification benefits and functioning of markets, so as to induce higher responsiveness to investor protection rules. Georgarakos and Inderst (2011), dealing with another puzzling behavior in international finance, i.e., the lack of stock market participation, underline a complementarity relation between perception of legal protection in the market and investor's perceived capability. They find that trust in financial advice matters only when perceived own capability is low, whereas for households with higher financial capability, only the perception of legal protection in financial markets matters for stock market participation. This lends support to the behavioral stance, spoused at large by the financial literacy literature, that relates lack of financial knowledge to investors' misunderstanding of benefits and markets' functioning.

Conversely, a negative sign would point to a substitutability relation between financial education and investor protection in their impact on foreign investment: highly literate investors tilt their portfolio toward countries that are less protective of minority shareholders' rights. In such a case, higher financial education can be interpreted as helping to alleviate information asymmetry aggrieving foreign investors, thus making relatively less costly the access to firms' financial information even

in economies featuring weaker protection of minority investor's rights.

In column (1) of Table 5, we add to the full regression specification adopted in column (6) of Table 4, an interaction term between financial education and  $ADR_j$ . The coefficient of the interaction term is negative (-0.125) and strongly significant: investing countries characterized by a higher education in finance appear to tilt their portfolio toward countries less protective of minority shareholders' rights. This finding represents the main innovative finding of the present paper and will undergo several tests to prove its validity.

The way to measure financial literacy is still debated. Indeed, research often fails to distinguish financial literacy from related concepts, such as numeracy. To the extent that financial literacy involves skills, rather than just knowledge, these skills likely depend on the ability to work with numbers. However, numeracy applies much more broadly than to just financial matters and is more closely aligned to cognitive abilities (Hung et al. (2009)). Defining and appropriately measuring financial literacy is essential to understand the extent of the educational impact as well as barriers to effective financial choices. Huston (2010) reviews the broad range of financial literacy measures used in research over the last decade, and highlights the existence of severe current limitations.

Consistency of results applying alternative measures of knowledge or skill is controversial. On the one hand, Ardle et al. (2009) and Delawande et al. (2008) show that more numerate individuals are more adept at complex decision making, including financial decisions. On the other hand, von Gaudecker (2015) finds that while low numeracy skills are associated with losses from under-diversification, financial knowledge does not seem to have an effect.

Since the type of knowledge matters, we check whether international portfolio diversification is related specifically to financial knowledge.

In column (2) of Table 5, we adopt, as an alternative to the variable "education in finance", the variable "economic literacy". When estimating the impact of economic literacy on foreign portfolio investment, we find that both its impact and its interaction term with  $ADR_j$  deliver coefficients significantly lower in size (respectively, one-fourth and one-half), though statistically significant. This suggests that the peculiar content of finance in the measure of knowledge we adopt, matters in our

results, at least quantitatively. To corroborate this conjecture, we adopt another variable drawn from the same dataset, related to "finance skills", though not directly referred to education. The regression analysis (column (3)) shows a significant positive impact on foreign investment and a significant negative coefficient of this variable interacted with  $ADR_j$ , with a coefficient size more comparable to the financial education's one.

To test the consistency of our findings, we account for the possibility of some form of measurement error in the construction of the three variables drawn from the IMD survey ("education in finance", "economic literacy" and "finance skills"). Two alternative versions of these three indexes are considered: a binary variable, splitting investors into those above and those below median (columns (#b), Table 5), and an ordinal variable taking values 1 to 4 according to the quartile the investors belong to (columns (#c), Table 5). Results are qualitatively unaffected by these alternative variable specifications.

## 6.4 Robustness

In previous econometric specifications, we controlled for (time-invariant) institutional factors specific of the destination economy to dispel the legitimate doubt that the index of investor protection rights miscaptured other characteristics of the destination economy. Here, we replace these institutional variables with two time-varying alternative variables, drawn from Worldwide Governance Indicators (WGI, World Bank): "political stability" and "control of corruption". In column (1) of Table 6, we report results from this specification: compared with the benchmark regression reported in column (1) of Table 5, the coefficients of  $finlit_l$ ,  $ADR_j$  index and their interaction term are only modestly affected.

In column (2) of Table 6, we add to the standard set of controls for the investing country  $l$ , also the bunch of control variable used for the destination country, including the  $ADR$  of the investing country, as proposed by Giannetti and Koskinen (2010) and Giofré (2014). Qualitative results persist, suggesting that they are not driven by omitted controls for the investing country.<sup>28</sup> In column (3)

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<sup>28</sup>Our findings are also robust to a regression specification including the level of investing country's  $ADR_l$  and its interaction with the destination country  $ADR_j$ , as in Giofré (2014) (results are available upon requests from the

of Table 6, we generally test the impact on foreign portfolio share of the signed difference between destination-specific and source-specific variables. We therefore consider the difference between  $ADR_j$  and  $ADR_l$  and their interaction with  $finlit_l$ , controlling for country-pair differences in all other regressors. We find no significant effect of the difference ( $ADR_j - ADR_l$ ) on our dependent variable.

In columns (4) to (6) of Table 6 we investigate the role of the financial crisis. The time period we are considering may be non-neutral for the analysis, since it encompasses the initial phase of the global financial crisis. We check if this event had a direct impact on international diversification incentives and, more importantly, if it affected the way international portfolios respond to financial education and investor protection legislation. In column (4), we test if the financial crisis affected international portfolio investment passing through financial education of the investing country, but we do not find such an evidence. In column (5), we test if the financial crisis affected foreign portfolio investment passing through investor protection legislation. The interaction term turns out to be positive: during the peak of the crisis, investors, probably suffering higher uncertainty, show to allocate a relatively higher portfolio share to countries affording stronger investor protection. Finally, column (6) shows that the coefficient of the interaction  $finlit_l \cdot ADR_j$  is still negative and statistically significant (-0.136) during the crisis period but the substitutability effect between financial education and investor protection decreases: the total coefficient in fact drops, in absolute value, to about -0.1 as the dummy for the crisis period increases the coefficient of the interaction  $finlit_l \cdot ADR_j$  by 0.037. A possible interpretation of this result is that in crisis periods, when the uncertainty increases, the role of financial education as a means to alleviate information asymmetry may shrink, thus weakening the informational channel. Of course, these preliminary findings cannot exhaust the investigation of the effect of the crisis on international diversification: such an analysis would require a whole picture of the crisis –while here we restrict to the initial phase only– and would necessitate a rigorous investigation of the evolution of the crisis and its forms of contagion across countries.

Finally, we test the robustness of our findings to the sample specification. In column (7) we exclude offshore financial centres, which might have the effect of distorting investors' decisions for  

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authors).

reasons beyond the scope of this work. We exclude Ireland, Switzerland, Singapore, Hong Kong and the United Kingdom.<sup>29</sup> In column (8), we restrict the sample to OECD countries only. Results do not highlight any peculiarity induced by the different sub-samples and our main findings remain qualitatively unaltered.

The robust evidence of a negative coefficient of the interaction term between  $finlit_i$  and  $ADR_j$  delivers support to the conjecture that education in finance affects international portfolio diversification by dampening information costs faced by foreign investors in accessing local firms' information in those economies featuring weak standards of investor protection.

Overall, these results can be interpreted as supportive of the information motives to explain puzzling economic behaviors. A similar interpretative approach can be found in Leuz et al. (2009) and Christelis et al. (2010). Leuz et al. (2009) investigate the impact of firm-level corporate governance on foreign holdings and find that foreign holdings in firms with poor governance are driven by information asymmetry. Their identification strategy relies on comparison across countries with different degree of investor protection: the role of firms' corporate governance within each country is present only where national level institutions are poor. Christelis et al. (2010) highlight that cognitive abilities are more important in explaining participation in financial markets characterized by more information-intensive assets (stocks versus bonds). The authors interpret these findings as confirming that the association between financial education and portfolio choice is driven by information constraints rather than by preferences or psychological traits. Likewise, our findings about the influence of financial education on international portfolio diversification point to an informationally-driven explanation rather than a behavioral one.

## 6.5 Endogeneity issues

Our findings are potentially flawed by endogeneity issues. The literature on financial literacy has widely recognized the difficulty in assessing a causal rather than a correlation link between financial literacy and economic or financial outcomes, such as wealth, stock market participation, pension

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<sup>29</sup>Note that Luxemburg is not present in our sample because data on its  $ADR_j$  index are unavailable.

funds participation, and portfolio diversification. Existing works are often based on cross-sectional surveys thus making unfeasible the identification of which variable is the driver and which is the outcome. In our case, the outcome of financial literacy (the scaled foreign portfolio investment) could represent a means to acquire financial literacy: more familiarity with foreign investment may create indeed higher incentives to accumulate financial knowledge. To address this issue, we exploit the panel dimension of our dataset to instrument current financial literacy with its lagged values, so as to ensure that the direction of causality goes from education to stock market investment. In order to be a good instrument, a variable must possess two properties: it must be highly correlated with the endogenous variable, and uncorrelated with the error term. While the first condition can be satisfied with a lagged value of financial literacy, the second condition is not so obviously fulfilled. The financial education variable drawn from the IMD survey, as specified above, is subject to a number of caveats and to the presence of measurement error. If this measurement error is related to some characteristics of the country in which the survey is conducted, then the same source of measurement error can arise in the reporting of portfolio holdings for the CPIS survey, data that are used to construct our dependent variable. In this case, the risk of correlation of the (lagged) financial education variable with the error term through the measurement error, is quite high. To circumvent this problem, we adopt the ordinal definition of financial literacy, that is likely less affected by measurement error.

Another possible source of endogeneity comes from the investor protection variable. Indeed, since the seminal paper by LLSV (1998), the literature has raised a severe endogeneity critique against the identification of a causal link between investor protection and financial market development. In LLSV (1998) the direction of causality between investor protection laws and development of financial markets (aggregate asset supply) is quite controversial. Our dependent variable is, instead, related to the demand side, being the ratio between portfolio weight and market share: the direction of causality, if any, should therefore go from investor protection to portfolio investment rather than vice versa. However, we account for this latter source of endogeneity drawing on the large literature on the legal and institutional origin of investor protection, and adopt, as an instrument, the legal origin

–common law versus civil law– of the destination country.<sup>30</sup> Indeed, if financial development can influence investor protection it is unlikely it had a role in determining countries’ legal origin, dating back to a period where financial markets were undeveloped.

In Table 7, we report results taking into account endogeneity problems. In column (1) we instrument (ordinal) financial literacy with its lagged value: the IV regression’s estimate of financial literacy is substantially larger (from 0.051 to 0.081) compared to the corresponding FGLS results in column (1b) of Table 5, reporting the analogous non instrumented regression results.<sup>31</sup> In column (2) of Table 8, we instrument investor protection with a dummy variable identifying the common law versus civil law legal origin of the destination country. Also in this case, the IV coefficient for  $ADR_j$  is larger (from 0.052 to 0.331) than the corresponding one in the FGLS specification in column (1b) of Table 5. Column (3) displays results when both sources of endogeneity are corrected through IV estimation. All coefficients are larger, compared to the FGLS regressions, and the statistical significance of the coefficients is maintained once endogeneity issues are accounted for.

The panel dimension of the financial literacy variable allows us to have more than one lagged-value to be used as instruments for the endogenous financial literacy, so that we can perform a test of overidentifying restrictions to check the instruments’ validity. In column (4) of Table 8, we report results of the regression adopting three instrumental variables (legal origin of the destination country; 1 year-lagged financial education; 2 year-lagged financial education) for two endogenous variables ( $ADR_j$  and financial education). The coefficients obtained are statistically significant and even larger in size, and the standard statistics reported at the bottom of column (4), confirm the validity of the included instruments.<sup>32</sup>

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<sup>30</sup>Note that this destination-country specific instrument is different from the pair-specific variable "equal legal origin dummy", included as a standard control in the analysis.

<sup>31</sup>The lower number of observations is due to countries displaying missing values for financial education in year 2000, thus preventing the IV procedure with lagged values for the year 2001.

<sup>32</sup>The F-test assesses the joint significance of the chosen instruments in the first stage regression of the endogenous regressors on the full set of exogenous variables (including instruments). A high F-test (i.e., a low p-value) reflects a strong correlation between endogenous regressor and instruments. The J-statistics instead assesses the exogeneity of the instruments. The p-value of the J-statistics supports the validity of the instruments.

## 7 Discussion and further empirical evidence

Our findings highlight that investors endowed with higher financial literacy invest relatively more in foreign countries with lower investor protection. This apparently puzzling behavior can be rationalized within the superior information hypothesis framework: highly literate investors have an incentive to deviate from average investor's information set by learning information that others cannot access.

The empirical evidence relative to portfolio investment distortions, such as excessive trading, portfolio concentration and preference for local stocks, could indeed reflect either behavioral biases (Grinblatt and Keloharju (2001); Huberman (2001); Goetzmann and Kumar (2008)) or informational advantage (Ivkovic and Weisbenner (2005); Ivkovic et al. (2008); van Nieuwerburgh and Veldkamp (2009)).

In particular, referring to international portfolio underdiversification, contributions in line with the first explanation emphasize that the preference for local stocks could be induced by familiarity and over-optimism on local stocks (Grinblatt and Keloharju (2001); Huberman (2001); Strong and Xu (2003); Li (2004)). The alternative strand of literature claims instead that the preference for local stocks could be driven by investors' superior information about local firms (Ivkovic and Weisbenner (2005); van Nieuwerburgh and Veldkamp (2009)).

Ivkovic and Weisbenner (2005) show that local investors are able to exploit local knowledge and that the excess return to investing locally is even larger among stocks not in the S&P 500 index, that is in firms where informational asymmetries between local and non-local investors may be largest.

van Nieuwerburgh and Veldkamp (2009) model the behavior of investors, endowed with a (small) home information advantage, who choose what information to learn before they invest. They find that investors profit more from knowing information others do not know: since prices reflect only as much as the average investor knows, when choosing what to learn investors make their information set as different as possible from the average investor's. To achieve the maximum difference, when choosing between domestic and foreign assets, home investors take home assets, which they start out knowing relatively more about, and specialize learning even more about them, thus further exacerbating information asymmetry and home bias. In their setting therefore, underdiversification

reflects superior information. Interestingly, van Nieuwerburgh and Veldkamp (2009) highlight that the higher is the information specificity (e.g., information about return that is specific to a stock or industry), the more profitable for investors to hold less than perfectly diversified portfolios in order to exploit their informational advantage.

Kumar and Korniotis (2013), using a demographic-based proxy for smartness, show that portfolio distortions of "smart" investors reflect an informational advantage that generate high risk-adjusted returns, while the distortions of "dumb" investors arise from psychological biases, as they experience low-risk adjusted performance. Both behavioral and information-based explanations for portfolio distortions are appropriate, but they apply to groups of dumb and smart investors, respectively. Interestingly, they find that a significant part of the smart-dumb performance differential can be attributed to the superior stock selection skill of smart investors: stock selection skill is concentrated among stocks that have greater information asymmetry and are therefore harder-to-value.

Our findings can be framed in the literature emphasizing the information-based explanation to investor behavior. According to the literature, the superior information hypothesis should hold for (a) "smart" investors (Kumar and Korniotis (2013)), (b) where informational asymmetries between local and non-local investors are largest (Ivkovic and Weisbenner (2005)), that is in economies where firm's governance structure is harder to value (Leuz et al. (2009); Kho et al. (2009)), and, finally, (c) when the information is stock or industry specific (van Nieuwerburgh and Veldkamp (2009) ), as it allows skilled investors to best exploit their informational advantage (Kumar and Korniotis (2013)).

To corroborate the idea that our findings can be interpreted as evidence of the superior information hypothesis, we try to reconcile the empirical evidence of the present paper with the above-mentioned basic stylized facts of the literature.

From the analysis of the investment patterns of investors endowed with various degrees of financial education, divided by quartiles, we uncover an interesting empirical regularity about the investment patterns of highly financially literate investors.

In Table 8, we report results –restricted to our variables of interest, i.e., financial education, investor protection and their interaction– relative to the investment made by the highest quartile of

investing countries in terms of financial education. We denote by  $rev\_finlit_l|_{q_4}$  a dummy variable identifying investors belonging to the fourth highest quartile ( $q_4$ ) of financial education.<sup>33</sup> Indeed, according to stylized fact (a), if a mechanism of superior information is at work it should be detectable for "smart" investors (Kumar and Korniotis (2013)), that is, for those investing countries ranked in the highest quartile of the financial education distribution.

While fact (a) refers to investor-specific characteristics, facts (b) and (c) are related to characteristics of the assets. Indeed, in order to understand how financial education affects the information access of investors, we can exploit the characteristics of the invested assets. While information is per se unobservable, and then non testable, some observed characteristics of the assets can predict investors' information sets, as suggested by van Nieuwerburgh and Veldkamp (2009).

Ivkovic and Weisbenner (2005) refer to firms where informational asymmetries between local and non-local investors may be largest. The literature emphasizes that information asymmetries between foreign and local investors are particularly severe with respect to the evaluation of a firm's governance structure (Leuz et al. (2009); Kho et al. (2009)). We therefore split the set of destination countries by quartiles according to their different degrees of investor protection.

We denote by  $ADR_j|_{Q_k}$  the dummy variable identifying destination countries belonging to the  $k$ -th quartile of the anti-director right index distribution ( $Q_k$ ). In Section I of Table 8, we report the coefficient estimates which consider the portfolio investment of highly literate investors ( $rev\_finlit_l|_{q_4}$ ) in countries featuring a low ( $Q_1$ ), intermediate ( $Q_2$ & $Q_3$ ) or high ( $Q_4$ ) degree of protection of minority shareholder rights. For instance, in column " $Q_1$ " of panel a) of Section I (Table 8) the coefficient of the  $rev\_finlit_l|_{q_4}$  variable reveals the following: belonging to the highest quartile of the distribution of financial education determines a 0.093 higher foreign portfolio share; belonging to the lowest quartile of  $ADR_j$  induces lower foreign portfolio investment (-0.022); investors in the highest quartile (of financial education) invest in low quartile (of  $ADR_j$ ) destination countries similarly to other investors (the coefficient of the interaction term is not statistically different from zero). Following a similar interpretation of coefficient estimates, we can draw a full picture of the

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<sup>33</sup>Notice that the regression specification adopted in Table 8 is the one adopted in column (1) of Table 5.

investment pattern of investors endowed with a top quartile financial education.

A coefficient of the interaction term significantly different from zero, highlights investment pattern of highly financially educated investors different from other investors. The interesting regularity of these set of regressions is the following: when considering measures capturing minority shareholder protection (section I), investors belonging to the top quartile of the financial education distribution invest systematically more than others in destination countries belonging to the second and third quartile ( $Q_2$ & $Q_3$ ), and less than others in destination countries belonging to the top quartile ( $Q_4$ ) of the investor protection distribution. The coefficient of the interaction term is indeed always positive and strongly statistically significant for the intermediate quartiles, and negative and statistically significant for the top quartile. Interestingly, investors do not display any difference in portfolio investments toward destination countries belonging to the lowest quartile of the investor protection distribution.

This evidence corroborates the information-based explanation of the role of financial literacy in international equity portfolio investment. Investment patterns depend on the balance between costs and benefits. While for low financially literate investors it would be unprofitable investing in firms residing in countries with weaker average corporate governance, because the information costs they incur would be disproportionately high, for highly educated people it is profitable as they can exploit their comparative advantage in acquiring information. However, when the cost is too high, that is in countries belonging to the lowest quartile, not even very highly educated investors have a comparative advantage in investing in: they behave similarly to less literate investors and in fact no significant difference across investors can be detected.

Finally, fact (c) emphasizes that the informational advantage is particularly relevant when the information is less accessible, e.g., is stock (or industry) specific. The macro-level analysis does not allow us to directly test the role of firm-specific characteristics. However, we can identify which types of information allow the investors to reach a higher knowledge specificity and then predict which information is more likely exploitable by literate investors. The latter, as far as corporate governance is concerned, can take advantage of their informational superiority by picking the best stocks and

departing from the average national investor protection index. It is not the case for general measures of legal protection that, being defined at aggregate country level, does not allow any exploitable variability at corporate level and then represents a dimension along which the information advantage of highly literate investors is less profitable.

The upper part of the Table 8 (Section I) reports results when the regulatory measure adopted to split in quartiles the destination countries, is one of the available indexes of corporate governance. Beyond the three indexes used in Table 4, two additional measures of minority shareholder protection are used: the Spamann anti-director rights index (Spamann (2010)) and the Anti-self dealing index (Djankov et al. (2008)). In the bottom part of Table 8 (Section II), destination countries are instead divided by quartiles according to a more general measure of legal protection: "legal enforcement", "rule of law", "law and order" (Economic Freedom Network).

As expected, the investment pattern widely described above systematically occurs only in Section I, when the investment opportunity set is split according to the dimension more informationally exploitable, that is the degree of corporate governance of the destination country, in all its alternative specifications (panel a) to e)): it reflects the commonly available aggregate information on corporate governance standards and literate investors can depart from the average relying on their firm-specific information set. Section II of Table 8, reports the investment pattern of highly educated investors with respect to countries split according to quartiles of a general index of legal protection: they appear to invest much less than other investors in countries with low legal protection and monotonically more in countries with stronger legal protection. The magnitude of the negative coefficient is larger for the lowest quartile than for the two intermediate quartiles, thus revealing that highly educated investors unequivocally appreciate a sounder regulatory system, without any signal of non-monotonicity that is instead a peculiar result in Section I. We consider these findings as corroborating our interpretation: if this mechanism worked for any kind of regulation measure the doubt of a spurious relationship could naturally arise. Instead, the observed non-monotonic investment pattern of highly financially literate investors is strictly related to the measure on minority shareholder rights' protection, which is the precisely the measure that should drive the investment choice of equity portfolio investors.

## 8 Conclusions

This paper investigates the impact of financial education and investor protection on international equity portfolio diversification.

We find that both dimensions are relevant in explaining cross-border investment and that they appear to be substitute: lack of investor protection can be supplemented by financial education or, phrased differently, countries featuring weaker standards of investor protection are particularly attractive to investing countries with a higher level of financial literacy.

Our interpretation of this finding follows the idea developed by van Nieuwerburgh and Veldkamp (2009): investors profit more from knowing information others do not know and, since prices reflect only as much as the average investor knows, when choosing what to learn and in which country to invest, investors make their information set as different as possible from the average investor's. Highly financially educated investors, facing lower cost of information acquisition, have an incentive to deviate from average investor's information set by learning information that others cannot access. Consequently, they are more prone to invest in countries affording lower levels of protection to minority shareholders.

The empirical evidence suggests that financial education affects international portfolio investment via the informational channel, and the consistency of our results with some stylized facts relative to the superior information hypothesis, corroborates this conjecture.

Our findings can be of interest to policymakers. From the investing country's perspective, ameliorating financial literacy can allow a wider portfolio diversification, also toward countries where minority investors' rights are less effectively shielded. From the recipient country's perspective, by strengthening minority shareholders' protection, destination economies can be particularly attractive for outside capital coming from those countries, namely emerging economies, featuring higher availability of capital to invest but lower standards of financial education.

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**Table 1. Variable description** (continued on next table)

This table reports definition and sources of all the variables adopted in the empirical analysis

Variable		Definition
<b>Panel A: Dependent variable</b>		
Equity portfolio share (country-pair)	<i>w<sub>it</sub></i>	The Coordinated Portfolio Investment Survey (CPIS) released by the International Monetary Fund (IMF) provides equity portfolio investment assets by economy of non resident issuer. Since the CPIS does not report domestic positions, it is necessary to retrieve the share of foreign assets (FS) in order to derive the bilateral foreign portfolio positions in the overall portfolio. FS-FA/(MCAP+FA-FL): MCAP is the country's stock market capitalization, FA and FL are, respectively, the outstanding foreign equity portfolio investments and the corresponding liabilities drawn from the International Financial Statistics (IFS) Database.
Market share (free-float adjusted)	<i>MS<sub>it</sub></i>	Fidora et al. (2007) and Sorensen et al. (2007) follow the same procedure dealing with the CPIS dataset. Source: CPIS (IMF) and IFS (IMF) The MSCI Investable Market Indexes (IMI) cover all investable large, mid and small cap securities across the Developed, Emerging and Frontier Markets, targeting approximately 99% of each market's free-float adjusted market capitalization. Source: MSCI
<b>Panel B: Main Regressors</b>		
<u>Financial knowledge</u>		
		The variables financial education, economic literacy and finance skills we adopt in the paper are drawn from the annual Executive Opinion Survey and are referred to in the WCY as Survey Data. The Executive Opinion Survey is sent to executives in top and middle management in all of the economies covered by the WCY (57 countries in the last issue). The sample of respondents covers a cross-section of the business community in each economic sector: primary, manufacturing and services, based on their contribution to the GDP of the economy. The survey respondents are nationals or expatriates, located in local and foreign enterprises in a country and who, in general, have an international dimension. Source: Executive Opinion Survey, IMD World Competitiveness Yearbook (WCY).
Financial education	<i>finlit<sub>it</sub></i>	Question asks respondents to evaluate, on a 0-10 scale, the statement: "Education in finance does meet the needs of the business economy". Source: Executive Opinion Survey (1999-2008), IMD World Competitiveness Yearbook (WCY).
Economic literacy	<i>eclit<sub>it</sub></i>	Question asks respondents to evaluate, on a 0-10 scale, the statement: "Economic literacy among the population is generally high". Source: Executive Opinion Survey (1995-2008), IMD World Competitiveness Yearbook (WCY).
Finance skills	<i>finskill<sub>it</sub></i>	Question asks respondents to evaluate, on a 0-10 scale, the statement: "Finance skills are readily available". Source: Executive Opinion Survey (1999-2008), IMD World Competitiveness Yearbook (WCY).
<u>Minority Shareholders Rights' Index</u>		
Antidirector rights index	<i>ADR<sub>it</sub></i>	The index captures antidirector rights, following LLSV (1998). The antidirector rights (ADR) index measures how strongly the legal system favors minority shareholders against managers or dominant shareholders in the corporate decision making process. Source: LLSV(1998).
Revised Antidirector Rights Index	<i>rev_ADR<sub>it</sub></i>	The index amends the original LLSV (1998) index (Djankov et al. (2008)). The revised index relies on the same basic dimensions of corporate law, but defines them with more precision. Source: Djankov et al. (2008).
Strength of Investor Protection Index	<i>WorldBank<sub>it</sub></i>	The Strength of Investor Protection Index (0-10) is constructed as the average of the "extent of disclosure index", "director liability index", and "shareholder suits index". Source: Doing Business Database, World Bank.
Spamann Antidirector rights Index	<i>Spamann_ADR<sub>it</sub></i>	The index is constructed as in LLSV (1998) but a reexamination of the legal data leads to corrections for thirty-three out of forty-six countries analyzed. The correlation between corrected and original values is 0.53. Source: Spamann (2010)
Anti-self-dealing Index	<i>Anti_SelfIndex<sub>it</sub></i>	Measure of legal protection of minority shareholders against expropriation by corporate insiders. Assembled with the help of LexMundi law firms, the index is calculated for 72 countries based on legal rules prevailing in 2003, and focuses on private enforcement mechanisms, such as disclosure, approval, and litigation, governing a specific self-dealing transaction. Source: Djankov et al. (2008)
<b>Panel C: Control variables</b>		
<u>Measures of legal protection</u>		
Legal enforcement		This component is based on the World Bank's Doing Business estimates for the time and money required to collect a clear-cut debt. Source: Economic Freedom Network
Law and order		This component is based on the International Country Risk Guide Political Risk. The "law" sub-component assesses the strength and impartiality of the legal system, and the "order" sub-component assesses popular observance of the law". Source: Economic Freedom Network
Rule of law		This index captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Source: Economic Freedom Network

\* : Since all regressors, except dummy variables, enter the analysis in relative terms, their label in the tables is preceded by the prefix "rel\_".

**Table 1 (continued). Variable description**

Variable	Definition
<b>Panel C: Control variables</b>	
<u>Time-invariant country controls</u>	
Expropriation risk	<i>variable label</i> *
Efficiency of judicial system	ICR's assessment of the risk of "outright confiscation" or "forced nationalization". Scale from zero to 10 with lower scores for higher risk. Source: LLSV (1998).
	Assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms" produced by Business International Corporation. Scale from zero to 10 with lower scores for lower efficiency level. Source: LLSV (1998).
<u>Time-varying country controls</u>	
Political stability and absence of violence	These variables are drawn from the Worldwide Governance Indicators (WGI, World Bank). The aggregate indicators are based on 30 underlying data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide. The original indexes are reported in their standard normal units, ranging from approximately -2.5 to 2.5, with an average of 0. Since our variables all enter in relative terms, to avoid the zero in the denominator, we re-scale the range from 0 to 5 (approximately) with an average of 2.5.
Control of corruption	This index measures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism. This index captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Source: Worldwide Governance Indicators (WGI, World Bank).
<u>Bilateral specific controls</u>	
Distance	<i>dist<sub>ij</sub></i>
	The distance is measured as the Great Circle distance in miles between capital cities of source (i) and destination (j) country. The average distance from a destination country (j) is obtained as weighted (by market share) average of the distance of investing countries. The variable included in the regression is the ratio of the distance $l_j$ to the average distance.
Common Border dummy	<i>dum_border<sub>ij</sub></i>
	Dummy variable taking value of 1 if the investing country and the destination country share a common border (0 otherwise).
Common Language dummy	<i>dum_lang<sub>ij</sub></i>
	Dummy variable taking value of 1 if the investing country and the destination country share a common language (0 otherwise)
EMU dummy (Common Currency dummy)	<i>dum_EMU<sub>ij</sub></i>
	Dummy variable taking value of 1 if the investing country and the destination country are members of the European Monetary Union (0 otherwise). In our case, it coincides with a common currency dummy since included countries do not belong to any other currency union.
Colony dummy	<i>dum_colony<sub>ij</sub></i>
	Dummy variable taking value of 1 if the investing country and the destination country share a colonial linkage (0 otherwise)
Equal Legal Origin dummy	<i>dum_eq_leg_origin<sub>ij</sub></i>
	Dummy variable taking value 1 if the investing country and the destination country share the same legal origin of the company law or commercial code of each country (0 otherwise). The countries included in our sample belong to four legal families: English, French, German, Scandinavian.
GAAP (Generally Accepted Accounting Pr	<i>GAAP<sub>ij</sub></i>
	Total number of GAAP differences between investing country $i$ and destination country $j$ . Measure based on the measure <i>gaapdiff2</i> in Bae et al. (2009). Survey data (GAAP 2001 survey) are used to identify commonly occurring differences in 21 accounting items across countries to determine which GAAP differences. See Appendix of Bae et al. (2009) for a description of the GAAP 2001 survey. Source: Bae et al. (2009).
<u>Other control variables</u>	
Exchange rate regime	<i>exch_rate_reg<sub>t</sub></i>
	The index is based on Annual Data IMF Classification of exchange rate regime (Coarse Classification) and ranges from 1 to 4. Source: Ilzetzki et al. (2008).
Economic development (GDP per capita)	<i>gdp_cap<sub>t</sub></i>
	GDP per capita (current US\$) GDP per capita is gross domestic product divided by midyear population. Source: World Bank national accounts data, and OECD National Accounts.
International capital mobility	<i>capital mobility</i>
	Index (0-10) measuring the restrictions countries impose on capital flows assigning a lower rating to countries with more restrictions on foreign capital transactions. Source: Economic Freedom Network.
Common law_dummy	
	Dummy variable equal to 1 if the destination country has a "common law" legal origin (0 otherwise). This variable is used as instrument for the index of investor protection in the destination country.

\* : Since all regressors, except dummy variables, enter the analysis in relative terms, their label in the tables is preceded by the prefix "rel\_".

**Table 2. Descriptive statistics: regressors**

This table reports descriptive statistics of all regressors included in the analysis (with exception of bilateral variables). The reported figures are, for time-varying variables, averages over the period 2001-2008.

	Regressors																		
	financial education	economic literacy	financial skills	ADR	revised ADR	World Bank index	Spamann ADR	Anti-self dealing Index	rule of law	law and order	legal enforcement	capital mobility	GDP per capita	exchange rate regime	control of risk of expropriation	efficiency of the judicial system (16)	regulatory quality	control of corruption	common law dummy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Argentina	4.771	4.106	6.277	4	2	5.0	3	0.342	1.852	4.402	5.016	4.604	5298	3	5.910	6.000	1.910	2.059	0
Australia	7.364	7.138	7.617	4	4	5.7	4	0.757	4.256	9.661	6.230	5.110	31636	4	9.270	10.000	4.126	4.479	1
Austria	6.530	6.233	7.495	2	3	5.0	4	0.213	4.380	10.000	6.620	6.527	35959	1	9.690	9.500	4.091	4.533	0
Belgium	6.839	5.844	7.127	0	3	7.0	2	0.544	3.787	8.333	5.650	7.461	34547	1	9.630	9.500	3.812	3.857	0
Brazil	5.131	3.116	6.239	3	5	5.3	5	0.274	2.112	3.559	4.763	5.362	4870	4	7.620	5.750	2.634	2.468	0
Canada	6.991	6.614	7.601	5	4	8.7	4	0.642	4.223	10.000	4.814	7.664	33435	4	9.670	9.250	4.070	4.503	1
Chile	6.686	5.308	7.698	5	4	6.3	5	0.625	3.760	8.333	5.109	7.599	7293	4	7.500	7.250	3.957	3.911	0
Czech Republic*	5.143	5.026	5.295	na	4	5.0	na	0.333	3.302	8.333	3.538	6.200	12589	3	na	na	3.575	2.817	0
Denmark	7.817	6.954	7.732	2	4	6.3	4	0.463	4.428	10.000	6.155	8.080	45580	1	9.670	10.000	4.294	4.966	0
Egypt‡	na	na	na	2	3	3.7	4	0.204	2.468	6.563	3.408	6.181	1415	3	6.300	6.500	2.092	1.969	0
Estonia*	6.560	5.803	5.425	na	na	5.7	na	na	3.414	6.667	6.057	7.398	10388	1	na	na	3.847	3.340	0
Finland	7.903	7.319	7.609	3	4	5.7	4	0.457	4.435	10.000	7.823	6.637	36528	1	9.670	10.000	4.228	4.979	0
France	5.992	4.314	7.017	3	4	5.3	5	0.379	3.893	8.333	6.913	7.264	32562	1	9.650	8.000	3.670	3.863	0
Germany	5.549	5.156	6.965	1	4	5.0	4	0.282	4.167	8.333	6.595	7.223	32861	1	9.900	9.000	4.024	4.350	0
Greece	5.284	4.708	6.074	2	2	5.3	3	0.217	3.320	6.303	4.125	6.371	20754	1	7.120	7.000	3.397	2.896	0
Hong Kong	6.780	6.714	7.763	5	5	9.0	4	0.963	3.908	7.943	7.625	8.737	26957	1	8.290	10.000	4.411	4.320	1
Hungary*	6.009	4.844	6.449	na	2	4.3	na	0.181	3.395	6.667	7.094	7.131	10131	1	na	na	3.671	3.079	0
India	6.445	4.518	7.470	5	5	6.3	4	0.579	2.615	6.667	2.594	3.350	722	3	7.750	8.000	2.200	2.101	1
Indonesia	4.232	3.497	4.651	2	4	6.0	na	0.653	1.717	4.305	1.169	4.206	1339	3	7.160	2.500	2.026	1.664	0
Ireland‡	7.188	6.939	7.587	4	5	8.3	4	0.789	4.099	10.000	4.949	8.568	45641	1	9.670	8.750	4.247	4.054	1
Israel	7.239	6.575	7.685	3	4	8.3	4	0.725	3.392	8.333	3.463	8.035	20430	4	8.250	10.000	3.506	3.471	1
Italy	4.043	3.630	5.315	1	2	6.0	4	0.421	3.052	7.205	3.183	6.998	29241	1	9.350	6.750	3.459	2.947	0
Japan	4.560	6.341	5.531	4	5	7.0	5	0.499	3.763	8.333	6.372	6.513	34504	4	9.670	10.000	3.531	3.692	0
Malaysia	6.402	6.055	6.739	4	5	8.7	4	0.950	2.996	5.972	4.286	3.844	5554	3	7.950	9.000	3.025	2.777	1
Mexico	3.774	2.858	5.010	1	3	5.7	3	0.172	2.038	4.462	5.393	4.634	7826	4	7.290	6.000	2.868	2.262	0
Netherlands	7.156	6.574	7.370	2	3	4.7	4	0.203	4.237	10.000	5.108	8.602	38002	1	9.980	10.000	4.301	4.628	0
New Zealand	6.140	5.519	6.456	4	4	9.7	5	0.950	4.324	9.644	7.497	8.050	24073	4	9.690	10.000	4.200	4.850	1
Norway	7.137	6.186	6.935	4	4	6.7	4	0.421	4.408	10.000	7.555	6.514	62940	4	9.880	10.000	3.810	4.568	0
Pakistan‡	na	na	na	5	4	6.3	5	0.408	1.646	5.000	3.554	3.458	684	3	5.620	5.000	1.844	1.640	1
Peru‡	3.750	2.475	6.150	3	4	7.0	5	0.450	1.836	5.000	4.501	7.990	2937	3	5.540	6.750	2.722	2.215	0
Philippines‡	5.770	4.760	7.236	3	4	4.3	5	0.215	2.029	3.698	3.457	3.399	1288	4	5.220	4.750	2.415	1.889	0
Poland*	4.215	3.517	4.885	na	2	6.0	na	0.288	2.981	7.031	4.271	4.130	8053	4	na	na	3.265	2.789	0
Portugal	4.619	3.311	5.589	3	3	6.0	4	0.444	3.639	8.333	5.291	6.611	17553	1	8.900	5.500	3.645	3.585	0
Russia*	4.754	3.489	5.991	na	4	4.7	na	0.440	1.561	6.458	7.533	3.776	5586	3	na	na	2.201	1.635	0
Singapore	7.549	7.588	7.694	4	5	9.3	4	1.000	4.091	8.750	8.301	7.521	28048	3	9.300	10.000	4.373	4.777	1
South Africa	4.009	2.421	4.501	5	5	8.0	5	0.813	2.588	4.063	3.926	3.951	4458	4	6.880	6.000	3.111	2.902	1
South Korea	4.914	5.850	5.485	2	5	6.0	6	0.469	3.389	7.917	8.105	4.559	16134	4	8.310	6.000	3.270	2.913	0
Spain	4.880	3.894	6.131	4	5	5.0	6	0.374	3.685	8.082	5.538	6.253	24781	1	9.520	6.250	3.770	3.732	0
Sweden	7.238	6.637	7.628	3	4	6.3	4	0.333	4.351	10.000	4.735	6.329	39668	4	9.400	10.000	4.061	4.727	0
Switzerland	7.109	6.795	7.868	2	3	3.0	3	0.267	4.377	8.333	5.991	7.093	50750	4	9.980	10.000	4.160	4.626	0
Taiwan‡	6.071	6.309	6.636	3	3	6.3	5	0.565	3.357	7.587	5.546	7.153	na	na	9.120	6.750	3.544	3.172	0
Thailand	5.037	4.324	5.709	2	4	7.7	4	0.813	2.629	5.313	6.062	3.872	2719	3	7.420	3.250	2.796	2.256	1
Turkey	5.920	4.447	6.863	2	3	6.3	4	0.429	2.556	7.396	6.157	4.415	6414	4	7.000	4.000	2.713	2.338	0
United Kingdom	4.995	4.515	6.420	5	5	8.0	5	0.950	4.153	9.540	6.037	8.552	35970	4	9.710	10.000	4.261	4.433	1
United States	6.552	5.928	7.740	5	3	8.3	2	0.654	4.037	8.437	7.329	7.174	41437	4	9.980	10.000	4.096	4.110	1
Venezuela	3.971	2.352	5.073	1	1	2.3	2	0.092	1.207	3.646	3.966	4.897	6019	1	6.890	6.500	1.461	1.564	0
mean	5.765	5.072	6.420	3.000	3.398	5.990	3.978	0.460	3.058	7.002	5.203	6.013	18032.190	2.484	8.050	7.667	3.187	3.118	0.295
median	5.806	5.171	6.506	3	3.5	6.0	4	0.429	3.250	6.667	5.109	6.175	10293.910	3	8.250	7.250	3.351	2.975	0
max	8.603	8.162	8.500	5	5	9.7	6	1.000	4.500	10.000	8.479	9.573	112028.500	4	9.980	10.000	4.620	5.086	1
min	2.154	1.614	2.948	0	1	2.3	2	0.075	0.715	0.833	1.169	0.769	354.631	1	5.220	2.500	0.290	1.142	0
st.dev.	1.283	1.483	1.151	1.294	1.138	1.601	0.989	0.243	1.022	2.246	1.570	1.864	18799.180	1.300	1.572	2.030	0.912	1.109	0.456

Notes:

‡: economies included as destination but not as investing countries.

\*: economies included as investing but not as destination countries.

**Table 3. Descriptive statistics: dependent variable and financial education**

This table reports descriptive statistics on the dependent variable and on financial education, country by country.

	by destination country				by investing country	
	portfolio share in country j ( $w_j$ )		market share country j ( $MS_j$ )	scaled foreign share ( $w_j/MS_j$ )	financial education ( $finlit_i$ )	
	<i>mean (%)</i>	<i>st.dev.(%)</i>	<i>mean (%)</i>	<i>mean</i>	<i>mean</i>	<i>st.dev.</i>
Argentina	0.014	0.024	0.045	0.318	4.771	0.613
Australia	0.594	1.820	2.175	0.273	7.364	0.462
Austria	0.271	0.539	0.152	1.780	6.530	0.487
Belgium	0.269	0.577	0.461	0.584	6.839	0.313
Brazil	0.197	0.264	0.761	0.259	5.131	0.499
Canada	0.196	0.297	2.889	0.068	6.991	0.486
Chile	0.008	0.012	0.105	0.080	6.686	0.592
Czech Republic*	0.096	0.236	0.070	1.373	5.143	0.500
Denmark	0.113	0.205	0.335	0.339	7.817	0.299
Egypt <sup>§</sup>	0.006	0.006	0.051	0.112	na	na
Estonia*	0.005	0.009	na	na	6.560	0.235
Finland	0.358	0.531	0.700	0.512	7.903	0.463
France	1.417	1.755	4.136	0.343	5.992	0.682
Germany	1.329	2.041	3.161	0.421	5.549	0.300
Greece	0.068	0.066	0.215	0.315	5.284	0.307
Hong Kong	0.385	0.875	0.791	0.487	6.780	0.517
Hungary*	0.086	0.186	0.080	1.082	6.009	0.728
India	0.154	0.342	0.436	0.354	6.445	0.598
Indonesia	0.062	0.164	0.114	0.548	4.232	0.290
Ireland <sup>§</sup>	0.915	0.915	0.324	2.822	7.188	0.269
Israel	0.033	0.039	0.216	0.154	7.239	0.387
Italy	0.481	0.556	1.639	0.294	4.043	0.308
Japan	1.132	1.246	9.234	0.123	4.560	0.546
Malaysia	0.195	0.739	0.236	0.828	6.402	0.647
Mexico	0.078	0.090	0.436	0.178	3.774	0.544
Netherlands	0.775	0.846	1.854	0.418	7.156	0.293
New Zealand	0.012	0.014	0.071	0.168	6.140	0.274
Norway	0.119	0.198	0.283	0.420	7.137	0.445
Pakistan <sup>§</sup>	0.001	0.003	0.013	0.101	na	na
Peru <sup>§</sup>	0.007	0.017	0.040	0.168	3.750	na
Philippines <sup>§</sup>	0.020	0.054	0.036	0.560	5.770	0.478
Poland*	0.163	0.398	0.111	1.459	4.215	0.607
Portugal	0.048	0.060	0.144	0.334	4.619	0.465
Russia*	0.277	0.434	0.440	0.628	4.754	0.616
Singapore	0.120	0.145	0.385	0.312	7.549	0.262
South Africa	0.085	0.102	0.671	0.127	4.009	0.670
South Korea	0.286	0.415	1.101	0.260	4.914	0.306
Spain	0.700	1.560	1.625	0.431	4.880	0.630
Sweden	0.535	1.349	0.958	0.558	7.238	0.165
Switzerland	0.718	0.856	3.074	0.233	7.109	0.432
Taiwan <sup>§</sup>	0.170	0.245	0.842	0.202	6.071	0.264
Thailand	0.103	0.293	0.125	0.829	5.037	0.530
Turkey	0.049	0.052	0.119	0.416	5.920	0.435
United Kingdom	2.457	2.407	9.944	0.247	4.995	0.407
United States	5.121	5.972	48.665	0.105	6.552	0.418
Venezuela	0.003	0.005	0.007	0.416	3.971	0.643

Notes:

§: economies included as destination but not as investing countries.

\*: economies included as investing but not as destination countries.

**Table 4. Financial education and investor protection**

This table reports results of the feasible GLS regression as in Section 3.1 in the text. The dependent variable is the scaled foreign portfolio, i.e., the ratio of portfolio share to market share,  $(w_{lj} / MS_j)$ , where the subscript  $lj$  represents the couple investing country  $l$ -destination country  $j$ . Each regressor  $X$  (dummy variables excluded) is expressed as the ratio of  $X$  to its world average. Further details on the variables are provided in Table 1. Two-way clustered (investing country and time) standard errors are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10% levels, respectively.

Financial education and investor protection										
	(1)	(1a)	(1b)	(2)	(3)	(4)	(5)	(6)	(6a)	(6b)
<i>rel_finlit<sub>l</sub></i>	0.507 ***	0.497 ***	0.018 ***	0.439 ***	0.177 ***	0.186 ***	0.186 ***	0.177 ***	0.175 ***	0.173 ***
	(0.013)	(0.013)	(0.005)	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)
<i>rel_ADR<sub>j</sub></i>						0.013 **	0.013 **	0.023 ***		
						(0.007)	(0.007)	(0.007)		
<i>rel_rev_ADR<sub>j</sub></i>									0.098 ***	
									(0.011)	
<i>rel_WorldBank<sub>j</sub></i>										0.057 ***
										(0.012)
<i>dist<sub>ij</sub></i>				-0.085 ***	-0.074 ***	-0.076 ***	-0.075 ***	-0.080 ***	-0.078 ***	-0.081 ***
				(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
<i>dum_lang<sub>ij</sub></i>				0.087 ***	0.076 ***	0.072 ***	0.069 ***	0.076 ***	0.068 ***	0.073 ***
				(0.005)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)
<i>dum_border<sub>ij</sub></i>				0.505 ***	0.527 ***	0.531 ***	0.529 ***	0.531 ***	0.533 ***	0.519 ***
				(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
<i>dum_EMU<sub>ij</sub></i>				0.585 ***	0.516 ***	0.519 ***	0.517 ***	0.496 ***	0.506 ***	0.504 ***
				(0.022)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
<i>dum_eq_leg_origin<sub>ij</sub></i>				0.001	0.039 ***	0.041 ***	0.039 ***	0.043 ***	0.050 ***	0.044 ***
				(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
<i>dum_colony<sub>ij</sub></i>				0.111 ***	0.051 ***	0.049 ***	0.050 ***	0.046 ***	0.047 ***	0.054 ***
				(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)
<i>exch_rate_reg<sub>l</sub></i>					0.004	0.005	0.004	0.005	0.005 *	0.005
					(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
<i>rel_gdp_cap<sub>l</sub></i>					0.042 ***	0.042 ***	0.042 ***	0.043 ***	0.044 ***	0.044 ***
					(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
<i>rel_cap_mob<sub>l</sub></i>					0.027	0.028	0.026	0.029	0.035 **	0.029
					(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
<i>rel_cap_mob<sub>j</sub></i>					0.125 ***	0.125 ***	0.125 ***	0.095 ***	0.106 ***	0.081 ***
					(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.015)
<i>crisis_dummy</i>					-0.010	0.021 ***	0.021 ***	0.020 ***	0.020 **	0.020 **
					(0.040)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
<i>rel_finlit<sub>l</sub> * crisis_dummy</i>					0.031					
					(0.040)					
<i>rel_GAAP<sub>ij</sub></i>							-0.016 *	-0.015	-0.014	-0.016 *
							(0.009)	(0.009)	(0.009)	(0.009)
<i>time dummies</i>	no	yes	no	no	no	no	no	no	no	no
<i>country l's fixed effect</i>	no	no	yes	no						
<i>country j's controls (time invariant)</i>	no	no	no	no	no	no	no	yes	yes	yes
<i>#obs</i>	10204	10204	10204	10204	10204	10204	10204	10204	10204	10204
<i>Adj-R<sup>2</sup></i>	0.02	0.01	0.17	0.18	0.23	0.23	0.23	0.24	0.25	0.24

**Table 5. Interaction between financial education and investor protection**

This table reports results of the feasible GLS regression as in Section 3.1 in the text. The dependent variable is the scaled foreign portfolio, i.e., the ratio of portfolio share to market share,  $(w_{lj} / MS_j)$ , where the subscript  $lj$  represents the couple investing country  $l$ -destination country  $j$ . Each regressor  $X$  (dummy variables excluded) is expressed as the ratio of  $X$  to its world average. Further details on the variables are provided in Table 1. Two-way clustered (investing country and time) standard errors are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10% levels, respectively.

	Interaction between financial education and investor protection								
	(1)	(1a)	(1b)	(2)	(2a)	(2b)	(3)	(3a)	(3b)
<i>rel_finlit<sub>l</sub></i>	0.306 *** ( 0.043 )	0.094 *** ( 0.017 )	0.051 *** ( 0.008 )						
<i>rel_ADR<sub>j</sub></i>	0.142 *** ( 0.035 )	0.043 *** ( 0.008 )	0.052 *** ( 0.009 )	0.080 *** ( 0.025 )	0.039 *** ( 0.009 )	0.050 *** ( 0.011 )	0.156 *** ( 0.042 )	0.039 *** ( 0.008 )	0.052 *** ( 0.010 )
<i>(rel_finlit<sub>l</sub>)(rel_ADR<sub>j</sub>)</i>	-0.125 *** ( 0.038 )	-0.054 *** ( 0.015 )	-0.023 *** ( 0.007 )						
<i>rel_eclit<sub>l</sub></i>				0.069 ** ( 0.032 )	0.020 ( 0.017 )	0.019 ** ( 0.008 )			
<i>(rel_eclit<sub>l</sub>)(rel_ADR<sub>j</sub>)</i>				-0.061 ** ( 0.026 )	-0.035 ** ( 0.014 )	-0.019 *** ( 0.006 )			
<i>rel_finskill<sub>l</sub></i>							0.211 *** ( 0.052 )	0.086 *** ( 0.017 )	0.038 *** ( 0.007 )
<i>(rel_finskill<sub>l</sub>)(rel_ADR<sub>j</sub>)</i>							-0.141 *** ( 0.046 )	-0.045 *** ( 0.015 )	-0.023 *** ( 0.006 )
<i>dist<sub>ij</sub></i>	-0.079 *** ( 0.005 )	-0.078 *** ( 0.005 )	-0.078 *** ( 0.005 )	-0.079 *** ( 0.005 )	-0.077 *** ( 0.005 )	-0.078 *** ( 0.005 )	-0.077 *** ( 0.005 )	-0.078 *** ( 0.005 )	-0.078 *** ( 0.005 )
<i>dum_lang<sub>ij</sub></i>	0.080 *** ( 0.012 )	0.085 *** ( 0.012 )	0.083 *** ( 0.012 )	0.086 *** ( 0.011 )	0.086 *** ( 0.011 )	0.088 *** ( 0.011 )	0.082 *** ( 0.012 )	0.077 *** ( 0.012 )	0.081 *** ( 0.012 )
<i>dum_border<sub>ij</sub></i>	0.526 *** ( 0.019 )	0.540 *** ( 0.019 )	0.533 *** ( 0.019 )	0.517 *** ( 0.019 )	0.538 *** ( 0.019 )	0.518 *** ( 0.019 )	0.553 *** ( 0.020 )	0.550 *** ( 0.020 )	0.553 *** ( 0.020 )
<i>dum_EMU<sub>ij</sub></i>	0.497 *** ( 0.023 )	0.482 *** ( 0.023 )	0.493 *** ( 0.023 )	0.483 *** ( 0.023 )	0.462 *** ( 0.023 )	0.479 *** ( 0.023 )	0.485 *** ( 0.023 )	0.483 *** ( 0.023 )	0.487 *** ( 0.023 )
<i>dum_eq_leg_origin<sub>ij</sub></i>	0.047 *** ( 0.007 )	0.048 *** ( 0.007 )	0.046 *** ( 0.007 )	0.050 *** ( 0.008 )	0.048 *** ( 0.007 )	0.049 *** ( 0.007 )	0.045 *** ( 0.007 )	0.045 *** ( 0.007 )	0.045 *** ( 0.007 )
<i>dum_colony<sub>ij</sub></i>	0.046 *** ( 0.016 )	0.042 ** ( 0.016 )	0.042 *** ( 0.016 )	0.046 *** ( 0.016 )	0.039 ** ( 0.016 )	0.038 ** ( 0.016 )	0.047 *** ( 0.016 )	0.047 *** ( 0.016 )	0.047 *** ( 0.016 )
<i>rel_GAAP<sub>ij</sub></i>	-0.014 ( 0.009 )	-0.015 ( 0.009 )	-0.016 * ( 0.009 )	-0.011 ( 0.009 )	-0.019 ** ( 0.009 )	-0.014 ( 0.009 )	-0.017 * ( 0.009 )	-0.018 * ( 0.009 )	-0.016 * ( 0.009 )
<i>crisis_dummy</i>	0.094 *** ( 0.014 )	0.094 *** ( 0.014 )	0.094 *** ( 0.014 )	0.087 *** ( 0.015 )	0.094 *** ( 0.014 )	0.087 *** ( 0.015 )	0.093 *** ( 0.014 )	0.093 *** ( 0.014 )	0.093 *** ( 0.014 )
<i>exch_rate_reg<sub>l</sub> &amp; rel_gdp_cap<sub>l</sub></i>	yes	yes	yes	yes	yes	yes	yes	yes	yes
<i>country's controls</i>	yes	yes	yes	yes	yes	yes	yes	yes	yes
<i>capital mobility</i>	yes	yes	yes	yes	yes	yes	yes	yes	yes
<i>#obs</i>	10204	10204	10204	10204	10204	10204	10204	10204	10204
<i>Adj-R<sup>2</sup></i>	0.24	0.24	0.24	0.25	0.25	0.24	0.25	0.25	0.25

**Table 6. Robustness**

This table reports results of the feasible GLS regression as in Section 3.1 in the text. The dependent variable is the scaled foreign portfolio, i.e., the ratio of portfolio share to market share,  $(w_{lj} / MS_j)$ , where the subscript  $lj$  represents the couple investing country  $l$ -destination country  $j$ . Each regressor  $X$  (dummy variables excluded) is expressed as the ratio of  $X$  to its world average. Further details on the variables are provided in Table 1. Two-way clustered (investing country and time) standard errors are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10% levels, respectively.

	Robustness							
	additional controls			crisis			sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>rel_finlit<sub>l</sub></i>	0.313 *** ( 0.043 )	0.340 *** ( 0.044 )	0.226 *** ( 0.018 )	0.172 *** ( 0.020 )	0.178 *** ( 0.019 )	0.311 *** ( 0.043 )	0.320 *** ( 0.040 )	0.432 *** ( 0.070 )
<i>rel_ADR<sub>j</sub></i>	0.141 *** ( 0.035 )	0.134 *** ( 0.037 )		0.023 *** ( 0.007 )	0.018 ** ( 0.008 )	0.146 *** ( 0.035 )	0.110 *** ( 0.033 )	0.203 *** ( 0.063 )
<i>(rel_finlit<sub>l</sub>)(rel_ADR<sub>j</sub>)</i>	-0.130 *** ( 0.038 )	-0.111 *** ( 0.040 )				-0.136 *** ( 0.038 )	-0.165 *** ( 0.036 )	-0.147 ** ( 0.064 )
<i>(rel_ADR<sub>l</sub>-rel_ADR<sub>j</sub>)</i>			0.036 ( 0.025 )					
<i>(rel_finlit<sub>l</sub>)(rel_ADR<sub>l</sub>-rel_ADR<sub>j</sub>)</i>			-0.026 ( 0.026 )					
<i>dist<sub>ij</sub></i>	-0.078 *** ( 0.005 )	-0.071 *** ( 0.005 )	-0.067 *** ( 0.004 )	-0.080 *** ( 0.005 )	-0.080 *** ( 0.005 )	-0.079 *** ( 0.005 )	-0.079 *** ( 0.005 )	-0.130 *** ( 0.009 )
<i>dum_lang<sub>ij</sub></i>	0.078 *** ( 0.012 )	0.096 *** ( 0.012 )	0.086 *** ( 0.011 )	0.076 *** ( 0.012 )	0.075 *** ( 0.012 )	0.080 *** ( 0.012 )	0.069 *** ( 0.011 )	-0.059 ** ( 0.025 )
<i>dum_border<sub>ij</sub></i>	0.533 *** ( 0.020 )	0.503 *** ( 0.019 )	0.474 *** ( 0.018 )	0.531 *** ( 0.019 )	0.531 *** ( 0.019 )	0.526 *** ( 0.019 )	0.654 *** ( 0.018 )	0.743 *** ( 0.036 )
<i>dum_EMU<sub>ij</sub></i>	0.498 *** ( 0.023 )	0.488 *** ( 0.023 )	0.535 *** ( 0.023 )	0.497 *** ( 0.023 )	0.496 *** ( 0.023 )	0.497 *** ( 0.023 )	0.250 *** ( 0.015 )	0.472 *** ( 0.030 )
<i>dum_eq_leg_origin<sub>ij</sub></i>	0.050 *** ( 0.008 )	0.017 ** ( 0.008 )	0.012 * ( 0.007 )	0.043 *** ( 0.007 )	0.042 *** ( 0.007 )	0.047 *** ( 0.007 )	0.076 *** ( 0.007 )	0.115 *** ( 0.017 )
<i>dum_colony<sub>ij</sub></i>	0.056 *** ( 0.017 )	0.036 ** ( 0.017 )	0.047 *** ( 0.015 )	0.046 *** ( 0.016 )	0.047 *** ( 0.016 )	0.046 *** ( 0.016 )	0.065 *** ( 0.016 )	0.118 *** ( 0.030 )
<i>rel_GAAP<sub>ij</sub></i>	-0.015 ( 0.009 )	-0.028 *** ( 0.010 )	-0.022 ** ( 0.010 )	-0.015 ( 0.009 )	-0.015 ( 0.009 )	-0.014 ( 0.009 )	-0.012 ( 0.010 )	0.111 *** ( 0.021 )
<i>dum_crisis</i>	0.023 *** ( 0.008 )	0.019 ** ( 0.008 )	0.023 *** ( 0.007 )	-0.011 ( 0.041 )	-0.012 ( 0.019 )	-0.017 ( 0.018 )	-0.011 ( 0.007 )	0.043 *** ( 0.016 )
<i>rel_finlit<sub>l</sub> • dum_crisis</i>				0.032 ( 0.043 )				
<i>rel_ADR<sub>j</sub> • dum_crisis</i>					0.031 * ( 0.017 )			
<i>(rel_finlit<sub>l</sub>)(rel_ADR<sub>j</sub>) • dum_crisis</i>						0.037 ** ( 0.016 )		
<i>bilateral factors</i>	yes							
<i>exch_rate_reg<sub>l</sub> &amp; rel_gdp_cap<sub>l</sub></i>	yes							
<i>country j's controls (time invariant)</i>	no	yes	no	yes	yes	yes	yes	yes
<i>country j's controls (time varying)</i>	yes	no						
<i>country l's controls &amp; ADR<sub>l</sub></i>	no	yes	no	no	no	no	no	no
<i>difference in country controls</i>	no	no	yes	no	no	no	no	no
<i>capital mobility</i>	yes							
<i>#obs</i>	10204	10204	10204	10204	10204	10204	8851	4918
<i>Adj-R<sup>2</sup></i>	0.24	0.24	0.23	0.25	0.25	0.24	0.38	0.31

**Table 7. Endogeneity issues**

In this table we apply an instrumental variable (IV) approach. In column (1) we run a IV approach instrumenting the  $finlit_t$  variable with its lagged value. In column (2) we instrument the  $ADR$  index with destination country's legal origin, in column (3) we instrument both variables. In column (4) we add a lagged value for  $finlit_t$  in order to perform a test of overidentifying restrictions (standard statistics to test the validity of instruments are reported at the bottom of column (4)) \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10% levels, respectively.

	IV regressions			
	exactly identified			over identified
	(1)	(2)	(3)	(4)
$rel\_finlit_t$	0.081 *** ( 0.013 )	0.156 *** ( 0.018 )	0.180 *** ( 0.022 )	0.509 *** ( 0.074 )
$rel\_ADR_j$	0.082 *** ( 0.014 )	0.331 *** ( 0.039 )	0.370 *** ( 0.044 )	1.069 *** ( 0.165 )
$(rel\_finlit_t)(rel\_ADR_j)$	-0.045 *** ( 0.010 )	-0.133 *** ( 0.017 )	-0.153 *** ( 0.020 )	-0.404 *** ( 0.065 )
$dist_{ij}$	-0.079 *** ( 0.005 )	-0.104 *** ( 0.006 )	-0.106 *** ( 0.006 )	-0.289 *** ( 0.023 )
$dum\_lang_{ij}$	0.083 *** ( 0.012 )	0.051 *** ( 0.013 )	0.050 *** ( 0.013 )	0.019 ( 0.084 )
$dum\_border_{ij}$	0.523 *** ( 0.019 )	0.549 *** ( 0.022 )	0.539 *** ( 0.022 )	0.924 *** ( 0.155 )
$dum\_EMU_{ij}$	0.492 *** ( 0.023 )	0.496 *** ( 0.024 )	0.500 *** ( 0.024 )	0.599 *** ( 0.089 )
$dum\_eq\_leg\_origin_{ij}$	0.051 *** ( 0.008 )	0.094 *** ( 0.009 )	0.099 *** ( 0.010 )	0.207 *** ( 0.040 )
$dum\_colony_{ij}$	0.042 ** ( 0.016 )	0.055 *** ( 0.019 )	0.054 ( 0.020 )	0.306 ** ( 0.151 )
$rel\_GAAP_{ij}$	-0.016 * ( 0.009 )	-0.017 ( 0.011 )	-0.017 ** ( 0.012 )	-0.385 *** ( 0.102 )
$dum\_crisis$	0.026 *** ( 0.008 )	0.028 *** ( 0.009 )	0.029 ( 0.009 )	0.005 ( 0.008 )
$exch\_rate\_reg_l$ & $rel\_gdp\_cap_l$	yes	yes	yes	yes
country l's controls	yes	yes	yes	yes
country j's controls	yes	yes	yes	yes
capital mobility	yes	yes	yes	yes
#obs	10168	10204	10168	10168
Adj-R <sup>2</sup>	0.24	0.25	0.24	0.07
				F-test (p-value)=0.000 J-Statistic= 0.389

**Table 8. Interpretation of findings**

This table reports results of the feasible GLS regression as in Section 3.1 in the text. The dependent variable is the scaled foreign portfolio, i.e., the ratio of portfolio share to market share,  $(w_{lj} / MS_j)$ , where the subscript  $lj$  represents the couple investing country  $l$ -destination country  $j$ . Each regressor  $X$  (dummy variables excluded) is expressed as the ratio of  $X$  to its world average. Further details on the variables are provided in Table 1. This table represents the investment patterns of investors endowed with a top-quartile financial education ( $rel\_finlit_l|_{q4}$ ) in destination countries belonging to the  $k$ -th quartile of the different regulatory measure's distribution ( $Qk$ ). Two-way clustered (investing country and time) standard errors are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10% levels, respectively.

Investment patterns of highly literate investors				
I. measures of minority shareholder protection	regression by quartiles of regulatory measure (Qk)			
	Q1	Q2&Q3	Q4	
a) $rel\_finlit_l _{q4}$	0.093 ***	0.075 ***	0.121 ***	
	( 0.013 )	( 0.014 )	( 0.011 )	
$rel\_ADR_j _{Qk}$	-0.022 ***	0.031 ***	-0.022 ***	
	( 0.007 )	( 0.007 )	( 0.008 )	
$(rel\_finlit_l _{q4})(rel\_ADR_j _{Qk})$	0.020	0.061 ***	-0.123 ***	
	( 0.021 )	( 0.020 )	( 0.025 )	
b) $rel\_finlit_l _{q4}$	0.106 ***	0.073 ***	0.138 ***	
	( 0.012 )	( 0.013 )	( 0.015 )	
$rel\_rev\_ADR_j _{Qk}$	-0.014	-0.045 ***	0.051 ***	
	( 0.009 )	( 0.007 )	( 0.007 )	
$(rel\_finlit_l _{q4})(rel\_rev\_ADR_j _{Qk})$	-0.019	0.087 ***	-0.065 ***	
	( 0.028 )	( 0.022 )	( 0.021 )	
c) $rel\_finlit_l _{q4}$	0.103 ***	0.065 ***	-0.272 ***	
	( 0.011 )	( 0.015 )	( 0.029 )	
$rel\_World\ Bank_j _{Qk}$	0.024 **	-0.056 ***	0.123 ***	
	( 0.010 )	( 0.007 )	( 0.013 )	
$(rel\_finlit_l _{q4})(rel\_World\ Bank_j _{Qk})$	-0.041	0.068 ***	0.051 ***	
	( 0.031 )	( 0.020 )	( 0.007 )	
d) $rel\_finlit_l _{q4}$	0.108 ***	0.033 **	0.129 ***	
	( 0.011 )	( 0.015 )	( 0.012 )	
$rel\_Spamann\ ADR_j _{Qk}$	-0.006	0.046 ***	-0.049 ***	
	( 0.009 )	( 0.007 )	( 0.007 )	
$(rel\_finlit_l _{q4})(rel\_Spamann\ ADR_j _{Qk})$	-0.065 **	0.132 ***	-0.102 ***	
	( 0.027 )	( 0.020 )	( 0.020 )	
e) $rel\_finlit_l _{q4}$	0.105 ***	0.068 ***	0.123 ***	
	( 0.012 )	( 0.014 )	( 0.013 )	
$rel\_Anti\_SelfIndex_j _{Qk}$	0.012	-0.062 ***	0.065 ***	
	( 0.008 )	( 0.007 )	( 0.007 )	
$(rel\_finlit_l _{q4})(rel\_Anti\_SelfIndex_j _{Qk})$	-0.022	0.071 ***	-0.060 ***	
	( 0.024 )	( 0.020 )	( 0.022 )	
II. measures of general legal protection				
a) $rel\_finlit_l _{q4}$	0.134 ***	0.154 ***	0.081 ***	
	( 0.012 )	( 0.013 )	( 0.012 )	
$leg\_enfj _{Qk}$	0.016 *	0.035 ***	-0.040 ***	
	( 0.010 )	( 0.006 )	( 0.008 )	
$(rel\_finlit_l _{q4})(leg\_enfj _{Qk})$	-0.171 ***	-0.120 ***	0.066 ***	
	( 0.025 )	( 0.020 )	( 0.022 )	
b) $rel\_finlit_l _{q4}$	0.110 ***	0.135 ***	-0.006	
	( 0.011 )	( 0.012 )	( 0.017 )	
$rule\_law_j _{Qk}$	0.030 **	0.020 **	-0.030 **	
	( 0.014 )	( 0.010 )	( 0.012 )	
$(rel\_finlit_l _{q4})(rule\_law_j _{Qk})$	-0.172 ***	-0.130 ***	0.161 ***	
	( 0.041 )	( 0.022 )	( 0.021 )	
c) $rel\_finlit_l _{q4}$	0.133 ***	0.122 ***	0.021	
	( 0.012 )	( 0.012 )	( 0.015 )	
$law\_order_j _{Qk}$	0.021 *	-0.026 ***	0.029 ***	
	( 0.012 )	( 0.007 )	( 0.008 )	
$(rel\_finlit_l _{q4})(law\_order_j _{Qk})$	-0.147 ***	-0.070 ***	0.162 ***	
	( 0.024 )	( 0.023 )	( 0.020 )	

## A Theoretical framework

Following Merton (1969) with constant relative risk aversion utility function and constant investment opportunities the vector of optimal portfolio shares takes the well known following form:

$$\mathbf{w}^* = \frac{1}{\lambda} \Sigma^{-1} (\bar{\boldsymbol{\mu}} - r \mathbf{i}) \quad (4)$$

where  $\lambda$  is the coefficient of relative risk aversion,  $\mathbf{w}$  is the vector of weights,  $\bar{\boldsymbol{\mu}}$  is the vector of stock returns,  $r$  is the risk-free interest rate,  $\mathbf{i}$  is a vector of ones and  $\Sigma$  is the variance-covariance matrix of stock returns.

We incorporate in this standard setting investment cross-border barriers following Gehrig (1993) approach. In his contribution foreign investments appear on average more risky to domestic investors -leading to an information-based justification to home bias- and the portfolio of each investor is different depending on the perceived variance-covariance matrix<sup>34</sup>. We consider this approach focusing on foreign investment only, considering a different investor-specific perceived variability of stock returns for each foreign stock index in the investment opportunity set.

Let us denote by  $\mathbf{C}_l$  the  $N \times N$  positive definite diagonal matrix of investment barriers, where the  $j$ -th diagonal element  $C_{lj}$  is the cost of holding country  $j$ 's stock by country  $l$ 's investor. Capturing  $C_{lj}$  the investment barrier cost for country  $l$  investing in  $j$ , its reciprocal  $\frac{1}{C_{lj}}$  stands for a variable capturing the investment "advantage" of country  $l$  investing in country  $j$ . Consequently, the optimal portfolio is no longer universal ( $\mathbf{w}^*$ ) but is investor-specific ( $\mathbf{w}_l$ )

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<sup>34</sup>In a standard setting with asymmetric information (Grossman and Stiglitz (1980)) an informed investor has a lower perceived variance due to its private signal but, at the same time, her perceived expected return is generally also different from the uninformed investor's. It implies that we should sometimes observe a "foreign-bias" when the domestic investors observe bad signals. What we, instead, label "information asymmetries" throughout the paper is closer to the concept of "model uncertainty" or "Knightian uncertainty" (Epstein and Miao (2003) and Uppal and Wang (2003)): roughly speaking, the foreign investor's perceived uncertainty is higher than the domestic investor's one, though they observe the same return. This approach may help to understand home bias because small differences in the ambiguity about the return distributions can lead to largely under-diversified portfolio holding. The same reasoning applies when considering allocation in several foreign stock markets rather than the choice between home and foreign assets.

$$\mathbf{w}_l = \frac{1}{\lambda} \Sigma_l^{-1} (\bar{\boldsymbol{\mu}} - r\mathbf{i}) = \mathbf{C}_l^{-1} \boldsymbol{\Omega}^{-1} \frac{1}{\lambda} (\bar{\boldsymbol{\mu}} - r\mathbf{i}) \quad (5)$$

where  $\Sigma_l = \boldsymbol{\Omega} \mathbf{C}_l$  (and therefore  $\Sigma_l^{-1} = \mathbf{C}_l^{-1} \boldsymbol{\Omega}^{-1}$ )<sup>35</sup>

Therefore the equilibrium condition, equating stock demand and stock supply, will be

$$\mathbf{MS} = \boldsymbol{\Phi} \boldsymbol{\Omega}^{-1} \left[ \frac{1}{\lambda} (\bar{\boldsymbol{\mu}} - r\mathbf{i}) \right] \quad (6)$$

where  $\mathbf{MS}$  represents the vector of market shares of stock market indexes (supply side) and the right hand side is the (weighted) sum of stock indexes' demands (demand side).  $\boldsymbol{\Phi}$  is a diagonal  $N \times N$  positive definite matrix where the  $j$ -th diagonal element,  $\phi_j = \sum_{l=1}^L MS_l \frac{1}{C_{lj}}$  is the average investment "advantage" in holding asset  $j$  across investors, weighted by the market share of each investor's domestic stock market.

Let us define  $\mathbf{D}_l = \boldsymbol{\Phi} \mathbf{C}_l$ , where  $\mathbf{D}_l$  is again a diagonal  $N \times N$  positive definite matrix. We can rewrite the above expression (5) as

$$\mathbf{w}_l = \mathbf{D}_l^{-1} \boldsymbol{\Phi} \boldsymbol{\Omega}^{-1} \left[ \frac{1}{\lambda} (\bar{\boldsymbol{\mu}} - r\mathbf{i}) \right] \quad (7)$$

where  $D_{lj} = \phi_j C_{lj}$  and  $\frac{1}{D_{lj}} = \frac{\frac{1}{C_{lj}}}{\sum_{l=1}^L MS_l \frac{1}{C_{lj}}}$

and using the equilibrium condition (6) we get the following result

$$\mathbf{w}_l = \mathbf{D}_l^{-1} \mathbf{MS} \quad (8)$$

or, in terms of individual asset, the following optimal portfolio weights

$$w_{lj} = \frac{1}{D_{lj}} MS_j \text{ or } \frac{w_{lj}}{MS_j} = \frac{1}{D_{lj}} \quad (9)$$

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<sup>35</sup>The matrix  $\boldsymbol{\Omega}$  is the universal variance-covariance matrix that would prevail in absence of investment barriers.

$MS_j$  is the market share of stock index  $j$  in the world stock market,  $\frac{1}{D_{lj}}$  represents the inverse of relative (with respect to world average) cost of country  $l$  investing in asset  $j$ . In other words, the investor  $l$  will demand a share of assets greater than the market share in proportion to  $\frac{1}{D_{lj}}$ <sup>36</sup>.

It is worth underlining the limits of our stylized analytical framework.

First, the model is not able to predict any particular functional form for the  $C_{lj}$  factor, which is meant to capture the (unobservable) investment barrier faced by investors residing in country  $l$  when investing in country  $j$ . It can be generally considered as a function of proxies of investment frictions

$$C_{lj} = f(X_{lj}, Y_{lj}, W_l, Z_j) \tag{10}$$

These proxies can be bilateral frictions  $X_{lj}$  and/or bilateral dummy variables  $Y_{lj}$ , investing country factors  $W_l$  or destination country factors  $Z_j$ . We estimate the unobservable  $D_{lj}$ , which is a transformation of  $C_{lj}$  as specified above, through linear estimation techniques, as a common practice. We then investigate potential nonlinearities in the role played by some crucial variables, to understand the mechanisms through which financial education affects international diversification patterns. Although not explicitly dictated by the model, this investigation breaks the assumption of pure linear specification and reveals the presence of a nonlinear effect of financial education on foreign investment, which represents the main innovative contribution of the paper.

Second, we need to specify that our final condition (9) cannot be strictly interpreted as a gravity equation, where bilateral factors, size and multilateral resistance indices of source and destination countries can be separately identified and, consequently, estimated (Okawa and van Wincoop (2012)).<sup>37</sup> In fact, differently from standard gravity specifications, investing and destination country variables –such as financial education and investor protection, in our case– are aimed to capture not the size of the source and destination country but factors aggravating or alleviating investment

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<sup>36</sup>Note that if  $C_{lj} = \phi_j$ , i.e. if the investment barrier for country  $l$  is equal to the average then the investor  $l$  will hold the value market share of asset  $j$ .

<sup>37</sup>Okawa and van Wincoop (2012) develop a general model providing theoretical foundation of a gravity equation for cross-border asset holdings. They show under which set of assumptions it is possible to derive a gravity equation for asset trade, and discuss how to estimate cross-border financial frictions. Within their theoretical framework, the case of only trade in equities would not allow to derive a standard gravity form specification, and the financial frictions should be estimated using non linear least squares.

barriers. Our dependent variable is indeed a vector of foreign portfolio shares: while the amount of the investment in equities does depend on the size of the investing country, the portfolio shares depend on the size of the source country only as far as the construction of the equilibrium condition and world averages are concerned. On the other hand, the size factor relative to the host country, i.e., any asset-specific factor, is fully embedded in the market share  $MS_j$ .

With these caveats in mind, some empirical implications of our stylized analytical framework are consistent with more sophisticated models specifically dealing with gravity specifications. First, our model provides a guidance about which country-specific variables can enter the analysis (in our case, uniquely those capturing a means to aggrieve or alleviate investment frictions) and which ones have instead no justification for being there, such as asset return correlations, similarly to what found in Okawa and van Wincoop (2012). A second, more specific, point driven by the model is the construction of our regressors in the empirical specification: similarly to Okawa and van Wincoop (2012) and Obstfeld and Rogoff (2001), regressors capturing financial frictions enter scaled by their world average, since the share of country  $j$ 's equity held by country  $l$  is a decreasing function of the bilateral trading frictions between  $l$  and  $j$  relative to the average one.