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Financial market development in host and source countries and their effects on bilateral foreign direct investment

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1 | INTRODUCTION

There is an emerging consensus that financial market development (FMD) increases foreign direct investment (FDI).[1] However, studies have typically addressed FMD on just one side of the source–host pair, leaving it unclear whether what matters for FDI is only FMD in the host countries, only in the source countries or in both host and source countries. We know of just two previous studies considering the role of financial market conditions in both host and source countries for bilateral FDI, namely Coeurdacier, Santis, and Aviat (2009) and Desbordes and Wei (2017, p. 154) who find that "a deep financial system in source and destination countries strongly facilitates the international expansion of firms through FDI." Importantly, whether FMD in source and host countries functions as complements or substitutes or promotes FDI independently of each other has to our knowledge not been analysed at all. The potential conditionality between host country FMD and source country FMD is particularly relevant for host countries that have remained on the sidelines in the global competition for FDI, such as many developing countries, since typically they score poorly on FMD whereas many, though by no means all, of the countries that could potentially invest in them score highly on FMD.

The differences-in-differences study by Desbordes and Wei (2017) is based on firm-level data on greenfield FDI projects in the manufacturing sector that are not freely available.[2] Our analysis comple-

[1]See, for example, Klein et al. (2002), Di Giovanni (2005), Antràs et al. (2009), Alfaro et al. (2009), Mohamed and Sidiropoulos (2010), Kaur et al. (2013), Bilir et al. (2019), Buch et al. (2014) and Otchere et al. (2016).

[2]These data are collected by *fDi Markets* (http://www.fdimarkets.com/), a fee-based service from the *Financial Times*.

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ments and extends the work of Desbordes and Wei (2017) in several ways. First and most importantly, we explore whether the effects of source- and host country FMD are conditional on each other. Second, we use a broader measure of FMD based on a comprehensive set of financial indicators, employing the unobserved component model suggested by Donaubauer, Meyer, and Nunnenkamp (2016a, 2016b). We regard this broadly defined and time-varying index as a major improvement over the existing literature, which typically approximates financial market conditions by just bank credit and stock market capitalisation only, whereas FMD goes well beyond these two, albeit admittedly important, aspects of developed financial markets. Third, our panel data set covers the period 2001–12 and thus a significantly longer time period than the analysis of Desbordes and Wei (2017) which is restricted to just 4 years (2003–06). Finally, we rely on bilateral FDI stocks as officially released by UNCTAD. As discussed in more detail in Section 3, we consider this FDI measure to be most appropriate in the context of assessing the role of financial market conditions in the global competition for external resources accessible through inward FDI.

We find positive, statistically significant and substantively important independent effects of both source and host country FMD on FDI. When we test for conditionality between the two FMD measures, we find no evidence for it in the global sample. However, if we restrict the host countries to developing countries, we find that source country FMD can function as a substitute for host country FMD, and vice versa. This central finding is robust to a battery of tests, in which we employ plausible modifications to the definition of the sample and the specification of the estimation model.

The paper proceeds as follows. Section 2 discusses the analytical background and derives our hypotheses. Section 3 describes the methods and the data used. We present our empirical results in Section 4 and conclude in Section 5 with what our results imply for developing host countries.

2 | ANALYTICAL BACKGROUND AND HYPOTHESES

As shown by Helpman, Melitz, and Yeaple (2004, p. 300), "of those firms that serve foreign markets, only the most productive engage in FDI." Compared to serving foreign countries through exports and other arm's length interactions, FDI involves particularly high fixed costs upfront since an affiliate has to be established or acquired in the host country. Highly productive firms may cover these fixed costs at least partly through internal financing. However, the availability of external financing clearly renders it easier to cover the fixed costs of undertaking FDI. As access to external financing depends on FMD, it is to be expected that better developed financial markets in the source country result in higher outward FDI (Desbordes & Wei, 2017).

In a similar vein, Klein, Peek, and Rosengren (2002) advanced the so-called "relative access to credit hypothesis" according to which outward FDI depends on the ability of potential investors to raise external funds. These authors highlight the role of imperfect capital markets in source countries of FDI that may impair the availability of credit and is, thus, expected to be associated with less outward FDI, notably by bank-dependent foreign investors. Indeed, Klein et al. (2002, p. 665) find that firms "associated with less healthy banks" are less likely to engage in FDI. Specifically, they show that the links between Japanese MNCs and troubled banks at home help explain the decline of Japanese FDI in the United States in the 1990s. In a similar vein, Buch, Kesternich, Lipponer, and Schnitzer (2014) show that financially constrained German firms are less likely to undertake FDI. Analysing the determinants of M&A deals during the 1990s, Di Giovanni (2005) finds that stock market capitalisation in the home country of the acquiring firms is strongly and positively associated with their M&A activity abroad.

This leads to our first hypothesis:

Hypothesis 1 *Better financial market development in the source country encourages outward FDI.*

As stressed by Feldstein (2000, p. 2), "not all foreign direct investment around the world represents net capital flows. Often such investments are financed in local markets." Likewise, Alfaro, Kalemni-Ozcan, and Sayek (2009, pp. 113–114) argue that foreign investors "tend to finance an important share of their investment in the local market." Foreign investors may rely on local financial markets for various reasons, including as a hedging device against exchange rate fluctuations (Harrison, Love, & McMillan, 2004). As noted by Harrison et al. (2004), enterprise surveys suggest that local financing constraints tend to deter (foreign as well as domestic) investment, particularly in developing countries.[3]

Well-functioning financial markets in the host countries help reduce the costs of external finance for firms (e.g., Rajan & Zingales, 1998), including foreign firms seeking access to local (co-) financing. According to Desai, Foley, and Hines (2004, p. 2453), "interest rates on external debt differ for affiliates of the same American parent company located in different host countries in a manner that corresponds to measures of capital market depth and creditor rights."[4] Moreover, local financial intermediaries may help foreign investors to overcome informational asymmetries by sharing local knowledge on risks and market opportunities (Kinda, 2010).

Better developed financial markets in the host country could attract FDI also in indirect ways. By relaxing the credit constraints of local firms, FMD allows for greater variety of intermediate inputs in the host country (Alfaro, Chanda, Kalemni-Ozcan, & Sayek, 2010). Easier availability of intermediates, in turn, encourages higher FDI to the extent that foreign firms depend on such local inputs. More generally, better developed financial markets may promote FDI by facilitating interactions between foreign and local firms (Kinda, 2010). Another indirect effect is that FMD may help expand local market size (Desbordes & Wei, 2017), thus promoting market-seeking (horizontal) FDI.

This leads to our second hypothesis:

Hypothesis 2 *Better financial market development in the host countries attracts FDI to these countries.*

However, Desbordes and Wei (2017) argue that the effect of FMD in the host country on inward FDI is theoretically ambiguous. Credit constraints due to deficient financial markets are likely to affect domestic firms in the first place, while it is easier for foreign firms to raise external finance abroad. This would imply that domestic firms are the main beneficiaries of FMD in the host country. By promoting local firm development, this competition effect may render the host country less attractive to foreign investors (see also Bilir, Chor, & Manova, 2019).

Related to this reasoning, the effects of FMD in the host country on bilateral FDI are likely to depend on FMD in the source country. Specifically, less developed financial markets in the host country could have less adverse effects on FDI from financially more developed source countries, compared to FDI from financially less developed source countries. Indeed, Desai et al. (2004, p. 2453) find that affiliates of US-based parent companies increase internal borrowing from parent companies to offset most of the reduction in external borrowing due to poor financial market conditions in the host countries. In other words, poor FMD in the host countries is associated with more FDI in the form of intra-company loans.[5] However, adverse effects on (overall) bilateral FDI become more likely when

[3]See, for example, the survey of executives in African countries in the African Competitiveness Report (World Economic Forum, 1998).

[4]As discussed below, however, this may induce substitution effects so that FDI by US-based companies is not necessarily lower in financially less developed host countries.

[5]Note that this does not necessarily imply that overall FDI increases since other forms of FDI, that is, equity capital in new projects, are likely to be negatively affected.

parent companies are based in source countries that are financially less developed than the United States, that is, where it is more difficult to offset financing constraints in the host countries.

This rationale for a substitutive conditional effect of FMD in the host and source country on FDI is supplemented by a similar rationale that looks at intra-company loans as hidden or indirect foreign borrowing. The above reasoning is corroborated by Baier, Bergstrand, Gainer, and Xu (2018) who point out that more highly developed financial markets in the source country may induce foreign affiliates in the host country to borrow financial resources from the parent company located in the source country in the form of intra-company loans, rather than raising these financial resources in the less developed financial markets of the host country itself. Peng and Wang (2016, p. 15, as cited by Baier et al., 2018) argue for the case of more highly developed financial markets in the host country: "Raising funds through their foreign affiliates by the Chinese enterprises has become one of the major ways of foreign borrowing, which has been dubbed as 'in direct foreign borrowing'."[6] These loans will be accounted for as negative FDI flows in the (Chinese) statistics and better developed FMD in the host country can thus indirectly undermine the positive effect of FMD in the less developed source country of FDI.

Conversely, the positive effects of FMD in the host country on bilateral FDI may diminish the more advanced financial markets that are in the source country. This is also because less costly financial contracting, stronger creditor rights and verifiable monitoring of arm's length transactions reduce the incentives to undertake FDI and strengthen the incentives to instead rely on market relations when engaging in the host country (Antràs, Desai, & Foley, 2009).[7] Using data on the financial characteristics of US firms operating abroad, Antràs et al. (2009) report empirical evidence supporting their prediction that fewer financial frictions in the host countries weaken the reliance on FDI financing of overseas operations.

It is questionable, however, whether this finding carries over to source countries that are less advanced than the United States, for instance, in terms of financial monitoring and alternative ways of financing operations abroad. Furthermore, foreign investors based in less advanced source countries are widely perceived to be less risk averse and more familiar with deficient financial market conditions.[8] Accordingly, FMD in the host countries would be less likely to induce substitution effects between FDI and other forms of overseas engagement by investors based in less advanced source countries.

Consequently, we expect that FMD in source and host countries can function as substitutes for each other and formulate as our third hypothesis:

Hypothesis 3 *The effect of financial market development in host countries is conditional on financial market development in source countries. Specifically, the positive effect of better developed financial markets in the host country diminishes with better financial market development in the source country.*

[6]The original Peng and Wang (2016) article is in Chinese, which is why we cite indirectly from Baier et al. (2018).

[7]In other words, the model of Antràs et al. (2009) predicts a lower share of FDI financing of MNC activity in host countries with better developed financial markets, while the scale on MNC activity (e.g., in terms of production and sales) is expected to increase in such host countries. In a similar vein, Hausmann and Fernández-Arias (2001, p. 21) argue that "countries that are riskier, less financially developed and have weaker institutions tend to attract less capital but more of it in the form of FDI."

[8]For instance, Lall (1983, p. 6) argued that MNCs based in emerging economies have advantages vis-à-vis competitors from more developed countries because of "the ability to function better in the environment of other LDCs." However, Sosa Andrés, Nunnenkamp, & Busse, (2013) contradict the view that nontraditional investors are generally less risk averse than their peers based in advanced source countries.

3 | METHODS AND DATA

We estimate gravity-type models for bilateral FDI stocks of source country s in host country h in period t. The baseline specification is as follows:

$$FDI_{sht} = \exp\left[\alpha_1 \ln GDP_{st-1} + \alpha_2 \ln GDP_{ht-1} + \alpha_3 \ln GDPpc_{st-1} + \alpha_4 \ln GDPpc_{ht-1} + \alpha_5 FMD_{st-1} + \alpha_6 FMD_{ht-1} + \eta_{sh} + \theta_t\right] + \varepsilon_{sht}. \quad (1)$$

An extended specification accounts for possible complementarities or substitutability of FMD in the source and host country of FDI:

$$FDI_{sht} = \exp\left[\alpha_1 \ln GDP_{st-1} + \alpha_2 \ln GDP_{ht-1} + \alpha_3 \ln GDPpc_{st-1} + \alpha_4 \ln GDPpc_{ht-1} + \alpha_5 FMD_{st-1} + \alpha_6 FMD_{ht-1} + \alpha_7 \left(FMD_{st-1} \times FMD_{ht-1}\right) + \eta_{sh} + \theta_t\right] + \varepsilon_{sht}. \quad (2)$$

The dependent FDI variable consists of bilateral stocks at the end of the period, publicly available from UNCTAD since 2001.[9] In contrast to the FDI data used by Di Giovanni (2005) as well as Desbordes and Wei (2017), this data set includes both greenfield FDI and M&As. Moreover, UNCTAD data cover FDI in manufacturing industries as well as service sectors, and they are not restricted to initial capital expenditures when FDI projects are launched, but also include sequential FDI, for instance, through reinvested earnings.[10] We use bilateral FDI stocks which are typically less volatile than bilateral FDI flows on an annual basis (see, e.g., de Sousa & Lochard, 2011).

Our sample includes 43 (traditional and nontraditional) source countries reporting bilateral FDI stocks in sufficient detail for 137 host countries during the period 2001–12, covering almost 90% of worldwide FDI stocks in 2012 as reported by UNCTAD. We exclude financial offshore centres such as the Bahamas or Cyprus.[11] In a robustness test, we additionally exclude all countries considered to be tax havens by one of the three sources listed in Appendix 2 of Hines and Rice (1994). We set to zero observations, for which UNCTAD reports no actual number but indicates a value of zero or a "negligible value" for the bilateral FDI stock, but in a robustness test, we set all these observations to missing instead. Similarly, we set to zero the small share of observations of circa 1.2% (full sample) and 1.4% (developing country host sample) with negative FDI stock entries. As explained by Baier et al. (2018), FDI stocks can be negative since foreign affiliates can be net lenders to the parent company in the source country. In a robustness test, we show that our results are fully robust towards dropping all observations with negative FDI stocks.

We are primarily interested in assessing the impact of financial market development (*FMD*), broadly conceived, in the source and host country on FDI as well as potential conditionality between the two effects. Instead of relying on just one or two specific indicators of FMD as most of the previous literature, we follow Donaubauer et al. (2016b) in making use of systematic and

[9] Available at: http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics-Bilateral.aspx.

[10] As stressed by Desbordes and Wei (2017, p. 158), the firm-level data they use "only reflect initial fixed costs incurred by firms" engaging in FDI projects in manufacturing. Note also that these data do not distinguish between internal and external financing of FDI projects. In other words, the data used by Desbordes and Wei include external funding through borrowing from unrelated sources in the home and/or host country, or in third countries. Funding from these sources is not part of FDI according to internationally agreed guidelines.

[11] The list of OFCs is taken from the International Monetary Fund (for details, see Zoromé, 2007). See Appendix Tables A2 and A3 for the list of source and host countries.

comprehensive measures of FMD. We employ a composite index of FMD based on nine indicators, capturing the stability, depth and efficiency of financial systems as well as the access to finance: the banks' *Z*-score and stock price volatility (stability); private credit by deposit money banks relative to GDP, the value of total shares traded on the stock market exchange relative to GDP, and money and quasi-money (M2) as percentage of GDP (depth); the stock market turnover ratio (efficiency); and the number of bank accounts per capita, the value of all traded shares outside the largest 10 traded companies as a share of the total value of all traded shares and the number of publicly listed companies per capita (access).[12] An unobserved component model is used to combine the information from the different indicators; accordingly, observed data on each aspect of FMD are a linear function of an unobserved common component of FMD and an error term.[13] This approach, which resembles the construction of the well-known Worldwide Governance Indicators by Kaufmann, Kraay, and Mastruzzi (2011), allows for a consistent picture of FMD on an annual basis for all countries in our sample.[14]

Using this comprehensive measure of FMD has three major advantages: first, as noted above, our *FMD* measure covers a very broad range of financial market indicators, including those that are most commonly used in the literature. Second, as pointed out by Kaufmann et al. (2011), a constructed measure based on an unobserved component model can be presumed to be more informative and precise about the quantity and quality of FMD than single indicators. Third, our *FMD* measure is available for a larger country sample than any single indicator.

Figure A1 in the Appendix ranks all sample countries at the end of our period of observation (2012) for which data on *FMD* are available.[15] Figure A2 additionally shows the distribution of *FMD* across a global map for both 2001 and 2012.

Apart from our focus on FMD, our estimation models are specified parsimoniously. Our models include the FDI partner countries' GDP (*lnGDP*) and GDP per capita (*lnGDPpc*), both in logged form.[16] In addition, we include country-pair (dyad) fixed effects as well as time fixed effects. The source–host pair fixed effects, η_{sh}, control for all time-invariant characteristics of each country pair (e.g., the geographical distance between FDI partner countries). Time fixed effects, θ_t, control for

[12]Donaubauer et al. (2016b) consider these financial market indicators as part of their overall index of infrastructure. We updated their (sub-) index on financial market development for the present study. The data on the indicators are available from the World Bank's Global Financial Development Database (available at: http://data.worldbank.org/data-catalog/global-financial-development), from Beck and Demirgüç-Kunt (2009) and from the World Bank's World Development Indicators (WDI, available at: http://data.worldbank.org/data-catalog/world-development-indicators).

[13]It is important to note that for estimating an unobserved component model (UCM), it is not necessary to observe all nine indicators that feed into our FMD measure for each point in time. As discussed in more detail in Donaubauer et al. (2016b) and Kaufmann et al. (2011), we need three single representative indicators for any country in a given year as a minimum requirement in order to identify the common unobserved component of FMD. While having more indicators is not essential for the identification of the UCM parameters, more than three indicators are clearly desirable to obtain a broader picture of FMD. The problem of varying sample size from year to year due to varying data availability for different indicators (and hence a potential selection bias) is solved by rescaling our FMD measure. This ensures comparability across years and countries. In particular, by rescaling we avoid that our FMD measure in earlier periods is distorted by the under-representation of low-performing countries in earlier periods.

[14]See Appendix Table A1 for summary statistics.

[15]Not surprisingly, most top performers with regard to FMD belong to the high-income group of countries. Outside this group, China and Jordan represent the first upper-middle-income countries on rank 5 and 6, respectively, and India the first lower-middle-income country on rank 21. The bottom of the ranking is dominated by low-income and lower-middle-income countries, with Kazakhstan, Uganda and Argentina performing worst.

[16]The data on *GDP* and *GDPpc* are taken from the WDI.

common shocks during our period of observation that affect all pairs in essentially the same way (such as the financial crisis in 2008). Standard errors are clustered on country pairs (dyads).

We follow Santos Silva and Tenreyro (2006) and estimate our model with fixed effects (pseudo-) Poisson maximum likelihood. Since the determinants of whether there is any bilateral FDI could differ from the determinants of the level of FDI, we additionally estimate in a robustness test separate first-stage fixed-effects logit models where the dependent variable is whether the host receives any FDI from the source in a particular year, and second-stage fixed-effects models on the log of FDI, conditional on positive FDI stocks in the source–host country pair. All explanatory variables are lagged by one period.

One-period lags are hardly sufficient to account for possible endogeneity concerns, however. While we address unobserved time-invariant heterogeneity by including country-pair fixed effects, neither bias from time-varying omitted variables nor reverse causality can be excluded. As concerns reverse causality, previous research has shown that FDI could help advance the host countries' FMD. Harrison et al. (2004) find that FDI inflows are associated with relaxed credit constraints at the firm level; this holds in particular for domestically owned firms in low-income host countries.[17] Likewise, Otchere, Soumaré, and Yourougou (2016) argue that FDI contributes to improving the depth and transparency of financial markets in Africa, where stock markets tend to be less liquid and less transparent than in more advanced economies.[18] We have no plausible instrument that would fulfil the exclusion restriction; hence, we cannot solve the endogeneity problem with instrumental variable regression. In its stead, we indirectly account for possible reverse causality by restricting the sample to observations where this endogeneity concern should be less relevant. Specifically, we exclude host countries falling into the top quartile of countries whose banking system is foreign-dominated and, in separate estimations, we exclude host countries' top-3 source country investors (see Section 4 for details).

As for potential omitted variable bias, in the robustness section we include a number of further control variables that are, however, not available for the total sample so that we lose some observations. Nevertheless, these robustness tests help us establish whether specific variables omitted from the main analysis are likely to bias the results on our central explanatory variables, namely FMD in both countries plus their interaction effect.

In addition to full sample results, we also report and indeed focus on a sub-sample with only developing host countries included, which excludes all countries that became members of the Organisation of Economic Cooperation and Development (OECD) before 2010 and that are at the same time classified as high-income countries by the World Bank—see Table A3. We subject the definition of what counts as a developing country to robustness tests since, at the margin, any such definition is somewhat arbitrary. As noted in the Introduction, the question of whether better developed local financial markets help attract FDI is particularly relevant for host countries that have remained on the sidelines in the global competition for FDI, as many developing countries have. At the same time, financial market conditions are often deficient in developing countries with greater potential to reform them and, thereby, potentially attract higher FDI. Focusing on developing host countries also allows us to address the concern about inappropriate pooling of developed and developing host countries that Blonigen and Wang (2004) draw attention to.

[17]As stressed by Harrison et al. (2004), this result is in contrast to Harrison and McMillan (2003) who find that financing constraints of firms in Ivory Coast were exacerbated by the presence of foreign firms.

[18]The empirical analysis of Otchere et al. (2016) points to bidirectional causality between FDI and the development of local financial markets. Soumaré and Tchana Tchana (2015) find that the effects of FDI inflows depend on whether indicators of stock markets or the banking sector are used as proxies of financial market development.

TABLE 1 Baseline estimation results (full sample and developing host countries' sample)

	Full sample		Developing host countries	
	(1)	(2)	(3)	(4)
$\ln GDP_{st-1}$	2.149***	2.141***	0.781	0.773
	(0.618)	(0.623)	(0.487)	(0.472)
$\ln GDPpc_{st-1}$	−0.675	−0.674	0.792*	0.752*
	(0.554)	(0.556)	(0.423)	(0.402)
$\ln GDP_{ht-1}$	0.985***	0.988***	1.062***	1.019***
	(0.372)	(0.370)	(0.321)	(0.317)
$\ln GDPpc_{ht-1}$	0.257	0.259	−0.0274	−0.0131
	(0.394)	(0.395)	(0.292)	(0.292)
FMD_{st-1}	0.0930**	0.111*	0.223***	0.274***
	(0.0363)	(0.0573)	(0.0493)	(0.0505)
FMD_{ht-1}	0.0835**	0.0931**	0.178***	0.228***
	(0.0414)	(0.0387)	(0.0448)	(0.0461)
$FMD_{st-1} \times FMD_{ht-1}$		−0.0178		−0.166***
		(0.0385)		(0.0436)
No. of observations	23,780	23,780	15,350	15,350
No. of country pairs	2,478	2,478	1,635	1,635

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

4 | EMPIRICAL RESULTS

In this section, we report the results from our baseline estimations, extended estimations and robustness tests.

4.1 | Baseline estimations

Table 1 reports our baseline estimation results. Note that all dyads which have no FDI stocks over the entire sample period are dropped from the estimations since these observations are collinear with the dyad fixed effects. Column (1) of Table 1 shows results for the effects on FDI of FMD in the source and the host country, while we additionally enter the interaction between FMD in both countries of a pair in separate estimations reported in column (2).[19] We then repeat both sets of estimations for a sub-sample of developing host countries only.

For the full sample, we find that bilateral FDI increases with better developed financial markets in the host and the source country and FMD in both countries of a pair plays a similarly important role in substantive terms. Coefficients in Poisson models can be interpreted as semi-elasticities. A one standard deviation improvement in FMD in host countries is predicted to increase bilateral FDI stocks by about 8.7%. There is less variation in FMD among source countries. A one standard deviation improvement in this variable is therefore predicted to increase bilateral FDI stocks by less than

[19]For ease of interpretation, we mean-centre the two FMD variables in the interaction effect estimation.

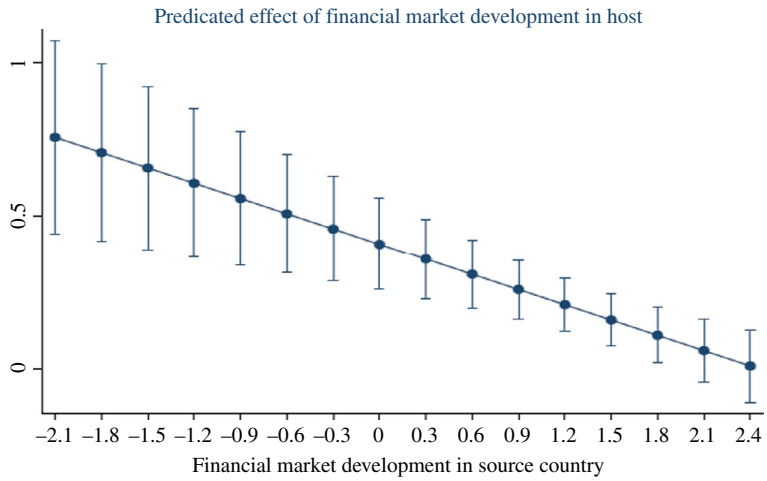

FIGURE 1 The conditional effect of financial market development in developing host countries' sample [Colour figure can be viewed at wileyonlinelibrary.com]

that despite the almost identical coefficient estimate, namely by about 7.7%. The results are hardly affected when adding the interaction between FMD in the source and host country in column (2), and we find no statistically significant evidence that FMD in source and host countries conditions each other.

Importantly, this result fundamentally changes when the sample is restricted to developing host countries. First, the estimated effects of FMD become much stronger[20]—17.6% for FMD in source countries and 15.9% for FMD in host countries in column (3). Second, we now find a substitutive conditioning effect between the two FMD measures in the model reported in column (4). The coefficient of the interaction term is negative and statistically significant, which is suggestive of a conditioning effect. However, since with non-linear estimators like Poisson, the existence of conditional effects cannot be reliably inferred by assessing the statistical significance of the interaction term coefficient (Ai & Norton, 2003); we further evaluate the existence of an interaction effect by plotting predicted average marginal effects.[21] Figure 1 plots the effect of a one-unit change in FMD in the host country, which is approximately equal to its standard deviation, over the range of FMD in the source country. At very low levels of FMD in source countries, the effect of improving FMD in host countries is very large at about 85% but with a wide 95% confidence interval around it. Figure A3 in the Appendix which plots the density histogram of FMD in source countries shows, however, that the vast majority of observations are in a range where the effect is well below 50%. At very high levels of FMD in source countries, the effect becomes substantively zero and statistically insignificant. This conditioning effect is our most novel and interesting result, and it is therefore the findings for the developing host countries' sub-sample that we subject to further analysis and robustness tests further below.

With regard to our control variables, the effects of market size, as reflected in the source and host country's GDP, are statistically significantly positive, except for GDP of the origin country in columns

[20]Combining the estimations from the two samples in seemingly unrelated estimation allows us to test whether the estimated coefficients differ statistically significantly. We find that the effects of FMD in developing host countries are stronger in the estimations shown in the developing host country sample compared to the full sample.

[21]We have done so for all estimation models in which an interaction term is included, but for reasons of space, we only show the relevant figure plotting marginal effects here.

(3) and (4) where it is marginally statistically insignificant. In contrast to market size, the effects of average per-capita incomes are mostly statistically insignificant, with the exception of per-capita income of the origin country which has a positive effect on FDI into developing host countries. The statistically insignificant effects of the host country's GDP per capita may be due to opposing effects on different types of FDI: while horizontal FDI could be attracted by higher purchasing power, reflected in higher per-capita income, vertical FDI could be discouraged by the accompanying increase in labour costs.

4.2 | Imposing further restrictions on the developing host country sample

In this sub-section, as an indirect way of dealing with reverse causality, we impose two sets of sample restrictions to the sub-sample of developing host countries. First, we exclude pairs with host countries where the banking system is dominated by foreign banks. Specifically, we exclude the quartile of host countries reporting the highest percentage of foreign banks among total banks in the country during the period 1995–2012. The data are taken from Claessens and van Horen (2014, 2015). Excluding this quartile of host countries provides an indirect way to address concerns about reverse causality. Arguably, reverse causality is most likely if FDI figures prominently in the host country's banking system and drives FMD in the host country. In the absence of sectoral FDI data, we take the share of the banking system dominated by foreign banks as a proxy variable. Results reported in columns (1) and (2) of Table 2 show that the baseline results from Table 1 are hardly affected. The same holds true if we exclude source–host pairs where the source country belongs to the top-3 sources of FDI in the host country, as results reported in columns (3) and (4) show. One would expect that any causal effects of FDI on the host country's FMD should be less likely once the major sources of FDI are excluded. Some of the arguments for reverse causality point towards host country governments improving the financial market conditions in the interest of major FDI source countries. Excluding the top investors should reduce reverse causality because minor source countries have less bargaining power vis-à-vis the host country's government.

4.3 | Robustness tests

Tables 3–7 report a number of robustness tests. The estimations reported on in Table 3 relax the assumption that there is only one stage of FDI decisions and instead allow the determinants for whether there is any FDI to differ from the determinants of the size of the FDI stock, conditional on the existence of FDI. This allows us to test whether the substitutive conditional relationship exists only at the extensive, only at the intensive, or at both FDI margins. The fixed-effects first-stage logit estimations for which results are reported in columns (1) and (2) estimate the effects of FMD on the likelihood that a source country starts to have FDI stocks in a developing host country during the sample period or ceases to have any FDI stock during the sample period if it had such stocks before. Note that all dyads which have either no FDI stocks over the entire sample period or have FDI stocks over the entire sample period are dropped from the estimations since these observations are collinear with the dyad fixed effects in logit estimations. In columns (3) and (4), we report results on the effects of FMD on the level of FDI stocks a source country holds in those host countries in which it holds any stock (second-stage estimations). While the coefficients are no longer comparable to the one-stage estimations, of course, the substitutive conditional relationship between source and host country FMD holds in both stages of the two-stage estimation set-up.

In models for which results are reported in Table 4, we return to the pseudo-Poisson one-stage estimation model and test the robustness of our results to plausible changes in the definition of

TABLE 2 Excluding developing host countries dominated by foreign banks and excluding top-3 investors (developing host countries' sample)

	Excl. top-25% foreign-dominated banking		Excl. top-3 investors	
	(1)	(2)	(3)	(4)
$\ln GDP_{st-1}$	0.974*	0.980*	1.926**	1.869**
	(0.526)	(0.507)	(0.763)	(0.756)
$\ln GDPpc_{st-1}$	0.674	0.622	−0.523	−0.485
	(0.426)	(0.396)	(0.607)	(0.586)
$\ln GDP_{ht-1}$	1.443***	1.408***	1.303***	1.262***
	(0.386)	(0.380)	(0.395)	(0.391)
$\ln GDPpc_{ht-1}$	−0.420	−0.427	−0.332	−0.298
	(0.320)	(0.316)	(0.304)	(0.300)
FMD_{st-1}	0.192***	0.240***	0.215***	0.273***
	(0.0533)	(0.0554)	(0.0746)	(0.0775)
FMD_{ht-1}	0.235***	0.311***	0.158**	0.190***
	(0.0543)	(0.0542)	(0.0620)	(0.0596)
$FMD_{st-1} \times FMD_{ht-1}$		−0.222***		−0.143***
		(0.0461)		(0.0516)
No. of observations	10,804	10,804	12,224	12,224
No. of country pairs	1,226	1,226	1,311	1,311

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

what counts as a developing host country. In columns (1) and (2), we adopt a narrower definition of developing country by excluding all countries that are both members of the OECD, independently of their date of joining the organisation, and that are considered high-income countries by the World Bank's country classification. This excludes Chile, Estonia, Israel, Latvia, Lithuania and Slovenia. In columns (3) and (4), we do the opposite and adopt a broader definition of developing country by including instead the Czech Republic, Hungary, Poland, the Slovakia and South Korea in the developing host country sample. Table 4 shows that our results on FMD in both host and source countries and its substitutive conditioning effect are hardly affected by these changes to the sample definition.

In robustness tests reported in Table 5, we restrict the sample in several ways. In columns (1) and (2), we exclude all (source and host) countries identified by one of three sources as tax haven countries, as listed in Appendix 2 of Hines and Rice (1994). In columns (3) and (4), we exclude Argentina, Kazakhstan and Venezuela as source countries, which allows us to test whether the substitutive conditioning effect is driven by these three source countries, which might be regarded as unusual since these three countries are the only source countries with very low FMD, as shown in Figure A1. Again, neither change in sample definition affects our results much. In columns (5) and (6), we exclude source–host pairs where the source country belongs to the top-15 countries in terms of FMD. We argued in Section 3 that firms in countries with highly developed financial markets are less financially constrained and therefore do not need to invest specifically in host countries with very good FMD. Consequently, FMD in host countries should be less important for firms from source countries with

TABLE 3 Robustness tests (developing host countries' sample)

	First stage (logit)		Second stage (OLS)	
	(1)	(2)	(3)	(4)
$\ln GDP_{st-1}$	0.673	0.659	3.033***	3.012***
	(0.628)	(0.629)	(0.557)	(0.562)
$\ln GDPpc_{st-1}$	1.019**	0.989**	−0.835	−0.831
	(0.474)	(0.476)	(0.516)	(0.522)
$\ln GDP_{ht-1}$	1.910***	1.918***	1.166***	1.162***
	(0.537)	(0.538)	(0.345)	(0.345)
$\ln GDPpc_{ht-1}$	0.775	0.792*	−0.0663	−0.0681
	(0.473)	(0.474)	(0.346)	(0.346)
FMD_{st-1}	0.286**	0.279**	0.0788	0.0778
	(0.134)	(0.134)	(0.0524)	(0.0524)
FMD_{ht-1}	0.397***	0.408***	0.179***	0.177***
	(0.107)	(0.107)	(0.0476)	(0.0469)
$FMD_{st-1} \times FMD_{ht-1}$		−0.231**		−0.101**
		(0.0975)		(0.0443)
No. of observations	7,446	7,446	11,572	11,572
No. of country pairs	799	799	1,649	1,649

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

very good FMD. Excluding the top-15 source countries in terms of FDM, one would therefore expect the effect of FMD in host countries to become much more important than in the baseline model. This is exactly what we find: the coefficient of FMD in the host country almost doubles and is statistically significantly different from the baseline specification. The conditioning effect between the two FMD measures should become less important (or even disappear) once we exclude source countries with well-developed financial markets. Indeed, the coefficient on the interaction term is now insignificant in column (6) and considerably smaller compared to our baseline estimates.

In Table 6, we test whether our results depend on the recoding to zero of values of FDI stocks indicated by UNCTAD to be zero or of "negligible value" and the recoding of negative FDI stocks to zero. Columns (1) and (2) are based on dropping all observations with negative FDI stock values in the original data, and columns (3) and (4) additionally drop all observations listed by UNCTAD as having zero or negligible value. Our results remain fully robust.

In models for which results are reported in Table 7, we include a range of further control variables: a dummy variable set to one for country pairs that are members of a regional trade agreement (*RTA*) and zero otherwise; dummy variables set to one for pairs of countries that have signed a bilateral investment treaty (*BIT*) or a double taxation treaty (*DTT*) and zero otherwise; measures of institutional quality (*ROL*); and natural resource endowments (*Resources*) in the FDI host country.[22] In

[22]Data on RTAs are taken from Mario Larch's RTA Database (http://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html). Data on BITs and DTTs are from UNCTAD (http://investmentpolicyhub.unctad.org/IIA). As a measure for institutional quality, we include the index of rule of law from the Worldwide Governance Indicators. Data on resources (total natural resources rents as percentage of GDP) and education (primary school enrolment ratio) are taken from the WDI.

TABLE 4 Robustness tests (developing host countries' sample)

	Narrower definition of developing country		Broader definition of developing country	
	(1)	(2)	(3)	(4)
$\ln GDP_{st-1}$	0.759	0.766	0.781	0.773
	(0.490)	(0.476)	(0.487)	(0.472)
$\ln GDPpc_{st-1}$	0.766*	0.729*	0.792*	0.752*
	(0.421)	(0.401)	(0.423)	(0.402)
$\ln GDP_{ht-1}$	1.089***	1.053***	1.062***	1.019***
	(0.332)	(0.329)	(0.321)	(0.317)
$\ln GDPpc_{ht-1}$	−0.0579	−0.0471	−0.0274	−0.0131
	(0.294)	(0.294)	(0.292)	(0.292)
FMD_{st-1}	0.239***	0.288***	0.223***	0.274***
	(0.0529)	(0.0539)	(0.0493)	(0.0505)
FMD_{ht-1}	0.193***	0.239***	0.178***	0.228***
	(0.0465)	(0.0479)	(0.0448)	(0.0461)
$FMD_{st-1} \times FMD_{ht-1}$		−0.160***		−0.166***
		(0.0461)		(0.0436)
No. of observations	14,042	14,042	15,350	15,350
No. of country pairs	1,496	1,496	1,635	1,635

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

addition, we include two measures of differences in factor endowments between source and host country, namely the difference in terms of human capital (proxied by the difference in a human capital index, *HC difference*) and in terms of physical capital stock per employee (*PC difference*), with data sourced from the Penn World Table version 9.0. Note that *RTA*, *BIT* and *DTT* only capture country pairs that enter (or, rarely, exit) such treaties during our sample period since all dyad variables that do not vary over time such as common language or colonial ties are absorbed by the dyad fixed effects. The inclusion of these variables allows us to test whether our main results spuriously pick up the effect of correlated control variables. As a final control variable, we include imports of the host country from the source country. We realise that including imports as a control variable is only a first step towards addressing the complex interactions between FDI, FMD and trade. Trade and FDI are not independent from each other with both substitution and complementary effects possible (Blonigen, 2001), and some evidence suggests that FMD has a positive effect on trade as well (Manova, Wei, & Zhang, 2015). Note that we lose about 20% of observations due to lack of data. The unconditional effects of FMD in the source and host countries are slightly weaker in substantive terms. Other than that, the baseline results are fully robust to this test.

In the estimations reported in columns (3) and (4), we deal with unobserved time-invariant heterogeneity in a different way by replacing the dyad fixed effects used hitherto with host and source country fixed effects. We now have to control for dyadic heterogeneity in different ways, which we do by additionally including the log of distance and dummy variables for common language, a shared

TABLE 5 Robustness tests (developing host countries' sample)

	Exclude tax haven countries		Exclude Argentina, Kazakhstan and Venezuela		Exclude top-15 FMD source countries	
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln GDP_{st-1}$	0.758	0.752	0.764	0.763	0.977	0.931
	(0.501)	(0.484)	(0.491)	(0.475)	(0.676)	(0.667)
$\ln GDPpc_{st-1}$	0.797*	0.755*	0.784*	0.744*	0.678	0.647
	(0.434)	(0.412)	(0.422)	(0.400)	(0.414)	(0.413)
$\ln GDP_{ht-1}$	0.957***	0.910***	1.061***	1.015***	0.837***	0.846***
	(0.295)	(0.290)	(0.321)	(0.317)	(0.322)	(0.322)
$\ln GDPpc_{ht-1}$	0.0966	0.113	−0.0266	−0.0118	−0.330	−0.338
	(0.275)	(0.273)	(0.293)	(0.292)	(0.258)	(0.262)
FMD_{st-1}	0.202***	0.257***	0.223***	0.276***	0.209***	0.228***
	(0.0498)	(0.0515)	(0.0499)	(0.0511)	(0.0729)	(0.0761)
FMD_{ht-1}	0.187***	0.239***	0.178***	0.221***	0.307***	0.317***
	(0.0464)	(0.0479)	(0.0449)	(0.0455)	(0.0566)	(0.0564)
$FMD_{st-1} \times FMD_{ht-1}$		−0.169***		−0.174***		−0.0769
		(0.0433)		(0.0452)		(0.0525)
No. of observations	14,747	14,747	14,917	14,917	8,892	8,892
No. of country pairs	1,581	1,581	1,588	1,588	975	975

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

colonial history and geographical contiguity into the estimations.[23] Again, our results of main interest are hardly affected by this different strategy of dealing with unobserved time-invariant heterogeneity.

In column (5), we go one step further and employ source-specific and host-specific year fixed effects, which obliterates the concern that any omitted variables that vary over time in the source or in the host country could bias our results.[24] Naturally, this model specification means that only the coefficient of the interaction term is estimable, not the coefficients of the two constituent terms of FMD in source and host countries, as these are now collinear with the fixed effects. While the coefficient in this robustness test is slightly lower than the coefficient in the baseline model, even this specification suggests a statistically significant substitutive conditional effect.

4.4 | Traditional financial market development measures

Lastly, in results reported in Table 8, we employ two traditionally used measures of FMD, namely domestic credit allocated to the private sector by banks and other financial intermediaries normalised by GDP (*private credit*) and the stock market capitalisation-to-GDP ratio (*stock_capital*).[25] Like in

[23]The data are taken from the standard gravity dataset provided by CEPII (http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?xml:id=8). For a detailed discussion of the data, see Head et al. (2010) and Head and Mayer (2014).

[24]Note that we had to drop *HC difference* because otherwise the estimator did not converge.

[25]Data are taken from Beck & Demirgüç-Kunt (2009).

TABLE 6 Robustness tests (developing host countries' sample)

	Drop observations with negative FDI stock values		Drop observations with negative, zero or negligible FDI stock values	
	(1)	(2)	(3)	(4)
$\ln GDP_{st-1}$	0.810*	0.801*	0.649	0.661
	(0.486)	(0.471)	(0.464)	(0.458)
$\ln GDPpc_{st-1}$	0.780*	0.741*	0.912**	0.865**
	(0.421)	(0.401)	(0.375)	(0.364)
$\ln GDP_{ht-1}$	1.060***	1.018***	0.996***	0.954***
	(0.321)	(0.318)	(0.335)	(0.332)
$\ln GDPpc_{ht-1}$	−0.0259	−0.0120	0.0598	0.0744
	(0.293)	(0.292)	(0.315)	(0.315)
FMD_{st-1}	0.221***	0.270***	0.213***	0.251***
	(0.0490)	(0.0500)	(0.0483)	(0.0488)
FMD_{ht-1}	0.173***	0.223***	0.166***	0.197***
	(0.0448)	(0.0461)	(0.0448)	(0.0452)
$FMD_{st-1} \times FMD_{ht-1}$		−0.162***		−0.148***
		(0.0436)		(0.0432)
No. of observations	15,061	15,061	10,710	10,710
No. of country pairs	1,629	1,629	1,426	1,426

Note: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

Desbordes and Wei (2017), both variables are lagged by one year and enter in logged form. As we have argued above, we submit our comprehensive and novel measure of FMD as an improvement over these traditional measures, which only capture aspects of FMD, but it is worth testing whether our major finding of a substitutive conditioning effect in developing host countries holds with these previously employed measures as well.[26] We find that independently of which of these two measures are chosen, FMD in origin countries never has a statistically significant effect. By contrast, FMD in the developing host country always has the expected positive and statistically significant effect. A one standard deviation increase in the two traditional host country FMD variables suggests a substantive effect of 26.0% and 26.7% for *private credit* and *stock_capital*, respectively, which is slightly higher than the 15.9% effect following a one standard deviation increase in our more comprehensive FMD variable. The coefficient of the interaction term between FMD in origin and source countries is negative for both measures but only statistically significant for *Stockcapital*. Plotting the marginal effects of FMD in host countries across the range of FMD in origin countries confirms the existence of a statistically significant substitutive conditional effect for *stock_capital* but not for *private credit* (graphs not shown).

[26]Although our measure for financial market development covers a very broad range of financial market indicators and is thus more informative about the quantity and quality of FMD than single indicators, the correlation between *FMD* and these traditional measures is surprisingly strong: The correlation coefficient is 0.77 for *private credit* and 0.61 for *stock_capital* for FDI source countries and 0.66 for *private credit* and 0.60 for *stock_capital* for FDI host countries.

TABLE 7 Robustness tests (developing host countries' sample)

	Extended model (dyad FE)		Extended model (host and source country FE)		Extended model (time-varying country FE)
	(1)	(2)	(3)	(4)	(5)
$\ln GDP_{st-1}$	0.594	0.580	0.594	0.580	
	(0.461)	(0.456)	(0.461)	(0.456)	
$\ln GDPpc_{st-1}$	0.953**	0.913**	0.954**	0.913**	
	(0.394)	(0.380)	(0.394)	(0.380)	
$\ln GDP_{ht-1}$	1.023***	0.994***	1.023***	0.994***	
	(0.334)	(0.332)	(0.334)	(0.332)	
$\ln GDPpc_{ht-1}$	−0.124	−0.108	−0.124	−0.108	
	(0.303)	(0.303)	(0.303)	(0.303)	
FMD_{st-1}	0.206***	0.248***	0.206***	0.248***	
	(0.0496)	(0.0503)	(0.0496)	(0.0503)	
FMD_{ht-1}	0.136***	0.175***	0.136***	0.175***	
	(0.0429)	(0.0443)	(0.0429)	(0.0443)	
$FMD_{st-1} \times FMD_{ht-1}$		−0.141***		−0.140***	−0.106***
		(0.0375)		(0.0375)	(0.034)
lnImports_{sht-1}	0.0859**	0.0874**	0.0859**	0.0875**	0.047*
	(0.0426)	(0.0433)	(0.0426)	(0.0432)	(0.028)
RTA_{sht-1}	0.121	0.122	0.121	0.122	0.002
	(0.0832)	(0.0806)	(0.0832)	(0.0805)	(0.083)
BIT_{sht-1}	−0.0490	−0.0471	−0.0489	−0.0470	−0.102
	(0.113)	(0.0980)	(0.113)	(0.0980)	(0.089)
DTT_{sht-1}	0.134	0.132	0.134	0.132	0.180**
	(0.109)	(0.109)	(0.109)	(0.109)	(0.086)
$\text{HC difference}_{sht-1}$	0.133	0.174	0.133	0.174	
	(0.360)	(0.355)	(0.360)	(0.355)	
$\text{PC difference}_{sht-1}$	5.87e-08*	4.69e-08	5.87e-08*	4.69e-08	0.000**
	(3.42e-08)	(3.50e-08)	(3.42e-08)	(3.50e-08)	(0.000)
ROL_{ht-1}	0.234**	0.245**	0.234**	0.245**	
	(0.114)	(0.114)	(0.114)	(0.114)	
Resources_{ht-1}	−0.00316	−0.00332	−0.00316	−0.00332	
	(0.00318)	(0.00315)	(0.00318)	(0.00315)	
lndistance_{sh}			−1.278***	−1.288***	
			(0.104)	(0.105)	
Comlang_{sh}			0.673***	0.704***	
			(0.170)	(0.174)	
Colony_{sh}			1.245***	1.225***	
			(0.188)	(0.190)	

(Continues)

TABLE 7 (Continued)

	Extended model (dyad FE)		Extended model (host and source country FE)		Extended model (time-varying country FE)
	(1)	(2)	(3)	(4)	(5)
Contiguity$_{sh}$			0.613***	0.649***	
			(0.205)	(0.209)	
No. of observations	12,754	12,754	12,754	12,754	13,897
No. of country pairs	1,450	1,450	1,450	1,450	1,471

Notes: Dyad fixed effects and year fixed effects included in columns (1) and (2). Host and source country fixed effects and year fixed effects included in columns (3) and (4). Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

TABLE 8 Employing traditional FMD measures (developing host countries' sample)

	Private credit		Stock_capital	
	(1)	(2)	(3)	(4)
$\ln GDP_{st-1}$	−0.980	−0.944	−1.061	−0.810
	(0.969)	(0.987)	(0.973)	(0.964)
$\ln GDPpc_{st-1}$	2.954***	2.883***	2.923***	2.722***
	(0.974)	(1.026)	(0.946)	(0.930)
$\ln GDP_{ht-1}$	0.677**	0.674**	0.307	0.297
	(0.329)	(0.326)	(0.248)	(0.247)
$\ln GDPpc_{ht-1}$	0.713**	0.709**	0.947***	0.944***
	(0.330)	(0.326)	(0.296)	(0.293)
FMD_{st-1}	−0.107	−0.129	0.0220	0.0169
	(0.189)	(0.190)	(0.0672)	(0.0654)
FMD_{ht-1}	0.292***	0.306***	0.219***	0.242***
	(0.0767)	(0.0787)	(0.0492)	(0.0472)
$FMD_{st-1} \times FMD_{ht-1}$		−0.0753		−0.0856**
		(0.155)		(0.0422)
No. of observations	11,132	11,132	9,732	9,732
No. of country pairs	1,496	1,496	1,225	1,225

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the 1%, 5% and 10% level is indicated by ***, ** and *, respectively.

5 | CONCLUSION

We have argued that FMD in both host and source countries matters for FDI and that one can substitute for the other. We estimated gravity-type models to assess the effects of FMD in the host and source countries on bilateral FDI stocks simultaneously, allowing, in separate estimations, for the effect of FMD in one country of the country pair to be conditioned by FMD in the other country. In contrast to the existing literature, we use a much broader measure of FMD, based on a comprehensive set of financial market indicators. Our analysis covers a larger and more globally representative sample compared to existing studies, comprising 43 source countries and 137 host countries over the period 2001–12.

One major finding is that bilateral FDI increases with better developed financial markets in both the host and the source country. This result is robust to various ways in which we indirectly account for potential reverse causality. More importantly, we also find evidence for a statistically significant conditional relationship but only if we restrict the analysis to developing host countries. Specifically, we find that FMD in the developing host country and FMD in the FDI source country function as substitutes for each other consistently across all estimation models.

This novel result has ambiguous implications for developing host countries, many of which have remained on the sidelines in the global competition for FDI. On the one hand, it suggests that poor FMD in developing host countries can be compensated for by highly developed financial markets in the FDI source countries. Clearly, given that financial markets are still very underdeveloped in developing countries, this is encouraging news. On the other hand, it also suggests that the payoff to better develop financial markets in developing host countries is not as large as policymakers might expect if the country's major FDI source countries themselves have highly developed financial markets. Future research should analyse whether similarly conditional effects prevail with regard to other FDI determinants such as physical infrastructure in transportation and communication.

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DATA AVAILABILITY STATEMENT

The data and code underlying the estimations presented in this paper are available from the corresponding author on request.

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APPENDIX

TABLE A1 Summary variables statistics

	N	Mean	*SD*	Min	Max
Total sample					
FDI stocks	23,780	4,844	23,340	0	645,098
$\ln GDP_s$	23,780	27.18	1.26	24.28	30.26
$\ln GDP_h$	23,780	25.57	1.96	20.48	30.26
$\ln GDPpc_s$	23,780	9.89	1.00	6.85	11.14
$\ln GDPpc_h$	23,780	8.76	1.53	4.91	11.14
FIN_s	23,780	1.05	0.83	−2.15	2.56
FIN_h	23,780	0.32	1.05	−2.20	2.56
Developing host countries' sample					
FDI stocks	15,350	1,066	4,406	0	101,030
$\ln GDP_i$	15,350	27.27	1.28	24.28	30.26
$\ln GDP_j$	15,350	24.69	1.70	20.48	29.07
$\ln GDPpc_i$	15,350	9.89	1.01	6.85	11.14
$\ln GDPpc_j$	15,350	7.90	1.18	4.91	11.02
FIN_i	15,350	1.08	0.79	−2.15	2.56
FIN_j	15,350	−0.14	0.89	−2.20	2.26

TABLE A2 List of FDI source countries

Argentina	Denmark	Italy	New Zealand	Switzerland
Australia	Finland	Japan	Norway	Thailand
Austria	France	Kazakhstan	Poland	Turkey
Belgium	Germany	Korea, Rep.	Portugal	United Arab Emirates
Brazil	Greece	Kuwait	Russian Federation	United Kingdom
Canada	Hungary	Libya	Saudi Arabia	United States
Chile	India	Malaysia	South Africa	Venezuela
China	Ireland	Mexico	Spain	
Colombia	Israel	Netherlands	Sweden	

TABLE A3 List of FDI host countries

Afghanistan	Cambodia	Gabon	Jordan	Morocco	Russian Federation	Togo
Albania	Cameroon	Georgia	Kazakhstan	Mozambique	Rwanda	Trinidad and Tobago
Algeria	Canada[a]	Germany[a]	Kenya	Namibia	Saudi Arabia	Tunisia
Angola	Chile	Ghana	Korea, Rep.[a]	Nepal	Senegal	Turkey
Argentina	China	Greece[a]	Kuwait	Netherlands[a]	Serbia	Uganda
Armenia	Colombia	Guatemala	Kyrgyz Rep.	New Zealand[a]	Sierra	Ukraine
Australia[a]	Congo, Dem. Rep.	Guinea	Lao	Nicaragua	Slovakia[a]	United Arab Emirates
Austria[a]	Congo, Rep.	Guyana	Latvia	Niger	Slovenia	UK[a]
Azerbaijan	Croatia	Haiti	Libya	Nigeria	South Africa	USA[a]
Bangladesh	Czech Republic[a]	Honduras	Lithuania	Norway[a]	Spain[a]	Uruguay
Belarus	Denmark[a]	Hungary[a]	Macedonia	Oman	Sri Lanka	Uzbekistan
Belgium[a]	Dominican Rep.	India	Madagascar	Pakistan	Sudan	Venezuela
Benin	Ecuador	Indonesia	Malawi	Papua New Guinea	Suriname	Vietnam
Bolivia	Egypt	Iran	Malaysia	Paraguay	Swaziland	West Bank and Gaza
Bosnia and Herzegovina	El Salvador	Ivory Coast	Mali	Peru	Sweden[a]	Yemen, Rep.
Botswana	Equatorial Guinea	Iraq	Mauritania	Philippines	Switzerland[a]	Zambia
Brazil	Estonia	Ireland[a]	Mexico	Poland[a]	Syria	Zimbabwe
Bulgaria	Ethiopia	Israel	Moldova	Portugal[a]	Tajikistan	
Burkina Faso	Finland[a]	Italy[a]	Mongolia	Qatar	Tanzania	
Cape Verde	France[a]	Japan[a]	Montenegro	Romania	Thailand	

Note: [a]Excluded from developing host countries sample.

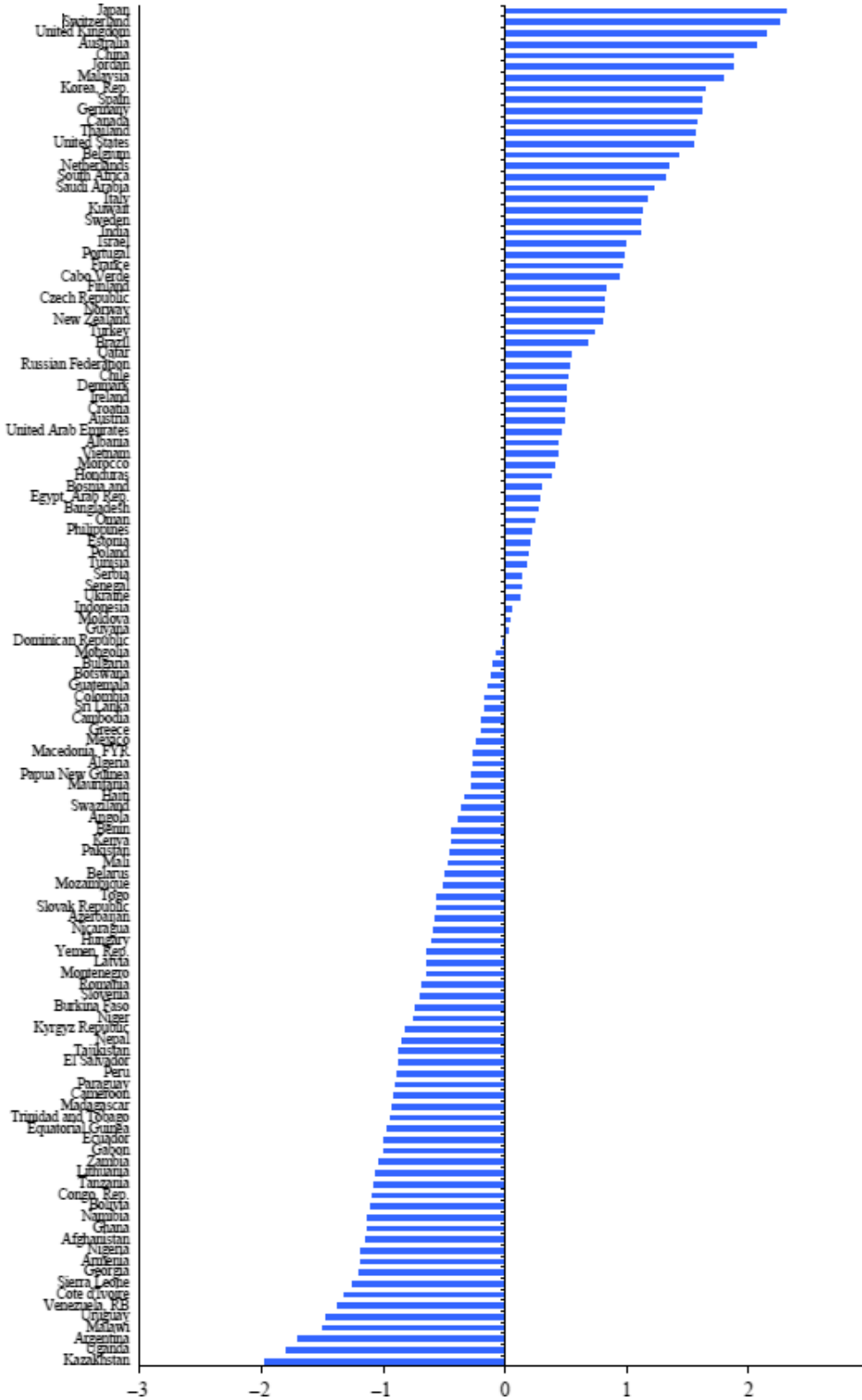

FIGURE A1 Country ranking of *FMD* in 2012 [Colour figure can be viewed at wileyonlinelibrary.com]

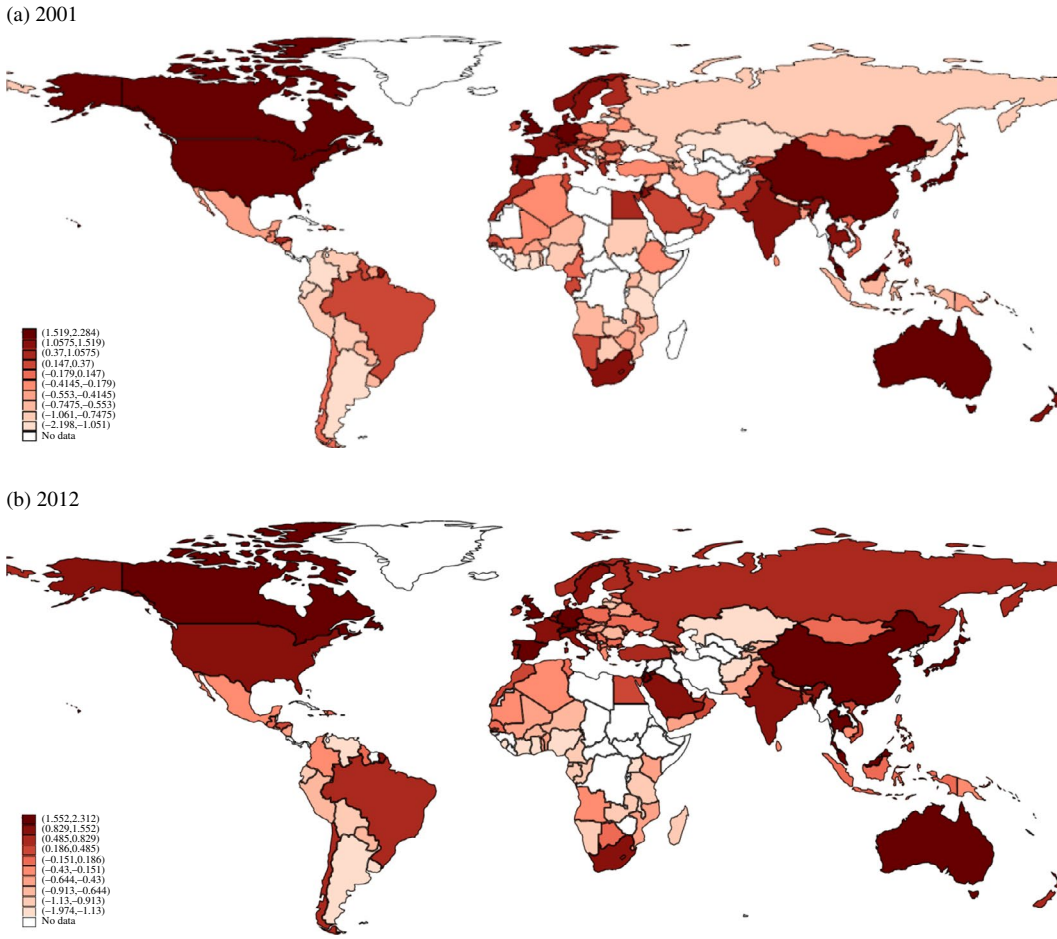

FIGURE A2 Mapping values of *FMD*. (a) 2001; (b) 2012 [Colour figure can be viewed at wileyonlinelibrary.com]

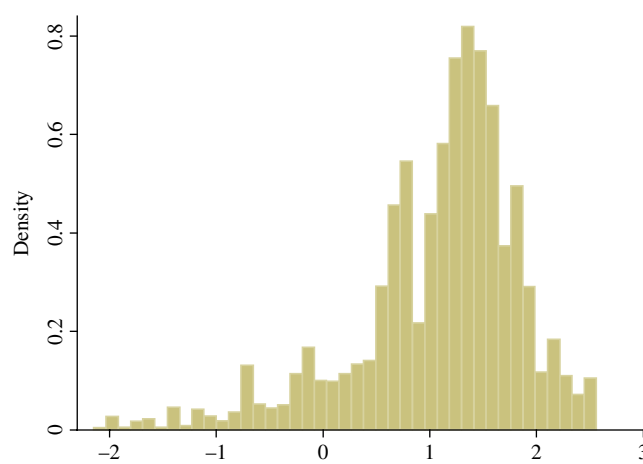

FIGURE A3 Density plot of financial market development in source countries [Colour figure can be viewed at wileyonlinelibrary.com]