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Julian Donaubauer, Eric Neumayer, and Peter Nunnenkamp

Abstract:

We estimate gravity-type models to assess the effects of financial market development in the host and source countries on bilateral FDI stocks. We address potential reverse causality, inter alia by performing instrumental variable estimations and restricting the sample to observations where reverse causality, if existent, should be less relevant. Our major and robust finding is that bilateral FDI increases with better developed financial markets in both the host and the source country. Furthermore, for developing host countries, we find evidence that financial market development in source and host countries function as substitutes for each other.

Keywords: foreign direct investment, financial market development, gravity model.

JEL classification: F21; G20; O16

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1. Introduction

There is relatively little evidence on whether better developed financial markets help attract FDI. This question is particularly relevant for host countries that have remained on the sidelines in the global competition for FDI such as many developing countries.¹ Prominent surveys of the literature on the determinants of FDI inflows, including Chakrabarti (2001) and Blonigen (2005), do not cover the host countries' financial market development.² The review of Blonigen and Piger (2014) lists just one prior study that considers selected financial market indicators among the determinants of FDI.³

To be sure, a few previous empirical studies exist but they have typically addressed financial market development on just one side of the source-host pair, leaving unclear whether what matters for FDI is only financial market development in the host countries, in the source countries, or in both host and source countries. Two studies are based on firm-level data for the United States as source country. Antràs et al. (2009) show that weak financial market conditions in the host country dampen the scale of activities by US-based multinational companies (MNCs), while such conditions strengthen the reliance of local subsidiaries on capital inflows from the parent company.⁴ Bilir et al. (2014: 30) conclude from their study: “Financially advanced countries attract more MNC subsidiaries. Strong financial institutions in the host country also

¹ The UN Summit on Financing for Development in Monterrey in 2002 concluded that creating the necessary conditions to facilitate FDI inflows is a central challenge for developing countries, particularly the poorest among them (United Nations 2003).

² The financial risk measures considered by Eicher et al. (2012) relate to foreign debt and the current account, rather than domestic financial markets.

³ Di Giovanni (2005) includes stock market capitalization and domestic credit as determinants of mergers and acquisitions (M&As). However, Di Giovanni considers these indicators for the source country – not the host country (see also below). Focusing on institutional determinants of FDI, Bénassy-Quéré et al. (2007) consider several indicators on financial institutions, for example, bank supervision and the degree of competition among banks. However, the underlying *Institutional Profiles* database, based on a survey conducted in 2001, does not allow for panel estimations.

⁴ In other words, the efficient scale of foreign firms is limited where financial markets are less developed. However, “parent companies own higher shares of affiliate equity when affiliates are located in countries where protections extended to creditors are weaker and private credit is scarcer” (Antràs et al. 2009: 1201).

raise aggregate affiliate sales.” Mohamed and Sidiropoulous (2010), Kaur et al. (2013), and Otchere et al. (2016) focus on specific sub-groups of host countries (Middle Eastern and North African countries, BRIC countries,⁵ and African countries, respectively). According to these studies, better developed local financial markets tend to be associated with higher aggregate FDI inflows, though the evidence is far from robust or even statistically insignificant as for the sub-group of Middle Eastern and North African countries.⁶

Studies exclusively addressing host-country conditions tend to neglect that foreign investors might be credit constrained at home, which might inhibit their ability to invest abroad, such that financial market development in the source country also matters. Such credit-constrained investors might also depend more on well-developed financial markets in the host countries than investors with recourse to well-developed financial markets at home. Few empirical studies explicitly assess the role of financial market conditions in the source countries. Klein et al. (2002) advance the ‘relative access to credit hypothesis’ according to which MNCs’ ability to undertake FDI depends on their chances to raise external funds. Specifically, Klein et al. 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 et al. (2014) show that financially constrained German firms are less likely to undertake FDI. Analyzing the determinants of M&A deals during the 1990s, Di Giovanni (2005) finds that stock market capitalization in the home country of the acquiring firms is strongly and positively associated with their M&A activity abroad.

⁵ Brazil, Russia, India, and China.

⁶ See also Kinda (2010) who reports ambiguous results for a sample of 58 developing host countries. Dutta and Roy (2010) stress non-linear effects. They find that political stability in the host country enhances the positive effects of financial market development on FDI. More strikingly, the effect on FDI becomes negative once financial market development improves beyond a threshold.

We know of just one previous study considering the role of financial market conditions in both host and source countries for bilateral FDI. Desbordes and Wei (2014: 4) find that “a sophisticated and well-functioning financial system in source and destination countries strongly facilitates the international expansion of firms through FDI.” Their study adopts a difference-in-differences approach and instruments financial market development by legal origin dummy variables and historical financial market conditions to account for possible reverse causality. The main analysis of Desbordes and Wei (2014) is based on firm-level data on greenfield FDI projects in the manufacturing sector that are not freely available.⁷

Our analysis complements and extends the work of Desbordes and Wei (2014) in several ways. First of all, we use a composite index to measure financial market conditions in the host and source countries of FDI. The construction of this index is based on a comprehensive set of financial indicators, employing the unobserved components model suggested by Donaubaer et al. (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 capitalization.⁸ Second, our panel dataset covers the period 2001-2012 and thus a significantly longer time period than the analysis of Desbordes and Wei (2014) which is restricted to just four years (2003-2006). Third, we rely on bilateral FDI flows 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 (notably foreign capital and superior technology). Finally, we pursue different avenues to tackle endogeneity concerns. In particular, we address potential reverse causality running from inward

⁷ These data are collected by *fDi Markets* (<http://www.fdimarkets.com/>), a fee-based service from the *Financial Times*.

⁸ For instance, Desbordes and Wei (2014) alternatively use domestic credit allocated by banks and other financial institutions and stock market capitalization (both normalized by GDP).

FDI to financial market conditions in the host country as well as potential omitted variable bias by using the financial market development index for geographically contiguous neighbors as an instrument. For addressing concerns regarding reverse causality only, we additionally run restricted sample regressions.

The paper proceeds as follows. Section 2 discusses the analytical background and derives our hypotheses. Section 3 describes the estimation models and 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 et al. (2004: 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 financial market development, it is to be expected that better developed financial markets in the source country result in higher outward FDI (Desbordes and Wei 2014).

In a similar vein, Klein et al. (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: 665) find that firms “associated with less healthy banks” are less likely to engage in FDI.

This leads to our first hypothesis:

H1: Better financial market development in the source country encourages outward FDI.

As stressed by Feldstein (2000: 2), “not all foreign direct investment around the world represents net capital flows. Often such investments are financed in local markets.” Likewise, Alfaro et al. (2009: 113-4) 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 et al. 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.⁹

Well-functioning financial markets in the host countries help reduce the costs of external finance for firms (e.g., Rajan and Zingales 1998), including foreign firms seeking access to local (co-) financing. According to Desai et al. (2004: 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.”¹⁰ Moreover, local financial intermediaries may help foreign investors to overcome informational asymmetries by sharing local knowledge on risks and market opportunities (Kinda 2010).

⁹ See, e.g., the survey of executives in African countries in the African Competitiveness Report (World Economic Forum 1998).

¹⁰ 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.

Furthermore, better developed financial markets in the host country could attract FDI in indirect ways. By relaxing the credit constraints of local firms, financial market development allows for greater variety of intermediate inputs in the host country (Alfaro et al. 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 financial market development may help expand local market size (Desbordes and Wei 2014), thus promoting market-seeking (horizontal) FDI.

This leads to our second hypothesis:

H2: Better financial market development in the host countries attracts FDI to these countries.

However, Desbordes and Wei (2014) argue that the effect of financial market development 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 financial market development 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 et al. 2014).

Related to this reasoning, the effects of financial market development in the host country on bilateral FDI are likely to depend on financial market development 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: 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 financial market development in the host countries is associated with more FDI in the form of intra-company loans.¹¹ However, adverse effects on (overall) bilateral FDI become more likely when parent companies are based in source countries that are financially less developed than the United States, i.e., where it is more difficult to offset financing constraints in the host countries.

Conversely, the positive effects of financial market development in the host country on bilateral FDI may diminish the more advanced financial markets 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 et al. 2009).¹² 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.¹³ Accordingly, financial market development in the host countries

¹¹ Note that this does not necessarily imply that overall FDI increases since other forms of FDI, e.g., equity capital in new projects, are likely to be negatively affected.

¹² 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: 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.”

¹³ For instance, Lall (1983: 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

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 financial market development in source and host countries can function as substitutes for each other and formulate as our third hypothesis:

H3: 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.

3. Method and data

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

$$FDI_{ijt} = \alpha_1 \ln GDP_{it-1} + \alpha_2 \ln GDP_{jt-1} + \alpha_3 \ln GDPpc_{it-1} + \alpha_4 \ln GDPpc_{jt-1} + \alpha_5 FIN_{it-1} \\ + \alpha_6 FIN_{jt-1} + \eta_{ij} + \theta_t + \varepsilon_{ijt}$$

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

$$FDI_{ijt} = \alpha_1 \ln GDP_{it-1} + \alpha_2 \ln GDP_{jt-1} + \alpha_3 \ln GDPpc_{it-1} + \alpha_4 \ln GDPpc_{jt-1} + \alpha_5 FIN_{it-1} \\ + \alpha_6 FIN_{jt-1} + \alpha_7 (FIN_{it-1} \times FIN_{jt-1}) + \eta_{ij} + \theta_t + \varepsilon_{ijt}$$

LDCs.” However, Sosa Andrés et al. (2013) contradict the view that non-traditional investors are generally less risk averse than their peers based in advanced source countries.

The dependent FDI variable consists of bilateral stocks at the end of the period, publicly available from UNCTAD since 2001.¹⁴ In contrast to the FDI data used by Di Giovanni (2005) as well as Desbordes and Wei (2014), this dataset 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.¹⁵ We use bilateral FDI stocks which are typically less volatile than bilateral FDI flows on an annual basis (see, e.g., de Sousa and Lochard 2011). Our sample includes 43 (traditional and non-traditional) source countries reporting bilateral FDI stocks in sufficient detail for 137 host countries during the period 2001-2012.¹⁶ In line with UNCTAD statistical procedures, we generally assume that bilateral FDI stocks are zero when a source country does not report data for a particular host country at a particular point in time.¹⁷

We are primarily interested in assessing the impact of financial market development (*FIN*) in the source and host country on bilateral FDI. Instead of relying on just one or two specific indicators of financial market development as most of the previous literature, we follow Donaubauer et al. (2016b) in making use of systematic and comprehensive measures of financial market development. We employ a composite index of financial market development based on nine indicators, capturing the stability, depth, and efficiency of financial systems as well as the access

¹⁴ Available at: <http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics-Bilateral.aspx> (accessed: July 2015).

¹⁵ As stressed by Desbordes and Wei (2014: 14), 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.

¹⁶ We exclude financial offshore centers such as The Bahamas or Cyprus. See Appendix Tables A2 and A3 for the list of source and host countries. Our sample of source and host countries covers almost 90 percent of worldwide FDI stocks in 2012 as reported by UNCTAD.

¹⁷ However, we follow Barthel et al. (2010) and consider bilateral FDI stocks reported as zero in the original data as missing when UNCTAD reports FDI *flows* for the source-host pair in previous years. Note also that we set a few negative entries of bilateral FDI stocks to zero.

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); 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).¹⁸ An unobserved components model is used to combine the information from the different indicators; accordingly, observed data on each aspect of financial market development are a linear function of an unobserved common component of financial market development and an error term. This approach, which resembles the construction of the well-known Worldwide Governance Indicators by Kaufmann et al. (2011), allows for a consistent picture of financial market development on an annual basis for all countries in our sample.¹⁹

Apart from our focus on financial market development, our empirical models are specified parsimoniously. According to Wilson et al. (2005: 849), "a correct specification of the gravity model is parsimonious in specific economic variables" and "rich in fixed effects." Our models include the FDI partner countries' GDP ($\ln GDP$) and GDP per capita ($\ln GDPpc$), both in logged form.²⁰ In addition, we include country-pair (dyad) fixed effects as well as time fixed effects. The source-host pair fixed effects, η_{ij} , 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 common shocks during our period of observation that affect all pairs in essentially the

¹⁸ Donaubaauer 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>).

¹⁹ See Appendix Table A1 for summary statistics.

²⁰ The data on GDP and $GDPpc$ are taken from the WDI.

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 there is no instrumental variable version of the fixed effects Poisson estimator, we additionally estimate 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, which we replace with a linear probability model in instrumental variable estimation, 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 the former, a gravity-type model necessarily omits some variables which could impact on FDI stocks but for which no data exist for a globally representative sample, such as wages, corporate taxes or the skill level of the labor force. As concerns reverse causality, previous research has shown that FDI could help advance the host countries' financial market development. 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.²¹ Likewise, Otchere et al. (2016) argue that FDI contributes to improving the depth and transparency of financial markets in Africa, where stock markets tend to be less liquid

²¹ 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 Côte d'Ivoire were exacerbated by the presence of foreign firms.

and less transparent than in more advanced economies.²² Furthermore, the available empirical evidence suggests that better developed financial markets amplify the economic growth effects of FDI (Hermes and Lensink 2003; Alfaro et al. 2004; 2010).²³

Consequently, we account for potential endogeneity in subsequent steps of our analysis. We instrument financial market development in a specific host country with financial market development in geographically contiguous neighboring countries.²⁴ Financial market development in geographically contiguous countries is a strong partial predictor of the endogenous variable since financial market development tends to be spatially clustered. The identifying assumption is that financial market development in geographically contiguous countries fulfils the exclusion restriction: it should not be subject to reverse causality, it should not have a direct effect on the dependent variable, nor have an effect on the dependent variable through an omitted time-varying variable. We find this identifying assumption plausible but as always the exclusion restriction cannot be tested.

Furthermore, 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, we exclude host countries' top-3 source country investors and we restrict the sample to developing host countries only (see Section 4 for details).

²² The empirical analysis of Otchere et al. (2016) points to bi-directional causality between FDI and the development of local financial markets. Soumaré and Tchana Tchana (2011) 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.

²³ Focusing on East Asian host countries (and some highly developed countries), Choong et al. (2004: 278) conclude that “FDI and economic growth are not cointegrated by themselves directly, but rather through their dynamic interaction with the development of the domestic financial sector.”

²⁴ Geographical contiguity is defined as being contiguous on land or separated by up to 400 miles of water (with data taken from <http://www.eugenesoftware.org>).

4. Empirical results

In this section, we report the results from our baseline estimations, from the instrumental variable regressions as well as from the estimations based on restricted samples.

Baseline estimations

Table 1 reports our baseline estimation results. As discussed in Section 3 above, we start with Pseudo-Poisson estimations which account for the existence and the level of FDI stocks in one step. 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 financial market development in the source and the host country, while we additionally enter the interaction between financial market development in both countries of a pair in column (2).²⁵ We then distinguish between the two stages of FDI. The fixed effects logit estimations for which results are reported in columns (3) and (4) estimate the effects of financial market development on the likelihood that a source country starts to have FDI stocks in a host country during the sample period or ceases to have any FDI stock during the sample period if it had such stocks before (first stage of selecting FDI hosts). 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 (5) and (6) we report results on the effects of financial market development on the level of FDI stocks a source country holds in those host countries in which it holds any stock (second stage).

²⁵ For ease of interpretation, we mean-centre the two variables of financial market development in the interaction effects estimation.

Among our control variables, the effects of market size, as reflected in the source and host country's GDP, are statistically significantly positive (at the five percent level or better) throughout the estimations reported in Table 1. More surprisingly perhaps, the effects of the source country's GDP on the amount of bilateral FDI stocks appear to be stronger than the effects of the host country's GDP. This holds especially for the second-stage fixed effects estimations in column (5) and (6): bilateral FDI stocks increase by almost three percent with a one-percent increase in the source country's GDP, compared to little more than one percent for a one-percent increase in the host country's GDP. In contrast to market size, the effects of average per-capita incomes are mostly statistically insignificant. The only exception is that higher per-capita incomes in the source country tend to be associated with a higher probability of any bilateral FDI activity in the logit estimations in columns (3) and (4). 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 labor costs.

Turning to financial market development as our variables of principal interest, we find that bilateral FDI increases with better developed financial markets in the host and the source country. Moreover, the Pseudo-Poisson estimations indicate that financial market development in both countries of a pair plays a similarly important role. Coefficients in Poisson models can be interpreted as semi-elasticities. A one standard deviation improvement in financial market development in host countries is predicted to increase bilateral FDI stocks by about 8.7 percent. There is less variation in financial market development among source countries. A one standard deviation improvement in this variable is therefore predicted to increase bilateral FDI stocks by less than that despite the almost identical coefficient estimate, namely by about 7.8 percent. The results are hardly affected when adding the interaction between *FIN* in the source and host

Table 1 - Baseline estimation results (full sample)

	one step (Pseudo-Poisson)		first-stage (logit)		second-stage (OLS)	
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln\text{GDP}_{it-1}$	2.149*** (0.618)	2.141*** (0.623)	1.243** (0.511)	1.238** (0.512)	2.886*** (0.403)	2.883*** (0.403)
$\ln\text{GDPpc}_{it-1}$	-0.675 (0.554)	-0.674 (0.556)	0.729* (0.375)	0.722* (0.376)	-0.509 (0.371)	-0.514 (0.371)
$\ln\text{GDP}_{jt-1}$	0.985*** (0.372)	0.988*** (0.370)	1.993*** (0.487)	1.976*** (0.487)	1.045*** (0.312)	1.044*** (0.312)
$\ln\text{GDPpc}_{jt-1}$	0.257 (0.394)	0.259 (0.395)	0.611 (0.465)	0.612 (0.465)	-0.0855 (0.328)	-0.0871 (0.328)
FIN_{it-1}	0.0930** (0.0363)	0.111* (0.0573)	0.155 (0.112)	0.160 (0.112)	0.131*** (0.0404)	0.132*** (0.0406)
FIN_{jt-1}	0.0835** (0.0414)	0.0931** (0.0387)	0.360*** (0.0947)	0.365*** (0.0948)	0.0953** (0.0388)	0.0956** (0.0388)
$\text{FIN}_{i,t-1} \times \text{FIN}_{j,t-1}$		-0.0178 (0.0385)		-0.104 (0.0735)		-0.0285 (0.0306)
No. of observations	23,780	23,780	9,675	9,675	19,118	19,118
No. of country pairs	2,478	2,478	1,042	1,042	2,497	2,497

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the one, five, and ten percent level is indicated by ***, ** and *, respectively.

country in column (2) and we find no evidence that financial market development in source and host countries would condition each other. This suggests that better developed financial markets in the source country of a pair are neither complements nor substitutes for less developed financial markets in the host country.

The first-stage estimation results reported in column (3) suggest that only financial market development in host countries has a statistically significant positive effect on the likelihood that a country pair of source and host country starts to have any FDI stock (and therefore a negative effect on the likelihood that a country pair ceases to have any FDI stock). Results in column (4) suggest there is no evidence for a statistically significant interaction between financial market development in the source and host country. The findings from the second-stage estimations reported in columns (5) and (6) resemble those reported in columns (1) and (2). Again, the coefficients on *FIN* in the source and host country are statistically significant and of similar size both compared to each other and compared to the one-step Pseudo-Poisson estimates in columns (1) and (2).²⁶ Moreover, the insignificant interaction term in column (6) once again points to unconditional effects of financial market development on either side of a host-source pair.

Instrumental variable estimations: overall sample

In estimations for which we report results in Table 2 we account for possible endogeneity by using financial market development in geographically contiguous neighboring countries as an instrument for financial market development in the host country of the dyad under consideration.²⁷

²⁶ For these two variables, the coefficients also represent semi-elasticities making them directly comparable to the one step Pseudo-Poisson estimates.

²⁷ In a similar vein, several studies on the effects of bilateral investment treaties (BITs) on FDI flows use BITs concluded by neighboring host countries as an instrument for BITs concluded by the host country under consideration (see, e.g., Tobin and Rose-Ackerman 2011).

Table 2 - Instrumental variable estimation results (full sample)

	first-stage (OLS)		second-stage (OLS)	
	(1)	(2)	(3)	(4)
$\ln\text{GDP}_{it-1}$	0.137 (0.0841)	0.135 (0.0843)	2.900*** (0.154)	2.874*** (0.155)
$\ln\text{GDPpc}_{it-1}$	0.115* (0.0625)	0.113* (0.0628)	-0.524*** (0.136)	-0.557*** (0.137)
$\ln\text{GDP}_{jt-1}$	0.254*** (0.0739)	0.249*** (0.0758)	0.848*** (0.122)	0.846*** (0.123)
$\ln\text{GDPpc}_{jt-1}$	0.144** (0.0716)	0.143** (0.0717)	-0.0389 (0.114)	-0.0520 (0.115)
FIN_{it-1}	0.0372* (0.0192)	0.0380* (0.0194)	0.130*** (0.0274)	0.141*** (0.0280)
FIN_{jt-1}	0.152*** (0.0340)	0.153*** (0.0340)	0.352*** (0.0538)	0.352*** (0.0539)
$\text{FIN}_{it-1} \times \text{FIN}_{jt-1}$		-0.0242 (0.0827)		-0.224** (0.108)
No. of observations	9,675	9,675	19,115	19,115
No. of country pairs	1,042	1,042	2,495	2,495

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Statistical significance at the one, five, and ten percent level is indicated by ***, ** and *, respectively.

As noted in Section 3, there is no instrumental variable (IV) version of the fixed effects Poisson estimator or of the fixed effects logit estimator. For the first-stage estimation we can switch to a linear probability model for which we can use a linear fixed effects IV estimator, restricting the sample to be the same as in the non-IV estimations. Results reported in column (1) and (2) of Table 2 for the first-stage linear probability IV regressions are qualitatively similar to the non-IV logit estimations from Table 1. However, the effects of the source country's GDP are no longer statistically significant, whereas the effects of GDP per capita in host countries and financial

market development in source countries are now statistically significant.²⁸ As before, we find no statistically significant interaction effect.

For the second-stage regressions, results reported in column (3) of Table 2 for the unconditional effects model are qualitatively similar in terms of statistical significance of variables to its non-IV equivalent for which results were reported in column (5) of Table 1, thus underscoring the importance of financial market development in both source and host countries for bilateral FDI relations. However, unlike in the non-IV estimations, financial market development in the host country now appears to be more important than that in the source country. This is not what one would have expected based on reverse causality concerns since reverse causality would have biased upward the coefficient of *FIN* in the host country in non-IV regression. One possible explanation is that potentially omitted variables bias the non-IV estimate downwards. For example, financial market development is likely to be positively correlated with wage levels in FDI-relevant sectors which have a negative effect on FDI. Another interesting difference between the IV and the non-IV estimate concerns the conditional effects model. The interaction term between *FIN* in the source and host country has a negative and statistically significant coefficient in column (4) of Table 2, suggesting that the effects of financial market conditions within host-source country pairs function as substitutes for each other.²⁹

²⁸ The t-statistic of the instrument is around 50 in the first-stage suggesting that financial market development in geographically contiguous countries is a very strong instrument. Being exactly identified, no over-identification test is possible. Note that coefficients are not comparable since Table 1 reports logit and Table 2 reports linear probability model results. We could analyse marginal effects but we focus our analysis of substantive effects on the one step model or the second-stage model.

²⁹ The t-statistic of the instrument is around 62 in the first stage, again signaling that financial market development in geographically contiguous countries is a very strong instrument. Being exactly identified, no over-identification test is possible.

Restricted samples

In this sub-section, we impose different sample restrictions before replicating the estimations shown in Table 1 above as alternative ways for dealing with reverse causality. First, we exclude pairs with host countries where the banking system is dominated by foreign banks.

Table 3 – Estimation results (restricted samples)

	one step (Pseudo-Poisson)		first-stage (logit)		second-stage (OLS)	
	(1)	(2)	(3)	(4)	(5)	(6)
Excl. top-25% foreign dominated banking						
FIN _{it-1}	0.0954**	0.110*	0.149	0.162	0.129***	0.133***
	(0.0403)	(0.0638)	(0.135)	(0.136)	(0.0480)	(0.0483)
FIN _{jt-1}	0.116**	0.126***	0.345***	0.352***	0.116**	0.117**
	(0.0494)	(0.0459)	(0.120)	(0.120)	(0.0472)	(0.0472)
FIN _{it-1} x FIN _{jt-1}		-0.0176		-0.183**		-0.0608
		(0.0514)		(0.0891)		(0.0385)
No. of observations	17,624	17,624	6,495	6,495	14,548	14,548
No. of country pairs	1,943	1,943	716	716	1,979	1,979
Excl. top-3 investors						
FIN _{it-1}	0.125**	0.124**	0.110	0.116	0.157***	0.158***
	(0.0528)	(0.0601)	(0.116)	(0.116)	(0.0463)	(0.0465)
FIN _{jt-1}	0.0841*	0.0837*	0.336***	0.343***	0.0804*	0.0810*
	(0.0457)	(0.0474)	(0.0977)	(0.0980)	(0.0462)	(0.0464)
FIN _{it-1} x FIN _{jt-1}		0.00117		-0.115		-0.0198
		(0.0483)		(0.0756)		(0.0346)
No. of observations	19,740	19,740	8,964	8,964	15,365	15,365
No. of country pairs	2,076	2,076	966	966	2,091	2,091
Developing hosts only						
FIN _{it-1}	0.222***	0.273***	0.268**	0.258*	0.0758	0.0745
	(0.0497)	(0.0508)	(0.135)	(0.136)	(0.0529)	(0.0530)
FIN _{jt-1}	0.179***	0.230***	0.389***	0.401***	0.182***	0.180***
	(0.0454)	(0.0467)	(0.108)	(0.108)	(0.0483)	(0.0476)
FIN _{it-1} x FIN _{jt-1}		-0.167***		-0.254***		-0.105**
		(0.0437)		(0.0981)		(0.0445)
No. of observations	15,149	15,149	7,340	7,340	11,423	11,423
No. of country pairs	1,614	1,614	788	788	1,628	1,628

Notes: Dyad fixed effects and year fixed effects included in all estimations. Standard errors clustered on dyads. Control variables included. Statistical significance at the one, five, and ten percent level is indicated by ***, ** and *, respectively.

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 financial market development 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.

The upper panel of Table 3 shows that the baseline results from Table 1 are hardly affected with one exception: we find a statistically significant interaction effect between financial market development in source countries and financial market development in host countries with the expected negative sign suggesting a substitutive relationship. We only find this for the first-stage fixed effects logit estimation, however (the effect is almost statistically significant at the 10 percent level in the second-stage estimations).

Second, we exclude source-host pairs where the source country belongs to the top-3 sources of FDI in the host country. One would expect that any causal effects of FDI on the host country's financial market development should be less likely once the major sources of FDI are excluded. Some of the arguments for reverse causality point toward 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. The middle panel of Table 3 shows that the baseline results from Table 1 are hardly affected.

Finally, we replicate the baseline regressions after excluding all developed host countries from the sample, defined as member countries of the Organisation of Economic Development and Co-

operation (OECD). The focus on developing countries in the bottom panel of Table 3 is for two reasons. 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. At the same time, it is mainly in developing countries where financial market conditions are often deficient so that there exists greater potential to reform financial markets and, thereby, attract higher FDI.

Indeed, the effects of financial market development in developing host countries are stronger in the estimations shown in the bottom panel of Table 3 compared to the baseline estimations (but statistically significantly so only in the Pseudo-Poisson estimations). Surprisingly perhaps, this applies not only to financial market development in the host country but also to that in the source country (with the exception of the second-stage fixed effects estimation). Furthermore, we now find consistent evidence across all three estimations for a statistically significant negative interaction effect between financial market development in source and host countries.

Figure 1 plots the effect that a one unit change in financial market development in host countries, which is approximately equal to its standard deviation, has on bilateral FDI stocks across the relevant range of values of financial market development in source countries. At very low levels of financial market development in source countries, the effect of improving financial market development in host countries is very large at about 85 percent but with a wide 95 percent confidence interval around it. Figure A1 in the Appendix which plots the density histogram of financial market development in source countries shows however that the vast majority of observations are in a range where the effect is well below 50 percent. At very high levels of financial market development in source countries the effect becomes practically zero and statistically insignificant.

Figure 1. The conditional effect of financial market development (Pseudo-Poisson one-step regression).

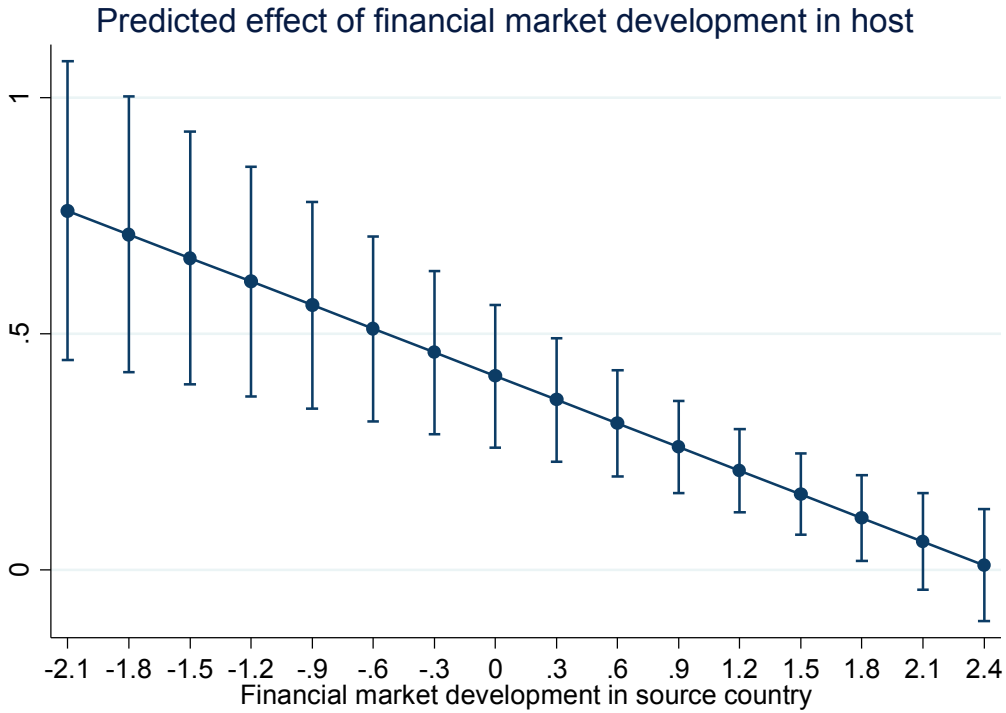
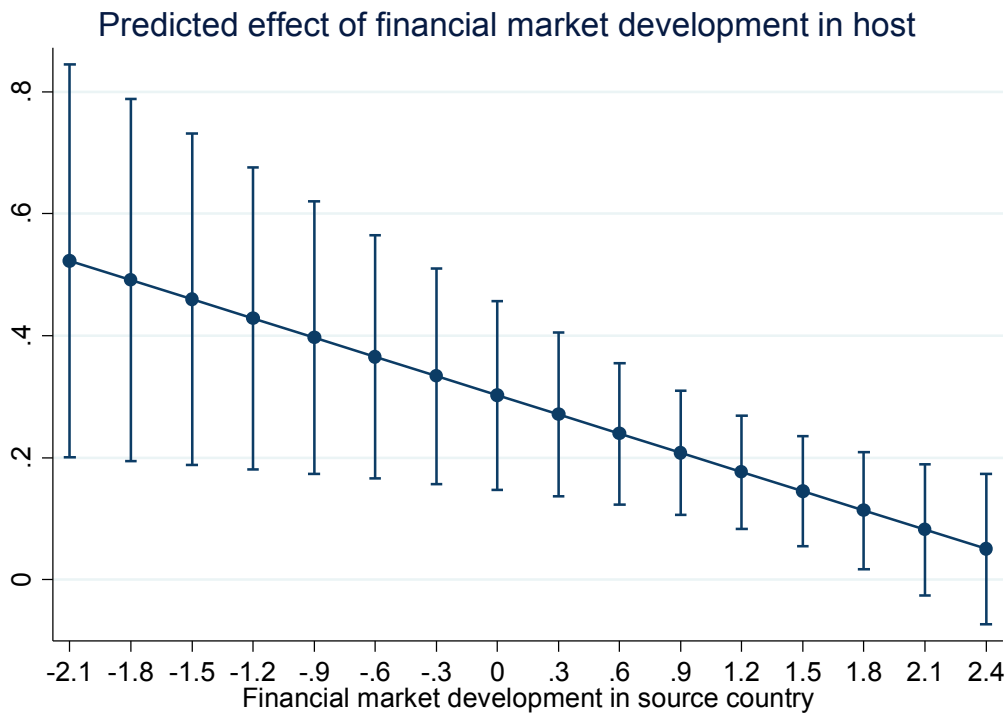


Figure 2 plots the effect in the second-stage regression. The conditioning effect is less pronounced as can be seen by the slope being less steep and there is more uncertainty as represented by the larger 95 percent confidence intervals around the point estimates.

Figure 2. The conditional effect of financial market development (second-stage regression).



5. Conclusion

The question of whether better developed local financial markets attract FDI is particularly relevant for host countries that have remained on the sidelines in the global competition for FDI such as many developing countries. Yet this question has received scant attention so far. What is more, studies addressing financial market conditions exclusively in the host country tend to neglect that foreign investors can be credit constrained at home, which might inhibit their ability to invest abroad, such that financial market development in the source country also matters. Typically, the existing literature also ignores that the effects of financial market development in the host country are likely to depend on financial market development in the source country, even though multinational enterprises can be expected to switch between local and foreign funding.

We estimated gravity-type models to assess the effects of financial market development in the host and source countries on bilateral FDI stocks simultaneously, allowing, in separate estimations, for the effect of financial market development in one country of the country-pair to be conditioned by financial market development in the other country. In contrast to the existing literature, we use a composite index, based on a comprehensive set of financial indicators, to measure financial market development. 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 2001-2012.

Our 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 account for potential reverse causality. We also find evidence for a conditional relationship but only in the IV second-stage regression and if we restrict the analysis to developing host countries. Specifically, we find that financial market development in the developing host country and financial market development in the FDI source country function as substitutes for each other consistently across all three estimation models. This result has ambiguous implications for developing host countries. On the one hand, it suggests that poor financial market development 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 pay-off to better develop financial markets in developing host countries is not as large as policy makers might expect if the country's major FDI source countries themselves have highly developed financial markets. Future research should analyze whether similarly conditional effects prevail with regard to other FDI determinants such as physical infrastructure in transportation and communication.

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Appendices

Table A1 — Summary variables statistics

	N	Mean	Std. dev.	Min	Max
FDI stocks	23,780	4,844	23,340	0	645,098
lnGDP _i	23,780	27.18	1.26	24.28	30.26
lnGDP _j	23,780	25.57	1.96	20.48	30.26
lnGDPpc _i	23,780	9.89	1.00	6.85	11.14
lnGDPpc _j	23,780	8.76	1.53	4.91	11.14
FIN _i	23,780	1.05	0.83	-2.15	2.56
FIN _j	23,780	0.32	1.05	-2.20	2.56

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

Figure A1 — Density plot of financial market development in source countries.

