1-2018

# Informal institutions and comparative advantage of South-based MNEs: Theory and evidence

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# Informal Institutions and Comparative Advantage of South-Based MNEs: Theory and Evidence*

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January 6, 2018

**Abstract**

This paper builds a theory to characterize the comparative advantage of South-based MNEs rooted in institutional qualities. MNEs headquartered in countries of poorer state institutions are hypothesized to invest more in 'informal institutions', and as an optimal response, undertake FDI in countries of weaker institutions, all else being equal. At the aggregate, MNEs generate more net profits in countries of weaker institutions, the poorer the institutional environment at home. Extensive tests of the theory are conducted using bilateral FDI volumes for 219 economies in year 2001–2010. The results indicate a statistically significant and robust institutional complementarity effect in bilateral FDI volumes.

*Key Words*: Informal Institution; Foreign Direct Investment; Gravity Equation

*JEL Classification*: C21; C23; C24; F21; F23

*The author thanks Jiahua Che, Kim Sau Chung, Benjamin Faber, Chang-Tai Hsieh, Wen-Tai Hsu, Chia-Hui Lu, Andrés Rodríguez-Clare, José de Sousa, Ping Wang, and conference and seminar participants for helpful comments and suggestions. This research was supported by the Singapore Ministry of Education (MOE) Academic Research Fund (AcRF) Tier 1 grant (C244/MSS13E002).

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# 1 Introduction

The accumulated knowledge of the FDI literature (see for example the survey by Helpman, 2006) has provided us a good understanding of the incentives and constraints of multinational enterprises (MNEs) in their choices (of organizational forms and production locations) in response to their own characteristics, the nature of the industry, and the country where they operate from. In these existing theoretical frameworks, MNEs are often theorized to be based in the North. This supposition, although understandable given the North MNEs' leading edge in R&D and technology, is increasingly incongruent with the facts. In 2006-2010, 17% of the world FDI outflows originate from the South (Dixit, 2012). At the same time, the share of FDI inflows received by the developing country from the peer South is disproportionately larger at 36% in 2000 (Aykut and Ratha, 2004). By 2013, FDI from developing countries (including transition economies) has accounted for 39% of global FDI outflows (UNCTAD, 2014). It thus seems useful that theoretical framework be established to formalize the comparative advantages of South-based MNEs. This paper aims to make one such contribution.[1]

It has been suggested by a lecture of Dixit (2012) that similarly poor governance endowments may be a source of comparative advantage for South-based MNEs when investing in developing countries. Several empirical studies (Darby et al., 2010; Cuervo-Cazurra and Genc, 2008; Bénassy-Quéré et al., 2007; Habib and Zurawicki, 2002) have found patterns consistent with this hypothesis.[2] In these studies, 'experiences', 'skills' and 'abilities' of firms based in the South 'to manage under difficult conditions' and their 'familiarity' with the norms in the host country are often cited as the potential explanations. Exactly how these comparative advantages arise endogenously is, however,

[1] In the general framework of Arkolakis et al. (2013), it is possible to have MNEs originating from all countries. However, because the pattern of multinational production (MP) is determined in large part by efficiency parameters $T_{il}$ characterizing productivity of firms originating from $i$ conducting MP production in country $l$, the framework implies a dominance of MNEs based in the North given their technology superiority. Second, the efficiency parameters $T_{il}$ by assumption are separable in innovation and production efficiencies: $T_{il} = T_i^e T_l^p$. This in general does not imply a systematic complementarity pattern in bilateral FDI flows within development stages (South-South or North-North).

[2] Darby et al. (2010) found that South MNEs are less (or not at all) deterred by bad institutional quality in the host country than North MNE, based on bilateral FDI count data (on the number of MNEs from a country of origin present in a destination country). Cuervo-Cazurra and Genc (2008) measured the proportion of developing-country MNEs among the largest foreign firms in each of 50 LDCs and found that developing-country MNEs are more prevalent in LDCs with poorer regulatory quality and lower control of corruption (although this negative relationship does not apply to all aspects of institutional quality, e.g., rule of law). Bénassy-Quéré et al. (2007), using a gravity model for bilateral FDI from OECD countries to the other countries, found that good institutions in the home country have no or even negative impact on outward FDI, and institutional distance has often a negative impact on bilateral FDI. Last but not least, Habib and Zurawicki (2002) focused on corruption and observed that the distance in the corruption level between the home and host countries reduce bilateral FDI flows.

less than fully understood, because often the relative cost advantages of the North and South MNEs have been assumed rather than derived.

In this paper, I propose a theoretical model to micro-found the cost structure of firms, given their endogenous response to the state institutions in which they are based and where their production facilities might be. Firms' optimal choice of FDI location, sourcing decision (FDI or domestic production), and production decision (produce or not) are fully characterized, in a vertical-FDI model with many countries, industries, and heterogeneous firms. I arrive at the main hypothesis that predicts an institutional complementarity pattern across countries in bilateral FDI flows at both the firm and country levels.

The theory is built on the fundamental assumption that the fixed operating cost of firms increases with poorer state institutions, but decreases with firms' own investment in *informal institutions*, and the investment in informal institutions is more effective in reducing overhead cost in environments of poorer formal institutions. As an endogenous outcome, when and where the formal institutions are weaker, the private sector tends to build more informal institutions to substitute the former. There is a vast intellectual literature that documents the endogenous response of the private sector to the formal institutions the state provides. Evidence abounds and we may for the purpose of exposition classify them into economic, legal and political informal institutions. First, where the market-supporting institutions such as contract enforcement and bank credit are lacking, firms tend to fill in the void with relational contracting and trade credit. These patterns are documented for example by McMillan and Woodruff (2002) for Russia, China, Poland and Vietnam. McMillan and Woodruff (1999a,b) provide detailed accounts of how these *informal economic institutions* work in Vietnam under reputation incentives and threat of community sanction. A similar argument is suggested by Acemoglu and Johnson (2005) that reputation-based mechanisms can, at least in part, alleviate the problems originating from weak contracting institutions.

Second, where the state legal institution is weak, the private sector tends to turn to *informal legal institutions* such as private patrols, private protection agencies or informal courts to substitute for police protection and judicial systems (Hay and Shleifer, 1998). For example, Frye and Zhuravskaia (2000) find that higher levels of regulation and weak legal institutions are associated with a higher probability of contact with a private protection organization in Russia.

Finally (and perhaps the most controversial of the three given its many faceted implications),

where the state's bureaucratic system is inefficient and regulatory quality poor, firms tend to build political connection (Fisman, 2001; Faccio, 2006) with politicians and government officials, or directly participate in politics. Political connection may help firms reduce regulatory burden (eg., fewer days to obtain business permit, fewer agencies to register or fewer on-site inspections) but also secure property rights (eg., lower expropriation via tax or fines) and enforce contracts. For example, Li et al. (2006) found that in China, the probability of entrepreneurs entering politics decreases by 8-20% when the institutional index in a region improves by one standard deviation. Chen et al. (2011) similarly show that firms are more likely to establish political connections in regions in which the government has more discretion in allocating economic resources. Bai et al. (2014) provide a vivid account of how in the aluminum and auto industries, Chinese local governments may have a large leverage in providing public goods (such as land and capital) to their cronies and alter the terms of competition in the market. In general, firms may engage in all three types of informal institutional building (economic, legal or political). For example, Cai et al. (2011) infer that the entertainment and travel costs expenditures of Chinese firms consist of grease money to obtain better government services, protection money to lower tax rates, and also business expenditures to build relational capital with suppliers and clients.[3]

The heavier investment in informal institution by firms based in the South then gives them comparative advantages in conducting FDI in countries of poorer institutional qualities, because the adverse effect of weak institutions at the destination on fixed cost is reduced by the firm-specific institutional investment and more so in destinations of weaker institutions. Thus, a MNE from a country of poorer state institutions than another MNE will tend more likely to invest in a destination of poorer state institutions than the other MNE's choice of destination, all else being equal. I go on to develop the implications on the volume of bilateral FDI flows at the country level, given the firm-level choice of FDI destination across sectors of different market sizes and across firms of heterogeneous productivity levels. The model generates the endogenous presence of zero FDI across some bilateral country relations. Conditional on positive bilateral FDI flows, the institutional complementarity continues to hold at the 'intensive margin': multinational firms will

[3]The term *informal institution* has been used in the literature to refer to many things ranging from customs, traditions, norms, religion (Williamson, 2000), social capital, trust (Chan et al., 2015) to culture. Here, I adopt the definition of Helmke and Levitsky (2004) that distinguishes informal institution from informal behavioral regularities, shared values and the broader concept of culture. Specifically, informal institutions are defined as socially shared rules, usually unwritten, that are created, communicated, and enforced outside of officially sanctioned channels.

generate more net profits in countries of poorer institutional qualities, the poorer the institutional environment at home. At the 'extensive margin', subject to certain qualifying conditions, more multinational firms will conduct FDI in countries of poorer institutional qualities, the poorer the institutional environment at home.

Although the empirical studies I cited earlier have presented evidence, at least in part, supporting the above hypothesis, there are some limitations to these studies. For example, institutional distance are often used as a control variable (except Darby et al., 2010) when the current theory suggests that institutional interaction term should be used. Second, the countries included are often restricted to the least developed countries as the host country (Cuervo-Cazurra and Genc, 2008) or developed countries as the home country (Bénassy-Quéré et al., 2007). Third, when the country coverage is comprehensive, it is often at the cost of using the FDI count data (ie, the number or percentage of firms; Darby et al., 2010) instead of the FDI volume data. To address these potential caveats, I assemble a dataset on bilateral FDI stocks (and flows) for 219 economies in 2001-2010 based on the UNCTAD's Bilateral FDI Statistics. This extends the country coverage to include almost all economies in the world, and enables us to look into the behavior of FDI flows from (to) the whole spectrum of countries in terms of institutional quality. I measure the institutional quality of countries by the World Bank's Worldwide Governance Indicators commonly used in the literature. I test the theory's main prediction of a positive assortative matching pattern in institutions, by regressing FDI on the level and the interaction of institutional quality indicators of the home and host countries, in addition to many potential FDI determinants suggested by the literature. This includes an extensive set of gravity variables (to control for information barriers or transaction costs), the home and host country characteristics (such as GDPs, GDPs per capita, and general production cost levels), and also variables to control for competing hypotheses. In particular, since income levels and institutional qualities are correlated, the difference in GDPs per capita between the home and host countries is included to control for the Linder effect on FDI as proposed by Fajgelbaum et al. (2015).

Overall, I find very robust support for the theory's prediction. The coefficient on the institutional interaction term is positive and significant, and the finding is robust to the FDI series used (inward or outward, stocks or flows), the measure of institutional quality (voice and accountability (VA), government effectiveness (GE), regulatory quality (RQ), rule of law (RL), and control of cor-

ruption (CC)), the estimation specification (with or without time-varying home and host country fixed effects), and the inclusion of zero FDI observations.

The strength of the complementarity varies across institutional indicators and robustness checks, but the effects are systematically stronger for GE, RQ and VA, weaker for RL and CC, and the weakest for political stability and absence of violence (PV). This pattern suggests an interesting interpretation of the areas where informal institutions are feasible and prevalent, and where they are not. Informal institutions tend to be built in response to inefficient public services or poor policy formulation/implementation (GE and RQ); these firm-specific investment most likely corresponds to political informal institutions such as political network or connections. To some extent, such political informal institutions may also help firms to maneuver in a society with less government political accountability (VA). On the other hand, economic and legal informal institutions such as relational contracting and private enforcement mechanisms appear more costly for firms to build in response to inefficient contract enforcement or property rights protection (RL and CC). Finally, it appears extremely costly for firms to build legal informal institutions such as private troops to guard against political violence, civil riots or terrorism (PV). To the extent that informal institutions are very costly to build, we will expect to observe weak (or no) complementarity effect in the corresponding institutional indicator (as the case of PV demonstrates).

Singapore often ranks among the top in terms of good governance. For example, in 2012, it clinched the 1st in terms of GE and RQ, the 4th in CC, and the 5th in RL. Thus, when its government undertook to jointly develop the China-Singapore Suzhou Industrial Park (SIP) with the Chinese government in 1994, by transplanting its Singapore-style institutions overseas in the Chinese land of cheap labor, it was greeted by the investor community with great enthusiasm. Take a few examples from Pereira (2002):

> *We are a Western multinational company. We operate entirely above board. We don't like hidden costs and personal benefits in business. We came on the basis that there would be a Singaporean system here. We can justify every single entry honestly in our account books. (Manager, European company, male, Germany citizen, aged 40-50)*

> *Things here [at the SIP] are very straightforward. All the rules are clear, all the personnel are very professional, and the estate is very modern. So this has allowed our company*

*to focus on doing business rather than worry about all the other aspects. (Manager, US company, male, Singapore citizen, aged 30-40)*

Few expected that the joint venture would soon 'sour' in 2001. There are no typical barriers in terms of language, ethnicity, or cultural origins. As the Singaporean leaders later reflected, the Singapore government misjudged the importance of relationship with local authorities. In particular, it underestimated the extent of latitude that the Chinese local officials had versus Beijing in altering the terms of competition (Pereira, 2002). The quotations cited above and the overall incident bring home the point that institutional endowments of an investor (what it is endowed with in formal institutions and what it develops in informal institutions) play a non-negligible role in the operation and the outcome of FDI.

The rest of the paper is organized as follows. In Section 2, I develop the theoretical model and predictions. In Section 3, I present the estimation framework and findings. Section 4 discusses potential extensions and concludes.

## 2 Model

This model is designed to highlight the mechanism of institution on FDI activities, and to keep the model tractable, I intentionally drop many other mechanisms that the previous literature has shown to be important. Thus, it is not a quantitative FDI model that can be calibrated to the data. Rather, the theoretical prediction in this section will be tested as a 'partial' effect of institution in the empirical section (after controlling for other relevant determinants of FDI). I discuss possible extensions of the current framework to incorporate these other elements of interest in Section 2.5. For recent developments in quantitative FDI models, see for example Garetto (2013), Ramondo and Rodríguez-Clare (2013), Irarrazabal et al. (2013) and Arkolakis et al. (2013).

Suppose there are a continuum of countries indexed by $r \in R$, where $r$ is an inverse measure of the quality of formal institutions. The larger $r$ is, the poorer the institution of the country. There are a continuum of sectors indexed by $j$ producing differentiated goods and one sector producing homogeneous good (used as the numeraire). The only factor of production is labor, and the homogeneous good is produced with constant unit labor requirement. I abstract away from any kind of trade frictions (and thus the incentives of horizontal FDI driven by market access).

This implies that there is a single world market for goods. Labor endowment is assumed to be large enough in each country such that the homogeneous good is always produced. As a result, a country's labor productivity in the numeraire good determines its wage rate $w$. Countries with better formal institutions are assumed to have higher labor productivity in the numeraire good and hence a higher wage: $w = \omega(r)$ and $\omega'(r) \equiv d\omega(r)/dr < 0$.

Each variety of the differentiated goods requires a headquarter service component and a manufactured component using a Cobb-Doublas production function (à la Antràs and Helpman, 2004), where each component has a unit labor requirement equal to one. This implies a unit cost of production equal to $c = w_h^{\eta} w_d^{1-\eta}/\phi$, where $\phi$ indexes the productivity of the firm producing the variety, $\eta$ the headquarter intensity in the production, and $w_h$ and $w_d$ the wage rate of the country where the headquarter and the manufacturing facility of the firm are located, respectively.

The world is populated by a unit measure of consumers with identical preferences: $U = x_0 + \frac{1}{\mu}\int X_j^{\mu} dj$, $0 < \mu < 1$, where $x_0$ indicates the consumption of the numeraire good, and $X_j$ a CES function over all available varieties $x_j(i)$ in sector $j$ with an elasticity of substitution $\sigma$. I drop the sector index $j$ below for the time being to simplify the notation. Given monopolistic competition, the CES preferences imply the standard pricing and profit function. Each firm charges a constant markup over its marginal cost of production $p(c) = \frac{\sigma}{\sigma-1}c$, sells a quantity of $x(p(c)) = X_j^{\sigma(\mu-1)+1} p(c)^{-\sigma}$ and earns a variable profit:

$$\begin{aligned} \pi &= (p(c) - c)x(p(c)) \\ &= Bc^{1-\sigma} \\ &= B\tilde{\phi}\left(w_h^{\eta} w_d^{1-\eta}\right)^{1-\sigma}, \end{aligned} \tag{1}$$

where $B \equiv \frac{1}{\sigma} X_j^{\sigma(\mu-1)+1} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}$ can be taken as an index of the world market size for the sector (exogenous from the point of view of the individual supplier) and $\tilde{\phi} \equiv \phi^{\sigma-1}$ a transformed index of the firm productivity level.

### 2.1 Choice of Informal Institution

A firm given its productivity level chooses whether to produce or not. If it chooses to produce both components at home, it incurs a fixed overhead cost $f(r_h, I)$, which depends on: i) the quality

of the formal institution where the firm is headquartered and, ii) the informal institution $I$ that the firm invests in. If it chooses to produce the manufactured component in a country different from where it is headquartered, it incurs an additional overhead cost $f(r_d, I)$, which depends on the quality of the formal institution in the country where the production facility is located, and similarly, its choice of informal institutional investment.

I make the following key assumptions on the technology of the informal institutional investment. First, it is assumed that $f(r, I)$ strictly increases in $r$ (worse formal institution increases overhead cost), strictly decreases in $I$ (firm-specific informal institutional investment reduces overhead cost), and

$$\frac{\partial}{\partial r}\left(\frac{\partial f(r,I)}{\partial I}\right) < 0, \tag{2}$$

that is, informal institution is more effective in reducing overhead cost in environments of poorer formal institutions. Second, the investment in informal institution is a common good within the boundary of the firm: it can be used at home or in the country where its production facility is located. Investing in informal institution, however, costs the firm $k(I)$, which is increasing and convex in $I$.

A firm chooses $I^*$ that minimizes $F(r_h, I) \equiv f(r_h, I) + k(I)$ if it chooses local production and $I^{FDI,*}$ that minimizes $F^{FDI}(r_h, r_d, I) \equiv f(r_h, I) + f(r_d, I) + k(I)$ if it chooses to undertake FDI. Let $F^*(r_h) \equiv \min_I \{f(r_h, I) + k(I)\}$ and $F^{FDI,*}(r_h, r_d) \equiv \min_I \{f(r_h, I) + f(r_d, I) + k(I)\}$.

**Proposition 1** *(i) The investment in informal institution is higher for FDI than for local production: $I^{FDI,*}(r_h, r_d) > I^*(r_h)$; (ii) The total fixed cost of production is higher for FDI than for local production: $F^{FDI,*}(r_h, r_d) > F^*(r_h)$; (iii) The total fixed cost of production is higher in FDI destinations of poorer institutional qualities: $dF^{FDI,*}/dr_d > 0$; (iv) For a given FDI destination, the total fixed cost of production is higher for MNEs based in countries of poorer institutional qualities: $dF^{FDI,*}/dr_h > 0$.*

**Proof.** (i) $\frac{\partial F^{FDI}}{\partial I}|_{I=I^*} = \frac{\partial f(r_h, I^*)}{\partial I} + \frac{\partial f(r_d, I^*)}{\partial I} + k'(I^*) = \frac{\partial f(r_d, I^*)}{\partial I} < 0$, where the second equality follows by the FOC condition for $I^*$: $\frac{\partial f(r_h, I^*)}{\partial I} + k'(I^*) = 0$, and the last inequality follows by the assumption that $f(r, I)$ strictly decreases in $I$. This implies that $I^{FDI,*} > I^*$. (ii) We can write $F^{FDI,*} - F^* = \left\{F^{FDI,*} - F(r_h, I^{FDI,*})\right\} + \left\{F(r_h, I^{FDI,*}) - F^*\right\} > 0$. The inequality holds

since $F^{FDI,*} - F(r_h, I^{FDI,*}) = f(r_d, I^{FDI,*}) > 0$ by the setup, and $F(r_h, I^{FDI,*}) - F^* > 0$ by the definition of $F^*$ and the fact that $I^{FDI,*} \neq I^*$. (iii) By the envelope theorem, we have

$$\frac{dF^{FDI,*}}{dr_d} = \frac{\partial f(r_d, I^{FDI,*})}{\partial r_d} > 0 \tag{3}$$

by the assumption that $f(r, I)$ strictly increases in $r$. (iv) The proof is similar to (iii), by replacing $r_d$ with $r_h$. ■

The predictions in Proposition 1 are derived from the endogenous choice of $I$ at the firm level and yet are consistent with typical assumptions (observations) made in the FDI literature. First, FDI sets a higher threshold than local production in terms of fixed costs. This will help explain the typical sorting of MNEs and local firms in terms of productivity. Second, poor state institutions discourage inward FDI by raising the total fixed cost of production $F^{FDI,*}$ (although at the same time the country offers a cheaper labor force). Third, poor state institutions also impose an absolute disadvantage on firms based in these countries; they incur a higher total fixed cost of production $F^{FDI,*}$ than firms based in the North given the same choice of FDI destination. This may explain in part the dominance of MNEs from the North.

**Proposition 2** *Multinational firms headquartered in countries of lower institutional quality invests more in informal institution:* $\frac{\partial I^{FDI,*}(r_h, r_d)}{\partial r_h} > 0$. *As a corollary, multinational firms headquartered in countries of lower institutional quality are more effective at reducing its overhead fixed cost at a given FDI destination:* $\frac{df(r_d, I^{FDI,*})}{dr_h} < 0$.

**Proof.** Let $f_I(r, I) \equiv \frac{\partial f(r,I)}{\partial I}$ and $f_{II}(r, I) \equiv \frac{\partial^2 f(r,I)}{\partial I^2}$. The FOC for $I^{FDI,*}$ requires that at $I^{FDI,*}$,

$$f_I(r_h, I) + f_I(r_d, I) + k'(I) = 0. \tag{4}$$

Take total differentiation of (4) with respect to $r_h$ and $I^{FDI,*}$, we have

$$\frac{\partial I^{FDI,*}}{\partial r_h} = -\frac{\frac{\partial f_I(r_h, I)}{\partial r_h}}{f_{II}(r_h, I) + f_{II}(r_d, I) + k''(I)} > 0$$

at $I^{FDI,*}$ by the SOC for $I^{FDI,*}$ and the assumption in (2).[4] As a corollary,

$$\frac{df(r_d, I^{FDI,*})}{dr_h} = f_I(r_d, I^{FDI,*})\frac{\partial I^{FDI,*}}{\partial r_h} < 0$$

by the assumption $f_I(r, I) < 0$ and the previous result $\frac{\partial I^{FDI,*}}{\partial r_h} > 0$. ■

Intuitively, the marginal benefit for a firm to invest in informal institution is higher if it is based in a country of poorer institutions, because the informal institution is more useful in environments where the formal institution is lacking (by reducing the fixed overhead cost of the headquarter operation). The heavier investment in informal institution in turn enables these firms to reduce by more the overhead production cost at the FDI destination. Propositions 1 and 2 together imply that for given FDI destination $r_d$, although South-based MNEs (MNEs based in countries with poorer state institutions $r_h$) have a higher total fixed cost of operation $F^{FDI,*}$ due to their home institutional disadvantage and the higher cost incurred to build $I$, they actually have a lower fixed cost of production $f(r_d, I)$ at the FDI destination.

## 2.2 Optimal FDI Destination

Having characterized the endogenous choice of informal institution by firms for given $(r_h, r_d)$, I now characterize their optimal choice of FDI destination $(r_d)$. If a firm chooses to produce locally, its net profit is

$$\Pi^D \equiv \pi^D - F^*(r_h) = B\tilde{\phi}\,(w_h)^{1-\sigma} - F^*(r_h), \tag{5}$$

which increases in $\tilde{\phi}$ linearly. Note that $F^*(r_h)$ has taken into account the optimal choice $I^*$ given the home institutional environment $r_h$. If a firm chooses to undertake FDI, its net profit is instead

$$\Pi^{FDI} = \pi^{FDI} - F^{FDI,*}(r_h, r_d) = B\tilde{\phi}\left(w_h^{\eta} w_d^{1-\eta}\right)^{1-\sigma} - F^{FDI,*}(r_h, r_d), \tag{6}$$

where again $F^{FDI,*}(r_h, r_d)$ has taken into account the optimal choice $I^{FDI,*}$ for given destination $r_d$ and the MNE's home condition $r_h$. In the current setting, since the fixed cost of production for FDI is higher than local production by Proposition 1(ii), if firms choose FDI, they necessarily

[4] I impose the necessary condition on $f_{II}(r, I)$ to ensure that the SOC, $f_{II}(r_h, I) + f_{II}(r_d, I) + k''(I) > 0$, is satisfied. Given the convexity of $k(I)$, a sufficient condition is $f_{II}(r, I) > 0$.

choose a destination with $r_d > r_h$ (such that $w_d < w_h$) that generates a higher variable profit. This is in line with most vertical-FDI models in the literature, where FDI is driven by differences in production cost across countries. Of course, in the data, reverse FDI ($r_d < r_h$) may arise due to factors not modelled in the paper, such as market access and technology acquisition motives.

Among possible destinations of FDI, firms trade off lower wages in countries of poorer institutions with higher fixed costs, and choose $r_d$ that maximizes (6). The FOC for the optimal choice $r_d^*$ requires that at $r_d^*$:

$$\frac{\partial \pi^{FDI}}{\partial w_d}\omega'(r_d) - \frac{\partial f(r_d, I^{FDI,*})}{\partial r_d} = 0, \tag{7}$$

where I have applied the envelope theorem to $F^{FDI,*}(r_h, r_d)$. This defines the optimal choice of the FDI destination $r_d^*$ as an implicit function of the firm, industry and home country characteristics: $r_d^* \equiv H(r_h, \tilde{\phi}, B, \eta)$, including the home institution $r_h$, the firm productivity level $\tilde{\phi}$, the world demand for the sector $B$, and the headquarter intensity of the industry $\eta$.

**Proposition 3** *(i)* **(Complementarity in Institutional Qualities)** *All else being equal, a firm will choose to undertake FDI in countries of poorer institutional qualities, the poorer the institutional quality at home:* $\frac{\partial r_d^*}{\partial r_h} > 0$*; (ii) All else being equal, a firm will choose to undertake FDI in countries of poorer institutional qualities, the more productive the firm is:* $\frac{\partial r_d^*}{\partial \tilde{\phi}} > 0$*; (iii) All else being equal, a firm will choose to undertake FDI in countries of poorer institutional qualities, the larger the world demand for the sector is:* $\frac{\partial r_d^*}{\partial B} > 0$*; (iv) All else being equal, a firm will choose to undertake FDI in countries of poorer institutional qualities, the less headquarter-intensive the sector is:* $\frac{\partial r_d^*}{\partial \eta} < 0$.

**Proof.** (i) Totally differentiate (7) with respect to $r_d^*$ and $r_h$, we obtain

$$\frac{\partial r_d^*}{\partial r_h} = -\frac{\frac{\partial^2 \pi^{FDI}}{\partial w_d \partial w_h}\omega'(r_d)\omega'(r_h) - \frac{\partial^2 f}{\partial I \partial r_d}\frac{\partial I^{FDI,*}(r_h, r_d)}{\partial r_h}}{\frac{\partial^2 \Pi^{FDI}}{\partial r_d^2}} > 0. \tag{8}$$

The inequality holds since $\frac{\partial^2 \Pi^{FDI}}{\partial r_d^2} < 0$ by the SOC for $r_d^*$, and the numerator is positive by the facts that: (a) $\frac{\partial^2 \pi^{FDI}}{\partial w_d \partial w_h} = \eta(1-\eta)(1-\sigma)^2 \pi^{FDI}/(w_h w_d) > 0$ and $\omega'(r) < 0$ and (b) $\frac{\partial^2 f}{\partial I \partial r_d} < 0$ by the assumption in (2) and $\frac{\partial I^{FDI,*}(r_h, r_d)}{\partial r_h} > 0$ by Proposition 2.[5]

[5] I make the necessary assumptions on $\omega''(r)$ and $\frac{\partial^2 f(r,I)}{\partial r^2}$ to ensure that the SOC, $\frac{\partial^2 \Pi^{FDI}}{\partial r_d^2} < 0$, for $r_d^*$ is satisfied.

(ii) Similarly, taking total differentiation of (7) with respect to $r_d^*$ and $\tilde{\phi}$, we have

$$\frac{\partial r_d^*}{\partial \tilde{\phi}} = -\frac{\frac{\partial^2 \pi^{FDI}}{\partial w_d \partial \tilde{\phi}} \omega'(r_d)}{\frac{\partial^2 \Pi^{FDI}}{\partial r_d^2}} > 0, \tag{9}$$

because $\frac{\partial^2 \pi^{FDI}}{\partial w_d \partial \tilde{\phi}} = (1-\eta)(1-\sigma)\pi^{FDI}/(w_d \tilde{\phi}) < 0$ and $\omega'(r) < 0$.

(iii) It is straightforward to see that $B$ has an analogous (positive) effect as $\tilde{\phi}$ on $r_d^*$, because $B$ and $\tilde{\phi}$ enter $\pi^{FDI}$ multiplicatively.

(iv) Finally, by similar derivations, we have

$$\frac{\partial r_d^*}{\partial \eta} = -\frac{\frac{\partial^2 \pi^{FDI}}{\partial w_d \partial \eta} \omega'(r_d)}{\frac{\partial^2 \Pi^{FDI}}{\partial r_d^2}} < 0,$$

where $\frac{\partial^2 \pi^{FDI}}{\partial w_d \partial \eta} = (1-\sigma)\left[(1-\eta)(1-\sigma)\ln\frac{w_h}{w_d} - 1\right]\pi^{FDI}/w_d > 0$, since $w_h > w_d$ ($r_d > r_h$) holds at the optimal choice of destination. ■

Institutional complementarity across the source and the destination of bilateral FDI flows arises for two reasons. First, firms based in countries of poorer institutional qualities tend to be more heavily endowed with firm-specific informal institutions, which gives them a comparative advantage in conducting FDI in countries of poorer institutional qualities (as the adverse effect of weak institutions at the destination on fixed cost is reduced by the firm-specific institutional investment, and more so in destinations of poorer institutions). This is the main mechanism the paper wishes to highlight. In addition, given the supermodularity between the headquarter and the intermediate component implied by the Cobb-Douglas production function, a lower wage at home (a lower-cost headquarter input) also increases the marginal benefit (increments in variable profits) of securing a lower-cost manufactured component. This second mechanism (through the variable cost) reinforces the main mechanism (through the fixed cost) and strengthens the complementarity effect in institutions. We could potentially do away with the supermodular production function, such that only the first mechanism is at work. The institutional complementarity effect will continue to hold.

A larger $\tilde{\phi}$ or $B$ increases the marginal benefit of having a lower wage $w_d$ at the FDI destination, since the market share (or size) at stake is larger. This encourages the firm to take on higher fixed costs associated with investing in countries of poorer institutional qualities so as to access the

cheaper labor pool in these destinations. In contrast, when a sector is more headquarter intensive, the cost of the manufactured component becomes less a concern, which weakens the incentive of firms to locate FDI in countries with weaker institutional support.

The prediction that a more productive firm will choose to engage FDI in countries of poorer institutions may come across as a surprising result. But it is no different from the traditional vertical-FDI models where the more productive firms in the North are more likely than the less productive firms to engage FDI in the South: the more productive firms with larger market shares stand to gain more from the lower variable production cost in the South, and at the same time, they are able to take on the higher fixed cost of production. We can think of some possible factors outside the model that may moderate this stark prediction. I discuss them in Section 2.5.

### 2.3 Sorting of Firms

Proposition 3(ii) (that the more productive firms choose FDI in countries of poorer institutions) implies that the net profit function of FDI will be an increasing and convex function of firm productivity level $\tilde{\phi}$ for a given sector and home country. To see this, define

$$\Pi^{FDI,**} \equiv \max_{r_d} \left\{ \pi^{FDI}(r_h, r_d, \tilde{\phi}, B, \eta) - F^{FDI,*}(r_h, r_d) \right\}$$

and $\pi^{FDI,**}$ and $F^{FDI,**}$ the corresponding variable profit and fixed cost given the optimal choice of destination $r_d^*$. Applying the envelope theorem, we have

$$\begin{aligned} \frac{d\Pi^{FDI,**}}{d\tilde{\phi}} &= \frac{\partial \pi^{FDI,**}}{\partial \tilde{\phi}} = B(w_h^{\eta} w_d^{1-\eta})^{1-\sigma} > 0; \\ \frac{d^2\Pi^{FDI,**}}{d\tilde{\phi}^2} &= (1-\eta)(1-\sigma) w_d^{-1} B(w_h^{\eta} w_d^{1-\eta})^{1-\sigma} \omega'(r_d^*) \frac{\partial r_d^*}{\partial \tilde{\phi}} > 0, \end{aligned}$$

where the sign for the second derivative follows by Proposition 3(ii). In addition, by Proposition 1(iii) and Proposition 3(ii) again, we have

$$\frac{dF^{FDI,**}}{d\tilde{\phi}} = \frac{dF^{FDI,**}}{dr_d^*} \frac{dr_d^*}{d\tilde{\phi}} > 0.$$

Thus, as the more productive firms choose FDI in countries of higher $r_d$, they earn a higher variable profit margin but also incur a higher fixed cost. This is illustrated in Figure 1 by firms of three representative productivity levels $\tilde{\phi}_1 < \tilde{\phi}_2 < \tilde{\phi}_3$. Their respective choice of $r_d$ (with $r_{d,1} < r_{d,2} < r_{d,3}$) implies increasingly steeper variable profit margins and higher fixed costs. The net profit function $\Pi^{FDI,**}$ corresponds to the upper contour of the net profit functions across the continuum of FDI destinations.

The profit function of producing locally and that of FDI are juxtaposed in Figure 2. Given a convex profit function $\Pi^{FDI,**}$ for FDI but a linear one for local production, and a higher fixed cost for FDI than local production (Proposition 1(ii)), there exists a productivity level $\tilde{\phi}^{FDI}$ at which firms are indifferent between FDI and local production ($\Pi^{FDI,**} = \Pi^D$). Let $\tilde{\phi}^D$ denote the productivity cutoff level for local firms to break even. I assume $\Pi^{FDI,**}(\tilde{\phi}^D) < 0$ such that firms are sorted into local firms and multinational firms. Specifically, firms with $\tilde{\phi} \in [\tilde{\phi}_{\min}, \tilde{\phi}^D]$ will choose not to produce and exit the industry, firms with $\tilde{\phi} \in [\tilde{\phi}^D, \tilde{\phi}^{FDI}]$ will produce locally, and firms with $\tilde{\phi} \in [\tilde{\phi}^{FDI}, \tilde{\phi}_{\max}]$ will undertake FDI. The cutoffs are defined implicitly by:

$$B\tilde{\phi}^D \omega(r_h)^{1-\sigma} = F^*(r_h); \tag{10}$$

$$B\tilde{\phi}^{FDI}\left[\omega(r_h)^{\eta}\omega(r_d(\tilde{\phi}^{FDI}))^{1-\eta}\right]^{1-\sigma} - B\tilde{\phi}^{FDI}\omega(r_h)^{1-\sigma} = F^{FDI,*}(r_h, r_d(\tilde{\phi}^{FDI})) - F^*(r_h). \tag{11}$$

The sorting condition $\Pi^{FDI,**}(\tilde{\phi}^D) < 0$ can be rewritten as: $\left(\frac{\omega(r_h)}{\omega(r_d(\tilde{\phi}^D))}\right)^{(1-\eta)(\sigma-1)} < \frac{F^{FDI,*}(r_h, r_d(\tilde{\phi}^D))}{F^*(r_h)}$, that is, the extra fixed cost of FDI dominates the wage advantage FDI offers for the least productive surviving firms (given its endogenous choice of $r_d$). I assume that this condition holds since sorting of firms by productivity levels into domestic and multinational ones is well documented.

### 2.4 Aggregate Bilateral FDI

As suggested by Figure 1, in the limiting scenario with a continuum of destinations $r_d$, for each destination $r_d^o$, there is one unique productivity level $\tilde{\phi}^o$ of firms in each sector that consider $r_d^o$ as the optimal FDI destination. To arrive at an expression for the aggregate bilateral FDI at the country level, I impose some structures on the sectoral-level parameters. In general, sectors may differ in terms of its global market size $B$, headquarter intensity $\eta$ and firm productivity distribution. For simplicity, I suppress the latter two sectoral heterogeneity and work with only the sectoral demand

heterogeneity because of its simple multiplicative relationship with firm productivity. I discuss the possibility of generalizing the framework in Section 2.5.

Suppose that the global market size has a uniform distribution across sectors such that $B \sim \mathcal{U}(0,1)$. In addition, assume that firm productivity in each sector follow the same cumulative density function $G(\tilde{\phi})$ with support $\tilde{\phi} \in [1, \infty)$.

For illustrative purposes, focus on a particular destination $r_d^o$. For a given home country $r_h$ and sector $B$, this pins down the firm productivity level $\tilde{\phi}^o$ that will choose $r_d^o$ as a preferred FDI destination. Specifically, the FOC for $r_d^*$ in (7) requires that $\tilde{\phi}^o = C(r_h, r_d^o)/B$, where $C(r_h, r_d) \equiv \left\{ w_h^{\eta(1-\sigma)} w_d^{(1-\eta)(1-\sigma)-1} (1-\eta)(1-\sigma)\omega'(r_d) \right\}^{-1} \frac{\partial f(r_d, I^{FDI,*})}{\partial r_d}$ is a constant given $r_h$ and $r_d$. Thus, a lower sectoral demand $B$ raises the corresponding productivity level of firms that would prefer $r_d^o$. More formally, we have $d\tilde{\phi}^o/dB = -\tilde{\phi}^o/B$.

Whether the firm indeed undertakes FDI in $r_d^o$, however, depends on whether the firm productivity level $\tilde{\phi}^o$ exceeds the threshold $\tilde{\phi}^{FDI}$. If this is not the case, the FDI profit $\Pi^{FDI,**}$ falls short of domestic profit $\Pi^D$ and FDI will not realize. Using the cutoff condition (11) for FDI, we can similarly derive the effect of the sectoral demand $B$ on the cutoff productivity $\tilde{\phi}^{FDI}$. In particular, take total differentiation of (11) with respect to $B$ and $\tilde{\phi}^{FDI}$, applying the FOC (7), we have $d\tilde{\phi}^{FDI}/dB = -\tilde{\phi}^{FDI}/B$. Thus, a lower sectoral demand also raises the productivity cutoff for FDI.

Given the response of $\tilde{\phi}^o$ and $\tilde{\phi}^{FDI}$ to the sectoral demand $B$, we can characterize the bilateral FDI flows across sectors and country pairs. Starting with the highest sectoral demand level $B = 1$, label the corresponding productivity level in this sector that would prefer $r_d^o$ to the other FDI locations as $\tilde{\phi}^o(1)$ and the FDI cutoff level in this sector as $\tilde{\phi}^{FDI}(1)$. It turns out that there are only two possible scenarios.

### 2.4.1 zero bilateral FDI at the aggregate

In the first scenario, suppose $\tilde{\phi}^o(1) < \tilde{\phi}^{FDI}(1)$ holds. This implies zero FDI in $r_d^o$ from $r_h$ in the sector with the largest demand. As we look across sectors with lower $B$, since

$$\left| d\tilde{\phi}^o/dB \right| = \left| -\tilde{\phi}^o/B \right| < \left| -\tilde{\phi}^{FDI}/B \right| = \left| d\tilde{\phi}^{FDI}/dB \right|, \tag{12}$$

$\tilde{\phi}^o$ rises by less than $\tilde{\phi}^{FDI}$. As a result, the firm who might prefer $r_d^o$ as a possible FDI destination in a sector always finds domestic production preferable to FDI. Thus, there would be no FDI in $r_d^o$ from $r_h$ for all $B \in [0,1]$, and zero bilateral FDI at the aggregate.

### 2.4.2 positive bilateral FDI at the aggregate

On the other hand, suppose $\tilde{\phi}^o(1) > \tilde{\phi}^{FDI}(1)$ holds, which implies positive FDI from $r_h$ in $r_d^o$ in the sector with the highest demand. Since in this case,

$$\left| d\tilde{\phi}^o/dB \right| = \left| -\tilde{\phi}^o/B \right| > \left| -\tilde{\phi}^{FDI}/B \right| = \left| d\tilde{\phi}^{FDI}/dB \right|, \tag{13}$$

$\tilde{\phi}^o$ increases faster than $\tilde{\phi}^{FDI}$ as $B$ decreases. Hence, firms who might choose $r_d^o$ as a potential FDI destination also find FDI more profitable relative to domestic production for all $B \in [0,1]$.

Aggregating across all sectors and firms, we have the bilateral FDI activity from country $r_h$ to $r_d^o$ (when measured in net profit) as:

$$\begin{aligned}
V(r_h, r_d^o) &\equiv \int_0^1 \int_1^\infty \Pi^{FDI}(\tilde{\phi}, B, \eta; r_h, r_d^o)\ \delta\left(\tilde{\phi} - \tilde{\phi}^o(B)\right) g(\tilde{\phi})\, d\tilde{\phi}\, dB \\
&= \int_0^1 \int_1^\infty \left( B\tilde{\phi} \left( w_h^\eta\, \omega (r_d^o)^{1-\eta} \right)^{1-\sigma} - F^{FDI,*}(r_h, r_d^o) \right) \delta\left(\tilde{\phi} - \tilde{\phi}^o(B)\right) g(\tilde{\phi})\, d\tilde{\phi}\, dB \\
&= \int_{\tilde{\phi}^o(1)}^\infty \left( C(r_h, r_d^o) \left( w_h^\eta\, \omega (r_d^o)^{1-\eta} \right)^{1-\sigma} - F^{FDI,*}(r_h, r_d^o) \right) g(\tilde{\phi}) d\tilde{\phi} \\
&= \left( C(r_h, r_d^o) \left( w_h^\eta\, \omega (r_d^o)^{1-\eta} \right)^{1-\sigma} - F^{FDI,*}(r_h, r_d^o) \right) \int_{\tilde{\phi}^o(1)}^\infty g(\tilde{\phi}) d\tilde{\phi} \\
&= \left( C(r_h, r_d^o) \left( w_h^\eta\, \omega (r_d^o)^{1-\eta} \right)^{1-\sigma} - F^{FDI,*}(r_h, r_d^o) \right) \left( 1 - G(\tilde{\phi}^o(1)) \right).
\end{aligned} \tag{14}$$

where $\delta$ is a Dirac delta function and $g \equiv dG/d\tilde{\phi}$ is the density function of firm productivity. Recall that $\tilde{\phi}^o(B) = C(r_h, r_d^o)/B$ by the FOC (7). In the above derivations, the first equality holds because $B$ has a uniform distribution and only firms with productivity $\tilde{\phi}^o(B)$ will choose to engage FDI in destination $r_d^o$ in sectors with demand level $B$. The second equality substitutes in the expression of the FDI profit, and the third equality follows by integrating over the combinations of ($B$, $\tilde{\phi}$) that satisfy the FOC (7) such that $\tilde{\phi}^o B = C(r_h, r_d^o)$. The lower bound $\tilde{\phi}^o(1) = C(r_h, r_d^o)$ corresponds to the productivity level of firms that choose $r_d^o$ in the sector with the highest demand ($B = 1$). As $B$ decreases toward zero across sectors, the corresponding productivity level of firms that choose $r_d^o$

increases toward infinity.

We may interpret the first term in (14) as reflecting the 'intensive margin' and the second term the 'extensive margin' of FDI activity. They correspond, respectively, to the average net FDI profit per firm and the mass of firms from country $r_h$ engaging FDI in country $r_d^o$.[6]

**Proposition 4 (Complementarity in Institutional Qualities at the Aggregate)** *Conditional on positive bilateral FDI: (i) At the intensive margin, bilateral FDI activity at the country aggregate level exhibits complementarity in institutional qualities: multinational firms generate more net profits in countries of poorer institutional qualities, the poorer the institutional environment at home; (ii) At the extensive margin, bilateral FDI activity may exhibit complementarity in institutional qualities (subject to certain qualifying conditions): more multinational firms conduct FDI in countries of poorer institutional qualities, the poorer the institutional environment at home.*

**Proof.** See the appendix for the proof of Proposition 4(ii). ■

Proposition 4(i) follows from the result $\frac{\partial \Pi^{FDI}}{\partial r_d \partial r_h} > 0$ shown in the proof of (8). In particular, $\frac{\partial \Pi^{FDI}}{\partial r_d \partial r_h}$ corresponds to the numerator of (8) and is shown to be positive for arbitrary combinations of $(r_h, r_d, \tilde{\phi}, B, \eta)$. This implies that the result $\frac{\partial \Pi^{FDI}}{\partial r_d \partial r_h} > 0$ also holds for the profit function $\Pi^{FDI}$ in (14) when $r_d = r_d^o$ and $(B,\ \tilde{\phi})$ satisfies the FOC (7). Thus, the intensive margin of FDI at the aggregate turns out to inherit the same institutional complementarity mechanism shown for individual firms in Proposition 3(i), with similar intuitions.

At the extensive margin, poorer institutions, as shown in Proposition 1(iv), raises the total fixed cost of production for MNEs based in these countries, which reduces the outward FDI from the South relative to the North. However, so long as this higher total fixed cost of FDI does not kill the outward FDI from $r_h$ toward a destination $r_d^o$, home countries with poorer institutions have a larger mass of firms investing in the given destination $r_d^o$. Intuitively, the higher informal institutional investment made by firms in the South allows less productive firms than their peers from the North to survive in a given FDI destination.

[6]The intensive and extensive margins are defined here conditional on positive bilateral FDI flows. This is not exactly the same as how these two margins are sometimes used in the literature. For example, some studies in the trade literature define the extensive margin by the proportion of active trade status among the universe of country-pairs, sectors, or product groups.

Whether this advantage of the South at the extensive margin is stronger in destinations with poorer institutions depends on two components. First, it depends on whether a higher $r_h$ lowers the productivity cutoff $\tilde{\phi}^o(1)$ by a larger margin in destinations of higher $r_d^o$. The answer is positive on second-order approximations. Next, it also depends on $g'(\tilde{\phi}^o(1))$, the curvature of the productivity distribution at the cutoff. Intuitively, as $r_d^o$ increases and the corresponding productivity threshold $\tilde{\phi}^o(1)$ increases, the advantage of the South is stronger if $g'(\tilde{\phi}^o(1)) > 0$, as we move up to a productivity level where the density of firms is higher; the reverse is true if $g'(\tilde{\phi}^o(1)) < 0$ holds. Overall, the institutional complementarity effect will hold at the extensive margin if $g'(\cdot)$ is not too negative such that the first positive component dominates.

### 2.5 Discussions of the Model

I discuss several possible extensions of the model for future work. First, in the model, I have implicitly assumed that labor productivity is the same across countries in the production of intermediate (headquarter or manufactured) components for differentiated goods. We can relax this assumption without affecting the result, if the wage rate adjusted for labor productivity is lower in countries of poorer institutional qualities.

Second, for modeling simplicity, I have also assumed that informal institutional endowment is a common good within the firm boundary and fully transnational (i.e., equally effective in combatting weak formal institutions in foreign countries as at home). Admittedly, the informal institution built likely cannot be fully transferred across countries. In alternative setups, we may allow firms to build local informal institutions at home and in the host country separately. The main result will continue to hold, so long as the level of informal institution that a firm can build in the host country is constrained by its home institutional environment.

Third, in the literature, several studies have suggested that larger firms tend to be more politically connected or politically active (Hellman et al., 2003; Faccio, 2006; Li et al., 2006; Chen et al., 2011). In the current setup, domestic firms do not differ in their choices of $I$. However, as shown by Proposition 3(ii), conditional on firms making the cutoff for FDI, the more productive firms will choose FDI destinations of higher $r_d$. Since the more productive firms are also larger and the informal institution a firm develops increases with $r_d$ in the current model, this establishes a positive correlation between firm size and firm-specific investment in informal institutions.

Fourth, the prediction of Proposition 3(ii) is derived from pure vertical-FDI incentives. We can think of some possible factors outside the model that may moderate this stark prediction. For example, in alternative setups with trade frictions, firms may conduct FDI in several destinations (of good or bad institutions) for market-access motives. Nonetheless, it is still likely that the lower bound of institutional qualities at the destination that a firm engages FDI in will be lower, the higher the firm productivity level (all else being equal). Intuitively, the higher fixed cost at a destination of poorer institutional qualities raises the bar on firm entry. Yet another possible moderating factor is quality control risk. If higher firm productivity is due to more sophisticated production technology a firm uses, the higher risk of quality control failure may create disincentives for the more productive firms to locate production in a country with lower wage but poorer institution (Chang and Lu, 2012). As a result, there may arise a non-monotonic relationship between the firm productivity level and the institutional quality of a firm's chosen FDI destination.

Fifth, in deriving the aggregate bilateral FDI, I have assumed the firm productivity support to be unbounded. We may instead impose some upper bound on the productivity support (à la Helpman et al., 2008). This will not affect the zero FDI conclusion in the first scenario (Section 2.4.1) but will introduce additional incidence of zero FDI in the second scenario (Section 2.4.2). Zero FDI in this case will occur not only at the bilateral country level but also at the sectoral level. In particular, let $\bar{\bar{\phi}}$ be the upper bound of the firm productivity support. Define $b \equiv C(r_h, r_d^o)/\bar{\bar{\phi}}$; ie., $b$ is the cutoff on the sectoral demand where the most productive firm would undertake FDI in $r_d^o$ from $r_h$. For $B < b$, the required productivity level for a firm to choose $r_d^o$ exceeds the upper bound of the productivity support. Thus, FDI will occur only in sectors of sufficiently large demand with $B \in [b, 1]$ for given $r_h$ and $r_d^o$. We have zero FDI from $r_h$ in $r_d^o$ in all sectors if $b > 1$.

Sixth, in deriving Proposition 4, I focus on the second-order (interaction) effects of home with respect to host institutions on bilateral FDI flows. In doing so, I have assumed that firm productivity distributions do not vary systematically across countries. If developed economies have a "better" distribution, tilted towards higher productivity, it is likely that more firms would be able to pay the fixed cost of FDI and set affiliates in countries with lower wages and poorer institutions. In empirical exercises, I include home and host-country specific variables to control for such level effects.

Seventh, in deriving the aggregate FDI flows, I have also suppressed possible heterogeneity in

headquarter intensity across sectors. In principle, it is possible to introduce another layer of sub-sectors characterized by $\eta \in [0,1]$ within each sector $B \in [0,1]$. For given $(B,\eta)$, we can identify the unique productivity level $\tilde{\phi}^o(B,\eta)$ of firms that would prefer $r_d^o$ as a FDI destination. Assume $\eta \sim U(0,1)$, the aggregate bilateral FDI can in principle be derived in a similar way as in (14). The difficulty is to identify the boundary between zero and positive bilateral FDI in terms of both parameters $(B,\eta)$ and as a result, a closed-form solution for the aggregate bilateral FDI.

Without doubts, the current model has missed some relevant features of multinational production, such as outsourcing and horizontal FDI. It is possible to introduce the sorting structure of outsourcing and FDI à la Antràs and Helpman (2004) such that the fixed cost of FDI is greater than outsourcing in the South taking into account the endogenous choice of firm-specific informal institution, and at the same time, the FDI variable profit margin is steeper than outsourcing in a given destination. Similar to how the FDI profit function is derived in Figure 1, the outsourcing profit function taking into account firm's optimal choice of destination will likely be an increasing convex function and cut the domestic and FDI profit functions in the middle spectrum of firm productivity, creating a lower cutoff for outsourcing and an upper cutoff for FDI. Institutional complementarity effect at the firm level is likely to follow for outsourcing as for FDI by a similar mechanism.

In models of horizontal FDI, firms may engage FDI in multiple destinations for market-access motives. However, the same institutional complementarity effect identified in this paper at the firm level is likely to apply to this alternative setting. Assume away differences in wage costs (and thus vertical-FDI incentives). MNEs based in poorer institutions still have a comparative advantage at reducing the overhead cost of FDI at the destination given their heavier informal institutional investment at home, and thus will be more likely to choose FDI over exporting to serve the market with poorer institutions, all else being equal.

Finally, in the empirical exercises that follow, I do not observe the cost structure or profit of MNEs but bilateral FDI flows or stocks across countries at the aggregate. As an attempt to bridge the theory and the empirics, we may suppose that the amount of investment that each firm is willing to make is proportional to the expected net profit of FDI (the first term in (14)); thus, the larger the expected net profit of FDI, the larger the amount of FDI flows per project (firm). Next, we may think of the mass of firms (the second term in (14)) as the number of FDI projects that will

be undertaken. Thus, the larger the amount of aggregate bilateral FDI profit expected, the larger the amount of aggregate bilateral FDI flows. This helps establish a one-to-one mapping between the theoretical concept in (14) and the empirical measure of FDI.

# 3 Empirical Evidence

Proposition 3(i) suggests that all else being equal, a MNE from a country with poorer institutional quality than another MNE, will tend more likely to invest in a destination with poorer institutional quality than the other MNE's choice of destination. Proposition 4 suggests that this institutional complementarity effect will also hold at the aggregate country level (subject to qualifying conditions). I estimate the bilateral FDI volume at the aggregate using the following gravity equation:

$$\begin{aligned}\ln(FDI_{dht}) &= \beta_0 + \beta_1 \ln(gdp_{d,t-1}) + \beta_2 \ln(gdp_{h,t-1}) + \beta_3 \ln(gdppc_{d,t-1}) + \beta_4 \ln(gdppc_{h,t-1}) \\ &\quad + \beta_5 |\ln(gdppc_{d,t-1}) - \ln(gdppc_{h,t-1})| + \beta_6 \ln(p_{d,t-1}) + \beta_7 \ln(p_{h,t-1}) \\ &\quad + \boldsymbol{\beta_8 G_{d,t-1} + \beta_9 G_{h,t-1} + \beta_{10}(G_{d,t-1} * G_{h,t-1})} + \gamma X_{dh,t-1} + \epsilon_{dht}, \qquad (15)\end{aligned}$$

where $FDI_{dht}$ denotes FDI in country $d$ from country $h$ in year $t$. In particular, the institutional qualities of both the home ($G_{h,t-1}$) and destination ($G_{d,t-1}$) countries and their interaction term ($G_{d,t-1} * G_{h,t-1}$) are included as part of the FDI determinants. Propositions 3(i) and 4 imply a relational matching pattern in FDI in terms of institutions. Thus, a positive sign of $\beta_{10}$ will provide support for these hypotheses. On the other hand, an insignificant $\beta_{10}$ would invalidate these hypotheses, as in this case, the home or destination institution has a uniform impact on FDI regardless of the partner country's institutional conditions.

In developing the theoretical model, I have abstracted away from many potentially important determinants of FDI suggested by the literature. I control for them empirically in (15). This includes the economic size of the home and host countries (measured by their gross domestic products, $gdp_{d,t-1}$ and $gdp_{h,t-1}$), the income level of the two countries (measured by their GDPs per capita, $gdppc_{d,t-1}$ and $gdppc_{h,t-1}$), and the business operating costs of the two countries (measured by their general price levels, $p_{d,t-1}$ and $p_{h,t-1}$). See Globerman and Shapiro (2002) for a literature survey of how these variables may (or may not) affect FDI. I also include a long list of bilateral

variables $X_{dh,t-1}$ typically used in the gravity literature to control for transaction and information barriers including: distance, contiguity, common language, colonial relationship, regional trade agreement (RTA), and currency union (CU). To this list I add bilateral investment treaty (BIT), since in the context of FDI, the presence of BIT may affect the fixed cost of FDI and its pattern as a result.

A recent study by Fajgelbaum et al. (2015) proposes a Linder hypothesis for FDI. This theory suggests that MNEs will tend to invest in countries of similar income per capita, due to non-homothetic preferences and the proximity-versus-concentration tradeoff in serving foreign markets. This mechanism is controlled for by including the absolute value of the difference in log-per capita income between the home and host countries $|\ln(gdppc_{d,t-1}) - \ln(gdppc_{h,t-1})|$ as in their study. Thus, the institutional complementarity effect presented below is independent of any potential Linder effect due to income similarity.

### 3.1 Data and Measurement

The FDI data are sourced from the UNCTAD's Bilateral FDI Statistics, which consists of 206 economies reporting their FDI inward stock, outward stock, inward flows, and outward flows (in current US dollars) from and to each of the partner countries during year 2001-2010. The set of partner countries ever recorded includes 193 economies, 13 of them not in the set of reporters. To my knowledge, this dataset is the most comprehensive in terms of country coverage on bilateral FDI flows: including poor and institutionally weak countries as FDI source or destination countries.[7] This is an advantage for this study, as it allows me to incorporate the less investigated spectrum of South-South FDI.

In this dataset, the inward FDI series reported by the recipient country $d$ (from $h$) is not necessarily equal to the outward FDI series reported by the origin country $h$ (to $d$). Given this, I do not attempt to gauge or correct the measurement errors, but instead choose to measure $FDI_{dht}$ alternately based on each of the four series reported and look for a robust pattern across the series.

I measure a country's institutional quality based on the Worldwide Governance Indicators (WGI), 2013 Update, in six dimensions: voice and accountability (VA), political stability and absence of violence (PV), government effectiveness (GE), regulatory quality (RQ), rule of law (RL),

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

and control of corruption (CC).[8] Details on the construction of these indicators can be found in Kaufmann et al. (2010). Since these indicators are highly correlated with one another, I include them one at a time in the estimation of (15). For each governance indicator, a country receives both a point estimate ranging from approximately -2.5 (weak) to 2.5 (strong), and a percentile ranking among all countries. The higher the index, the better the institutional quality. I report the results based on the point estimate, although the results are qualitatively similar based on the percentile ranking.

The data on GDP and GDP per capita (in current US dollars) are based on the World Development Indicators.[9] I then construct the general price level of a country relative to the United States by the ratio of its GDP (per capita) in current US dollars to its GDP (per capita) in current PPP dollars. This variable aims to capture the overall cost of production (including, e.g., rent, wages, intermediate materials and infrastructure) facing the firms operating in the country.

The transaction and information cost proxies $X_{dh,t-1}$ are compiled from several sources. The CEPII website provides the data on bilateral distance, and whether two countries are contiguous (*contig*), share a common language (*comlang*), have ever had a colonial link (*colony*), have had a common colonizer after 1945 (*comcol*), are currently in a colonial relationship (*curcol*) or were/are the same country (*smctry*).[10] The data on whether two countries are currently in a regional trade agreement (*rta* for 1958-2014), and whether they use a common currency (*comcur* for 1948-2009) are retrieved from de Sousa's website.[11] Last but not least, the data on bilateral investment treaties are obtained from UNCTAD. I construct a dummy variable that equals one if a BIT is currently in force between a country pair and zero otherwise, according to the date a BIT enters into force (and the date it is terminated if ever).[12]

All regressors (if time variant) are lagged one period relative to the FDI variable, to reduce the

[8] http://data.worldbank.org/data-catalog/worldwide-governance-indicators.

[9] http://data.worldbank.org/data-catalog/world-development-indicators (22-Jul-2014 update).

[10] http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=6. See Mayer and Zignago (2011) for further details. I corrected some coding errors of *smctry* in the original data, wherever they were not symmetric for the same country pair *dh* and *hd* based on the information in http://www.worldstatesmen.org/, which is the same source used by the original data to create the variable. Details on the entries corrected are available upon request.

[11] http://jdesousa.univ.free.fr/data.htm. See also de Sousa (2012).

[12] The data were retrieved from the UNCTAD website in June 2013. The interface has since been migrated to http://investmentpolicyhub.unctad.org/IIA. I corrected the original data downloaded in cases where BIT entries on one side are missing or where the dates of entry into force are inconsistent between two BIT partner countries. The corrections are made based on the updated information provided in the above website. I set the cutoff date to be July 1st of the current year in defining the year-varying *bit* dummy.

concern of reverse causality. I also experiment using longer lags of the right-hand-side variables in unreported exercises, but the results are similar.

In sum, the study covers bilateral FDI stocks (flows) for 219 economies in 2001-2010, with attrition in the sample size due to missing entries or gaps in the data. The effective sample size varies, depending on the FDI series used and the estimation specification studied.[13]

Figure 3 illustrates the fraction of FDI inflows received from countries of poorer institutional quality by the world as a whole, by host countries of poorer institutional quality and by host countries of better institutional quality. To classify the source/destination of FDI by institutional quality, I match the bilateral FDI data with the WGI data (with one-year lag). The cutoff for each of the institutional quality indicators is set at the 65 percentile of its distribution to match approximately the proportion of developing countries in the world (139 developing countries and 75 developed countries in 2015 by the World Bank classification).

Note that the fraction of FDI inflows from countries of poorer institutional quality shown in Figure 3 is likely systematically under-reported than FDI inflows from developing countries reported by UNCTAD (cited in the introduction) for a few reasons. First, the FDI data used to generate the plot are aggregated from bilateral FDI entries, and bilateral FDI entries may not be separately reported (and show up as missing) for minor sources (which tend to be less developed countries). Second, even when the FDI data are not missing, the WGI data may be missing and more likely to be missing for less developed countries. Third, the 65% cutoff also excludes the mass of transition economies that fall into high-income (developed) countries. For these reasons, we will not focus on the absolute magnitude of the numbers in Figure 3 but their relative magnitudes across groups of reporting countries.

We see from Figure 3 that the share of FDI flows received by the institutionally poorer countries from their counterparts are in general more than proportional to the latter's weight in worldwide FDI outflows. At the same time, the share of FDI flows received by the institutionally stronger countries from poorer ones are less than proportional. The asymmetry is especially pronounced when countries are classified by institutional quality in VA, GE and RQ, slightly less so in terms of

[13]The whole set of 219 economies consists of 206 reporting countries and 13 partner countries that did not appear as reporting countries. Gaps in the data, for example, occur in the governance indicators, which are not available for year 2001. Missing data arise mainly due to the dependent variable, although different country coverage across data sources leads to missing data on the independent variables as well.

RL and CC, and with no clear pattern in terms of PV.[14] This provides a first illustrative evidence of institutional complementarity in bilateral FDI flows. As we will see in the following analyses, this complementarity effect still holds true after controlling for an extensive list of FDI determinants.

### 3.2 Results

Table 1 presents the OLS estimation result of (15) for FDI inward stock reported by the recipient country. As shown by the table, the coefficient on $(G_d * G_h)$ is positive and significant regardless of the indicators used to measure institutional quality, supporting the paper's theoretical prediction. The Linder hypothesis of Fajgelbaum et al. (2015) is also supported overall by the data.

Most of the other coefficients are precisely estimated and consistent with ex ante theoretical predictions. A larger home or host market size, a lower production cost at the destination and a higher production cost at home, physical proximity, common language, colonial relationship, and currency union all help raise bilateral FDI stock. Regional trade agreements and bilateral investment treaties do not have robust positive effects on bilateral FDI. In fact, ironically, BIT is shown to have a negative (and statistically significant) effect on inward FDI stock. This result, however, is not robust to variations in estimation specifications as will be discussed later.

Table 2 summarizes the results when the FDI outward stock, inflows, or outflows are used instead to measure the FDI activity. The sign of the coefficient on $(G_d * G_h)$ is significantly positive and amazingly robust across all FDI series and institutional indicators (except perhaps PV). The Linder hypothesis of Fajgelbaum et al. (2015) receives empirical support from data on FDI stocks, but not in terms of FDI flows. The results above are hardly affected if I also control for year fixed-effects in the baseline specification (15).

I take the strength of the complementarity in institutions as reflecting the possibility for firms to build firm-specific informal institutions to reduce fixed overhead costs of FDI. The strongest complementarity is observed for RQ and weakest for PV in Table 2. This suggests that firms 'born' in countries of weak regulatory quality may find it easier to build informal institutions such as political network to deal with red tapes than firms born in politically unstable and violence-prone countries to build informal institutions such as private security forces to deal with civil

[14]The WGI data are missing for year 2001, which would be used to classify countries' FDI flows in 2002. This explains the missing entries in the figure for year 2002.

riots, terrorism, or wars. To the extent that such informal institutions are too costly, we will expect to observe weak (or no) complementarity effect. This is illustrated by the case of PV given FDI outward stock (flows), where the sign for the coefficient on $G_d$ is positive and for $(G_d * G_h)$ insignificant, indicating a universal preference for a politically more stable host country. Without the complementarity effect, the positive sign for the coefficient on $G_h$ implies that firms coming from a politically more stable country also have a universal advantage in outward FDI, all else being equal.

## 3.3 Robustness Checks

### 3.3.1 with multilateral fixed-effects (FE)

Following Anderson and van Wincoop (2003), it has become a regular practice to control for the multilateral resistance to trade of exporting and importing countries in empirical trade analysis. Several alternative theoretical foundations have been provided for such multilateral effects; see for example, Eaton and Kortum (2002), Helpman et al. (2008) and Chaney (2008). In the FDI literature, Head and Ries (2008) and de Sousa and Lochard (2011) developed models for bilateral FDI that bear resemblance to the gravity equations for trade, suggesting the presence of multilateral home- and host-country effects. In view of this, I include destination-country-year and home-country-year FE as a robustness check. The fixed effects are allowed to vary by year given the panel data structure.

Table 3 summarizes the results. The findings are quite similar regardless of the FDI series used (in stocks or flows, reported by the recipient or the country of origin). The institutional complementarity effect is robust to the inclusion of time-variant multilateral FE controls, and is statistically significant overall. The effect tends to be stronger for VA, GE and RQ, weaker for RL and CC, and absent for PV. This pattern suggests an interesting interpretation of the areas where informal institutions are feasible and prevalent, and where they are not. Informal institutions tend to be built in response to inefficient public services or poor policy formulation/implementation (GE and RQ); these firm-specific investment corresponds to most likely political informal institutions such as political network or connections. To some extent, such political informal institutions may also help firms to maneuver in a society with less government political accountability (VA). On

the other hand, economic and legal informal institutions such as relational contracting and private enforcement mechanisms seem to be relatively costly for firms to build in response to inefficient contract enforcement or rules of law (RL and CC). Finally, it appears extremely costly for firms to build legal informal institutions such as private troops to guard against political violence or terrorism (PV), as the institutional complementarity effect estimated in this area is weak at best.

The Linder hypothesis of Fajgelbaum et al. (2015) is now clearly supported by the data. Most of the other variables (unreported) have qualitatively similar effects on FDI as in the benchmark. In contrast, the BIT effect has in general become insignificant (rather than negative) and the RTA effect has turned statistically positive.

### 3.3.2 with zero FDI observations

In the second robustness check, I take into account the presence of zero observations on FDI. The raw data differentiate between missing data (data that are not available or are not separately reported) and zero data (where the item is equal to zero or negligible). The pattern of zero and missing FDI data however suggests some degrees of measurement errors (e.g., the recipient country reports zero FDI while the origin country reports missing or positive FDI). Having no convincing way of correcting the data, I choose to use only the positive and zero FDI entries, and treat the missing FDI entries as literally missing and drop them from the analysis.[15]

In unreported exercises, I conduct Probit estimations and find that the same set of regressors in specification (15) have good explanatory powers of the likelihood of having an active bilateral FDI relation (in terms of either stocks or flows). In particular, the interaction term of institutions have the same positive effect on the likelihood of an active bilateral FDI status as on the volume of FDI reported above. Given this, I estimate the joint effects on both margins using the Tobit estimation method à la Eaton and Kortum (2001). This is implemented by the STATA *intreg* command, where the lower censoring point is allowed to vary across observations and set at the minimum positive value reported by each reporting country. For example, the lower censoring point is \$1 million US dollars for FDI inward stock reported by the United States, and \$2000 US dollars for FDI outward flow reported by El Salvador.

[15] I also drop the negative FDI entries from the analysis, as they cannot be accounted for by the current theoretical or empirical framework.

As shown in Table 4, the coefficient on $(G_d * G_h)$ now roughly doubles compared to the benchmark, and is significantly positive across all institutional quality indicators and FDI series. Overall, the complementarity effect is still the strongest in terms of VA, GE and RQ, and the weakest in terms of PV, with RL and CC somewhere in between.

The evidence for the Linder hypothesis is not uniform: it is generally stronger in terms of the FDI stocks, and weaker or absent in terms of the FDI flows, similar to the benchmark. The coefficient estimates for most other variables (unreported) increase in magnitude relative to the benchmark, as may be expected given that OLS estimates of bottom truncated data tend to be downward biased toward zero. In particular, the sign of BIT turns around and becomes significantly positive. This indicates the importance of BIT at driving the extensive margin of FDI. For example, signing a BIT increases the latent bilateral inward FDI stock by around 30%, an economically significant figure. This is also supported by the unreported Probit estimations where BIT is found invariably to raise the likelihood of positive FDI.

### 3.3.3 more robustness checks

I conduct several other robustness checks in terms of the measures of institutional quality, the samples, the estimators, and the estimation specifications. First, the results are qualitatively similar if we measure the institutional quality of a country by its percentile ranking instead of point estimate from WGI. Second, by dropping territories that are considered tax havens, the institutional complementarity effect estimates turn out to be stronger in general across all FDI measures and institutional indicators.[16] Third, I repeat the estimations using different subsets of countries in income levels (setting income ceiling for the FDI recipient countries at the 25%, 50%, or 75% of all countries in the current year). The institutional complementarity effect still holds in general, across variations in the estimation specifications or by allowing for zero FDI observations.

In dealing with zero FDI observations, I have taken the Tobit approach à la Eaton and Kortum

[16]I consider two alternative lists of tax havens. The first list was published by the EU on 18 June 2015. This includes (30 of them): Andorra, Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Brunei, Cayman Islands, Cook Islands, Grenada, Guernsey, Hong Kong, Liberia, Liechtenstein, Maldives, Nauru, Niue, Marshall Islands, Mauritius, Monaco, Montserrat, Panama, St Kitts and Nevis, St Vincent and the Grenadines, Seychelles, Turks and Caicos, US Virgin Islands, and Vanuatu (http://www.eubusiness.com/news-eu/economy-politics.120n). The second, shorter, list by Investopedia consists of: Andorra, Bahamas, Belize, Bermuda, British Virgin Islands, Cayman Islands, Channel Islands, Cook Islands, Hong Kong, Isle of Man, Liechtenstein, Mauritius, Monaco, Panama, Switzerland and St. Kitts and Nevis (http://www.investopedia.com/terms/t/taxhaven.asp).

(2001). This approach supposes that there is a minimum level of FDI, such that if the latent value $FDI^*_{dht}$ falls below this threshold, we observe $FDI_{dht} = 0$ but otherwise we observe $FDI_{dht} = FDI^*_{dht}$. For example, FDI values that fall short of a certain threshold may fail to be recognized by government agencies. This approach is also consistent with a structural interpretation of zero FDI, where FDI activity is observed only if the profits of FDI exceed that of domestic production. Thus, the intensive and extensive margins (at the bilateral country level) are inherently related: a FDI relation is more likely to be dormant where potential FDI profit is small. Another popular approach in the trade literature proposed by Silva and Tenreyro (2006), in contrast, treats zeros as random realizations modelled by the Poisson process, and estimates the dependent variable in levels with the Poisson Pseudo Maximum Likelihood estimator (PPML). When I apply the PPML estimator to the FDI data, the results are not as regular as the Tobit estimates. The coefficient on the income difference has the wrong (positive) sign and rejects the Linder hypothesis of Fajgelbaum et al. (2015). The coefficient on the institutional interaction term is not as uniformly precisely estimated as in the Tobit estimation, although the signs are correct in most cases and statistically significant in several cases.[17]

To exclude the possibility that South-South FDI may be driven by their similarity in industrial structures, I repeat the estimations by including an index of industrial structure similarity between two countries.[18] The industrial structure similarity index does not have a robust sign or significant effect on FDI flows. The coefficient on the institutional interaction term remains positive and significant overall across all estimations (benchmark, with multilateral effects, or with zero FDI observations).

There may be concerns that the coefficient estimate on the institutional interaction term is picking up higher-order effects of institutions on FDI. However, any such nonlinear effects of institutions (such as $G^2_{h,t-1}$ and $G^2_{d,t-1}$) would have been absorbed by the multilateral home-country-year and host-country-year fixed effects, and as shown in Table 3, the positive institutional complementarity

[17] See Head and Mayer (2015, p. 178–180) for further discussions of these two approaches (Tobit and PPML), in particular, their difference in interpretations based on structural versus random zeros.

[18] The measure is constructed as $indsim_{dht} = 1 - \sqrt{\sum_{j=1}^{J}(va_{dt,j} - va_{ht,j})^2}/J$, where $va_{dt,j}$ is the value added of sector $j$ in year $t$ (as a percentage of GDP of country $d$) and similarly defined for $va_{ht,j}$. Data are taken from World Development Indicators, 11/12/2015 Update. Data are available on four distinct sectors: agriculture (ISIC divisions 1-5), manufacturing industry (ISIC divisions 15-37), non-manufacturing industry (ISIC divisions 10-14 and 38-45; including mining, construction, electricity, water, and gas), and services (ISIC divisions 50-99).

effect is robust to the inclusion of such fixed effects.

Culture (socially shared values) and institutions (socially shared rules) are two concepts that are sometimes difficult to disentangle, and likely to be highly correlated with each other. In the list of regressors in (15), I have controlled for dimensions of culture in terms of language and the current and past colonial relationships between countries. The above results show that institution has its own independent effects on FDI flows. I also repeat the estimations by including an index of religion similarity between countries as an extra control for cultural similarity.[19] Similarity in religion compositions between two countries helps raise bilateral FDI flows. However, the institutional complementarity effect remains positive and significant overall across all estimations (with the same caveat regarding PV).

Finally, given that institutional quality does not change much over time, we may also consider restricting the analysis to a cross-sectional analysis by taking the average of the FDI measures, the institutional quality, and the other time-variant variables during 2001-2010. I run cross-sectional estimations in parallel to the baseline specification (15), the specification with multilateral FE, and the Tobit estimation with zero FDI. The institutional complementarity effect is in general stronger and similar in patterns as documented for the panel analysis.

# 4 Conclusion

In this paper, I propose a theoretical framework to micro-found the hypothesis that South-based MNEs have a comparative advantage to deal with the inefficiency associated with weak formal institutions and to maneuver in relationship-based investment environment, relative to their peers from the North. The theory predicts a complementarity in institutional qualities of the home and host countries in bilateral FDI flows. This helps explain the greater presence of South-based MNEs in countries of relatively poorer institutions.

I conduct an extensive econometric test of the theory using bilateral FDI for 219 economies in year 2001-2010. The results indicate a statistically significant complementarity effect between the

[19]The religion index is constructed based on the religion dataset of Maoz and Henderson (2013). The index follows Maoz and Henderson (2013) and measures the similarity of religious compositions between two countries as $relsim_{hdt} = 1 - \sqrt{\sum_{r=1}^{R}(ra_{ht,r} - ra_{dt,r})^2}/R$, where $ra_{ht,r}$ is the proportion of population in country $h$ in year $t$ that are adherents of religion $r$ and similarly defined for $ra_{dt,r}$. I used the top four religion categories: Christianity, Judaism, Islam and Buddhism. The results are similar if I use instead all 14 listed religion categories.

home and destination institutional qualities. The finding is robust to the FDI series studied, the institutional indicators used, the inclusion of multilateral country-fixed effects, and the consideration of zero FDI. The effect tends to be stronger with the inclusion of zero FDI and for dimensions of institutions where the scope for firms to build informal institutions is bigger. These are in line with the theoretical mechanism proposed in the paper and its implications.

In addition to predictions on the bilateral FDI activity at the country level, the paper's theoretical framework also suggests several interesting testable predictions at the firm and sectoral levels. In particular, a firm will choose to undertake FDI in countries of poorer institutional qualities, the poorer the institutional quality at home, the more productive the firm is, the larger the world demand for a sector is, and the less headquarter-intensive a sector is, all else being equal. I leave the test of these hypotheses to future work with firm-level and sectoral-level FDI data.

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## Math Appendix

**Proof of Proposition 4(ii).** To derive the effect of institutions on the extensive margin of FDI, I proceed in three steps. First, note that $\frac{\partial \tilde{\phi}^o(1)}{\partial r_h} < 0$. To see this, use Proposition 3(i) and 3(ii). Since both $r_h$ and $\tilde{\phi}$ raise the optimal choice of $r_d$, the two must move in opposite directions holding the destination $r_d^o$ constant. More formally, taking total differentiation of (7) with respect to $r_h$ and $\tilde{\phi}$, setting $dr_d = 0$, we have

$$\frac{\partial \tilde{\phi}^o(1)}{\partial r_h} = -\frac{\frac{\partial \Pi^{FDI}}{\partial r_d^o \partial r_h}}{(1-\eta)(1-\sigma) w_h^{\eta(1-\sigma)} w_d^{(1-\eta)(1-\sigma)-1} \omega'(r_d^o)} < 0, \tag{16}$$

where both the numerator and the denominator are positive as shown in the proof of (8) and (9).

Given the above result, it follows that

$$\frac{\partial \left(1 - G(\tilde{\phi}^o(1))\right)}{\partial r_h} = -g(\tilde{\phi}^o(1)) \frac{\partial \tilde{\phi}^o(1)}{\partial r_h} > 0. \tag{17}$$

Next, I analyze whether this advantage of the South at the extensive margin is stronger in destinations with poorer institutions:

$$\frac{\partial^2 \left(1 - G(\tilde{\phi}^o(1))\right)}{\partial r_d^o \partial r_h} = -g(\tilde{\phi}^o(1)) \underbrace{\frac{\partial^2 \tilde{\phi}^o(1)}{\partial r_d^o \partial r_h}}_{(-)} - g'(\tilde{\phi}^o(1)) \underbrace{\frac{\partial \tilde{\phi}^o(1)}{\partial r_h}}_{(-)} \underbrace{\frac{\partial \tilde{\phi}^o(1)}{\partial r_d^o}}_{(+)}. \tag{18}$$

The first component in (18) verifies whether a higher $r_h$ lowers $\tilde{\phi}^o(1)$ by a larger margin in destinations of higher $r_d^o$. The answer is a qualified yes. To show this, use the result in (9) setting $B = 1$, we have

$$\frac{\partial \tilde{\phi}^o(1)}{\partial r_d^o} = -\frac{\frac{\partial^2 \Pi^{FDI}}{\partial (r_d^o)^2}}{(1-\eta)(1-\sigma) w_h^{\eta(1-\sigma)} w_d^{(1-\eta)(1-\sigma)-1} \omega'(r_d^o)} > 0, \tag{19}$$

where the numerator is negative by the SOC for $r_d^*$ $(= r_d^o)$ and the denominator is positive. As suggested by Proposition 3(ii), the more productive firms will choose destinations with higher $r_d$. Thus, a destination of higher $r_d$ will attract on average the more productive firms. Note that the denominator in (19) increases in $r_h$. On the other hand, the derivative of the numerator with respect to $r_h$ involves third-order derivatives of $\Pi^{FDI}$ (with respect to $r_d^2$ and $r_h$), which cannot be signed.

Suppose we can safely ignore the higher-order changes in the numerator as $r_h$ changes; the effect of $r_h$ on the denominator in (19) implies that $\frac{\partial^2 \tilde{\phi}^o(1)}{\partial r_d^o \partial r_h} < 0$. Thus, on second-order approximations, the first component in (18) is positive, implying an institutional complementarity effect at the extensive margin.

Turn to the second component of (18). Its sign depends on $g'(\tilde{\phi}^o(1))$, the curvature of the productivity distribution at $\tilde{\phi}^o(1)$. If $g'(\tilde{\phi}^o(1))$ is positive, we have an unambiguous positive complementarity effect, reinforcing the first component in (18). Intuitively, as $r_d^o$ increases and the corresponding $\tilde{\phi}^o(1)$ increases, we are evaluating (17) at a productivity level where the density of firms is higher if $g'(\tilde{\phi}^o(1)) > 0$, creating a positive complementarity effect. The reverse is true if $g'(\tilde{\phi}^o(1)) < 0$ holds.

Overall, the complementarity effect in institutions will hold at the extensive margin if $g'(\cdot)$ is not too negative such that the first positive component in (18) dominates. ■

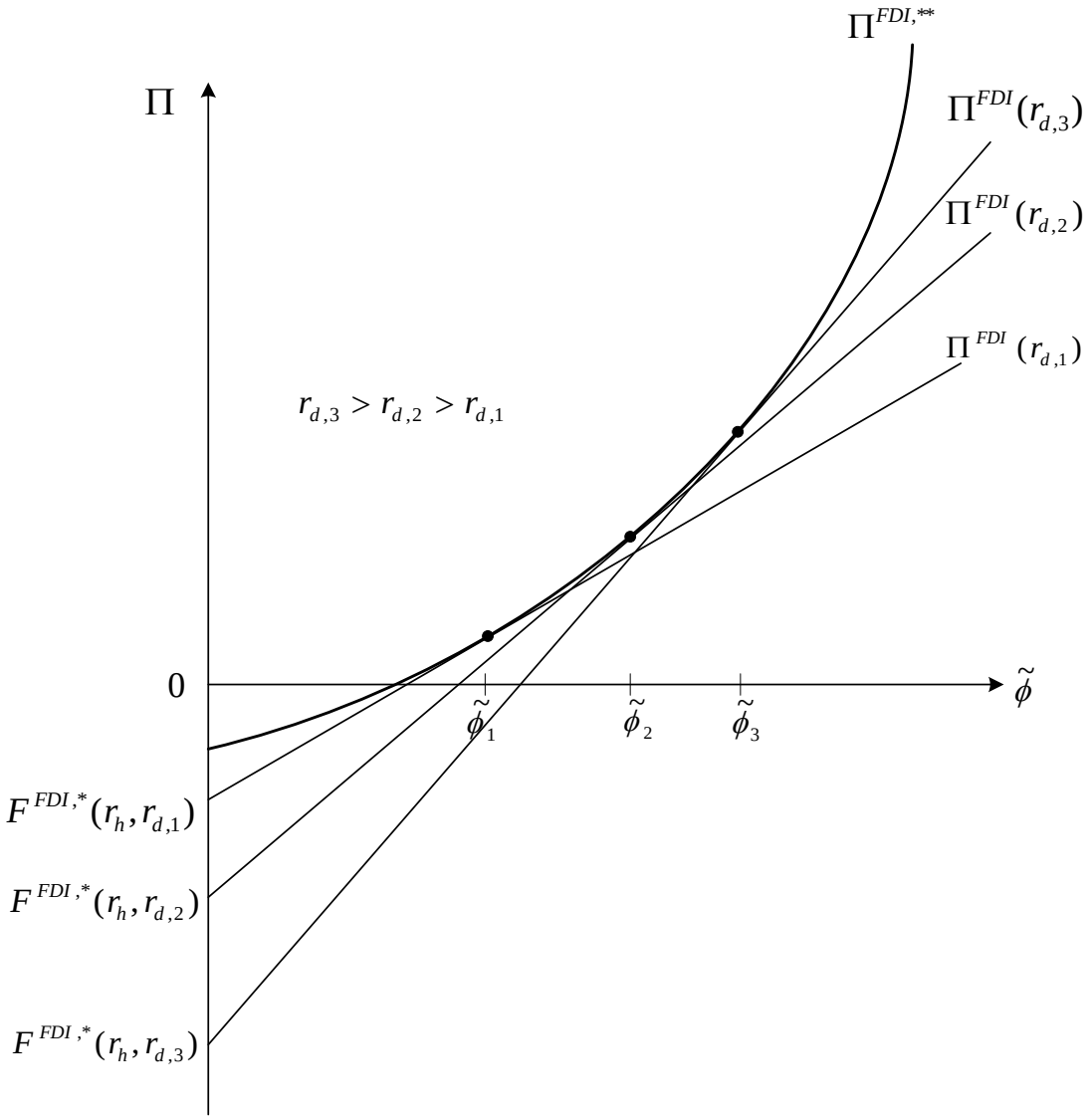


Figure 1: Profit Functions of FDI

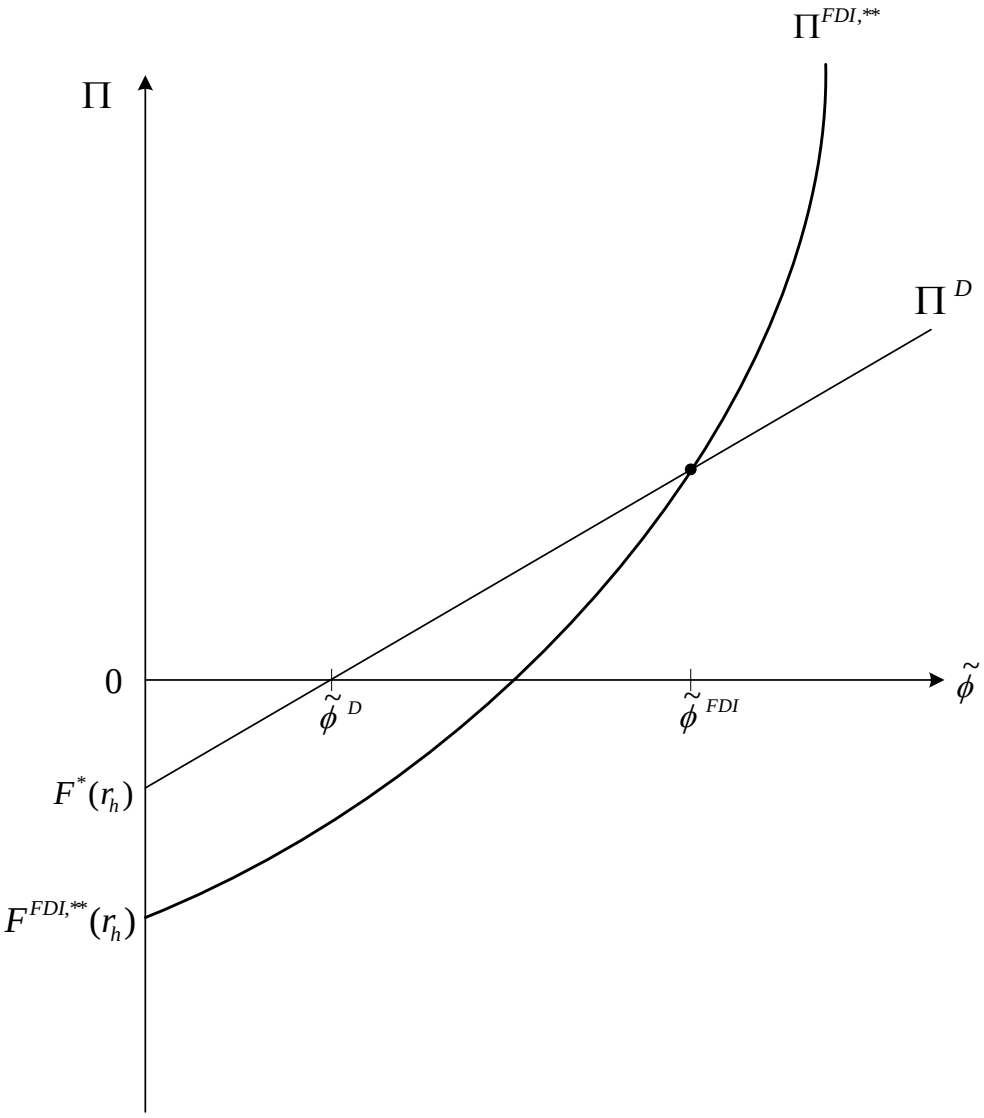


Figure 2: Sorting of Firms

Figure 3: Fraction of FDI flows received from countries of poorer institutional quality (based on FDI inflows reported by receiving countries)

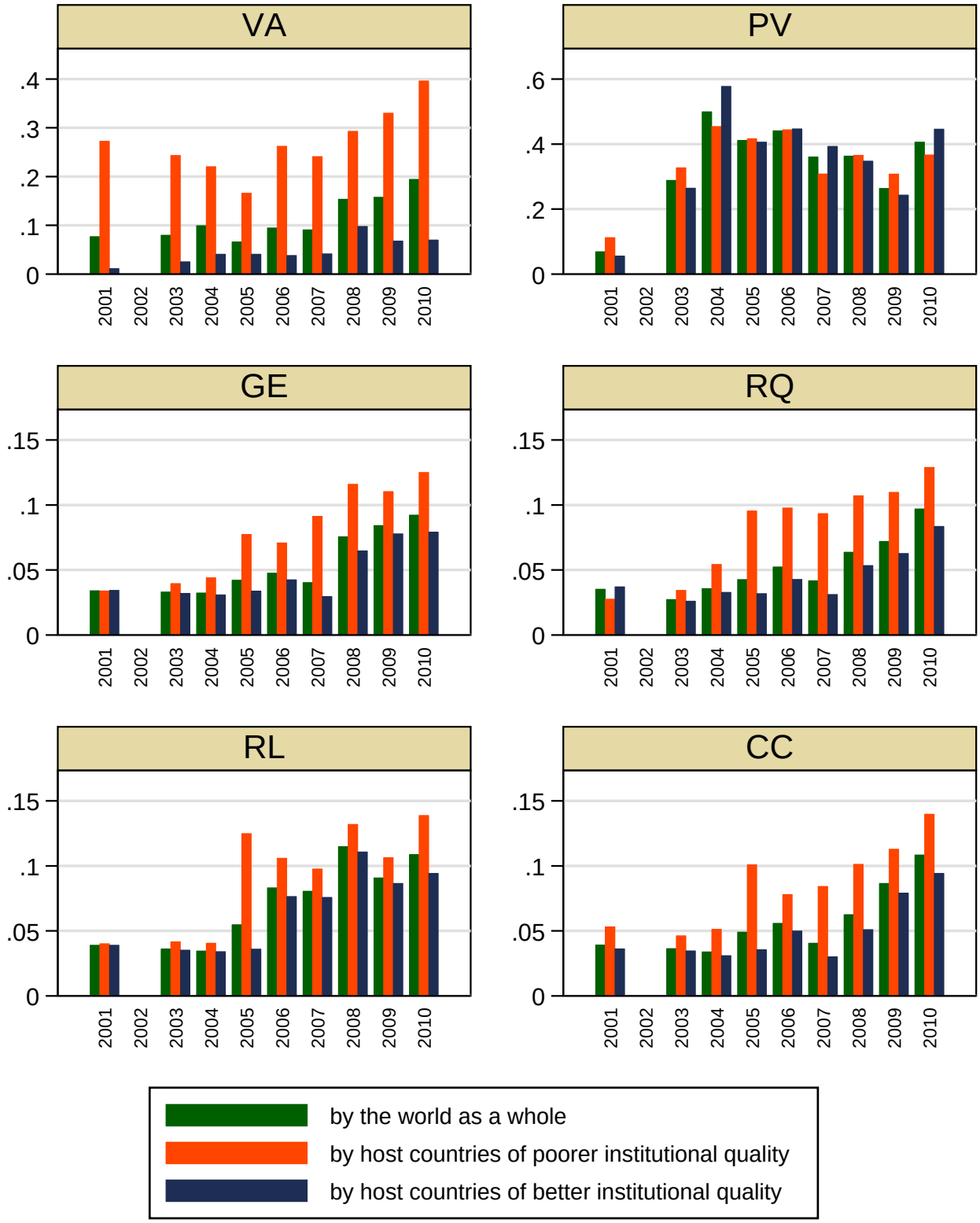

Table 1: Positive bilateral FDI—inward stock reported by the recipient country

| **FDI inward stock** | **VA** | | **PV** | | **GE** | | **RQ** | | **RL** | | **CC** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\ln(gdp_d)$ | 0.586 | *** | 0.617 | *** | 0.565 | *** | 0.581 | *** | 0.584 | *** | 0.584 | *** |
| | (0.020) | | (0.022) | | (0.020) | | (0.020) | | (0.020) | | (0.020) | |
| $\ln(gdp_h)$ | 0.449 | *** | 0.477 | *** | 0.437 | *** | 0.449 | *** | 0.451 | *** | 0.454 | *** |
| | (0.018) | | (0.019) | | (0.018) | | (0.018) | | (0.018) | | (0.018) | |
| $\ln(gdppc_d)$ | -0.029 | | -0.143 | ** | -0.146 | *** | -0.148 | *** | -0.138 | ** | -0.159 | *** |
| | (0.052) | | (0.056) | | (0.054) | | (0.055) | | (0.055) | | (0.053) | |
| $\ln(gdppc_h)$ | 0.262 | *** | 0.165 | *** | 0.091 | | 0.172 | *** | 0.099 | * | 0.082 | |
| | (0.054) | | (0.058) | | (0.057) | | (0.057) | | (0.058) | | (0.056) | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.125 | *** | -0.179 | *** | -0.066 | * | -0.035 | | -0.073 | * | -0.098 | *** |
| | (0.034) | | (0.033) | | (0.038) | | (0.039) | | (0.039) | | (0.037) | |
| $\ln(p_d)$ | -0.088 | | -0.088 | | -0.271 | ** | -0.303 | ** | -0.301 | ** | -0.342 | *** |
| | (0.136) | | (0.120) | | (0.125) | | (0.125) | | (0.124) | | (0.124) | |
| $\ln(p_h)$ | 0.840 | *** | 1.080 | *** | 0.932 | *** | 1.020 | *** | 0.879 | *** | 0.856 | *** |
| | (0.154) | | (0.132) | | (0.136) | | (0.136) | | (0.133) | | (0.132) | |
| $G_d$ | -0.124 | ** | 0.167 | *** | 0.150 | ** | 0.164 | ** | 0.168 | ** | 0.224 | *** |
| | (0.054) | | (0.049) | | (0.072) | | (0.080) | | (0.066) | | (0.059) | |
| $G_h$ | 0.097 | * | 0.175 | *** | 0.257 | *** | 0.017 | | 0.290 | *** | 0.310 | *** |
| | (0.051) | | (0.047) | | (0.059) | | (0.069) | | (0.060) | | (0.050) | |
| $\boldsymbol{G_d * G_h}$ | **0.267** | *** | **0.082** | * | **0.298** | *** | **0.400** | *** | **0.283** | *** | **0.210** | *** |
| | **(0.035)** | | **(0.042)** | | **(0.045)** | | **(0.055)** | | **(0.045)** | | **(0.034)** | |
| $\ln(distance)$ | -0.486 | *** | -0.491 | *** | -0.525 | *** | -0.517 | *** | -0.509 | *** | -0.522 | *** |
| | (0.042) | | (0.042) | | (0.041) | | (0.041) | | (0.041) | | (0.041) | |
| *contig* | 0.535 | *** | 0.513 | *** | 0.552 | *** | 0.567 | *** | 0.560 | *** | 0.531 | *** |
| | (0.130) | | (0.130) | | (0.128) | | (0.129) | | (0.129) | | (0.128) | |
| *comlang* | 1.164 | *** | 1.204 | *** | 1.100 | *** | 1.145 | *** | 1.106 | *** | 1.049 | *** |
| | (0.090) | | (0.089) | | (0.088) | | (0.088) | | (0.089) | | (0.088) | |
| *colony* | 0.876 | *** | 0.887 | *** | 0.898 | *** | 0.894 | *** | 0.892 | *** | 0.870 | *** |
| | (0.136) | | (0.135) | | (0.134) | | (0.133) | | (0.136) | | (0.133) | |
| *comcol* | 0.417 | *** | 0.468 | *** | 0.313 | ** | 0.362 | *** | 0.337 | *** | 0.346 | *** |
| | (0.127) | | (0.127) | | (0.123) | | (0.123) | | (0.123) | | (0.123) | |
| *curcol* | 0.484 | | 0.587 | * | 0.736 | ** | 0.648 | ** | 0.735 | ** | 0.988 | *** |
| | (0.330) | | (0.328) | | (0.349) | | (0.313) | | (0.345) | | (0.370) | |
| *smctry* | 0.165 | | 0.089 | | 0.126 | | 0.145 | | 0.187 | | 0.202 | |
| | (0.229) | | (0.228) | | (0.225) | | (0.227) | | (0.227) | | (0.225) | |
| *rta* | 0.030 | | 0.154 | ** | 0.007 | | -0.017 | | 0.037 | | 0.064 | |
| | (0.080) | | (0.078) | | (0.076) | | (0.078) | | (0.077) | | (0.076) | |
| *comcur* | 0.713 | *** | 0.739 | *** | 0.756 | *** | 0.745 | *** | 0.710 | *** | 0.746 | *** |
| | (0.144) | | (0.146) | | (0.145) | | (0.142) | | (0.146) | | (0.144) | |
| *bit* | -0.176 | *** | -0.229 | *** | -0.163 | *** | -0.212 | *** | -0.157 | ** | -0.110 | * |
| | (0.064) | | (0.064) | | (0.062) | | (0.062) | | (0.063) | | (0.062) | |
| # Observations | 24974 | | 24959 | | 24970 | | 24970 | | 24974 | | 24970 | |
| $R^2$ | 0.528 | | 0.525 | | 0.539 | | 0.535 | | 0.537 | | 0.541 | |

Note: Robust standard errors clustered by country-pairs are reported in the parenthesis. The entry ***, ** and * indicates statistical significance at the 1%, 5% and 10% level, respectively. All regressors (if time variant) are lagged one period relative to the FDI variable.

Table 2: Positive bilateral FDI—all stocks and flows

| | VA | | PV | | GE | | RQ | | RL | | CC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDI inward stock:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.125 | *** | -0.179 | *** | -0.066 | * | -0.035 | | -0.073 | * | -0.098 | *** |
| | (0.034) | | (0.033) | | (0.038) | | (0.039) | | (0.039) | | (0.037) | |
| $G_d$ | -0.124 | ** | 0.167 | *** | 0.150 | ** | 0.164 | ** | 0.168 | ** | 0.224 | *** |
| | (0.054) | | (0.049) | | (0.072) | | (0.080) | | (0.066) | | (0.059) | |
| $G_h$ | 0.097 | * | 0.175 | *** | 0.257 | *** | 0.017 | | 0.290 | *** | 0.310 | *** |
| | (0.051) | | (0.047) | | (0.059) | | (0.069) | | (0.060) | | (0.050) | |
| $\boldsymbol{G_d * G_h}$ | **0.267** | *** | **0.082** | * | **0.298** | *** | **0.400** | *** | **0.283** | *** | **0.210** | *** |
| | **(0.035)** | | **(0.042)** | | **(0.045)** | | **(0.055)** | | **(0.045)** | | **(0.034)** | |
| # Observations | 24974 | | 24959 | | 24970 | | 24970 | | 24974 | | 24970 | |
| $R^2$ | 0.528 | | 0.525 | | 0.539 | | 0.535 | | 0.537 | | 0.541 | |
| **FDI outward stock:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.087 | ** | -0.168 | *** | -0.053 | | -0.033 | | -0.081 | * | -0.093 | ** |
| | (0.038) | | (0.038) | | (0.041) | | (0.043) | | (0.042) | | (0.041) | |
| $G_h$ | 0.053 | | 0.281 | *** | 0.323 | *** | 0.029 | | 0.428 | *** | 0.533 | *** |
| | (0.056) | | (0.055) | | (0.067) | | (0.079) | | (0.066) | | (0.055) | |
| $G_d$ | 0.165 | *** | 0.121 | ** | 0.121 | | 0.235 | *** | 0.100 | | 0.130 | ** |
| | (0.058) | | (0.054) | | (0.076) | | (0.083) | | (0.069) | | (0.062) | |
| $\boldsymbol{G_d * G_h}$ | **0.270** | *** | **0.018** | | **0.273** | *** | **0.348** | *** | **0.215** | *** | **0.184** | *** |
| | **(0.037)** | | **(0.046)** | | **(0.047)** | | **(0.058)** | | **(0.046)** | | **(0.034)** | |
| # Observations | 22793 | | 22782 | | 22793 | | 22793 | | 22793 | | 22793 | |
| $R^2$ | 0.522 | | 0.516 | | 0.528 | | 0.525 | | 0.525 | | 0.535 | |
| **FDI inward flow:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.050 | * | -0.085 | *** | 0.060 | * | 0.053 | | 0.010 | | 0.016 | |
| | (0.028) | | (0.028) | | (0.034) | | (0.034) | | (0.035) | | (0.032) | |
| $G_d$ | -0.103 | ** | 0.214 | *** | -0.162 | ** | -0.066 | | -0.092 | | 0.024 | |
| | (0.051) | | (0.046) | | (0.069) | | (0.076) | | (0.064) | | (0.057) | |
| $G_h$ | 0.097 | ** | 0.076 | * | 0.092 | * | 0.007 | | 0.207 | *** | 0.130 | *** |
| | (0.047) | | (0.045) | | (0.053) | | (0.062) | | (0.054) | | (0.044) | |
| $\boldsymbol{G_d * G_h}$ | **0.248** | *** | **0.133** | *** | **0.395** | *** | **0.444** | *** | **0.289** | *** | **0.263** | *** |
| | **(0.033)** | | **(0.038)** | | **(0.044)** | | **(0.055)** | | **(0.044)** | | **(0.033)** | |
| # Observations | 19414 | | 19403 | | 19407 | | 19407 | | 19414 | | 19407 | |
| $R^2$ | 0.422 | | 0.421 | | 0.432 | | 0.430 | | 0.427 | | 0.431 | |
| **FDI outward flow:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.019 | | -0.085 | *** | 0.053 | | 0.045 | | -0.003 | | 0.011 | |
| | (0.031) | | (0.031) | | (0.035) | | (0.034) | | (0.036) | | (0.035) | |
| $G_h$ | -0.034 | | 0.119 | ** | 0.174 | *** | -0.022 | | 0.254 | *** | 0.246 | *** |
| | (0.050) | | (0.050) | | (0.056) | | (0.068) | | (0.058) | | (0.047) | |
| $G_d$ | 0.066 | | 0.161 | *** | -0.107 | | 0.041 | | 0.010 | | 0.019 | |
| | (0.053) | | (0.048) | | (0.068) | | (0.075) | | (0.061) | | (0.057) | |
| $\boldsymbol{G_d * G_h}$ | **0.250** | *** | **0.047** | | **0.328** | *** | **0.359** | *** | **0.216** | *** | **0.213** | *** |
| | **(0.032)** | | **(0.041)** | | **(0.041)** | | **(0.052)** | | **(0.042)** | | **(0.032)** | |
| # Observations | 16305 | | 16299 | | 16304 | | 16304 | | 16305 | | 16304 | |
| $R^2$ | 0.442 | | 0.436 | | 0.449 | | 0.445 | | 0.444 | | 0.449 | |

Note: See the note of Table 1. Coefficient estimates for the remaining regressors are omitted in the table.

Table 3: Positive bilateral FDI—all stocks and flows; with multilateral FE controls

| | **VA** | | **PV** | | **GE** | | **RQ** | | **RL** | | **CC** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDI inward stock:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.230 | *** | -0.314 | *** | -0.188 | *** | -0.236 | *** | -0.231 | *** | -0.198 | *** |
| | (0.030) | | (0.031) | | (0.037) | | (0.036) | | (0.038) | | (0.036) | |
| $\boldsymbol{G_d * G_h}$ | **0.174** | *** | **-0.056** | | **0.163** | *** | **0.109** | ** | **0.092** | ** | **0.113** | *** |
| | **(0.032)** | | **(0.038)** | | **(0.043)** | | **(0.049)** | | **(0.042)** | | **(0.031)** | |
| # Observations | 25692 | | 25677 | | 25688 | | 25688 | | 25692 | | 25688 | |
| $R^2$ | 0.716 | | 0.714 | | 0.715 | | 0.714 | | 0.715 | | 0.715 | |
| **FDI outward stock:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.271 | *** | -0.397 | *** | -0.249 | *** | -0.276 | *** | -0.328 | *** | -0.257 | *** |
| | (0.034) | | (0.036) | | (0.042) | | (0.040) | | (0.042) | | (0.042) | |
| $\boldsymbol{G_d * G_h}$ | **0.184** | *** | **-0.126** | *** | **0.151** | *** | **0.138** | *** | **0.027** | | **0.103** | *** |
| | **(0.034)** | | **(0.040)** | | **(0.046)** | | **(0.053)** | | **(0.044)** | | **(0.032)** | |
| # Observations | 23323 | | 23312 | | 23323 | | 23323 | | 23323 | | 23323 | |
| $R^2$ | 0.721 | | 0.720 | | 0.720 | | 0.720 | | 0.719 | | 0.720 | |
| **FDI inward flow:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.213 | *** | -0.280 | *** | -0.146 | *** | -0.179 | *** | -0.228 | *** | -0.187 | *** |
| | (0.029) | | (0.030) | | (0.035) | | (0.034) | | (0.036) | | (0.035) | |
| $\boldsymbol{G_d * G_h}$ | **0.195** | *** | **0.024** | | **0.222** | *** | **0.202** | *** | **0.087** | ** | **0.118** | *** |
| | **(0.029)** | | **(0.033)** | | **(0.038)** | | **(0.045)** | | **(0.037)** | | **(0.028)** | |
| # Observations | 19905 | | 19894 | | 19898 | | 19898 | | 19905 | | 19898 | |
| $R^2$ | 0.643 | | 0.640 | | 0.642 | | 0.642 | | 0.641 | | 0.641 | |
| **FDI outward flow:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.223 | *** | -0.313 | *** | -0.197 | *** | -0.226 | *** | -0.271 | *** | -0.233 | *** |
| | (0.033) | | (0.034) | | (0.039) | | (0.037) | | (0.040) | | (0.040) | |
| $\boldsymbol{G_d * G_h}$ | **0.173** | *** | **-0.048** | | **0.158** | *** | **0.135** | *** | **0.036** | | **0.071** | ** |
| | **(0.033)** | | **(0.037)** | | **(0.041)** | | **(0.049)** | | **(0.039)** | | **(0.030)** | |
| # Observations | 16681 | | 16675 | | 16680 | | 16680 | | 16681 | | 16680 | |
| $R^2$ | 0.661 | | 0.659 | | 0.659 | | 0.659 | | 0.659 | | 0.659 | |
| Controls: | | | | | | | | | | | | |
| Home Country * Year FE | Y | | Y | | Y | | Y | | Y | | Y | |
| Destination Country * Year FE | Y | | Y | | Y | | Y | | Y | | Y | |

Note: See the note of Table 1. Coefficient estimates for the remaining regressors are omitted in the table.

Table 4: Zero augmented bilateral FDI—all stocks and flows

| | VA | | PV | | GE | | RQ | | RL | | CC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FDI inward stock:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.126 | *** | -0.254 | *** | -0.053 | | -0.029 | | -0.056 | | -0.106 | ** |
| | (0.042) | | (0.042) | | (0.048) | | (0.048) | | (0.049) | | (0.047) | |
| $G_d$ | -0.095 | | 0.355 | *** | 0.161 | * | 0.287 | *** | 0.059 | | 0.156 | ** |
| | (0.073) | | (0.069) | | (0.092) | | (0.105) | | (0.087) | | (0.077) | |
| $G_h$ | -0.268 | *** | -0.009 | | 0.068 | | -0.244 | *** | 0.160 | ** | 0.225 | *** |
| | (0.066) | | (0.066) | | (0.081) | | (0.091) | | (0.080) | | (0.068) | |
| $\boldsymbol{G_d * G_h}$ | **0.554** | *** | **0.178** | *** | **0.521** | *** | **0.641** | *** | **0.511** | *** | **0.366** | *** |
| | **(0.047)** | | **(0.058)** | | **(0.059)** | | **(0.071)** | | **(0.059)** | | **(0.044)** | |
| # Observations | 36587 | | 36483 | | 36567 | | 36567 | | 36587 | | 36567 | |
| # Zeroes | 11613 | | 11524 | | 11597 | | 11597 | | 11613 | | 11597 | |
| **FDI outward stock:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.135 | *** | -0.270 | *** | -0.101 | ** | -0.099 | * | -0.122 | ** | -0.125 | ** |
| | (0.047) | | (0.046) | | (0.051) | | (0.053) | | (0.053) | | (0.051) | |
| $G_h$ | -0.258 | *** | 0.293 | *** | 0.626 | *** | -0.007 | | 0.654 | *** | 0.690 | *** |
| | (0.073) | | (0.071) | | (0.092) | | (0.107) | | (0.090) | | (0.075) | |
| $G_d$ | -0.039 | | -0.029 | | -0.159 | | 0.159 | | -0.190 | ** | -0.156 | * |
| | (0.075) | | (0.074) | | (0.099) | | (0.113) | | (0.092) | | (0.080) | |
| $\boldsymbol{G_d * G_h}$ | **0.514** | *** | **0.121** | ** | **0.442** | *** | **0.502** | *** | **0.393** | *** | **0.354** | *** |
| | **(0.049)** | | **(0.061)** | | **(0.062)** | | **(0.077)** | | **(0.062)** | | **(0.046)** | |
| # Observations | 35225 | | 35134 | | 35225 | | 35225 | | 35225 | | 35225 | |
| # Zeros | 12432 | | 12352 | | 12432 | | 12432 | | 12432 | | 12432 | |
| **FDI inward flow:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | 0.006 | | -0.078 | ** | 0.108 | ** | 0.102 | ** | 0.029 | | 0.023 | |
| | (0.037) | | (0.037) | | (0.043) | | (0.043) | | (0.044) | | (0.042) | |
| $G_d$ | -0.204 | *** | 0.396 | *** | -0.286 | *** | 0.000 | | -0.198 | ** | -0.055 | |
| | (0.069) | | (0.062) | | (0.086) | | (0.097) | | (0.081) | | (0.072) | |
| $G_h$ | 0.031 | | 0.108 | * | 0.242 | *** | 0.020 | | 0.390 | *** | 0.310 | *** |
| | (0.062) | | (0.060) | | (0.073) | | (0.084) | | (0.073) | | (0.060) | |
| $\boldsymbol{G_d * G_h}$ | **0.472** | *** | **0.204** | *** | **0.530** | *** | **0.610** | *** | **0.366** | *** | **0.324** | *** |
| | **(0.044)** | | **(0.052)** | | **(0.055)** | | **(0.067)** | | **(0.055)** | | **(0.042)** | |
| # Observations | 36340 | | 36236 | | 36315 | | 36315 | | 36340 | | 36315 | |
| # Zeros | 16926 | | 16833 | | 16908 | | 16908 | | 16926 | | 16908 | |
| **FDI outward flow:** | | | | | | | | | | | | |
| $\lvert\ln(gdppc_d) - \ln(gdppc_h)\rvert$ | -0.056 | | -0.186 | *** | 0.036 | | -0.009 | | -0.046 | | -0.027 | |
| | (0.042) | | (0.042) | | (0.047) | | (0.048) | | (0.049) | | (0.047) | |
| $G_h$ | -0.206 | *** | 0.253 | *** | 0.327 | *** | -0.028 | | 0.481 | *** | 0.430 | *** |
| | (0.069) | | (0.067) | | (0.080) | | (0.093) | | (0.082) | | (0.066) | |
| $G_d$ | -0.061 | | 0.096 | | -0.374 | *** | -0.022 | | -0.200 | ** | -0.197 | ** |
| | (0.072) | | (0.068) | | (0.091) | | (0.106) | | (0.083) | | (0.076) | |
| $\boldsymbol{G_d * G_h}$ | **0.547** | *** | **0.144** | ** | **0.555** | *** | **0.546** | *** | **0.394** | *** | **0.383** | *** |
| | **(0.046)** | | **(0.058)** | | **(0.056)** | | **(0.071)** | | **(0.058)** | | **(0.044)** | |
| # Observations | 32913 | | 32832 | | 32900 | | 32900 | | 32913 | | 32900 | |
| # Zeros | 16608 | | 16533 | | 16596 | | 16596 | | 16608 | | 16596 | |

Note: See the note of Table 1. Coefficient estimates for the remaining regressors are omitted in the table.