d·i·e

Years | 1964 – 2014

Deutsches Institut für
Entwicklungspolitik

German Development
Institute

Discussion Paper 37/2014

Do Preferential Trade Agreements Increase Their Members' Foreign Direct Investment?

Max Büge

Do preferential trade agreements increase their members' foreign direct investment?

Max Büge

Bonn 2014

Discussion Paper / Deutsches Institut für Entwicklungspolitik
ISSN 1860-0441

Die deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über http://dnb.d-nb.de abrufbar.

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available at http://dnb.d-nb.de.

ISBN 978-3-88985-655-5

Dr Max Büge, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Advisor, and German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), Associate Researcher

E-mail: max.buege@die-gdi.de

Tulpenfeld 6, 53113 Bonn
☎ +49 (0)228 94927-0
🖷 +49 (0)228 94927-130
E-Mail: die@die-gdi.de
www.die-gdi.de

Acknowledgements

This paper is the second chapter of the PhD thesis "Three essays on institutions and international economic relations" at Sciences Po Paris. Research support from the German National Academic Foundation, Sciences Po's Groupe d'Economie Mondiale, Princeton University's Woodrow Wilson School and Harvard University's Weatherhead Center for International Affairs is gratefully acknowledged. The author wishes to thank Axel Berger, Dominique Bruhn and Armin von Schiller for helpful comments. The opinions expressed in this article are those of the author and do not reflect in any way those of the institutions to which he is affiliated.

Bonn, September 2014 Max Büge

Abstract

The mushrooming of preferential trade agreements (PTAs) has represented a puzzle in international economics and international relations since the mid-1990s. A possible explanation is that PTAs are not so much about trade *per se*, but that PTAs are a strategic instrument in the international competition for foreign direct investment (FDI). The objective of this paper is to test for the hypothesis that a PTA increases bilateral FDI. The estimator builds upon recent theoretical work on the determinants for FDI that – similar to gravity models in international trade – takes multilateral resistance into account. Since PTA formation is not an exogenous predictor variable, I apply estimation techniques that are borrowed from microeconometrics in order to control for endogeneity. I find that a PTA has a strong and robust average treatment effect on FDI (for developed and developing countries). Furthermore, I control for the average treatment effect of bilateral investment treaties (BITs) and find a clear pattern: BITs between a developed and a developing country increase FDI from the former to the latter, controlling for reverse causality. By contrast, the econometric results suggest no robust average treatment effect of BITs between developed countries on their bilateral FDI. But it appears that pairs of high income countries with high levels of FDI in the first place are less likely to conclude BITs.

JEL codes: F23; F36; F53; F55
Keywords: FDI, preferential trade agreements, gravity model

Contents

Figures

Tables

Tables in the Appendix

Abbreviations

AFTA	ASEAN Free Trade Area
Andean Comm.	Andean Community
ATE	Average treatment effect
BIT	Bilateral investment treaty
CAFTA	Central America Free Trade Agreement
CARICOM	Caribbean Community
CEEC	Central and Eastern European country
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
COMESA	Common Market for Eastern and Southern Africa
CU	Customs union
CUSFTA	Canada-US Free Trade Agreement
EC	European Communities
EMFTAs	Euro-Med Free Trade Agreements
Eth. lang.	Ethnical language
EU	European Union
FDI	Foreign direct investment
FTA	Free trade agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
HAC	Heteroskedasticity and autocorrelation consistent
km	Kilometre
IPR	Intellectual property rights
IV	Instrumental variable
MERCOSUR	Mercado Común del Sur (Common Market of the South)
MFN	Most favoured nation
MLI	Member Liberalization Index
NAFTA	North American Free Trade Agreement
Obs.	Observations
OECD	Organisation for Economic Co-operation and Development
Off. lang.	Official language
OLS	Ordinary least squares
PTA	Preferential trade agreement
R&D	Research and development
SADC	Southern African Development Community
Std. Dev.	Standard deviation
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
US	United States
USD	United States dollars
WTO	World Trade Organization

"International Institutions (…) make commitments to liberal economic policies more credible and consequently reassure foreign investors…"
Büthe / Milner (2008, 758)

1 Introduction

The phenomenon of the exponentially growing number of preferential trade agreements (PTAs)[1] is known as 'regionalism'[2] and has for two decades represented an ongoing social scientific puzzle for scholars in international economics, international relations and international law. An element of this puzzle is that recent trade agreements often, and paradoxically, seem to be not much about trade. Until lately, the empirical literature in trade economics could provide only little sound and robust empirical evidence on the average treatment effect of PTAs on dyadic trade (Ghosh / Yamarik 2004). By today though, the question of whether PTAs increase bilateral trade can be unequivocally and positively answered (Baier / Bergstrand 2007; Eicher / Henn 2011). However, trade concessions in these agreements are often minimal: Less than 50% of all trade flows between members of a PTA are truly 'preferential', once the costs of relevant rules of origin are accounted for (Medvedev 2006a). A complementary explanation for the spread of PTAs is that countries use regionalism as an instrument to compete for foreign direct investment (FDI) (Ethier 1998; Büthe / Milner 2008).

International trade agreements are nothing genuinely new. The world had seen a first wave of regionalism in the aftermath of the Anglo-French Free Trade Treaty signed in 1860.[3] However, the spread of PTAs during the last two decades is unprecedented in history. In fact, more than three-quarters of the existing PTAs were signed after 1990 (Medvedev 2006b). By today, 585 PTAs for trade in goods or services have been notified to the WTO, of which most are free trade areas and less than 10% are customs unions (WTO 2011; WTO 2014). This new regionalism coincides with another trend in the international economic arena: the boost of FDI. FDI has grown by a significant rate since the 1980s. Average growth rates of FDI flows amounted to 32% in the second half of the 1990s, and this number is all the more impressive when compared to the 1.5% annual increase in exports or the mere 0.6% annual growth in world GDP during the same period (Markusen 2002; Blonigen et al. 2007). Of particular relevance is FDI for developing countries, where foreign investment is not only one of the most stable components of capital flows, but also a significant driver of technology and knowledge transfer (Bénassy-Quéré / Coupet / Mayer 2007).

---

1 The term 'preferential trade agreement' refers to bi- or minilateral free trade agreements (FTAs), customs unions (CU) and common markets. An FTA foresees a bi- or minilateral reduction of trade barriers. A CU has, in addition to an FTA, a common external tariff. Common markets allow, additionally to CUs, free movements of internal factors between their member states.

2 The term 'regionalism' refers to the formal process of intergovernmental collaboration between at least two states which do not necessarily have to be in the same geographical region. By contrast, the term 'regionalisation' refers to an increasing political or economic interdependence within a specific geographical area.

3 From 1860 onwards, France signed 25 PTAs and Great Britain more than 40. However, this first wave of regionalism was not to survive the protectionism of the late 19th century (Cadot / de Melo / Olarreaga forthcoming).

The synchrony of both trends – new regionalism and FDI – caused a number of authors to raise the question of whether there is causality beyond correlation and to argue that PTAs are political-economy instruments, established in order to increase FDI (e.g. Ethier 1998; Baltagi / Egger / Pfaffermayr 2008; Dee / Gali 2005; Yeyati / Stein / Daude 2003; Medvedev 2006b; Büthe / Milner 2008; Büthe / Milner 2010). Yet, until recently the absence of a theoretically grounded gravity estimator for international investment represented a difficulty in assessing quantitative estimates on the average treatment effect of a PTA on bilateral FDI between its members. Building on recent micro-theoretical insights on the determinants for bilateral FDI in a multi-country world (Head / Ries 2008; Bergstrand / Egger 2007; Kleinert / Toubal 2010), I test the hypothesis that a PTA partnership increases dyadic FDI. In order to take potential endogeneity between PTA membership and FDI into account, I use estimation techniques that are borrowed from microeconometrics and that were proposed by Baier / Bergstrand (2007) for the estimation of the PTA effects on trade. I use a panel with 30 OECD source countries and 95 OECD and non-OECD destination countries for the period 1993-2006 and find that a PTA membership has a strong and robust average treatment effect on FDI. In quantitative terms, it increases bilateral FDI stocks by approximately 170% over ten years.

A companion effect, which results from the fact that I control for bilateral investment treaties (BITs), is that this paper represents to the best of my knowledge the first analysis of the average treatment effect of BITs on bilateral FDI, controlling for spatial effects. I find a pattern that is very different for BITs between a developed and a developing country on the one side, and between two developed countries on the other side. The gravity estimation results suggest that the implementation of a BIT between an OECD member and a non-OECD member has a strong and statistically significant average treatment effect, which corresponds to a 130% increase in bilateral FDI stocks. By contrast, a bilateral investment treaty between two OECD countries has, according to my findings, no robust FDI effect, but appears to be (significantly) associated with relatively low dyadic FDI-levels in the first place.

The remainder of this paper is as follows: In Section 2, potential causal channels between membership in a preferential trade agreement and foreign direct investment, as well as the results of previous empirical analyses, are presented. Section 3 sets out the estimator while Section 4 describes the data used. Different atheoretical and theory-motivated estimation techniques and their respective results are presented for reasons of comparison in Section 5; and the final results are given in Sub-section 5.7. Section 6 concludes.

2 Preferential trade agreements (PTAs) and foreign direct investment (FDI)

2.1 Trade and investment

The early theoretical literature on the activity of multinational enterprises has provided influential two-country general equilibrium models on ‘horizontal’ or ‘vertical’ FDI. Horizontal FDI is motivated by a trade-off between the concentration of production and trade costs. When a market is characterised by substantial barriers to trade – but also by market size that allows for the exploitation of economies of scale and low fixed costs to establish a subsidiary – a foreign firm has incentives to set up a plant in this market in order to serve it. This ‘tariff-jumping’ investment is a substitute for trade (Markusen 1984;

Brainard 1997; Markusen / Venables 1998; 2000; Egger / Pfaffermayr 2000). Historically, high tariff rates are reported for having induced important investment volumes into the United Kingdom, Canada or Australia, and this horizontal FDI is reported to have substantially contributed to the industrial development of the latter two countries (Dunning 1958; Horst 1972; Brash 1996; Caves 1996).

Vertical FDI, by contrast, is explained by cross-country differences in relative factor endowment and the resulting factor price differentials. Multinational firm activity is then determined by the search for the most cost efficient factor inputs and characterised by the fragmentation of the different steps of production. In this framework, the headquarters' services are located in a (skilled-labour abundant) home country. The production is delocalised to a (unskilled labour-abundant) foreign country, which re-exports the final or intermediate goods to the first country (Helpman 1984; Grossman / Helpman 1991). In the vertical perspective, trade and investment are seen as complementary.

The expected effect of a PTA on FDI is, by consequence, very different when considered from the horizontal or the vertical point of view. From the horizontal perspective, a PTA is likely to reduce bilateral FDI. This is because trade becomes less costly and the relative costs of setting up and operating a foreign plant increase. From the vertical perspective, a growth in trade caused by a PTA is expected to be accompanied by an increase in FDI, given the interconnectedness of both. Other 2×2×2 general equilibrium models bring the horizontal and the vertical dimension together in a 'knowledge-capital' setting, which makes possible PTA effects less clear-cut (Carr / Markusen / Maskus 2001; Markusen 2002; Markusen / Maskus 2001; Markusen / Venables 2000).[4]

A restrictiveness of this seminal literature on FDI is the absence of multilateral FDI decision-making and *N*-country (*N*>2) models (Blonigen et al. 2007). Different empirical and theoretical studies address this shortcoming and go beyond the traditional two-country framework by focusing on the spatial interdependence of FDI. Export-platform models incorporate the potentiality that investment and production take place in a host country (the 'export-platform') in order to serve the market of a third country, rather than the parent country (Ekholm / Forslid / Markusen 2003; Bergstrand / Egger 2004; Yeaple 2003). A number of studies demonstrate that these models provide an explanation for, *inter alia*, the FDI booms in Ireland after the country's accession to the European Communities in 1973 and the development of the Single European Market in 1992 (Barry 2004) or the increase of US-based multinational firms' activities in Mexico and Canada after the establishment of the North American Free Trade Agreement (NAFTA) (Hanson / Mataloni Jr. / Slaughter 2001). Discrete choice models such as those of Head, Ries and Swenson (1995) or Head and Mayer (2004) take agglomeration effects into account. They find that Japanese FDI location in the United States and in Europe, respectively, depend not only on the host's GDP, but also on the GDP (weighted for distance and trade frictions) of adjacent states or countries. Similarly, Coughlin and Segev (2000) propose a spatial econometric analysis on agglomeration effects of US-FDI across different Chinese provinces, and the authors find a positive endogenous spatial lag of FDI. Models of complex spatial FDI go beyond the remoteness or agglomeration effects that are caused by

4 These models predict that foreign affiliates' sales replace trade in a pair of countries with the same relative and absolute factor endowments. It is noteworthy, however, that this prediction is contrasted by the fact that the United States and the European Union have, both, the largest bilateral intra-industry trade flows and the largest intra-industry foreign direct investment flows (Bergstrand / Egger 2007, 778).

third countries (Blonigen et al. 2007; Baltagi / Egger / Pfaffermayr 2005; Bergstrand / Egger 2007; Baltagi / Egger / Pfaffermayr 2008): Bilateral FDI is, so the argument, always affected by third countries via their weight in worldwide demand or supply and general equilibrium effects on product and factor prices. From an econometric perspective, this spatial interdependence of FDI necessitates including multilateral resistance in estimators for aggregate FDI, similar to the standard gravity model of international trade (Anderson / van Wincoop 2003). Head and Ries (2008) or Kleinert and Toubal (2010) propose such gravity models for FDI, which are displayed in a more detailed way in Section 3. The spatial interdependence models make the potential FDI effects of PTAs more complex than simple form models. PTAs possibly affect bilateral FDI between the partners of an agreement, but also FDI with third countries. A PTA between country i and country j plausibly increases the incentives for firms in country ℓ to invest in one of the two countries, since the PTA allows access to both markets. On the other hand, a given firm in country ℓ that owns production facilities in both countries prior to the agreement might, once the agreement enters into force, reduce activity in one host country in order to concentrate facilities with increasing economies of scale in the other host country. Further, bilateral FDI from country i to country j is likely to depend not only on the PTA between both partners, but also on additional agreements that each country signs independently with third countries. Arguably, the volume of bilateral FDI can be assumed to decrease when, *ceteris paribus*, the number of a country i's agreements increases, because its firms' headquarters have a broader set of destinations with preferential access to choose from. By contrast, when country j concludes additional PTAs, and thereby gains access to consumers in third-country markets, investors from country i have an incentive to serve the extended market via country j. On the other side, the bid-competition for targets in country j can be exacerbated with the entry of investors from country ℓ. By consequence, models on spatial FDI bring forward an important element into the possible interconnectedness of regionalism and international investment: strategic interaction. When the FDI vector is not only a function of the source and host countries' characteristics, but also of multilateral resistance, PTA formation represents a strategic instrument in the international competition for spatial FDI.

2.2 Deep integration provisions

A potential channel for the FDI effects of PTAs, which is beyond the trade-investment nexus, is provided by 'deep integration' provisions within the agreement. Deep integration or 'trade +' provisions are a common characteristic of agreements in the context of the new regionalism and can broadly be defined as contractual elements that go beyond the bilateral reduction of tariffs (Panagariya 1999). They may comprise investment, services, or intellectual property rights (IPR) provisions or clauses on the regulation of standards and domestic competition, as well as the establishment of a dispute settlement mechanism. An example of such a deep integration agreement is the first preferential trade agreement that Japan concluded: the Japan-Singapore Economic Agreement, which was signed in 2002 (Dee / Gali 2005, 4). Both partner countries had already low or zero tariffs on most industrial goods before entering into the agreement. Furthermore, sensitive products such as cut flowers, agricultural products, and a number of petrochemical and petroleum goods are excluded from the treaty. Instead, the agreement emphasises deep integration provisions, which include foreign direct investment, e-commerce, and services provisions as well as a dispute settlement mechanism. Medvedev (2006b) provides an overview on deep integration provisions in a number of selected PTAs (Table 1). The most evident contractual mechanism to increase FDI via a PTA is represented by investment provisions. Investment provisions can take a variety of forms, but the most common are most favoured nation (MFN) and national treatment clauses. MFN clauses extend a reduction of barriers on productive capital towards investors from a third country to the PTA-partner. National treatment clauses put investors from the PTA-partner on par with domestic investors. In this regard, a PTA that comprises investment provisions can be understood as a legal framework with a nested bilateral investment treaty (BIT). This is particularly noteworthy since no comprehensive multilateral treaty analogous to the GATT/WTO framework for international trade exists for FDI.[5]

Table 1: 'Deep integration' provisions of various PTAs

	Invest-ment	**Services**	**Standards**	**Com-petition**	**Customs cooperation**	**IPR**	**Dispute settlement**
North-South							
US-Jordan	Yes	Yes	No	Yes	Yes	Yes	Yes
US-Chile	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US-Singapore	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US-Australia	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US-CAFTA	Yes	Yes	Yes	No	Yes	Yes	Yes
US-Morocco	Yes	Yes	Yes	No	Yes	Yes	Yes
NAFTA	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EU-South Africa	No	No	No	Yes	No	Yes	Yes
EU-Mexico	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EU-Chile	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Euro-Med	No	No	No	Yes	No	Yes	Yes
Japan-Singapore	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Canada-Chile	Yes	Yes	No	Yes	Yes	No	Yes
South-South							
MERCOSUR	Yes	Yes	Yes	Yes	Yes	No	Yes
Andean Comm.	Yes	Yes	Yes	Yes	Yes	No	Yes
CARICOM	Yes	Yes	Yes	Yes	Yes	No	Yes
AFTA	Yes	Yes	Yes	No	Yes	No	No
SADC	No	n/a	n/a	n/a	Yes	Yes	Yes
COMESA	Yes	Yes	Yes	Yes	Yes	No	Yes
Chile-Mexico	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: n/a: not available
Source: Medvedev (2006a)

Traditionally, international investors have had to rely on customary international law, embraced by the Hull Rule which states that *"no government is entitled to expropriate private property, for whatever purpose, without provision for prompt, adequate, and effective payment therefore"* (Elkins / Guzman / Simmons 2006, 3). Not only is customary

5 For an overview of trade-related investment issues that are partly covered by the WTO see: http://www.wto.org/english/tratop_e/invest_e/invest_e.htm.

international law characterised by the absence of efficient enforcement mechanisms, but the Hull Rule has also been challenged since the 1950s in both national and international fora.[6] Thus, bilateral contracts that provide a legal framework for investment regulation fill a judicial vacuum and have a dual function: They reduce risk and uncertainty from the perspective of the country of origin and serve as a device for potential host countries to credibly signal their commitment to protecting foreign investors. The demand for bilateral contracts that regulate investment is manifested in the exponentially growing number of BITs. Whereas roughly 20 treaties had been concluded per year between 1960 and the mid-1980s, more than 100 treaties were signed on average during the 1990s (Elkins / Guzman / Simmons 2006, 5). Obviously, this dynamic shares a striking resemblance with the spread of PTAs and the interconnectedness between both trends has been surprisingly under-researched (Tobin / Busch 2010).

The contractual aspect of investment provisions within a PTA is accompanied by an enforcement mechanism when the agreement contains a dispute settlement mechanism. For instance, the dispute settlement mechanism within the Canada-US Free Trade Agreement (CUSFTA) is said to have considerably strengthened the agreement's investment provisions by reducing the risk of discriminatory behaviour of the contracting parties (Blomström / Kokko 1997, 15). Yet another 'deep integration' agreement is the US-Vietnam Trade Agreement, which entered into force in December 2001. Büthe and Milner (2008) argue that a decisive aspect of the agreement was not only the liberalisation of different legal, political or bureaucratic sets of regulations, but also contractual clauses on monitoring and an enforcement mechanism for investment protection. In this regard, the authors (id., 746) quote a document of the Vietnamese government stating: "*The comprehensive set of obligations in the [treaty] was expected to stimulate not only bilateral trade between the two countries, but also to increase the attractiveness of Vietnam for U.S. and many other foreign investors*". The apparent success of this agreement with regard to FDI is not only mirrored by an increase in the average growth of investment flows from US firms with regional headquarters in Asia (27% *per annum* between 2002 and 2004, compared to 3% annually between 1996 and 2001), but also in perception surveys with US (and non-US) multinationals who quote the agreement as a major reason for their investment choice in Vietnam (id., 746).

Other contractual provisions within trade agreements that potentially augment a member country's attractiveness for foreign investors are related to services and intellectual property rights. Closely related to the investment dimension are provisions on services, since services that fall under the GATS "mode 3" typology (commercial presence abroad) typically go along with investment. For instance, under NAFTA, Mexico has eliminated discriminatory restrictions on financial services for providers who are based in the United States or Canada. As a result, Spanish or Dutch banks have also established a presence in Mexico via their US or Canadian subsidiaries (Mattoo / Fink 2002). PTA-provisions on intellectual property rights might reduce firms' reluctance to invest *"in stages of production that involve a significant transfer of proprietary knowledge, such as R&D and technology intensive manufacturing processes"* (Primo Braga / Fink 1998, 173). But empirical evidence on the causal relationship between intellectual property rights protection and FDI is not clear-cut. Lee and Mansfield (1996) use a random sample of 100

6 Elkins / Guzman / Simmons (2006) name as examples the expropriation of assets in developing countries, such as Iran (1951), Libya (1955) or Egypt (1956).

US firms in 6 manufacturing industries and data on their investment strategies in 14 countries to test for the relationship between intellectual property rights and FDI. The authors find that the perception of intellectual property rights protection is positively associated with firms' FDI activity, but they underline that the broader legal system has to be considered and that marginal changes in copyright or patent law are unlikely to contribute to an increase in FDI inflows. A similar conclusion was found by Frischtak (1993). Maskus (1998) finds that the stock of foreign assets reacts positively to the strength of patents in developing countries. Primo Braga and Fink (1998), by contrast, conduct a gravity estimation that controls for gross national product, gross national product *per capita*, average tariff rates, and gravity controls such as distance, and cannot find robust empirical evidence for a significant positive relationship.

2.3 Investment climate and domestic reform

Another potential causal link between PTAs and FDI involves the domestic political economy dimension. And, indeed, a frequent argument with reference to commercial regionalism is that strategic political choices outweigh considerations on trade liberalisation alone (Johnson 1965; Cooper / Massell 1965; Bhagwati / Panagariya (eds.) 1996). A recurring point in this regard is based upon the concept of 'time inconsistency' (Kydland / Prescott 1977), that is, governments choose international economic agreements to 'tie their hands' in intrastate policy design processes (Fernandez / Portes 1997). When reforms are linked to binding international obligations, domestic interest groups have a harder deal to reverse these reforms. Structural domestic changes are 'locked in' via the international agreement, while uncertainty concerning policy inconsistency in time is reduced (Keohane 1989; Simmons 2000a; 2000b).

A country's investment climate goes beyond purely economic aspects, such as market factors to also include political and regulatory aspects (Agarwal 1980; Medvedev 2006a). Different authors analyse the relevance of politics, policies and polities for FDI, considering aspects such as government stability and governance predictability, the risks of expropriation, domestic and external conflicts, regulatory burdens, corruption, the role of the military in domestic politics, the quality of the legal system, democratic accountability, or the efficiency of the bureaucracy. They find a direct positive link between the quality of governance infrastructure and FDI (Schneider / Frey 1985; Wei 2000a; 2000b; Asiedu 2001; Henisz 2002; Busse / Hefeker 2007; Globerman / Shapiro 2002; Bénassy-Quéré / Coupet / Mayer 2007).[7] Today's FDI is characterised by complex international production chains. This makes a direct expropriation of an asset less likely, since its sole value to the host country's government is low (Büthe / Milner 2008, 744). But FDI is, by definition, characterised by a mid- or long-term engagement of multinational firms in the host country (OECD 1999). In light of the immobility of assets, it is costly to reverse FDI decisions in the short run and investors cannot easily react to changes in regulatory and policy measures which have an adverse effect on profit margins. Domestic macro-economic and institutional reforms can result in the improvement of a country's investment climate; however they will fail to attract inward FDI when investors' uncertainty that these reforms are consistent over time and will not be negated *ex post* is

7 It is noteworthy, though, that the positive link between the quality of governance and FDI was contested in the earlier literature (e.g. Bornschier / Chase-Dunn 1985).

not reduced. Hence, the 'obsolescing bargain' problem can represent an *ex ante* reason for sub-optimal FDI allocation and Büthe and Milner (2008) argue that a membership in international trade agreements represents an instrument to overcome this dilemma:

> *…international institutions can lead to increased monitoring as well as gathering and dissemination of information about noncompliance with institutionalized commitments, which facilitates punishment by foreign governments and private actors. In addition, violating one's internationally institutionalized commitments might inflict reputational damage on a country, which adds to the long-term cost of changing policy in directions that are inconsistent with those commitments. And foreign governments and domestic political opposition can impose costs on such governments who renege on their policy commitments, and they can do so more quickly than foreign direct investors who may decide to exit or not even enter. The prospect of increased and more rapidly incurred costs reduces the time-inconsistency problem faced by host governments, making it less likely that they will renege on the commitments if they are embodied in international agreements, which in turn should make these commitments more credible* (id., 747).

In a different paper, Büthe and Milner (2010) extend their argument and interconnect the commitment mechanism effects of international agreements with the type of the domestic regime. The empirical findings of Büthe and Milner (2008; 2010), who see evidence for a positive link between the total number of a country's PTAs and its FDI inflow, are illustrated in more detail in the following section. Another early theoretical study, Ethier (1998) shares a similar focus with that of Büthe and Milner (2008; 2010), and also focuses on the nexus between the domestic political economy dimension, FDI, and strategic PTAs. Ethier's analytical starting point is the observation that the new regionalism from the 1990s onwards and its context differ qualitatively from the old regionalism of the Vinerian era in the 1950s: Since then, multilateral liberalisation has progressed, and average MFN tariffs are much lower. In 1947, the founding year of GATT, the average level of industrial tariffs imposed by developed countries was around 40%. Almost five decades and seven rounds of negotiations later it was reduced to almost 4% (Winham 2005, 103). This makes vertical investment less costly, and developing countries enter into an international competition for FDI. Ethier (1998) argues against this backdrop that a PTA with a developed country is less about trade, but rather provides developing countries with a marginal competitive advantage in attracting global FDI by signalling domestic reform and open market policies. In coherence with these arguments, Burfisher, Robinson and Thierfelder (2001) underline that NAFTA has had a major impact on the Mexican economy by serving as a credible signalling device to foreign investors during the peso crisis, indicating that the country was dedicated to reform and open market policies in the long term. Deep integration provisions, as described in the previous section, improve the investment conditions bilaterally. By contrast, when domestic reforms ameliorate a country's investment climate, the effects are not necessarily bilateral, but can be multilateral in nature when investors from third countries also interpret the conclusion of a PTA as a credible signal that the reforms will be time consistent.

2.4 Empirical analyses on the FDI effects of PTAs

To resume, the earlier literature has proposed three broad chains of causality for the impact of preferential trade agreements on international foreign direct investment: i) trade,

ii) deep integration provisions in the agreement, as well as iii) political economy aspects of domestic institutions and reform, which are locked into and signalled by the international agreement.[8] In light of the rich theoretical considerations on the potential impact of PTAs on FDI[9], it is not astonishing that a number of studies empirically analyse the interconnectedness between both.

Earlier empirical work on the FDI effects of PTAs is mainly descriptive and/or case study-based, focusing on a particular agreement, region or country. The European Union and its predecessors – the European Communities (EC) – representing the world's deepest international trading agreement, have attracted considerable attention in this regard. But no non-ambiguous and generalisable results have been identified. Whereas the accession of the United Kingdom to the European Communities in 1973 did not seem to result in considerable FDI effects, this has apparently been the case with the accession of Ireland, which took place during the same year (Blomström / Kokko 1997). One possible explanation is that the United Kingdom represented a market which was already open and had been liberalised in the decades prior to the EC membership; its competitive advantage resulting from membership was therefore relatively small compared to Ireland, which did not represent a major host for FDI before its EC accession (id.). Lim (2001, 20) describes that FDI in percent of GDP doubled in Spain after its accession to the EC in 1986 and more than doubled in the case of Portugal. Greece's accession to the EC in 1981, by contrast, did not trigger a significant increase in FDI inflow, mainly because investor confidence towards the country's macroeconomic structure remained low (Blomström / Kokko 1997). Eastern European countries, such as Hungary or Poland, have experienced considerable FDI inflows, mainly from Germany or Austria, during the post-Socialist transition period and after ratification of the Central European Free Trade Agreement in 1992 (Lim 2001). However, since these countries underwent important structural reforms at the same time, it is difficult to establish a clear causal link. The findings with respect to FDI diversion are as divided as they are with respect to FDI creation. Yannopolous (1990) examines literature that focuses on the integration process of the European Community. European integration during the 1960s and 1970s is likely to have diverted US-FDI from non-participating European countries to participating European countries; but the effects of the conclusion of the Single European Act and the formation of a European common market on US-FDI are contended (Dunning 1992; Lipsey 1991), whereas the effects on Japanese FDI are assumed to be positive and considerable (Balasubramanyam / Greenway 1992). A suggestive indicator for the diversion of European investment is the fact that intra-EC investment amounted to 30% of outward investment between 1984 and 1988, but increased to more than 60% in the five years prior to the Maastricht Treaty in 1993 (Shatz / Venables 2000; Lim 2001).

8 Potential causal mechanisms are not limited to these static effects, but can also be related to dynamic effects. For instance, Medvedev (2006a) or Blomström and Kokko (1997) discuss the possibility that a PTA increases GDP growth via one or more of the mechanisms described above and that the growth in GDP results in an increase of FDI inflows. However, I do not refer in more detail to this aspect of the literature since the dynamic aspects in the general equilibrium are beyond the scope of this paper.

9 I am not aware, though, of a paper which explicitly proposes the topsy-turvy nature of this hypothesis and theoretically considers whether an increase in bilateral FDI increases the likelihood of PTA-formation. To control for reverse causality, I test this hypothesis in the empirical Section 5 and do not find empirical evidence in this regard. By contrast, controlling for BITs, my findings suggest that BITs between OECD member states do not have a robust and statistically significant average treatment effect on bilateral FDI, but that current FDI-levels are inversely related to the future likelihood of BIT formation.

Other studies focus on the FDI effects of the new regionalism's first agreement: NAFTA. With the Canada-US Free Trade Agreement (CUSFTA), Canada and the United States had already had a common Free Trade Agreement five years before NAFTA entered into force. Blomström and Kokko (1997) emphasise that no important and consistent change in the FDI patterns between both countries took place, although the ratification of CUSFTA was accompanied by a slight increase in FDI from Europe to Canada. By contrast, the enlargement of the agreement towards the south with the establishment of NAFTA in 1994 was isochronal with a relative increase in FDI in Mexico (Graham / Wada 2000). Mexico's FDI in percent of GDP amounted to 1.2 on average in the five years prior to NAFTA and increased to 2.9% on average in the five years after the agreement entered into force (Lim 2001). FDI inflows into Mexico increased from USD 3 billion in 1989 to USD 8 billion in 1994. US FDI stocks in Mexico increased from USD 5 billion in 1987 to USD 14 billion in 1995 (Blomström / Kokko 1997, 22). It is important to note though, that this evidence is purely descriptive and might indicate a time trend alone. Furthermore, a closer look at the data reveals a less clear-cut picture: Although US foreign direct investment stocks grew in absolute terms, they decreased in relative terms. Whereas about 3% of the total US foreign direct investment was hosted by Mexico prior to NAFTA, this figure decreased to less than 2% in the year following the establishing of the agreement (id., 23). Similarly, the expectation that sectors such as the automobile industry would massively delocalise from the United States to Mexico – an argument that was repeatedly made during the pre-NAFTA debate in the United States – proved to be wrong (Burfisher / Robinson / Thierfelder 2001). In addition, it is disputed whether the absolute growth in FDI to Mexico was a result of NAFTA itself, or the preceding domestic reforms in telecommunications, transport or transportation (Blomström / Kokko 1997; Hufbauer / Schott 1993).

Case study analyses on economically smaller agreements, such as MERCOSUR or the Euro-Med Free Trade Agreements (EMFTAs), come to similarly inconclusive findings. Blomström and Kokko (1997) analyse the implementation of MERCOSUR and find that the US FDI stock in the region increased by 25% in 1995, the year the Customs Union entered into force. However, as the authors note, the region had experienced important growth rates for inward FDI before (by factor 3 for the period 1989-1993), and investment had been mainly concentrated on Argentina and Brazil. These countries have seen considerable economic reforms that are not necessarily linked to MERCOSUR membership, which makes it again difficult to establish a causal link between the PTA and FDI inflows. Blomström and Kokko argue with respect to Argentina:

> *The most important attraction for foreign investors was arguably Argentina's comprehensive privatization program, which opened several public service industries to foreign investment. Several public companies in the telecommunications and transportation sector were sold to foreign investors. Another important determinant was the country's successful macroeconomic reforms, which managed to bring down public deficits, inflation, and interest rates, and ensured the convertibility of the currency* (Blomström / Kokko 1997, 28).

Schumacher (2004) cannot find evidence that the preferential trade agreements between the European Union and a number of its southern Mediterranean neighbours in the framework of the so-called "Barcelona Process" have resulted in increased Euro-Mediterranean FDI flows. Instead, he argues (id., 14) that the agreements might have led, via the so-called 'hub-and-spokes' phenomenon, to a net decrease of European FDI stocks in the region: Since trade costs decreased with the agreement, European investors in the South Mediterranean have had an incentive to delocalise productive assets to the European Union (the hub) in order to serve all markets that the EU has preferential access to (the spokes). The hub-and-spokes phenomenon might have been further accentuated by the fact that liberalisation between the South Mediterranean countries mainly stagnated during and after the Barcelona Process.

In light of these often contradictory results from descriptive studies, Ledermann and Maloney (2003, 13) conclude that a PTA seems to be

> *… a complement, rather than a substitute, for an investment-friendly policy and institutional environment, and it cannot make up for macroeconomic instability and weak institutions. Thus, countries hoping to benefit from [PTA]-induced investment creation need to push forward with reforms*.

Blomström / Kokko (1997, 31) also comment that "*[t]he relationship between regional integration agreements and FDI is neither self-evident nor straightforward…".* In order to more precisely control for the different exogenous variables, a number of authors in recent years have started to conduct econometric tests, based on large *n* cross-country samples, on the FDI effects of PTAs. This empirical literature is briefly outlined below.

Büthe and Milner (2008) propose a research design that does not focus on dyadic FDI between two members of a common PTA but that is based, similar to the study by Neumayer and Spess (2005), on the FDI effects of bilateral investment treaties, on what Baldwin and Taglioni (2006, 1) call "potluck assumption": All nations throw capital for productive assets into a pot, and each nation draws its share out of this pot in proportion to its income and other characteristics. The regressand in the econometric framework of Büthe and Milner (2008) is a country's net flow of inward FDI as a percentage of GDP, and their baseline regressors are the log of the country's population as a measure for market size, the log of its *per capita* GDP in constant dollars as a measure for economic development, and the percentage change in the country's real GDP from the previous year as a measure for GDP growth (all lagged by one period), as well as a country fixed effect to capture other idiosyncrasies. The authors augment their baseline regression by country-specific measures for political instability, domestic political constraints, the cumulative number of bilateral investment treaties, a dummy for WTO/GATT membership and the cumulative number of the country's preferential trade agreements. The sample consists of a panel with 122 developing (non-OECD) countries with a population of more than a million for the period 1970-2000. The authors estimate that a one standard deviation rise in the cumulative number of PTAs increases inward FDI by 9% of a standard deviation in FDI. In a companion paper, Büthe and Milner (2010) build upon their earlier approach and extend it by focusing on the interaction between democracy and international institutions. Overall, they find that *"[t]rade agreements boost FDI to a statistically significant extent, and democracy reinforces this effect"* (id., 3).

A similar specification was proposed by Medvedev (2006b). His lefthand-side variable is the log of FDI inflow in country *i* at period *t*. His right-hand-side variables are a fixed effect for country *i* and a number of monadic variables for this country in period *t*: log of GDP, the trade-to-GDP ratio, the GDP growth rate, the inflation rate, the annual percentage change in the real effective exchange rate index, the log of global FDI minus country *i*'s FDI inflow, the growth rate of world GDP, the log of the sum of GDP of PTA partners (as a measure for an extended market via PTAs) and the log of average distance between the country and its PTA partners. Medvedev (2006b) applies his estimation strategy on a panel with 143 countries over the period 1980-2003 and finds that a 10% increase of an average country's extended market size can be associated with an expansion of FDI inflows by 6%. According to these estimates, the 2004 accession of Costa Rica to the Central American Free Trade Agreement (CAFTA), of which the United States is a member, should have resulted in a net increase of Costa Rica's FDI inflow by 11.6%. A Costa Rican PTA with Ecuador, by contrast would only result in an increase of net FDI inflows by 0.08%, because the extended market would be much smaller.

Because these studies do not use bilateral data, they do not distinguish between FDI from PTA partners and third countries and cannot, by consequence, answer the question which is at the heart of the paper at hand of whether, and by how much, a PTA increases bilateral FDI between its members. Probably the most often used empirical specification for determinants of bilateral FDI activity is the gravity equation (Blonigen et al. 2007). Indeed, *"the cross-country pattern of FDI is quite well approximated by the 'gravity' relationship"* (Barba Navaretti / Venables 2004, 32): Beginning with the early application of Eaton and Tamura (1994), a number of studies find that the market size of the countries of origin and destination have a positive impact on bilateral FDI, whereas the distance between both countries has a negative effect. Since then, the gravity equation has been augmented with political-economy variables, such as PTA membership (Brenton / Di Mauro / Lücke 1999; Di Mauro 2000; Baltagi / Egger / Pfaffermayr 2008; Yeyati / Stein / Daude 2003; Dee / Gali 2005), and the results of this gravity literature are briefly outlined below.

Brenton, Di Mauro and Lücke (1999) use a gravity model that controls for distance, host country income and population to test for the FDI effect of the economic integration between the EU and the Central and Eastern European countries (CEECs). The authors cannot find any important FDI effects of regionalism. Using the same sample, Di Mauro (2000) proposes a different gravity specification that controls for aggregate GDP of a dyad as well as measures for relative size and relative endowments, the remoteness adjusted relative distance between both countries, a source country fixed effect and measures for tariffs, non-tariff barriers, exchange rate stability and the degree of competitiveness in the destination country. The author does not find a link between the tariff rate and FDI, but between the level of non-tariff barriers and FDI: her results suggest that a PTA which decreases non-tariff barriers and, by consequence, leads to an increase in trade by 10% can be associated with a 10% increase in FDI.

Baltagi, Egger and Pfaffermayr (2008) apply spatial HAC (heteroskedasticity and autocorrelation consistent) estimation techniques to test for the impact of the Europe Agreements on FDI between the member countries of the EU and the CEECs between 1989 and 2001. Their approach allows for two sorts of spatial interaction (id., 196). First, they build upon a three-factor knowledge-capital model with spatially weighted predictors that reflect third-country size and relative factor endowment. Second, they take regional interdependencies of stochastic shocks between FDI destination countries into account by allowing for spatially correlated disturbances. Overall, they find that the direct effects of the Europe Agreements on FDI to Central and Eastern Europe from Western European home countries are in a much higher magnitude than estimated by Di Mauro (2000). According to their estimates, the effect of the Europe Agreements ranges from 120% to 135%, depending on the year and the countries involved. Furthermore, they find empirical evidence for investment diversion in the range of -2% to -9% for the Western European and non-participating Central and Eastern European countries. Whereas the former results are large in terms of percentage but small in absolute results, the latter are small in relative, but large in absolute terms. The authors conclude:

> *Altogether, the estimation results point to a relocation of FDI from Western European host countries flowing from the Europe Agreements. This is consistent with the prevalence of export-platform FDI, where foreign subsidiaries are located in host markets from which large consumer bases can be served cheaply* (Baltagi / Egger / Pfaffermayr 2008, 202).

Yeyati, Stein and Daude (2003) use a sample of 20 OECD parent countries and 60 OECD and non-OECD host countries. Their dependent variable is bilateral FDI outward stocks. The regressors in their baseline estimation are measures for the host source countries' GDP, a dummy that equals 1 if both countries have a common PTA, a variable for the extended market of both the host country and the source country (measured by the log of the joint GDP of all of their respective PTA-partners), a country pair fixed effect and a time dummy. Later they drop the country pair fixed effect and include (time invariant) country fixed effects and dyadic variables for a common language, a common border or a common colonial history. According to their baseline result, a common PTA can be associated with a bilateral FDI increase of 90%. As one example, the authors estimate that Mexico's accession to NAFTA and the extension of its market access that goes along with it could be associated with an increase of its FDI from non-NAFTA members by approximately 100%.

Dee and Gali (2005) apply a different regression strategy for a panel with 77 countries, for the period 1988-1997. They conduct Tobit maximum likelihood estimations and their equation's right-hand-side contains a number of dyadic variables. These include distance, the sum of both countries' GDPs, the sum of absolute differences in GDP *per capita*, a dummy for a common border, a common currency, a common language and a common bilateral investment treaty as well as monadic variables that indicate landlockedness or whether the country is an island. They include source and host country fixed effects in their estimations. Instead of using an indicator variable for PTA membership, the authors use data for a range of different agreements that stem from the Member Liberalization Index (MLI) and apply it in a threefold way: A first variable indicates the MLI between country *i* and country *j*, a second variable indicates the MLI for country *i* only, and a third the MLI for country *j* only. The results are not clear without ambiguity and the coefficients for all three variables range according to the agreement from 'negative and not statistically significant' to 'positive and not statistically significant', and from 'negative and statistically significant' to 'positive and statistically significant', and sometimes variables are dropped because of collinearity. In order to interpret these results, it is noteworthy that the simultaneous inclusion of non-exogenous monadic variables and country fixed effects can lead to spurious results given the possible collinearity between both (Wooldridge 2002).

The gravity analyses above have in common that, throughout the different estimations, they do not address either, or both, of the following two considerations: The first consideration is the aspect of endogeneity, or as Robert Lawrence has put it (1998, 59): *"The issue of exogeneity may also be an important problem when dummy variables are used to estimate the effects of free trade areas. Free trade areas may well be an endogenous variable…"*. The estimates on the trade effects of PTAs have long been biased, because endogeneity has not been taken sufficiently into account (Baier / Bergstrand 2007). I argue that the same applies to FDI effects. The second consideration is multilateral resistance: FDI is spatial, and bilateral FDI between country *i* and country *j* is likely to be not only a function of the (time-variant) characteristics of both countries, but also of the (time-variant) characteristics of a third country ℓ. Both aspects, endogeneity and multilateral resistance, will be dealt with, theoretically and empirically, in Sections 3 and 5, respectively.

3 Estimator

For a long time, the application of the gravity model for FDI had a serious flaw: the lack of a theoretical underpinning. Regression equations were mainly constructed *ad hoc* or in analogy with the gravity model of trade, without taking the idiosyncrasies of FDI into account. This represented, as Bergstrand and Egger (2007, 278) state, *"…a puzzle similar to the one posed 30 years ago for trade: The gravity equation explains bilateral FDI empirically quite well… but why?"*

A number of recent papers propose to answer this question and advance empirically testable frameworks for the determinants of bilateral investment. Kleinert and Toubal (2010) develop a set of three different models for FDI: Their first model uses a framework of monopolistic competition and symmetric firms. Firms can produce domestically and export to the foreign market or they can delocalise production to the latter in order to serve it. However, production requires intermediate inputs, which have to be imported from the home country and the volume of each affiliate's sales is inversely related to trade costs. Their second model – similar to the Melitz model (2003) in international trade – uses a framework of monopolistic competition with heterogeneous firms. Most productive firms enter foreign markets as multinationals, and proximity-concentration is explained by search and organisation costs that increase in distance. The third model uses a two-country factor-proportions model of fragmentation. Differences in factor endowment explain the fragmentation of production. But distance, which is associated with trade costs, makes investing abroad more costly and discourages fragmentation and affiliates' production. Head and Ries (2008 henceforth Head and Ries) propose a model where firms' headquarters compete in a market for corporate control of foreign assets. In the following, I describe their model, which provides an estimator that takes multilateral resistance into account, similar to the standard gravity model in international trade (Anderson / van Wincoop 2003).

The mechanisms of corporate control are at the heart of the Head and Ries model. Investors are heterogeneous and compete internationally for the management of corporate resources. In this competition, it is not only a firm's entrepreneurial ability which plays a role, but also frictions due to remote inspection costs which inhibit transnational ownership. When a firm invests abroad, its headquarters has to monitor the activity of its subsidiary – in analogy to the inspection game of industrial organisation. The firm's parent country is denoted by the subscript *i* whereas the host country is denoted by the subscript *j*. Inspection costs $r(D_{ij})=\delta D_{ij}$ are an increasing function of remote inspections (δ) and a vector of bilateral characteristics (D_{ij}). These characteristics are linkages that have an impact on monitoring costs. These include geography, measured in the log of distance ($\ln Dist_{ij}$); a common border ($Contiguity_{ij}$); historical and political connections, such as a former colonial relationship ($Colony_{ij}$); social and cultural aspects, such as a common official or ethnical language (*$Lang_{ij}$* or *$EthLang_{ij}$*); and other not observable bilateral characteristics that are captured by u_{ij}. When the (investment) provisions within a PTA reduce bilateral monitoring costs – for instance by reducing uncertainty, by improving judicial protection, or by reducing regulatory burdens on investment – PTA_{ij} is an element of this vector. Since bilateral investment treaties (BIT_{ij}) have been identified as drivers for FDI (Büthe / Milner 2009; Neumayer / Spess 2005) and since a large body of literature considers the effects of a common currency ($Currency_{ij}$) on bilateral economic transactions (e.g. Rose 2000; Frankel / Rose 2002; Rose / van Wincoop 2001), I control for these two variables and $D_{ij}=\{\ln Dist_{ij}, Contiguity_{ij}, Colony_{ij}, Lang_{ij}, EthLang_{ij}, PTA_{ij}, BIT_{ij}, Currency_{ij}, u_{ij}\}$. The payoff for a representative headquarters from country *i* that invests in a given target in country *j* is what Head and Ries call an *"ability versus proximity trade-off"* (p. 5) and is given by

$$\text{i)} \qquad v_{ij} = a + b - \sqrt{b}r(D_{ij})$$

where a represents value added by the headquarters and *b* represents the value added by the manager of the foreign subsidiary who has to be monitored. Head and Ries model the investment process as a stylised auction, where the firm with the highest investment pay-off *v* makes the highest bid and gains control over the subsidiary. Expected bilateral FDI stocks FDI_{ij} are a function of the aggregate asset value of investment targets AV_j in the host country, and the probability π_{ij} that a firm based in *i* takes control of a randomly drawn target in *j*:

$$\text{ii)} \qquad E[FDI_{ij}] = \pi_{ij} AV_j$$

The source country is home to m_i firm headquarters and its worldwide share of headquarters across ℓ-countries is given by $s_i^m \equiv m_i/(\sum_\ell m_\ell)$. There is variation among each headquarters in the valuation of a given investment target in the host country *j*. The heterogeneity in valuation is given by a which takes Gumbel properties with exp(-exp(-(x-μ)/σ)), where σ represents the shape parameter and μ the location parameter. The bid-competition for investing in targets in country *j* is given by $B_j \equiv \sum_\ell s_\ell^m exp\left[\frac{\mu_\ell}{\sigma} - D_{\ell j}\theta\right]$, where $\theta \equiv \delta\sqrt{b}/\sigma$ is a compound parameter that determines the FDI-impeding effect of remoteness. Overall, the probability for a country *i* headquarters to acquire control of a target in *j* is given by:

$$\text{iii)} \qquad \pi_{ij} = \frac{exp\left[\frac{\mu_i}{\sigma} + lnm_i - \left(\frac{\sqrt{b}}{\sigma}\right)r(D_{ij})\right]}{\sum_\ell exp\left[\frac{\mu_\ell}{\sigma} + lnm_\ell - \left(\frac{\sqrt{b}}{\sigma}\right)r(D_{\ell j})\right]}$$

Expected dyadic FDI stocks can then be expressed by substituting iii) into ii), which yields:

$$\text{iv)} \qquad E[FDI_{ij}] = \frac{m_i exp\left[\frac{\mu_i}{\sigma} - \left(\frac{\sqrt{b}}{\sigma}\right)r(D_{ij})\right]}{\sum_\ell m_\ell exp\left[\frac{\mu_\ell}{\sigma} - \left(\frac{\sqrt{b}}{\sigma}r(D_{\ell j})\right)\right]} AV_j$$

This can be re-arranged to:

v) $$E\left[FDI_{ij}\right] = exp\left[\frac{\mu_i}{\sigma} - D_{ij}\theta\right] s_i^m AV_j B_j^{-1}$$

Discernibly, this equation takes a form similar to the gravity model in Newtonian physics. Expected FDI grows with the size variables of the country of origin and the country of destination (s_i^m and AV_j), but is inversely related to the measures of distance. Equation iv) can be re-arranged into an expression which has a functional form comparable to the Anderson and van Wincoop (2003) gravity model in international trade:

vi) $$E\left[FDI_{ij}\right] = exp(\underbrace{\mu_i/\sigma + lns_i^m}_{Outward\,effect} + \underbrace{lnAV_j - lnB_j}_{Inward\,effect} - D_{ij}\theta)$$

This expression can be further compressed into:

vii) $$E\left[FDI_{ij}\right] = exp(\Pi_i + P_j - D_{ij}\theta)$$

Third country effects are taken into account via multilateral resistance: The outward effect $\Pi_i = \mu_i/\sigma + lns_i^m$ takes country *i*'s share of world headquarters and their mean ability into account. The inward effect $P_j = lnAV_j - lnB_j$ takes into account that the FDI stock in country *j* from country *i* does not only depend on the aggregate asset value in *j*, but also on the degree of bid competition over its assets. The higher the degree of international competition – that is, the higher the ability of competitors and the lower their monitoring costs are – the lower the share of assets controlled by headquarters from *i*. By consequence, PTA effects on expected FDI stocks are spatial. When PTAs reduce the costs of controlling remote assets, the effects on expected FDI stocks from parent country *i* to host country *j* are not limited to a PTA between both countries, but also depend on respective PTAs with third countries: Country *i*'s PTAs with third countries render the targets in *j* relatively less attractive, whereas additional PTAs of country *j* increase the bid competition over its assets, resulting in a relatively tougher auctioning process for bidders from *i*. Although it is beyond the scope of this paper to quantify the third-country effects of PTAs on FDI, multilateral resistance has to be considered in the estimation. Since the dependent variable of interest is not expected dyadic FDI stocks, but actual bilateral FDI stocks, equation vii) has to be reformulated.[10] The ratio of actual to expected FDI stocks is given by $\eta_{ij}=FDI_{ij}/E[FDI_{ij}]$ and the econometric error term is defined by $\varepsilon_{ij}=\theta_9 u_{ij}+ln\eta_{ij}$. After re-arranging, equation viii) provides the estimator in its log-linear form:

viii) $$lnFDI_{ij} = \Pi_i + P_j - \theta_1 lnDist_{ij} + \theta_2 Contiguity_{ij} + \theta_3 Colony_{ij} + \theta_4 Lang_{ij} + \theta_5 EthLang_{ij} + \theta_6 PTA_{ij} + \theta_7 BIT_{ij} + \theta_8 Currency_{ij} + \epsilon_{ij}$$

In the estimation, it has to be considered that u_{ij}, and therefore the error term ε_{ij}, is likely to be correlated with other elements of D_{ij}, in particular with the independent variable of interest in this context PTA_{ij}.

10 For a discussion of the econometric advantages of using logs instead of levels, see Mutti and Grubert (2004).

4 Data

FDI data stems from the OECD database (2010). Generally, data available on international FDI is considerably more incomplete and more highly aggregated than, for instance, data on international trade. Cross-sectional or panel data which is disaggregated into 'country-of-origin' and 'country-of-destination' is the exception rather than the norm and data which is additionally sectorally disaggregated is not available. The OECD provides data on bilateral FDI inflows and stocks and I use the unbalanced panel for the period 1993-2006. In the production process, investment stocks are used, not flows, and the dependent variable in the model I use is bilateral FDI stocks.[11] Yet another reason suggests the use of bilateral FDI stocks as a dependent variable instead of using bilateral FDI flows: there is considerable year-to-year variation in the inflow of investment for a reason that Head and Ries (2008) refer to as 'lumpiness'. That is, FDI to a given country is usually not in a continuum, but comprises a number of high value targets. For instance, Renault's USD 5.4 billion investment in Nissan in 1999 accounted for 95% of Japan's net FDI inflow over that year (Head / Ries 2008, 6). The FDI inflow a year later did not reflect these assets, whereas the FDI stock did. Since countries mainly report only non-zero stocks, I balance the panel and interpret missing values as zeros. Most of the world's countries do not have outward FDI stock in most of the other countries. By consequence, any cross-country investment matrix is characterised by a considerable amount of zeros, and the same is true for the balanced OECD sample I have at my disposal: 67% of the sample is represented by country pairs with an outward FDI stock of zero. A negative stock in country j from country i is mirrored as a positive stock in country i from country j. If this approach results in two different values, I follow Head, Mayer and Ries (2010) methodologically and use the higher value. The OECD sample contains data on FDI from some OECD source countries to other OECD and a number of non-OECD host countries. Hence, a shortcoming of this data is that it does not contain information on bilateral FDI between developing countries.

The 30 source countries are:

Australia, Austria, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

The 95 destination countries or territories are:

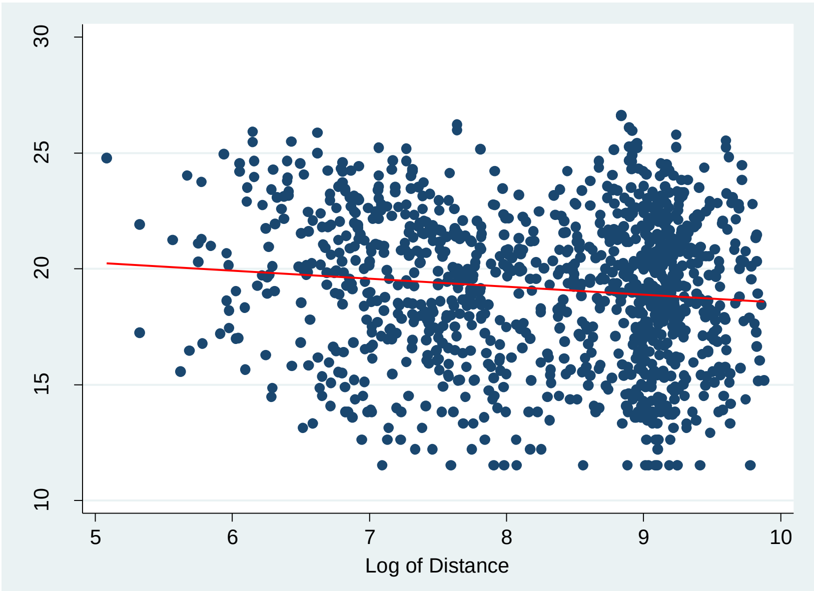
Algeria, Angola, Argentina, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Croatia, the Czech Republic, Denmark, the Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gabon, Germany, Ghana, Greece, Guatemala, Hong Kong, Hungary, Iceland, India, Indonesia, the Islamic Republic of Iran, Ireland, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Latvia, Lebanon, Libyan Arab Jamahiriya, Lithuania, Luxembourg, Macao, Malaysia, Mexico, Morocco, the Netherlands, New Zealand, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, the Philippines, Poland, Portugal, Romania, the Russian Federation, Senegal, Serbia,

11 A shortcoming of bilateral, country-aggregated data is, as Büthe and Milner (2008; 2009) point out, that the investment activities via a firm's subsidiaries in third countries are imprecisely measured.

Singapore, the Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, the Syrian Arab Republic, the United Republic of Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, the United Kingdom, the United States, Uruguay, Uzbekistan, Venezuela, Viet Nam, Zimbabwe.

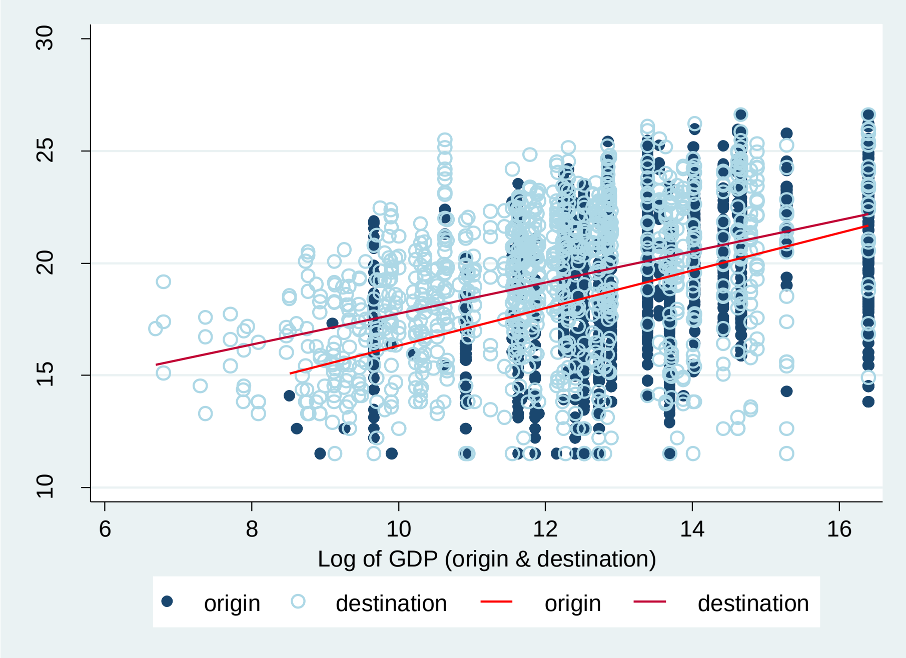
The population-weighted great circle distance between the largest cities of two countries is from the CEPII database. The correlation between the bilateral FDI stocks (2006) and the distance between the two countries is depicted in Figure 1. Data on adjacency, a colonial relationship, a common official language, and a common ethnical language is also taken from the CEPII database.

Figure 1: Log of FDI (stocks) in USD versus log of distance in km, 2006



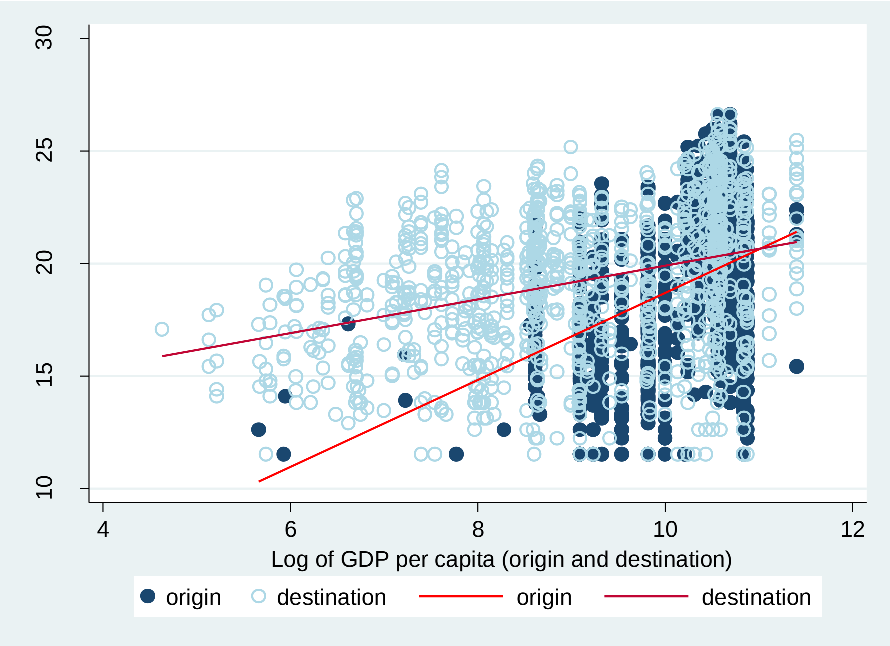
Source: Author

Figure 2: Log of FDI (stocks) versus log of GDP in USD (origin and destination), 2006



Source: Author

Figure 3: Log of FDI (stocks) versus log of GDP *per capita* in USD (origin and destination), 2006



Source: Author

Data on PTAs is constructed by Head, Mayer and Ries (2010). Data on BITs is from UNCTAD and is accessible at http://www.unctadxi.org/templates/docsearch.aspx?id=779. For illustrative purposes, the correlation between bilateral FDI and the country of origin's and destination's GDP and the correlation between bilateral FDI as well as the country of origin's and destination's GDP *per capita* are depicted in Figure 2 and Figure 3, respectively. Data on GDP and GDP *per capita* is from the World Bank indicators. All data on the right-hand-side variables, with the exception of data on BITs, has been compiled by Head, Mayer and Ries (2010) and made available at http://www.cepii.fr/anglaisgraph/bdd/gravity.htm.

5 Estimation and results

5.1 Specification of the regressand

From an econometric perspective, the large amount of zeros in the investment matrix (29,293 out of 43,474 observations) represents a challenge, since it raises the question of the specification of the regressand. The dependent variable, as set out in the estimator (equation viii), is the log of outward FDI stocks. All the observations with an outward FDI stock of zero are then dropped, since the log of zero is undefined. This restricts the sample to country pairs with positive intensive and extensive margins of FDI. Some authors (e.g. Rose 2000) use such reduced samples in the estimation of log-linearised bilateral trade data. However, this approach has the disadvantage of dropping data that contains potentially valuable information, resulting in a selection bias and, since investment matrices are generally characterised by a much higher level of zeros than trade matrices, these problems are considerably aggravated in the estimation of FDI. Santos Silva and Tenreyro (2011) argue that Jansen's inequality ($E\,ln(y) \neq ln\,E(y)$) is quantitatively and qualitatively relevant for the estimation of gravity equations and propose Poisson-MLE, which results in unbiased estimates, as an estimation technique. The approach of Santos Silva and Tenreyro (id.) is an elegant and theory-consistent way to deal with the zeros and, for instance, Head and Ries (2008) apply it in the estimation of FDI stocks. A limit to this method is, however, that it does not lend itself to estimations with large numbers of fixed effects (Yeyati / Stein / Daude 2003, 15). As outlined below, I will apply a regression strategy with a number of indicator variables in the 4-digit range, which is beyond the computational limits of the statistic program STATA for Poisson regressions (Santos Silva / Tenreyro 2011). Therefore I will adopt a transformation strategy which consists of adding a small constant α to the dependent variable. Following this transformation strategy, the dependent variable is $ln(FDI+\alpha)$ instead of $ln(FDI)$ and this approach is widely used in the literature (Bénassy-Quéré / Coupet / Mayer 2007, 769). Bénassy-Quéré, Coupet and Mayer (2007) use FDI-stocks converted to millions of US dollars and set α=0.3, which corresponds to the first decile of the distribution of positive FDI values.[12] They prefer a constant <1 in order to less compress the distribution of FDI. By contrast, Yeyati, Stein and Daude (2003) use α=1 because it allows one to set the dependent variable equal to zero when the FDI-stock equals zero with $log(1+y)=y$ at $y=0$ and argue that is represents a 'natural choice' with

12 The authors use Poisson estimations as robustness checks, but prefer the above mentioned approach in a set of IV-estimations with qualitatively similar results.

reference to this transformation strategy (id., 15) and I use the same constant. The dependent variable is thus *ln*$(FDI_{ij}+1)$ instead of *ln*(FDI_{ij}).

5.2 Multilateral resistance and endogeneity

From an econometric perspective, a first challenge in the estimation of equation viii) is that the outward and the inward effects (multilateral resistance) are unobserved. A second challenge is endogeneity: Dummy variables, which indicate membership in free-trade areas, have been used as right-hand variables for almost 50 years, when Jan Tinbergen first introduced the gravity model to international economics. But, as Baier and Bergstrand (2007, 73) note: *"In reality, FTA dummies are not exogenous random variables; rather, countries likely select endogenously into FTAs, perhaps for reasons unobservable to the econometrician and possibly correlated with the level of trade."* The potential endogeneity bias in analysing the impact of economic policies on trade has been regularly pointed of (e.g. Lawrence 1998; Baldwin / Taglioni 2006). Yet, to the best of my knowledge, Baier and Bergstrand (2007) are the first authors who explicitly address the issue of an endogeneity bias in the estimation of average treatment effects of PTAs on trade. They find that estimations, which do not account for endogeneity, systematically bias the effects of PTAs on trade and result in inconsistent coefficients. I argue that the very same problem applies in the estimation of PTA effects on FDI and I adopt in the following the approach proposed by Baier and Bergstrand (id.) in order to test for the average treatment effect of PTAs on bilateral FDI.

Two categories of endogeneity bias apply within this research context (Baier / Bergstrand 2007, 70; Wooldridge 2002): Omitted variable (and selection bias) as well as simultaneity bias.[13] The omitted variable and selection bias results from the fact that unobservable determinants for bilateral FDI u_{ij} are part of the error term ε_{ij} (equation viii). Baldwin and Taglioni (2006, 9) argue that barriers for economic exchange depend on many factors, which are unobservable to the econometrician and range *"… from personal relationships among business leaders that were developed as school children on cultural exchange programmes to convenient flight schedules."* Arguably, these determinants are not independent of the variable $PTA_{ij,}$ but also play a role in determining whether both countries enter into a bilateral agreement in the first place. Hence, the error term is correlated with the explanatory variable of interest, and the dummy variable indicating PTA-membership $PTA_{ij,}$ is not a random exogenous variable. Estimated results that do not take this form of endogeneity into account will be biased. The direction of resulting endogeneity bias depends upon the form of correlation. When the omitted variables have a positive effect on both – international exchange and the probability for selection into a bilateral agreement – the PTA coefficient will be upward biased. On the contrary, plausible considerations for a negative correlation between omitted variables and PTA selection also exist. Baier and Bergstrand (2007, 78) use as an example the existence of immeasurable domestic regulation in two

13 A third potential source for an endogeneity bias is measurement error in an independent variable (Wooldridge 2002, 73). A possibility to address this problem is the use of more precise data for the explanatory variable of interest (Baier / Bergstrand 2007, 80), but the construction of continuous data on PTA-membership for large *n* cross-country samples is an ongoing challenge in international economics and international political economy. Hence, I rely, as conventionally done, on data where PTA-membership is coded as 1 (0) in the presence (absence) of such a treaty between two countries for a given year.

countries. When this regulation represents a barrier to economic exchange, but increases the likelihood that the two countries choose to select into a bilateral agreement in order to implement and anchor reform, the correlation is negative. Hence, in this case, estimated effects of a PTA on bilateral FDI will be downward biased.

The simultaneity bias refers to the fact that not all right-hand-side variables are necessarily independent variables, but can be dependent on the regressand. Whereas distance, colonial linkages and shared languages can be considered exogenous of bilateral FDI, this is not the case for PTAs. For instance, high bilateral trade volumes might be associated with both, high bilateral FDI volumes and strong domestic export interest groups who lobby for a bilateral trade agreement with the partner country. Or, by contrast, low bilateral trade volumes might be associated with low bilateral FDI volumes and two governments decide to conclude an agreement, because their economic exchanges are below a 'natural' level.[14] Methodologically, the estimation of the partial effect of an endogenous binary regressor on a continuous endogenous regressand has been widely dealt with in the average treatment effect literature in microeconometrics.[15] A convenient method to estimate the average treatment effect is to use an exogenous instrumental variable (IV) (Wooldridge 2002, 621). A multi-step IV (instrumental variable) estimation with a valid IV delivers asymptotically efficient and consistent results with asymptotically valid 2SLS or 3SLS standard errors and test statistics (Baier / Bergstrand 2007, 82). But, as Büthe and Milner note:

> *A good instrument is often hard to find in social science analyses, since it must have two qualities: it must be a good predictor of the endogenous explanatory variable in question, PTAs, but must not be correlated with the error term and hence with the dependent variable, FDI (it should exert its effects through the endogenous variable only*) (Büthe / Milner 2008, 749–750).

Whereas the choice of a valid instrument is a sensitive challenge in econometrics in general, it seems difficult to identify an instrumental variable that represents a determinant for bilateral PTA-formation but cannot be associated with bilateral FDI, since PTA-formation can be quite well explained on economic grounds alone. Magee (2003) conducts a study where he treats both bilateral trade flows and PTAs as endogenous variables. He finds that large bilateral trade flows (which can be associated with large FDI volumes) significantly increase the likelihood that countries enter into a PTA. Baier and Bergstrand (2004) build upon a general equilibrium model with two factors of production, two monopolistically-competitive product markets and trade costs and they use a qualitative choice model to estimate the probability of a country-dyad entering into a PTA. Their results strongly suggest that PTA-formation can be well explained by gravity determinants: The smaller the geographic distance between two countries, the higher the remoteness of a dyad from other trading partners; the larger and the more homogenous both trading partners are, the greater the difference in both countries' capital-labour ratios; and the smaller a dyads' difference in capital-labour ratios with respect to the capital-labour ratio of the rest of the world is, the higher is the probability that both countries conclude a PTA. Building upon

14 The simultaneity bias is not limited to PTAs but can potentially be extended to Πi and Pj or, more precisely, to si and AVj which can be assumed to be associated with GDP-levels. However, since multilateral FDI is only a fraction of GDP, I consider the effects of bilateral FDI on Πi and Pj as negligible. Nonetheless, I control for the robustness of the final results by bringing GDP-levels on the equation's lefthand side. The results are depicted in Appendix 7.

15 For a detailed description of the statistical properties of average treatment effect (ATE) estimations, see Wooldridge 2002, Chapter 18.

these purely economic characteristics, Baier and Bergstrand (2004, 30) correctly predict 85% of the 286 PTAs that existed between 1,431 country dyads in 1996, and 97% of the remaining 1,145 dyads in their sample without PTAs. These characteristics can also be assumed to be determinants for bilateral FDI and, by consequent, an IV estimation strategy does not seem to be suitable here.[16]

5.3 Estimation strategy

Instead of an IV approach, Baier and Bergstrand (2007) propose a fixed-effect panel estimation strategy for testing the average treatment effect of PTAs on trade. Their method takes both multilateral resistance and endogeneity into account. In order to control for time variant multilateral resistance, they include – as widely applied in the gravity literature (Baldwin / Taglioni 2006) – country-year fixed effects. Omitted variables (and selection bias) caused by unobservable dyad-specific characteristics is accounted for by the inclusion of country-pair fixed effects. A robustness check controls for the simultaneity bias by regressing current FDI stocks on future levels of PTA-membership. I apply the same gravity estimation techniques and, with the objective to illustrate the different results when various specifications are applied, I conduct four series of estimations: First, 'traditional' cross-section gravity estimations that take neither endogeneity, nor multilateral resistance into account (Tables I.1-I.3). Second, cross-section estimations, which take multilateral resistance into account, but not endogeneity (Tables II.1-II.3). Third, panel estimations, which take endogeneity into account, but not multilateral resistance (Tables III.1-III.3). And finally, fourth, panel estimations, that control for multilateral resistance, omitted variable and selection bias, as well as simultaneity bias (Tables IV.1-IV.3).

It is noteworthy that the Head and Ries model (2008) does make different predictions for FDI stocks according to development levels *per se*. However, many papers that deal with FDI focus – in part for policy reasons – on developing countries only (e.g. Neumayer / Spess 2005; Büthe / Milner 2008). Similarly, Blonigen and Wang (2004) argue from an econometric perspective that there is a structural and systemic difference in FDI activity in developed and developing countries, and that the pooling of both in the empirical analysis of FDI is by consequence inappropriate. In order to take these considerations into account, I apply within each step of regression three different ways of pooling the sample: First, I test the total sample. Second, I focus on developing host countries and exclude OECD host countries from the sample. And, thirdly, I reduce the sample to OECD countries of destination and exclude observations with non-OECD host countries. As mentioned in the data section, all source countries are OECD members and it is not possible with the data I have at my disposal to test either for FDI effects between developing countries or for effects on FDI from a developing source to developed host countries.

---

16 Mansfield (1998) provides empirical evidence that the number of PTAs of country *i*'s regional neighbours is an adequate predictor for the number of PTAs of country *i*. The probability of country *i*'s neighbours concluding a PTA seems to be a weak instrument in a gravity context, though, where the concentration of economic activity can be associated with the concentration of PTA formation. Büthe and Milner (2008) use as an instrument, similar to Mansfield, Milner and Rosendorff (2002), the average probability that a country signs a PTA with all other countries in the world in the given year (p. 751). They find that this variable predicts reasonably well the number of country *i*'s PTAs, but not very well its FDI inflow. But since the authors do not use a gravity model, they focus on absolute FDI and do not test for the dependent variable of this research context, which is bilateral FDI, controlling for other gravity factors.

Each regression is conducted by including the explanatory variable of interest PTA_{ij} and is then repeated by a controlling for a bilateral investment treaty and, in the regressions that involve the total sample and the OECD member states sample, for a common currency. The only OECD/non-OECD-dyad that shares a common currency is USA-Panama and I therefore do not include the currency-variable in the estimations on the reduced non-OECD host country sample. A companion effect of this control variable approach is that this paper represents, to the best of my knowledge, the first gravity analysis on the average treatment effect of BITs on bilateral FDI.

5.4 Atheoretical cross-section gravity estimations

I begin with a first series of cross-section estimations that correspond to traditional gravity analyses and I ignore the outward and inward effects Π_i and P_j in the estimator. Instead, I include as independent variables the log of GDP_i and the log of GDP_j as measures for the economic masses of both partners. I run an OLS (ordinary least squares) regression for each of the last seven years of the panel. These estimations take neither multilateral resistance into account, nor do they control for the different aspects of endogeneity, as described above. Hence, the parameter estimates can be expected to be biased. Table I.1 shows the results for the total sample, Table I.2 shows the results for the reduced sample with non-OECD host countries and Table I.3 illustrates the results for the reduced sample with OECD host countries. The coefficients for the variable of interest PTA are highly inconsistent from year to year, throughout all sets of regressions.

In the estimations for the entire sample (Table I.1), the variable PTA is always statistically significant when tested alone, but is not significant in 2003 and 2004 when controlling for a common currency and a bilateral investment treaty (columns I.1.4b and I.1.5b). The coefficients range from 0.98 to 2.8, with an average of 1.8, when tested without the controls. According to these results, the PTA effects range from a 166% to 1,544% increase in bilateral FDI (500% on average). The adjusted R^2 always increases when the controls are included, which indicates a better fit for a model with BITs and a common currency. The coefficients range between 0.55 (≈ 70% FDI increase) and 2.7 (≈ 1,400% FDI increase), with an average of 2 (≈ 640% FDI increase).

The results vary in a similarly implausible way when the sample is reduced to non-OECD host countries (Table I.2). The coefficients for PTA_{ij} are always positive, but not statistically significant in different regressions (I.2.4a and b, I.2.5b). When significant, they range from 1.4 (≈ 300% FDI increase) to 2.2 (≈ 840% FDI increase) with an average of 1.8 (≈ 500% FDI increase). Once the controls are included, the significant coefficients range from 0.9 (≈ 150% FDI increase) to 1.9 (≈ 570% FDI increase) and their average is 1.4 (≈ 300% FDI increase).

The PTA_{ij} variable is not statistically significant in more than half of the estimations when the sample is reduced to OECD countries of destination (with sometimes negative coefficients). When the controls are excluded and the variable is significant, the smallest coefficient is 2.7 (≈1,390% FDI increase) and the highest is 3.9 (≈4,840% FDI increase), with an average of 3.4 (≈ 2,750% FDI increase). Once the controls are included, the significant coefficients range between 3.1 (≈ 2,100% FDI increase) and 4.1 (≈ 5,900% FDI increase) and their mean is 3.6 (≈ 3,560% FDI increase).

Table I.1: Traditional cross-section gravity equation coefficient estimates, 2000-2006: total sample

	I.1.1a 2000	I.1.1b 2000	I.1.2a 2001	I.1.2b 2001	I.1.3a 2002	I.1.3b 2002	I.1.4a 2003	I.1.4b 2003	I.1.5a 2004	I.1.5b 2004	I.1.6a 2005	I.1.6b 2005	I.1.7a 2006	I.1.7b 2006
Distance	-1.581*** (0.200)	-1.465*** (0.202)	-1.714*** (0.197)	-1.562*** (0.198)	-1.405*** (0.195)	-1.296*** (0.198)	-2.157*** (0.202)	-1.907*** (0.202)	-2.043*** (0.223)	-1.832*** (0.223)	-2.131*** (0.223)	-1.905*** (0.223)	-2.417*** (0.231)	-2.137*** (0.227)
GDP (host)	2.306*** (0.0826)	2.295*** (0.0839)	2.442*** (0.0798)	2.429*** (0.0813)	2.157*** (0.0816)	2.134*** (0.0829)	2.205*** (0.0779)	2.163*** (0.0791)	2.161*** (0.0785)	2.119*** (0.0799)	2.127*** (0.0815)	2.093*** (0.0833)	2.415*** (0.0780)	2.407*** (0.0781)
GDP (origin)	1.773*** (0.0755)	1.725*** (0.0773)	1.653*** (0.0752)	1.579*** (0.0774)	2.188*** (0.0769)	2.133*** (0.0788)	2.528*** (0.0784)	2.399*** (0.0813)	2.506*** (0.0812)	2.356*** (0.0842)	2.610*** (0.0811)	2.458*** (0.0847)	2.477*** (0.0847)	2.286*** (0.0875)
Contiguity	2.088** (0.947)	2.385** (0.943)	2.532*** (0.869)	2.852*** (0.853)	1.913** (0.934)	1.943** (0.947)	1.704** (0.838)	1.858** (0.832)	2.568*** (0.779)	2.638*** (0.774)	1.675** (0.731)	1.723** (0.735)	1.648** (0.721)	2.024*** (0.711)
Official language	0.127 (0.793)	0.300 (0.793)	0.912 (0.795)	1.162 (0.786)	3.141*** (0.755)	3.213*** (0.756)	-0.498 (0.769)	-0.210 (0.776)	-0.945 (0.713)	-0.675 (0.713)	2.780*** (0.756)	3.016*** (0.760)	-1.717** (0.704)	-1.062 (0.707)
Ethnical language	1.820** (0.733)	1.765** (0.730)	-0.195 (0.736)	-0.264 (0.724)	-1.139 (0.728)	-1.112 (0.728)	1.245* (0.702)	1.224* (0.702)	2.076*** (0.672)	2.106*** (0.668)	-2.174 *** (0.731)	-2.101 *** (0.736)	2.210*** (0.648)	2.059*** (0.640)
Colony	-0.295 (0.922)	-0.500 (0.931)	0.627 (0.899)	0.349 (0.914)	3.014*** (0.881)	2.920*** (0.884)	3.401*** (0.798)	3.107*** (0.814)	2.924*** (0.786)	2.624*** (0.807)	4.890*** (0.765)	4.640*** (0.772)	4.220*** (0.751)	3.642*** (0.781)
PTA	1.665*** (0.468)	1.736*** (0.474)	2.262*** (0.457)	2.330*** (0.464)	2.842*** (0.447)	2.710*** (0.453)	0.995** (0.443)	0.686 (0.447)	0.979** (0.436)	0.553 (0.437)	2.500*** (0.440)	2.105*** (0.441)	1.418*** (0.461)	1.118** (0.454)
Currency		-0.574 (1.014)		-0.503 (0.867)		1.076 (0.851)		2.128*** (0.780)		2.493*** (0.761)		2.635*** (0.618)		1.112 (0.764)
BIT		1.293*** (0.350)		1.745*** (0.340)		1.030*** (0.337)		2.494*** (0.325)		2.441*** (0.328)		2.246*** (0.327)		3.176*** (0.326)
Constant	-27.26*** (1.955)	-27.87*** (1.946)	-26.10*** (1.936)	-26.82*** (1.923)	-32.49*** (1.900)	-32.80*** (1.898)	-30.10*** (2.073)	-30.88*** (2.037)	-30.48*** (2.291)	-30.63*** (2.265)	-31.36*** (2.282)	-31.67*** (2.265)	-29.91*** (2.412)	-30.78*** (2.338)
Obs.	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,116	3,116	3,056	3,056	2,876	2,876
F-Test	275.4***	228.0***	331.0***	277.6***	378.1***	299.9***	478.5***	403.7***	455.4***	381.9***	576.7***	475.3***	579.9***	471.8***
R2	0.371	0.375	0.397	0.404	0.412	0.414	0.433	0.446	0.408	0.421	0.441	0.452	0.447	0.467
Adj. R2	0.370	0.373	0.396	0.402	0.410	0.412	0.431	0.444	0.406	0.418	0.440	0.450	0.445	0.465
Host FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Origin FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (*FDIij*+1). (Clustered) robust standard errors are in parentheses. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table I.2: Traditional cross-section gravity equation coefficient estimates, 2000-2006: reduced sample (non-OECD host countries)

	I.2.1a **2000**	**I.2.1b** **2000**	**I.2.2a** **2001**	**I.2.2b** **2001**	**I.2.3a** **2002**	**I.2.3b** **2002**	**I.2.4a** **2003**	**I.2.4b** **2003**	**I.2.5a** **2004**	**I.2.5b** **2004**	**I.2.6a** **2005**	**I.2.6b** **2005**	**I.2.7a** **2006**	**I.2.7b** **2006**
Distance	-1.484*** (0.227)	-1.182*** (0.224)	-1.649*** (0.224)	-1.311*** (0.221)	-1.064*** (0.223)	-0.759*** (0.222)	-1.823*** (0.237)	-1.476*** (0.233)	-1.596*** (0.264)	-1.294*** (0.261)	-1.776*** (0.267)	-1.370*** (0.262)	-1.867*** (0.285)	-1.327*** (0.270)
GDP (host)	2.267*** (0.121)	2.091*** (0.124)	2.475*** (0.120)	2.284*** (0.123)	2.091*** (0.124)	1.921*** (0.127)	2.209*** (0.119)	2.014*** (0.121)	2.131*** (0.118)	1.942*** (0.121)	2.220*** (0.118)	2.028*** (0.119)	2.521*** (0.119)	2.260*** (0.122)
GDP (origin)	1.512*** (0.0844)	1.316*** (0.0888)	1.324*** (0.0808)	1.081*** (0.0851)	1.942*** (0.0876)	1.712*** (0.0926)	2.383*** (0.0903)	2.108*** (0.0962)	2.399*** (0.0935)	2.086*** (0.100)	2.487*** (0.0931)	2.100*** (0.101)	2.426*** (0.102)	1.951*** (0.109)
Contiguity	2.516 (1.794)	2.222 (1.688)	4.679*** (1.502)	4.376*** (1.387)	5.723*** (1.616)	5.240*** (1.504)	6.233*** (1.499)	5.759*** (1.322)	6.711*** (1.351)	6.120*** (1.225)	6.041*** (1.403)	5.359*** (1.239)	6.190*** (1.287)	5.454*** (1.113)
Official language	-0.463 (0.871)	-0.527 (0.872)	0.370 (0.811)	0.365 (0.782)	1.607* (0.846)	1.627* (0.842)	-0.249 (0.781)	-0.0687 (0.784)	-1.705** (0.795)	-1.477* (0.797)	1.806** (0.867)	2.072** (0.876)	-2.761*** (0.825)	-2.232*** (0.819)
Ethnical language	2.023** (0.807)	2.161*** (0.812)	-0.351 (0.748)	-0.221 (0.725)	-0.300 (0.792)	-0.166 (0.808)	0.374 (0.730)	0.414 (0.741)	2.029*** (0.751)	2.115*** (0.758)	-1.569* (0.804)	-1.395* (0.838)	2.479*** (0.753)	2.461*** (0.743)
Colony	-0.636 (1.088)	-1.134 (1.098)	0.691 (1.085)	0.171 (1.101)	4.389*** (1.040)	3.893*** (1.039)	4.338*** (1.002)	3.725*** (1.011)	3.734*** (1.006)	3.008*** (1.035)	6.410*** (0.929)	5.593*** (0.935)	5.114*** (1.051)	4.071*** (1.103)
PTA	1.564** (0.679)	1.246* (0.667)	2.052*** (0.685)	1.695** (0.664)	2.240*** (0.611)	1.896*** (0.600)	0.929 (0.580)	0.405 (0.570)	1.339*** (0.512)	0.731 (0.513)	1.923*** (0.514)	1.212** (0.510)	1.675*** (0.546)	0.929* (0.531)
BIT		2.996*** (0.421)		3.399*** (0.410)		3.098*** (0.404)		3.694*** (0.399)		3.762*** (0.400)		4.299*** (0.400)		5.018*** (0.413)
Constant	-24.56*** (2.364)	-23.71*** (2.317)	-22.99*** (2.353)	-21.88*** (2.314)	-31.77*** (2.352)	-30.69*** (2.324)	-31.31*** (2.581)	-29.89*** (2.530)	-32.81*** (2.787)	-30.54*** (2.769)	-33.85*** (2.787)	-31.70*** (2.748)	-35.28*** (2.989)	-32.71*** (2.865)
Obs.	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,273	2,273	2,213	2,213	2,033	2,033
F-Test	96.7***	94.7***	102.0***	104.7***	129.9***	127.3***	185.7***	196.2***	193.5***	196.4***	221.3***	241.5***	235.2***	252.5***
R^2	0.259	0.283	0.264	0.295	0.303	0.328	0.348	0.381	0.328	0.361	0.356	0.399	0.364	0.419
Adj. R^2	0.256	0.280	0.261	0.293	0.300	0.326	0.346	0.379	0.325	0.358	0.354	0.396	0.361	0.417
Host FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Origin FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (FDI_{ij}+1). (Clustered) robust standard errors are in parentheses. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table I.3: **Traditional cross-section gravity equation coefficient estimates, 2000-2006: reduced sample (OECD host countries)**														
	I.3.1a 2000	**I.3.1b 2000**	**I.3.2a 2001**	**I.3.2b 2001**	**I.3.3a 2002**	**I.3.3b 2002**	**I.3.4a 2003**	**I.3.4b 2003**	**I.3.5a 2004**	**I.3.5b 2004**	**I.3.6a 2005**	**I.3.6b 2005**	**I.3.7a 2006**	**I.3.7b 2006**
Distance	-1.886*** (0.437)	-2.166*** (0.452)	-1.820*** (0.401)	-1.938*** (0.411)	-1.863*** (0.406)	-2.272*** (0.416)	-2.979*** (0.405)	-2.968*** (0.414)	-3.326*** (0.466)	-3.363*** (0.475)	-2.241*** (0.467)	-2.496*** (0.471)	-3.830*** (0.425)	-3.899*** (0.427)
GDP (host)	2.166*** (0.177)	2.188*** (0.175)	2.265*** (0.165)	2.304*** (0.165)	2.252*** (0.170)	2.244*** (0.170)	1.897*** (0.172)	1.877*** (0.173)	1.899*** (0.177)	1.862*** (0.180)	1.957*** (0.178)	1.937*** (0.179)	1.927*** (0.177)	1.950*** (0.178)
GDP (origin)	2.490*** (0.157)	2.499*** (0.158)	2.570*** (0.157)	2.603*** (0.158)	2.894*** (0.155)	2.830*** (0.154)	2.951*** (0.159)	2.928*** (0.162)	2.725*** (0.170)	2.668*** (0.174)	2.978*** (0.170)	2.904*** (0.172)	2.523*** (0.159)	2.543*** (0.166)
Contiguity	0.447 (1.220)	0.453 (1.212)	0.00397 (1.147)	0.104 (1.124)	-1.184 (1.209)	-1.350 (1.182)	-1.380 (0.971)	-1.443 (0.981)	-0.756 (0.936)	-0.902 (0.942)	-0.663 (0.888)	-0.897 (0.878)	-1.864** (0.840)	-1.824** (0.837)
Official language	1.286 (1.892)	1.268 (1.907)	2.015 (1.910)	2.239 (1.911)	7.470*** (1.743)	6.594*** (1.771)	-1.808 (1.723)	-1.993 (1.756)	0.726 (1.480)	0.291 (1.503)	5.836*** (1.600)	4.852*** (1.639)	0.913 (1.246)	0.915 (1.255)
Ethnical language	2.091 (1.856)	1.850 (1.872)	1.504 (1.873)	1.127 (1.878)	-3.606** (1.823)	-3.591* (1.864)	5.065*** (1.556)	5.239*** (1.575)	2.697* (1.379)	2.996** (1.389)	-4.120** (1.674)	-3.911** (1.726)	1.837 (1.138)	1.648 (1.157)
Colony	1.134 (1.652)	0.747 (1.677)	1.185 (1.524)	0.902 (1.534)	0.728 (1.640)	0.566 (1.578)	1.392 (1.246)	1.493 (1.266)	1.422 (1.210)	1.591 (1.189)	2.374* (1.259)	2.499** (1.155)	2.699*** (0.851)	2.599*** (0.834)
PTA	1.328 (0.961)	1.425 (0.971)	2.708*** (0.882)	3.107*** (0.891)	3.403*** (0.897)	3.645*** (0.906)	-0.151 (0.901)	-0.307 (0.920)	-1.539 (1.107)	-1.776 (1.134)	3.930*** (1.111)	4.122*** (1.135)	-1.214 (1.037)	-0.947 (1.052)
Currency		-2.158** (1.049)		-2.142** (0.907)		-2.006** (0.890)		0.752 (0.831)		1.010 (0.838)		-0.606 (0.659)		-1.125 (0.789)
BIT		-1.602** (0.689)		-0.784 (0.636)		-3.754*** (0.647)		-0.0299 (0.639)		-0.524 (0.655)		-3.135*** (0.628)		-0.739 (0.607)
Constant	-31.45*** (4.399)	-28.98*** (4.689)	-34.38*** (4.011)	-34.05*** (4.173)	-38.80*** (4.071)	-33.43*** (4.337)	-23.88*** (4.226)	-23.43*** (4.416)	-17.74*** (5.687)	-16.08*** (5.889)	-33.68*** (5.493)	-29.53*** (5.709)	-10.94** (5.186)	-10.73** (5.372)
Obs.	843	843	843	843	843	843	843	843	843	843	843	843	843	843
F-Test	74.6***	65.0***	86.4***	75.3***	110.6***	107.3***	110.1***	88.0***	87.2***	71.1***	92.8***	87.8***	83.4***	70.1***
R^2	0.329	0.336	0.372	0.376	0.393	0.417	0.384	0.384	0.358	0.360	0.396	0.414	0.374	0.375
Adj. R^2	0.323	0.328	0.366	0.369	0.388	0.410	0.3778	0.377	0.352	0.352	0.390	0.407	0.368	0.3680
Host FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Origin FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (FDI_{ij}+1). (Clustered) robust standard errors are in parentheses. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

5.5 Theory motivated cross-section gravity estimations

A convenient way to take the outward and inward effects Π_i and P_j (equation viii) in a cross-section estimation into account is to include fixed effects for the country of origin and the country of destination, respectively (Baldwin / Taglioni 2006). From an econometric perspective, fixed effects are preferable to random effects, since a random effects model would require zero correlation between u_{ij} and PTA_{ij}. But, because precisely such a correlation can be assumed on conceptual grounds, the fixed-effects method seems to be more suitable here. I conduct three different sets of cross-section regressions for each year in the 2000-2006 period with country *i* and country *j* specific fixed effects, first with the total sample (Table II.1), then with the non-OECD host country sub-sample (Table II.2) and finally with the OECD host country sub-sample (Table II.3). These estimations take multilateral resistance into account, which account for the effects of third country PTAs. However, this method does not address the problem of endogeneity and the coefficients can still be expected to be biased. This bias is mirrored in PTA_{ij}-coefficients, which are not statistically significant in more than one out of two estimations and which are highly inconsistent from year to year. As illustrated in Table II.1, the variable PTA_{ij} has from 2003 onwards a significance at the p>.1 level (except for column II.1.6a). Before and without the controls, its coefficients ranged from 0.97 (≈ 160% FDI increase) to 2.36 (≈ 960% FDI increase) and had an average of 1.5 (≈ 350% FDI increase). When the controls are included, the coefficients range between 1.05 (≈ 190% FDI increase) and 2.27 (≈ 870% FDI increase) and have a mean of 1.66 (≈ 430% FDI increase). The adjusted R^2 is, again, in the same magnitude or higher when the control variables for a bilateral investment treaty and a common currency are included. The changes are marginal though, which is not astonishing given the fixed effects. Similarly, the variable PTA_{ij} is only statistically significant before 2003 for the non-OECD host country sub-sample, as shown in Table II.2. When significant, the coefficients are between 1.72 (≈ 460% FDI increase) and 2.33, which corresponds to an FDI increase of ca. 930% (without controls, average: 2 ≈ 640% FDI increase) and 1.69 and 2.26 (with controls, average: 2 ≈ 640% FDI increase). The estimations with the OECD host country sub-sample result in statistically significant coefficients for only two out of the seven years (columns II.3.2a and b and II.3.7a and b). For the year 2001, the variable PTA has a coefficient of 2.3 (≈ 800% FDI increase) without the controls and 2.16 (≈ 770% FDI increase) when the controls are included. In the 2006 cross-section, the coefficients are 3.11 (≈ 2,140% FDI increase) and 3.06 (≈ 2,030% FDI increase), respectively.

Table II.1: Theory-motivated cross-section gravity equation coefficient estimates, 2000-2006: total sample

	II.1.1a 2000	**II.1.1b 2000**	**II.1.2a 2001**	**II.1.2b 2001**	**II.1.3a 2002**	**II.1.3b 2002**	**II.1.4a 2003**	**II.1.4b 2003**	**II.1.5a 2004**	**II.1.5b 2004**	**II.1.6a 2005**	**II.1.6b 2005**	**II.1.7a 2006**	**II.1.7b 2006**
Distance	-3.146*** (0.275)	-3.219*** (0.275)	-2.432*** (0.285)	-2.457*** (0.286)	-2.356*** (0.292)	-2.322*** (0.293)	-2.950*** (0.295)	-2.881*** (0.294)	-3.141*** (0.322)	-3.067*** (0.321)	-2.637*** (0.337)	-2.544*** (0.337)	-3.448*** (0.332)	-3.354*** (0.328)
Contiguity	0.224 (0.829)	0.250 (0.833)	1.469* (0.789)	1.507* (0.789)	1.323 (0.890)	1.194 (0.901)	0.457 (0.811)	0.573 (0.809)	1.475* (0.794)	1.531* (0.787)	0.943 (0.786)	0.949 (0.781)	0.141 (0.770)	0.396 (0.755)
Official language	0.681 (0.716)	0.754 (0.713)	1.357* (0.758)	1.381* (0.756)	1.654** (0.650)	1.631** (0.650)	-0.190 (0.683)	-0.252 (0.688)	0.756 (0.652)	0.693 (0.652)	1.106* (0.664)	1.051 (0.664)	0.379 (0.679)	0.386 (0.671)
Ethnical language	0.807 (0.682)	0.765 (0.679)	-0.163 (0.707)	-0.176 (0.705)	-0.474 (0.636)	-0.462 (0.636)	0.744 (0.642)	0.782 (0.643)	0.313 (0.617)	0.349 (0.615)	0.410 (0.623)	0.439 (0.621)	0.177 (0.633)	0.150 (0.624)
Colony	1.245* (0.698)	1.206* (0.702)	1.356* (0.723)	1.323* (0.724)	2.592*** (0.743)	2.685*** (0.740)	3.626*** (0.719)	3.551*** (0.728)	3.191*** (0.701)	3.150*** (0.707)	4.453*** (0.720)	4.453*** (0.723)	4.801*** (0.745)	4.632*** (0.751)
PTA	0.970* (0.545)	1.050* (0.546)	1.599*** (0.556)	1.662*** (0.558)	2.363*** (0.507)	2.273*** (0.509)	0.463 (0.516)	0.324 (0.519)	0.252 (0.639)	0.0699 (0.637)	1.038* (0.629)	0.845 (0.627)	0.782 (0.632)	0.745 (0.628)
Currency		-1.504* (0.837)		-0.834 (0.751)		1.546** (0.761)		1.018 (0.770)		1.597** (0.755)		2.123*** (0.716)		0.154 (0.760)
BIT		-0.494 (0.311)		-0.113 (0.306)		-0.103 (0.300)		1.068*** (0.299)		0.970*** (0.297)		0.941*** (0.301)		1.379*** (0.312)
Constant	33.63*** (2.843)	28.48*** (2.678)	17.96*** (2.424)	23.82*** (2.766)	17.92*** (2.577)	31.30*** (2.741)	29.30*** (2.672)	40.05*** (2.768)	24.25*** (2.937)	23.68*** (2.940)	42.69*** (3.701)	41.28*** (3.705)	43.68*** (3.001)	26.73*** (3.067)
Obs.	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,116	3,116	3,056	3,056	2,876	2,876
F-Test	62.9***	62.7***	60.8***	60.2***	72.2***	70.3***	86.4***	87.8***	85.8***	86.7***	92.0***	92.1***	87.0***	92.3***
R2	0.628	0.629	0.628	0.629	0.646	0.647	0.655	0.657	0.655	0.657	0.664	0.666	0.663	0.666
Adj. R2	0.611	0.6112	0.611	0.611	0.630	0.630	0.639	0.640	0.639	0.641	0.648	0.650	0.647	0.650
Host FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (*FDIij*+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of country fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table II.2: Theory-motivated cross-section gravity equation coefficient estimates, 2000-2006: reduced sample (non-OECD host countries)

	II.2.1a 2000	**II.2.1b 2000**	**II.2.2a 2001**	**II.2.2b 2001**	**II.2.3a 2002**	**II.2.3b 2002**	**II.3.4a 2003**	**II.3.4b 2003**	**II.3.5a 2004**	**II.3.5b 2004**	**II.3.6a 2005**	**II.3.6b 2005**	**II.3.7a 2006**	**II.3.7b 2006**
Distance	-3.591*** (0.323)	-3.530*** (0.325)	-2.962*** (0.337)	-2.885*** (0.339)	-2.732*** (0.351)	-2.617*** (0.351)	-3.459*** (0.356)	-3.326*** (0.357)	-3.793*** (0.388)	-3.662*** (0.387)	-3.207*** (0.404)	-3.027*** (0.404)	-4.007*** (0.407)	-3.727*** (0.402)
Contiguity	1.212 (1.662)	1.170 (1.651)	3.455** (1.492)	3.393** (1.482)	4.669*** (1.711)	4.502*** (1.693)	4.927*** (1.396)	4.721*** (1.351)	5.907*** (1.325)	5.717*** (1.284)	5.359*** (1.375)	5.079*** (1.306)	4.865*** (1.221)	4.495*** (1.116)
Official language	-0.276 (0.743)	-0.350 (0.747)	0.280 (0.756)	0.181 (0.760)	0.925 (0.660)	0.767 (0.654)	0.572 (0.679)	0.423 (0.682)	1.301* (0.702)	1.168* (0.705)	1.693** (0.754)	1.567** (0.748)	0.815 (0.808)	0.775 (0.798)
Ethnical language	1.263* (0.722)	1.289* (0.724)	0.363 (0.711)	0.401 (0.713)	-0.309 (0.642)	-0.232 (0.641)	0.0228 (0.668)	0.0709 (0.671)	-0.121 (0.693)	-0.0789 (0.698)	0.350 (0.679)	0.381 (0.678)	0.0271 (0.742)	-0.0677 (0.727)
Colony	0.948 (0.884)	0.923 (0.882)	1.066 (0.924)	1.040 (0.927)	3.687*** (0.896)	3.638*** (0.889)	4.316*** (0.883)	4.244*** (0.882)	3.673*** (0.898)	3.586*** (0.901)	5.693*** (0.912)	5.620*** (0.908)	5.464*** (0.997)	5.337*** (1.009)
PTA	1.972*** (0.739)	1.946*** (0.742)	1.720** (0.734)	1.690** (0.735)	2.330*** (0.626)	2.262*** (0.629)	0.889 (0.644)	0.778 (0.645)	0.419 (0.761)	0.310 (0.748)	0.171 (0.747)	0.0634 (0.735)	0.395 (0.762)	0.375 (0.748)
BIT		0.583 (0.375)		0.801** (0.359)		1.170*** (0.361)		1.536*** (0.368)		1.419*** (0.362)		1.698*** (0.371)		2.234*** (0.399)
Constant	44.62*** (3.189)	43.82*** (3.217)	33.45*** (3.307)	32.38*** (3.364)	36.64*** (2.991)	35.98*** (3.141)	43.50*** (3.062)	38.72*** (3.170)	45.83*** (3.262)	39.96*** (3.315)	39.61*** (3.172)	31.91*** (3.164)	45.21*** (3.262)	36.51*** (3.168)
Obs.	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,273	2,273	2,213	2,213	2,033	2,033
F-Test	30.8***	30.6***	29.8***	30.2***	41.1***	42.1***	61.8***	64.0***	71.8***	74.9***	78.5***	82.9***	71.1***	79.6***
R^2	0.569	0.570	0.567	0.568	0.602	0.605	0.626	0.630	0.636	0.639	0.642	0.646	0.638	0.645
Adj. R^2	0.548	0.548	0.545	0.546	0.580	0.584	0.608	0.611	0.617	0.620	0.623	0.628	0.618	0.626
Host FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (FDI_{ij}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of country fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table II.3: Theory-motivated cross-section gravity equation coefficient estimates, 2000-2006: reduced sample (OECD host countries)

	II.3.1a 2000	**II.3.1b 2000**	**II.3.2a 2001**	**II.3.2b 2001**	**II.3.3a 2002**	**II.3.3b 2002**	**II.3.4a 2003**	**II.3.4b 2003**	**II.3.5a 2004**	**II.3.5b 2004**	**II.3.6a 2005**	**II.3.6b 2005**	**II.3.7a 2006**	**II.3.7b 2006**
Distance	-2.947*** (0.540)	-2.984*** (0.546)	-2.230*** (0.537)	-2.280*** (0.540)	-2.958*** (0.557)	-2.870*** (0.557)	-3.522*** (0.566)	-3.566*** (0.571)	-3.308*** (0.634)	-3.295*** (0.633)	-2.286*** (0.600)	-2.240*** (0.602)	-2.502*** (0.610)	-2.455*** (0.610)
Contiguity	-0.935 (0.883)	-0.954 (0.883)	-0.0645 (0.911)	-0.0193 (0.913)	-0.735 (0.926)	-0.787 (0.934)	-1.010 (0.856)	-0.894 (0.861)	0.117 (0.902)	0.171 (0.901)	0.679 (0.841)	0.627 (0.840)	0.00799 (0.933)	-0.0108 (0.937)
Official language	2.437 (1.694)	2.536 (1.699)	3.107* (1.738)	3.067* (1.736)	3.303** (1.486)	3.340** (1.502)	-0.969 (1.191)	-1.117 (1.210)	0.421 (1.397)	0.359 (1.397)	1.354 (1.377)	1.342 (1.385)	0.919 (1.364)	0.876 (1.366)
Ethnical language	-0.758 (1.647)	-0.860 (1.655)	-0.930 (1.669)	-0.883 (1.666)	-1.536 (1.495)	-1.595 (1.508)	1.628 (1.135)	1.838 (1.145)	0.205 (1.285)	0.286 (1.280)	-1.361 (1.363)	-1.345 (1.366)	-1.155 (1.377)	-1.098 (1.383)
Colony	1.574 (0.981)	1.489 (1.001)	1.364 (0.990)	1.328 (0.995)	0.0248 (1.126)	0.118 (1.124)	1.435 (1.007)	1.368 (1.041)	1.917* (0.980)	1.917* (0.990)	1.955** (0.858)	2.045** (0.859)	3.349*** (0.982)	3.427*** (0.985)
PTA	1.359 (1.069)	1.427 (1.076)	2.313* (1.213)	2.162* (1.217)	-0.847 (1.188)	-0.612 (1.197)	-0.669 (1.176)	-1.096 (1.207)	-0.0244 (1.754)	-0.123 (1.763)	1.634 (1.505)	1.629 (1.512)	3.110** (1.552)	3.062* (1.565)
Currency		-0.827 (0.817)		-0.133 (0.801)		0.419 (0.803)		0.602 (0.791)		0.393 (0.829)		0.751 (0.784)		0.852 (0.815)
BIT		-0.417 (0.646)		0.453 (0.659)		-0.555 (0.613)		1.096* (0.613)		0.442 (0.651)		-0.220 (0.662)		0.0326 (0.692)
Constant	36.52*** (5.649)	36.66*** (5.718)	19.60*** (4.985)	30.09*** (5.658)	26.74*** (4.771)	35.95*** (5.826)	37.11*** (4.875)	43.06*** (6.031)	47.65*** (6.905)	31.88*** (7.099)	36.31*** (6.368)	29.67*** (6.537)	37.07*** (6.568)	21.43*** (6.737)
Obs.	843	843	843	843	843	843	843	843	843	843	843	843	843	843
F-Test	57.0***	55.1***	45.8***	44.5***	74.1***	72.9***	61.2***	60.9***	47.8***	46.6***	66.0***	65.1***	36.2***	34.6***
R^2	0.713	0.714	0.694	0.694	0.723	0.724	0.710	0.711	0.679	0.679	0.699	0.699	0.655	0.655
Adj. R^2	0.690	0.690	0.669	0.668	0.701	0.701	0.686	0.687	0.653	0.652	0.674	0.674	0.627	0.655
Host FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (FDI_{ij}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of country fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

5.6 Atheoretical panel gravity estimations

The previous cross-section estimations, though controlling for inward and outward effects, do not take the aspect of endogeneity into account. In order to econometrically consider the omitted variable (and selection) bias, I now turn to a series of estimations on the sample in its panel dimension. In this context, equation viii) can be re-expressed as:

ix) $$lnRFDI_{ijt} = \Pi_{it} + P_{jt} - \theta_1 lnDist_{ij} + \theta_2 Contiguity_{ij} + \theta_3 Colony_{ij} + \theta_4 Lang_{ij} + \theta_5 EthLang_{ij} + \theta_6 PTA_{ijt} + \theta_7 BIT_{ijt} + \theta_8 Currency_{ijt} + \epsilon_{ijt}$$

I test this estimator in different specifications, but ignore throughout this section the (time variant) outward and the inward effects Π_{it} and P_{jt}. By consequence, the results will be biased and are for illustrative purposes only, before I turn to the theory-consistent estimation in Sub-section 5.7. In order to specify the estimator, I generate real FDI ($RFDI_{ijt}$) outward stocks by scaling the nominal FDI outward stocks with a country of origin deflator, before adding α=1 and taking the logarithmic form. I include the log of real GDP, which is nominal GDP scaled by a country deflator, as *ad hoc* right-hand variables for economic mass. I begin the series of panel estimations, again, for the total sample, the non-OECD host country sub-sample and the OECD host country sub-sample, without any time or fixed effects (columns III.1.1/III.2.1/III.3.1). In a next series, time effects are included (columns III.1.2/III.2.2/III.3.2). With the objective of controlling for the endogeneity bias, which is caused by a time invariant correlation between ε_{ijt} and PTA_{ijt}, a series of regressions with bilateral fixed effects [17] are conducted (columns III.1.3/III.2.3/III.3.3). In these regressions all dyadic variables are dropped for reasons of collinearity. The resulting PTA coefficients range throughout the estimations between 1.2 (≈ 220% FDI increase) and implausible 3 (≈ 2,000% FDI increase).

17 Fixed effects and not random effects are used for the same reason as in the previous section.

Table III.1: Panel gravity equations using various specifications, 1993-2006: total sample

	III.1.1a No fixed or time effects	**III.1.1b No fixed or time effects**	**III.1.2a With time effects**	**III.1.2b With time effects**	**III.1.3a With time and bilateral fixed effects**	**III.1.3b With time and bilateral fixed effects**
Distance	-1.045*** (0.0495)	-0.897*** (0.0498)	-1.198*** (0.208)	-1.072*** (0.182)		
Real GDP (host)	2.110*** (0.0216)	2.071*** (0.0219)	2.093*** (0.0676)	2.067*** (0.0671)	2.796*** (0.206)	2.483*** (0.200)
Real GDP (origin)	1.928*** (0.0203)	1.843*** (0.0208)	1.893*** (0.109)	1.832*** (0.0951)	3.151*** (0.238)	2.844*** (0.230)
Contiguity	2.133*** (0.253)	2.233*** (0.252)	2.145*** (0.173)	2.240*** (0.180)		
Official language	0.520** (0.212)	0.648*** (0.212)	0.534 (0.352)	0.644* (0.336)		
Ethnical language	1.460*** (0.199)	1.482*** (0.199)	1.513*** (0.411)	1.517*** (0.406)		
Colony	1.562*** (0.236)	1.400*** (0.238)	1.510*** (0.460)	1.377*** (0.435)		
PTA	2.582*** (0.119)	2.318*** (0.120)	2.007*** (0.203)	1.877*** (0.211)	2.837*** (0.255)	2.171*** (0.258)
Currency		2.567*** (0.287)		1.691*** (0.504)		4.473*** (0.531)
BIT		1.820*** (0.0952)		1.414*** (0.295)		3.085*** (0.226)
Constant	-31.79*** (0.494)	-32.04*** (0.492)	-29.78*** (0.765)	-30.17*** (0.755)	-62.56*** (2.616)	-56.17*** (2.534)
Obs.	43,474	43,474	43,474	43,474	43,474	43,474
F-Test	3968.11***	3265.40***	1980.11***	1719.39***	328.26***	234.06***
R^2 (overall	0.388	0.395				
Adj. R^2	0.388	0.395				
R^2 (within)			0.380	0.384	0.078	0.099

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (real FDI_{ijt}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of time or fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table III.2: Panel gravity equations using various specifications, 1993-2006: reduced sample (non-OECD host countries)

	III.2.1a No fixed or time effects	**III.2.1b No fixed or time effects**	**III.2.2a With time effects**	**III.2.2b With time effects**	**III.2.3a With time and bilateral fixed effects**	**III.2.3b With time and bilateral fixed effects**
Distance	-0.929*** (0.0550)	-0.691*** (0.0545)	-1.041*** (0.157)	-0.805*** (0.122)		
Real GDP (host)	2.101*** (0.0307)	1.937*** (0.0313)	2.046*** (0.0760)	1.904*** (0.0594)	2.838*** (0.215)	2.507*** (0.208)
Real GDP (origin)	1.646*** (0.0227)	1.434*** (0.0236)	1.614*** (0.128)	1.425*** (0.100)	1.986*** (0.235)	1.723*** (0.228)
Contiguity	3.077*** (0.445)	2.897*** (0.418)	3.125*** (0.666)	2.947*** (0.582)		
Official language	-0.109 (0.227)	-0.0517 (0.228)	-0.145 (0.297)	-0.0874 (0.287)		
Ethnical language	1.531*** (0.215)	1.631*** (0.216)	1.609*** (0.378)	1.688*** (0.370)		
Colony	1.936*** (0.286)	1.423*** (0.290)	1.927*** (0.606)	1.461** (0.551)		
PTA	2.356*** (0.168)	1.746*** (0.165)	1.622*** (0.126)	1.174*** (0.111)	2.815*** (0.304)	2.045*** (0.301)
BIT		3.347*** (0.114)		3.060*** (0.323)		3.480*** (0.242)
Constant	-29.29*** (0.589)	-27.85*** (0.584)	-27.32*** (1.045)	-26.31*** (0.914)	-48.64*** (2.656)	-42.88*** (2.581)
Obs.	32,137	32,137	32,137	32,137	32,137	32,137
F-Test	1468.79***	1466.82***	1097.05***	1015.89***	205.65***	194.36***
R^2 (overall)	0.288	0.317				
Adj. R^2	0.288	0.317				
R^2 (within)			0.277	0.301	0.073	0.098

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (real FDI_{ijt}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of time or fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table III.3: Panel gravity equations using various specifications, 1993-2006: reduced sample (OECD host countries)

	III.3.1a No fixed or time effects	**III.3.1b No fixed or time effects**	**III.3.2a With time effects**	**III.3.2b With time effects**	**III.3.3a With time and bilateral fixed effects**	**III.3.3b With time and bilateral fixed effects**
Distance	-1.358*** (0.110)	-1.412*** (0.113)	-1.613*** (0.309)	-1.778*** (0.295)		
Real GDP (host)	2.044*** (0.0486)	2.019*** (0.0487)	2.008*** (0.0677)	1.998*** (0.0702)	1.997*** (0.672)	1.692** (0.662)
Real GDP (origin)	2.747*** (0.0423)	2.709*** (0.0428)	2.698*** (0.0918)	2.664*** (0.0864)	6.339*** (0.656)	6.013*** (0.633)
Contiguity	0.128 (0.334)	-0.0148 (0.336)	-0.00315 (0.259)	-0.135 (0.266)		
Official language	1.827*** (0.528)	1.444*** (0.532)	1.892** (0.702)	1.520** (0.639)		
Ethnical language	1.959*** (0.527)	2.217*** (0.530)	1.992** (0.770)	2.104** (0.762)		
Colony	1.442*** (0.411)	1.536*** (0.410)	1.321*** (0.179)	1.287*** (0.194)		
PTA	2.639*** (0.237)	2.438*** (0.239)	1.801*** (0.444)	1.693*** (0.404)	2.806*** (0.471)	3.046*** (0.484)
Currency		1.276*** (0.296)		-0.366 (0.454)		4.162*** (0.517)
BIT		-0.644*** (0.189)		-1.389*** (0.304)		-0.175 (0.575)
Constant	-38.34*** (1.132)	-36.96*** (1.173)	-34.78*** (2.762)	-32.48*** (2.513)	-91.84*** (6.332)	-84.54*** (6.191)
Obs.	11,337	11,337	11,337	11,337	11,337	11,337
F-Test	1218.42***	984.69***	12720.93***	108268.08***	125.84***	83.63***
R^2 (overall)	0.348	0.351				
Adj. R^2	0.348	0.350				
R^2 (within)			0.346	0.349	0.090	0.108

Notes: All continuous variables are in their logarithmic form. The dependent variable is the logarithm of (real FDI_{ijt}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of time or fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

5.7 Theory motivated panel gravity estimations that account for endogeneity

The previous results have shown the fragility of coefficient estimates in different cross-section and panel specifications. This section econometrically addresses the inward and outward effects, the omitted variable and selection bias as well as a simultaneity bias. A convenient method to take Π_{it} and P_{jt} in panel estimations into account is to include host-country-year fixed effects and origin-country-year fixed effects. Since the inward and outward effects can be supposed to vary over time, simple country fixed effects would not be sufficient (Baldwin / Taglioni 2006). As before, bilateral country fixed effects are included in the estimation with the objective to control for unobservable country-pair characteristics that influence both: bilateral FDI stocks and the likelihood to select into a PTA. Baier and Bergstrand (2007) propose a simple, though efficient, method to control for the simultaneity bias: they include in the estimation the future values of the variable PTA. In the case of strict exogeneity, the log of current FDI stocks can be expected to be uncorrelated with future PTA values. By contrast, a correlation between PTA_{ijt+1} and FDI_{ijt}, suggests a feedback effect where the logs of current of FDI can be associated with the decision of two countries whether to enter a PTA or not.

First, I test for the PTA effects on FDI with the total sample. The results are depicted in Table IV.1. Column IV.1.1a shows the average treatment effect of PTAs without the controls. The PTA variable is statistically significant at the 1%-level and its coefficient is 1.07, which corresponds to an average treatment effect of 190% FDI increase. For theoretical considerations and because in previous estimations the model has had a better fit by including the controls, the regression is repeated by including the BIT and Currency variables (column IV.1.1b). The variable PTA continues to be statistically significant with $p<.01$, and its coefficient is 0.99. This equates to an average treatment effect of PTAs in the magnitude of a roughly 170% increase in bilateral FDI stocks over ten years. Columns 4.1.2 show the results when future levels of bilateral agreements are included in the estimation. Reverse causality does not seem to represent a problem: the PTA variable continues to be highly significant and its coefficient changes only at the margin when PTA_{ijt+1} is included. The variables indicating future agreements are not statistically significant.

Second, the estimations are repeated for the reduced sub-sample that includes only developing (non-OECD) host countries. The results are qualitatively similar to those in Table IV.1 and are shown in Table IV.2. PTA_{ij} is statistically significant at the 1%-level and has a coefficient of 0.92 when tested alone and of 0.86, when controlling for a bilateral investment treaty. This corresponds to an average treatment effect of a 150% and a 140% increase in FDI, respectively. Similar to the previous series of estimations, future levels of agreements are not statistically significant when controlling for strict exogeneity and their inclusion has no important impact on the PTA coefficient estimate.

Table IV.1: Panel gravity equations with bilateral fixed and country-and-time effects, 1993-2006: total sample

	IV.1.1a	IV.1.1b	IV.1.2a	IV.1.2b
PTA	1.071*** (0.278)	0.986*** (0.279)	1.037*** (0.273)	1.013*** (0.273)
PTA t+1			-0.155 (0.298)	-0.215 (0.298)
Currency		0.247 (0.643)		-0.206 (0.637)
Currency t+1				0.573 (0.589)
BIT		0.867*** (0.214)		0.596*** (0.213)
BIT t +1				0.177 (0.204)
Constant	-3.297 (2.049)	1.016 (1.580)	7.845*** (1.864)	5.245*** (1.270)
Observations	43,474	43,474	40,328	40,328
F-test	15.29***	15.38***	12.92***	13.02***
R^2 (within)	0.371	0.372	0.356	0.357

Notes: The dependent variable is the logarithm of (real FDI_{ijt}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of various fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Table IV.2: Panel gravity equations with bilateral fixed and country-and-time effects, 1993-2006: reduced sample (non-OECD host countries)

	IV.2.1a	IV.2.1b	IV.2.2a	IV.2.2b
PTA	0.922** (0.359)	0.864** (0.359)	0.945*** (0.345)	0.919*** (0.346)
PTA t+1			-0.061 (0.338)	-0.103 (0.337)
BIT		0.818*** (0.228)		0.476** (0.229)
BIT t +1				0.321 (0.212)
Constant	1.826 (1.707)	6.306*** (2.128)	3.604* (1.912)	8.893*** (1.760)
Observations	32,137	32,137	29,834	29,834
F-test	17.15***	17.55***	15.12***	15.10***
R^2 (within)	0.387	0.388	0.376	0.377

Notes: The dependent variable is the logarithm of (real FDI_{ijt}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of various fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

A third series of estimations is built on the reduced sub-sample, which involves only economic exchange between OECD member states, and the results are illustrated in Table IV.3. The variable PTA_{ij} is not statistically significant when tested separately (column IV.3.1a), but significant at the 1%-level when tested together with the other control variables. The coefficient in estimation IV.3.1b is 0.82, which indicates an average treatment effect of a 130% increase in FDI. Future levels of PTAs are not correlated with the log of current FDI stocks (columns IV.3.2a and b).

Table IV.3: Panel gravity equations with bilateral fixed and country-and-time effects, 1993-2006: reduced sample (OECD host countries)

	IV.3.1a	**IV.3.1b**	**IV.3.2a**	**IV.3.2b**
PTA	0.697 (0.494)	0.821* (0.496)	1.028* (0.541)	1.159** (0.535)
PTA t+1			-0.623 (0.694)	-0.480 (0.697)
Currency		-0.230 (0.682)		-0.828 (0.720)
Currency t+1				0.638 (0.575)
BIT		-0.982* (0.536)		-0.137 (0.530)
BIT t +1				-1.220** (0.543)
Constant	19.36*** (3.063)	23.57*** (2.242)	9.867*** (0.817)	13.71*** (0.750)
Observations	11,337	11,337	10,494	10,494
F-test	369.49***	378.09***	221.67***	230.39***
R^2 (within)	0.530	0.530	0.511	0.512

Notes: The dependent variable is the logarithm of (real FDI_{ijt}+1). (Clustered) robust standard errors are in parentheses. Coefficient estimates of various fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

A companion effect of controlling for bilateral investment treaties in the estimations above is that this paper represents, to the best of my knowledge, the first estimation of the average treatment effect of BITs on bilateral FDI.[18] Some interesting patterns are discernible in this regard: First, overall, BITs have a strong positive and statistically significant average treatment effect on FDI. The coefficient of 0.87 (column IV.1.1b) corresponds to an increase in bilateral FDI stocks of approximately 140%. However, a closer look at the different sub-samples suggests that bilateral investment treaties between OECD members seem to play a very different role from those between OECD and non-OECD members. In the sub-sample that includes only non-OECD host countries, the BIT_{ij} variable is statistically significant at the 1%-level and has a coefficient of 0.82 (≈ 130% FDI increase). Future agreements are uncorrelated with current FDI stocks, but controlling for the former reduces the BIT coefficient by almost half to 0.476 ($e^{0.476}$-1=0.61). This

18 Earlier empirical studies on the topic (with different econometric specifications) are provided by Neumayer and Spess (2005), Hallward-Driemeier (2003), Büthe and Milner (2009) or Egger and Pfaffermayr (2004).

result suggests that the implementation of a bilateral investment treaty between an OECD country and non-OECD country can be associated with approximately a 60%-increase in outward FDI from the former to the latter, after controlling for strict exogeneity.

By contrast, in the sub-sample that is limited to OECD host countries, a different pattern becomes apparent. The BIT_{ij}-coefficient is statistically significant at the 10%-level, but its coefficient is negative. The robustness check that involves the future level of the variable BIT (column IV.3.2b) provides an explanation for this counterintuitive result. When BIT_{ijt+1} is included in the estimation, this variable is statistically significant at the p.<05 level and its coefficient is -1.22, whereas the variable BIT_{ijt} is not significant anymore. This indicates a feedback effect: In contrast to non-OECD host countries, the implementation of a bilateral investment treaty between OECD member dyads does not seem to be an effective tool to increase bilateral FDI, but can be associated with relatively low logs of bilateral investment ex ante.

The result that the variable PTA has higher coefficient estimates than the covariate BIT, and is in contrast to the latter robust and significant throughout the estimations of all sub-samples, is puzzling because BITs are explicitly defined to increase FDI. One possible explanation is the interconnectedness between trade and FDI, as outlined in Section 2. When the average treatment effect of PTAs on FDI, as found here, can be related to the trade-investment nexus, earlier work on vertical FDI and its sensitivity to trade costs is confirmed. Consequently, the reduction of tariffs (and plausibly of other trade costs, too) would represent an effective instrument to attract FDI.

The control variable $Currency_{ij}$ does not have a statistically significant average treatment effect on FDI for the panel I use. As a robustness check I repeat the estimations IV.1-3, but use as regressand the log of (real FDI_{ij}+1/(real GDP_i*real GDP_j)). The results are, with higher coefficients in absolute terms, qualitatively similar to the regression outcomes as described above and are illustrated in the Appendix.

6 Conclusions and research outlook

"The rapid spread of regionalism…", according to Richard Baldwin (1997, 865), *"... is surely the most important recent development in the global trade system"* and an entire sub-field of the literature is dedicated to exploring the effects of PTAs on trade or growth. Comparably little attention has been paid to the FDI effects of PTAs. But, trade and investment are not fundamentally different but closely interrelated activities, and trade costs are important determinants for FDI-decisions (Barba Navaretti / Venables 2004, 33). In addition, many PTAs have 'deep integration' provisions that bilaterally improve a set of regulations on investment, services or intellectual property rights and that establish dispute settlement mechanisms, which secure the enforcement of commercial law, and potentially result in positive FDI effects. Ethier (1998) and Büthe and Milner (2008) argue that the international competition for FDI might explain the spread of PTAs in the first place: PTAs can serve as an instrument to anchor domestic reform and liberalisation and thus provide a marginal advantage in this competition, by contributing to an improved investment climate in the potential host country.

A difficulty in assessing the determinants of bilateral FDI has been until recently the absence of a theoretically justified gravity estimator. Head and Ries (2008) provide a microtheoretically grounded gravity model for FDI in a multi-country world. I build upon their model, which sees FDI as an outcome of the market for corporate control, in order to test for the average treatment effect of a PTA on its members' bilateral FDI. Furthermore, estimation strategies have to take into consideration that PTA membership is not an exogenous variable, but is likely to be endogenous to economic activity and the reasons that explain the volume of trade might well be the same as those that explain the selection into PTA membership. The fragility of regressions, which do not account for endogeneity, has been illustrated throughout different cross-sectional (and panel) estimations in this paper. Econometrically, endogeneity is accounted for by applying panel estimation strategies that have been proposed by Baier and Bergstrand (2007) and which have been developed in the 'treatment effect' literature in microeconometrics.

The empirical results suggest that PTAs have a strong and robust positive average treatment effect on bilateral FDI between their members. Overall, the establishment of a PTA, which is generally implemented over a period of ten years, can be associated with a 170% increase in bilateral FDI. A strong positive, but smaller average treatment effect remains when testing separately for sub-samples of non-OECD and OECD host-country (in the magnitude of a 140% and 130% FDI increase, respectively).

Furthermore, bilateral FDI and BIT-partnership are highly correlated, but with a very different pattern for non-OECD host countries on the one side and OECD host countries on the other. A BIT-partnership between an OECD source country and a non-OECD destination country has a robust and significant average treatment effect on FDI, which corresponds to an increase in FDI in the magnitude of 60%, after controlling for strict exogeneity. By contrast, a BIT-partnership between two OECD countries does not result in a robust average treatment effect on FDI. But the results show a feedback effect: changes in current FDI are negatively associated with the implementation of a BIT. A possible explanation is that the governments of two OECD countries with FDI stocks below 'natural levels' in terms of the gravity equation might have relatively more incentives to conclude a BIT. Existing work on the determinants for BIT-formation (Elkins / Guzman / Simmons 2006) does not focus on dyads of developing countries and this puzzle is of interest for future research on the topic.

The estimation strategy that has been applied here focuses on the average treatment effect and does not address the general equilibrium comparative static effects of a PTA on dyadic FDI between its members and does not allow one to draw conclusions about the magnitude or direction of third country effects. When PTAs are strategic instruments in the international competition for FDI, the purpose of PTAs is not only about the classic Vinerian 'trade creation' and 'trade diversion', but also about 'investment creation' and 'investment diversion' [19] and it represents an interesting project for future studies to further explore and to quantify these aspects.

The gravity equation that is used here builds upon a model of corporate control with monitoring costs, which are reduced via a PTA's investment provisions. This represents one plausible causal mechanism for the FDI-effect of PTAs, but not the only one, as

19 An early conceptualisation of these terms can be traced back to Kindleberger (1966).

illustrated in Section 2. The introductory quote suggests the signalling effect of PTAs for foreign investors. It has to be underlined that this paper focuses on dyadic FDI and that signalling aspects are only captured when they are bilateral, not multilateral in nature (Büthe / Milner 2008). Another possible explanation for FDI effects is related to the reduction in trade costs. The importance of the trade cost mechanism is potentially mirrored in the fact that the average treatment effect of PTAs is higher than the average treatment effect of BITs, and valid for both, OECD country dyads and OECD/non-OECD country dyads. To further differentiate between these mechanisms, more precise measures of PTAs (and FDI) have to be used. The categorisation of PTAs is an ongoing challenge for empirical analyses and this paper is based upon the standard methodology to quantify PTA as a binary variable. The same approach can be applied to estimate and to test the effects of various specific PTAs, such as the EU, NAFTA, MERCOSUR, etc. However, the use of more detailed measures is worthwhile for future studies in order to capture not only the existence, but also the depth of various PTAs. It might be an interesting project, but is beyond the scope of this paper, to compare, for instance, PTAs with and without investment provisions or PTAs with and without substantial reductions in tariffs. Similarly, it might be worthwhile to test the PTA-effects with less aggregated or firm-level data in order to distinguish between effects on horizontal and vertical FDI, and to incorporate FDI-activity of firm subsidiaries in third countries.

To conclude, this paper not only has important implications for future research but also for policy. FDI represents not only an important source for capital inflows, in particular to developing countries, but also a vector for technology and expertise spillovers. Knowledge about the determinants of FDI is a prerequisite for sustainable and efficient policy-making that aims to improve the regulatory framework for FDI.

Bibliography

Agarwal, J. P. (1980): Determinants of foreign direct investment: a survey, in: *Weltwirtschaftliches Archiv* 116, 739–773

Anderson, J. E. / E. van Wincoop (2003): Gravity with gravitas : a solution to the border puzzle, in: *American Economic Review* 93, 170–192

Asiedu, E. (2001): On the determinants of foreign direct investment to developing countries : is Africa different?, in: *World Development* 30 (1), 107–119

Baier, S. L. / J. H. Bergstrand (2004): Economic determinants of free trade agreements, in: *Journal of International Economics* 64 (1), 29–63

– / – (2007): Do free trade agreements actually increase member's FDI?, in: *Journal of International Economics* 71 (1), 72–95

Balasubramanyam, V. N. / D. Greenway (1992): Economic integration and foreign direct investment: Japanese investment in the EC, in: *Journal of Common Market Studies* 30, 175–193

Baldwin, R. (1997): The causes of regionalism, in: *The World Economy* 20 (7), 865–888

– / D. Taglioni (2006): Gravity for dummies and dummies for gravity equations, Cambridge, MA: National Bureau of Economic Research (NBER Working Paper 12516)

Baltagi B. H. / P. Egger / M. Pfaffermayr (2005): Estimating models of complex FDI : are there third-country effects?, Syracus, NY: Center for Policy Research (Working Paper No. 91)

– / – / – (2008): Estimating regional trade agreement effects on FDI in an interdependent world, in: *Journal of Econometrics* 145, 194-208

Barba Navaretti, G. / A. J. Venables (2004): Multinational firms in the world economy, Princeton & Oxford: Princeton University Press

Barry, F. (2004): Export-platform foreign direct investment : the Irish experience, in: *EIB Papers* 9 (2), 8–37

Bénassy-Quéré, A. / M. Coupet / T. Mayer (2007): Institutional determinants of foreign direct investment, in: *World Economy* 30 (5), 764–782

Bergstrand, J. H. / P. Egger (2004): A theoretical and empirical model of international trade and foreign direct investment with outsourcing : Part I, developed countries, Notre Dame, IN, in: University of Notre Dame Working Paper (April)

– / – (2007): A knowledge-and-physical-capital model of international trade flows, foreign direct investment, and multinational enterprises, in: *Journal of International Economics* 73(2), 278–308

Bhagwati, J. / A. Panagariya (eds.) (1996): Preferential trading areas and multilateralism – strangers, friends, or foes?, in: Free trade areas or free trade. The economics of preferential trading agreements, Washington, DC: The AEI Press

Blomström, M. / A. Kokko (1997): Regional integration and foreign direct investment, Cambridge, MA: National Bureau of Economic Research (NBER Working Paper 6019)

Blonigen, B. A. / R. B. Davies / G. R. Waddell / H.T. Naughton (2007): FDI in space : spatial autoregressive relationship in foreign direct investment, in: *European Economic Review* 51, 1303–1325

Blonigen, B. A. / M. Wang (2004): Inappropriate pooling of wealthy and poor countries in empirical FDI studies, Cambridge MA: National Bureau of Economic Research (NBER Working Paper 10378)

Bornschier, V. / C. Chase-Dunn (1985): Transnational corporations and underdevelopment, New York: Praeger Publishers

Brainard, S. L. (1997): An empirical assessment of the proximity-concentration trade-off between multinational sales and trade, in: *American Economic Review* 87(3), 693–708

Brash, D. T. (1996): American investment in Australian industry, Canberra: Australian National University Press

Brenton, P. / F. Di Mauro / M. Lücke (1999): Economic integration and FDI : an empirical analysis of foreign direct investment in the EU and in Central and Eastern Europe, in: *Empirica* 26, 95–121

Burfisher, M. / S. Robinson / K. Thierfelder (2001): The impact of NAFTA on the United States, in: *Journal of Economic Perspectives* 15 (1), 125–144

Büthe, T. / H. V. Milner (2008): The politics of foreign direct investment into developing countries: increasing FDI through international trade agreements?, in: *American Journal of Political Science*, 52(4), 741–762

– / – (2009): Bilateral investment treaties and foreign direct investment : a political analysis, in K. P. Savant / L. E. Sachs (eds.), The effect of treaties on foreign direct investment : bilateral investment treaties, double taxation treaties, and investment flows, Oxford & New York: Oxford University Press, 171–224

– / – (2010): The interaction of domestic and international institutions : democracy, preferential trade agreements, and foreign direct investment into developing countries, Paper prepared for presentation at the workshop on the politics of preferential trade agreements : theory, measurement, and empirical applications, Princeton University, Niehaus Center for Globalization and Governance (30 Apr.– 1 May 2010)

Busse, M. / C. Hefeker (2007): Political risk, institutions and foreign direct investment, in: *European Journal of Political Economy* 23, 397–415

Cadot, O. / J. de Melo / M. Olarreaga (forthcoming): The political economy of international trade and migration

Carr, D. L. / J. R. Markusen / K. E. Maskus (2001): Estimating the knowledge-capital model of the multinational enterprise, in: *American Economic Review* 87 (4), 693-708

Caves, R. (1996): Multinational enterprise and economic analysis, New York: Cambridge University Press

Cooper, C. / B. F. Massell (1965): A new look at customs union theory, in: *Economic Journal* 75, 742–747

Coughlin, C. / E. Segev (2000): Foreign direct investment in China : a spatial econometric study, in: *The World Economy* 23(1), 1–23

Dee, P / J. Gali (2005): The trade and investment effects of preferential trading arrangements, Cambridge, MA: National Bureau of Economic Research (NBER Working Paper 10160)

Devereux, M. P. / R. Griffith (2002): The impact of corporate taxation on the location of capital : a review, in: *Swedish Economic Policy Review* 9, 79–102

Di Mauro, F. (2000): The impact of economic integration on FDI and exports : a gravity approach, Brussels: Center for European Policy Studies (CEPS Working Document No. 156)

Dunning, J. H. (1958): American investment in British manufacturing industry, London: George Allen and Unwin

– (1992): Transatlantic foreign direct investment and the European economic community, in: *International Economic Journal* 6, 59–81

Eaton, J. / A. Tamura (1994): Bilateralism and regionalism in Japanese and U.S. trade and direct foreign investment patterns, in: *Journal of the Japanese and International Economies* 8 (4), 478–510

Egger, P. / M. Pfaffermayr (2000): Trade, multinational sales and FDI in a three-factors model, Linz, Austria: University of Linz (Working Paper No. 0013)

– / – (2004): the impact of bilateral investment treaties on foreign direct investment, in: *Journal of Comparative Economics* 32 (4), 788-804

Eicher, T. S. / C. Henn (2011): In search of WTO trade effects : preferential trade agreements promote trade strongly, but unevenly, in: *Journal of International Economics* 83, 137–153

Ekholm, K. / R. Forslid / J. R. Markusen (2003): Export-platform foreign direct investment, Cambridge, MA: National Bureau of Economic Research (NBER Working Paper 9517)

Elkins, Z. / A.T. Guzman / B. Simmons (2006): Competing for capital : The diffusion of bilateral investment treaties, in: *International Organization* 60 (4), 811–846

Ethier, W. J. (1998): Regionalism in a multilateral world, in: *Journal of Political Economy* 106 (6), 1214–1245

Fernandez, R. / J. Portes (1997): Return to regionalism : an analysis of nontraditional gains from regional trade agreements, in: *World Bank Economic Review* 12 (2), 197–220

Frankel, J. A. / A. K. Rose (2002): An estimate of the effect of common currencies on trade and income, in: *Quarterly Journal of Economics* 117 (2), 437–466

Frischtak, C. R. (1993): Harmonization versus differentiation, in: M. B. Wallerstein / M. E. Mogee / R. A. Schoen. (eds.), Global dimensions of intellectual property rights in science and technology, Vol. 89, 103–105

Ghosh, S. / S. Yamarik (2004): Are regional trading arrangements trade creating? An application of extreme bound analysis, in: *Journal of International Economics* 63 (12), 369–395

Globerman, S. / D. Shapiro (2002): Global foreign direct investment flows : the role of governance infrastructure, in: *World Development* 30 (11), 1899-1919

Graham, E. M. / E. Wada (2000): Domestic reform, trade and investment liberalisation, financial crisis, and foreign direct investment into Mexico, in: *World Economy* 23 (6), 777–797

Grossman, G. M. / E. Helpman (1991): Innovation and growth in the global economy, Cambridge, MA: MIT Press

Habib, M. / L. Zurawicki (2002), Corruption and foreign direct investment, in: *Journal of International Business Studies* 33 (2), 291–307

Hallward-Driemeier, M. (2003): Do bilateral investment treaties attract FDI? Only a BIT…and they could bite, mimeo, World Bank

Hanson, G. H. / R. J. Mataloni Jr. / M. J. Slaughter (2001): Expansion strategies of U.S. multinational firms, Cambridge, MA: National Bureau of Economic Research (NBER Working Paper 8433)

Head, K. / T. Mayer (2004): Market potential and the location of Japanese investment in the European Union, in: *Review of Economics and Statistics* 86 (4), 959–972

– / T. Mayer / J. Ries (2010): The erosion of colonial trade linkages after independence, in: *Journal of International Economics* 81, 1–14

– / J. Ries (2008): FDI as an outcome of the market for corporate control : theory and evidence, in: *Journal of International Economics* 74, 2–20

– / J. Ries / D. Swenson (1995): Agglomeration benefits and location choice : evidence from Japanese manufacturing investments in the United States, in: *Journal of International Economics* 38 (3-4), 223–247

Helpman, E. (1984): A simple theory of international trade with multinational corporations, in: *Journal of Political Economy* 92, 451–472

Henisz, W. J. (2002): The institutional environment for multinational investment, in: *Journal of Law, Economics and Organization* 16 (2), 334–364

Horst, T. (1972): Firm and industry determinants of the decision to invest abroad, in: *Review of Economics and Statistics* 54, 37–45

Hufbauer, G. C. / J. J. Schott (1993): NAFTA. An assessment, Washington, DC: Institute for International Economics

Johnson, H. (1965): An economic theory of protectionism, in: *Journal of Political Economy* 73, 256–283

Keohane, R. O. (1989): International institutions and state power : essays in international relations theory, Boulder: Westview Press

Kindleberger, C. P. (1966): European integration and the international corporation, in: *Columbia Journal of World Business* 1, 65–73

Kleinert, J. / F. Toubal (2010): Gravity for FDI, in: *Review of International Economics* 18 (1), 1–13

Kydland, F. E. / E.C. Prescott (1977): Rules rather than discretion : the inconsistency of optimal plans, in: *Journal of Political Economy* 85 (3), 473–492

Lawrence, R. Z. (1998): Comment on the role of history in bilateral trade flows, in: J. A. Frankel (ed.), The regionalization of the world economy, Chicago: The University of Chicago Press, 57–59

Lederman D. / W. F. Maloney (2003): Trade structure and growth, Washington DC: The World Bank (World Bank Policy Research Paper 3025)

Lee, J. / E. Mansfield (1996): Intellectual property protection and U.S. foreign direct investment, in: *Review of Economics and Statistics* LXXVIII (2), 181–186

Lim, E. (2001): Determinants of, and the relation between, foreign direct investment and growth : a summary of the recent literature, Washington, DC: International Monetary Fund (WP/01/175)

Lipsey, R. G. (1991): American firms facing Europe: 1992, Cambridge, MA: National Bureau of Economic Research (NBER Working Paper 3293)

Magee, C. S. (2003): Endogeneous preferential trade agreements: An empirical assessment, in: *Contributions in Economic Analysis and Policy*, 2 (1)

Mansfield, E. D. (1998): The proliferation of preferential trading arrangements, in: *Journal of Conflict Resolution* 42 (5), 523–543

Mansfield, E. D. / H. Milner / P. Rosendorff (2002): Why democracies cooperate more : electoral control and international agreements, in: *International Organization* 56 (3), 477–514

Markusen, J. R. (1984): Multinationals, multi-plant economies, and the gains from trade, in: *Journal of International Economics* 16 (3-4), 205–226

– (2002): Multinational firms and the theory of international trade, Cambridge & London: MIT Press

– / K. E. Maskus (2001): Multinational firms : reconciling theory and evidence, in: M. Blomström / L. S. Goldberg (eds.), Topics in empirical international economics : a festschrift in honor of Robert E. Lipsey, Chicago: University of Chicago Press for NBER

– / A. J. Venables (1998): Multinational firms and the new trade theory, in: *Journal of International Economics* 46, 183–203

– / – (2000): The theory of endowment, intraindustry and multinational trade, in: *Journal of International Economics* 52, 209–234

Maskus, K. E. (1998): The international regulation of intellectual property, in: *Review of World Economics* 134 (2), 186-208

Mattoo, A. / C. Fink (2002): Regional agreements and trade in services : policy issues, Washington, DC: World Bank (Policy Research Working Paper No. 2852)

Medvedev, D. (2006a): Preferential trade agreements and their role in world trade, Washington, DC: World Bank (Policy Research Working Paper No. 4038)

– (2006b): Beyond trade: the impact of preferential trade agreements on foreign direct investment inflows, Washington, DC: World Bank (Policy Research Working Paper No. 4065)

Mutti, J. / H. Grubert (2004): Empirical asymmetries in foreign direct investment and taxation, in: *Journal of International Economics* 62, 337–358

Neumayer, E. / L. Spess (2005): Do bilateral investment treaties increase foreign direct investment to developing countries?, in: *World Development* 33 (10), 1567–1585

OECD (Organisation for Economic Co-operation and Development) (1999): OECD benchmark definition of foreign direct investment, 3rd edition Paris

– (2010): Foreign direct investment (FDI) statistics, OECD data, analysis and forecast, Paris; online: http://www.oecd.org/document/8/0,3746,en_2649_34863_40930184_1_1_1_1,00.html (accessed 23 Feb. 2010)

Panagariya, A. (1999): The regionalism debate : an overview, in: *World Economy* 22 (4), 455–476

Primo Braga, C. A. / C. Fink (1998): The relationship between intellectual property rights and foreign direct investment, in: *Duke Journal of Comparative and International Law* 9, 163–187

Rose, A. K. (2000): One money, one market : the effect of common currencies on trade, in: *Economic Policy* 15 (30), 7–46

– / E. van Wincoop (2001): National money as a barrier to international trade : the real case for currency union, in: *American Economic Review* 91 (2), 386–390

Santos Silva, J. M. C. / S. Tenreyro (2011): Poisson : some convergence issues, mimeo; online: http://privatewww.essex.ac.uk/~jmcss/Convergence.pdf (accessed 3 Mar. 2011)

Schneider, F. / B. S. Frey (1985): Economic and political determinants of foreign direct investment, in: *World Development* 13 (2), 161–175

Schumacher, T. (2004): Survival of the fittest : the first five years of euro-mediterranean economic relations, San Domenico di Fiesole: European University Institute (EUI Working Paper RSCAS No. 2004/13)

Shatz, H. / A. J. Venables (2000): The geography of international investment, Washington, DC: World Bank (Policy Research Paper No. 1531)

Simmons, B. A. (2000a): The legalization of international monetary affairs, in: *International Organization* 54 (3), 573–602

– (2000b): International law and state behavior : commitment and compliance in international monetary affairs, in: *American Political Science Review* 94 (4), 819–835

Tobin, J. L. / M. L. Busch (2010): A BIT is better than a lot : bilateral investment treaties and preferential trade agreements, in: *World Politics* 1, 1–42

Wei, S. (2000a): Does corruption relieve foreign direct investors of the burden of taxes and capital controls?, in: J. R. Hines Jr. (ed.), International taxation and multinational activity, Chicago: University of Chicago Press, 73–88

– (2000b): How taxing is corruption on international investors?, in: *Review of Economics and Statistics* 81, 1–11

Winham, G. R. (2005)*:* The evolution of the global trade regime, in: J. Ravenhill (ed.), Global political economy, Oxford & New York: Oxford University Press

Wooldridge, J. M. (2002): Econometric analysis of cross section and panel data, Cambridge, MA: The MIT Press

WTO (World Trade Organization) (2011): Regional trade agreements, Geneva; online: http://www.wto.org/english/tratop_e/region_e/region_e.htm (accessed 5 Jan. 2011)

– *(World Trade Organization)* (2014): Regional trade agreements, Geneva; online: http://www.wto.org/english/tratop_e/region_e/region_e.htm (accessed 30 Sep. 2014)

Yannopoulos, G. N. (1990): Foreign Direct investment and European integration : the evidence from the formative years of the European Community, in: *Journal of Common Market Studies* 28, 235–259

Yeaple, S. R. (2003): The complex integration strategies of multinational firms and cross-country dependencies in the structure of foreign direct investment, in: *Journal of International Economics* 60, 293–314

Yeyati, E. L. / E. Stein / C. Daude (2003): Regional integration and the location of FDI, Washington, DC: Inter-American Development Bank (Working Paper, No. 492)

Appendix

Table A.1: Correlation matrix, independent variables, total sample (2006)

	Distance	GDP host	GDP orig.	Contiguity	Off. lang	Eth. lang	Colony	PTA	BIT	Currency
Distance	1.0000									
GDP host	-0.1223	1.0000								
GDP orig.	0.1231	-0.0083	1.0000							
Contiguity	-0.3828	0.1309	0.0036	1.0000						
Off. lang	0.0577	-0.0075	0.1333	0.1364	1.0000					
Eth. lang	0.1000	-0.0035	0.2051	0.1078	0.7646	1.0000				
Colony	-0.0748	0.0277	0.1070	0.1624	0.3364	0.3177	1.0000			
PTA	-0.7095	0.2214	-0.1110	0.2048	-0.0487	-0.0651	0.0118	1.0000		
BIT	-0.1746	0.0169	0.1605	0.0190	-0.0666	-0.0212	0.0746	0.1525	1.0000	
Currency	-0.2802	0.2013	0.0407	0.1830	0.0271	-0.0194	-0.0217	0.3003	-0.1351	1.0000

Note: All continuous variables are in their logarithmic form.
Source: Author

Table A.2: Descriptive statistics, independent variables, total sample (2006)

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Distance	2,876	8.421867	.9729999	5.080959	9.881444
GDP host	2,876	11.42025	1.681245	8.519281	16.39586
GDP orig.	2,876	12.79316	1.584922	9.671176	16.39586
Contiguity	2,876	.0305981	.172256	0	1
Off. lang	2,876	.0730181	.2602114	0	1
Eth. lang	2,876	.0827538	.2755577	0	1
Colony	2,876	.0354659	.1849865	0	1
PTA	2,876	.3240612	.4681044	0	1
BIT	2,876	.3358832	.4723804	0	1
Currency	2,876	.04242	.2015805	0	1

Note: All continuous variables are in their logarithmic form.
Source: Author

Table A.3: Correlation matrix, independent variables, reduced sample: non-OECD host countries (2006)

	Distance	GDP host	GDP orig.	Conti-guity	Off. lang	Eth. lang	Colony	PTA	BIT	Currency
Distance	1.0000									
GDP host	0.0801	1.0000								
GDP orig.	0.1111	0.0009	1.0000							
Contiguity	-0.2693	0.0431	-0.0465	1.0000						
Off. lang	0.1212	-0.0565	0.1425	-0.0291	1.0000					
Eth. lang	0.1224	-0.0354	0.2195	0.0016	0.7545	1.0000				
Colony	-0.0774	-0.0024	0.1269	0.1127	0.3615	0.3319	1.0000			
PTA	-0.5433	-0.0064	-0.0544	0.0737	-0.0525	-0.0277	0.0325	1.0000		
BIT	-0.2203	0.1320	0.2871	0.0911	-0.0196	0.0234	0.1190	0.2077	1.0000	
Currency	-0.0111	-0.0174	0.0505	-0.0023	-0.0062	0.0721	-0.0041	-0.0105	0.0299	1.0000

Note: All continuous variables are in their logarithmic form.
Source: Author

Table A.4: Descriptive statistics, independent variables, reduced sample: non-OECD host countries (2006)

Variable	Obs	Mean	Std. Dev.	Min	Max
Distance	2,033	8.636443	.8004571	5.194819	9.881444
GDP host	2,033	10.77334	1.311141	8.519281	14.79687
GDP orig.	2,033	12.79498	1.583376	9.671176	16.39586
Contiguity	2,033	.0108214	.1034872	0	1
Off. lang	2,033	.0865716	.2812754	0	1
Eth. lang	2,033	.0718151	.2582449	0	1
Colony	2,033	.0334481	.1798478	0	1
PTA	2,033	.1824889	.386342	0	1
BIT	2,033	.3556321	.4788222	0	1
Currency	2,033	.0004919	.0221785	0	1

Note: All continuous variables are in their logarithmic form.
Source: Author

Table A.5: Correlation matrix, independent variables, reduced sample: OECD host countries (2006)

	Distance	GDP host	GDP orig.	Contiguity	Off. lang	Eth. lang	Colony	PTA	BIT	Currency
Distance	1.0000									
GDP host	0.1569	1.0000								
GDP orig.	0.1681	-0.0308	1.0000							
Contiguity	-0.4240	0.0257	0.0517	1.0000						
Off. lang	-0.0279	0.0753	0.1119	0.3166	1.0000					
Eth. lang	0.0613	0.1236	0.1683	0.2562	0.7943	1.0000				
Colony	-0.0690	0.0708	0.0638	0.2320	0.2827	0.2887	1.0000			
PTA	-0.8293	-0.2242	-0.2647	0.2066	-0.0721	-0.1373	-0.0463	1.0000		
BIT	-0.2029	-0.0751	-0.1600	-0.0197	-0.1824	-0.1492	-0.0240	0.2125	1.0000	
Currency	-0.2820	0.0213	0.0732	0.1578	0.0487	-0.0376	-0.0495	0.2902	-0.2381	1.0000

Note: All continuous variables are in their logarithmic form.
Source: Author

Table A.6: Descriptive statistics, independent variables, reduced sample: OECD host countries (2006)

Variable	Obs	Mean	Std. Dev.	Min	Max
Distance	843	7.904391	1.143262	5.080959	9.880192
GDP host	843	12.98036	1.433652	9.671176	16.39586
GDP orig.	843	12.78876	1.589577	9.671176	16.39586
Contiguity	843	.0782918	.2687897	0	1
Off. lang	843	.0759193	.2650262	0	1
Eth. lang	843	.0735469	.261187	0	1
Colony	843	.0403321	.1968538	0	1
PTA	843	.6654804	.4721023	0	1
BIT	843	.2882562	.4532199	0	1
Currency	843	.143535	.3508257	0	1

Note: All continuous variables are in their logarithmic form.
Source: Author

Table A.7: Robustness test for regressions IV.1-3, with log of the ratio of FDI to joint GDPs as dependent variable												
	Total sample				**Non-OECD host countries**				**OECD host countries**			
PTA	2.756*** (0.6628)	2.495*** (0.6642)	2.699*** (-0.650)	2.585*** (0.6512)	1.930** (0.8464)	1.788** (0.8450)	2.112*** (0.8137)	2.047** (0.8156)	1.981 (1.203)	2.189* (1.2074)	2.727** (1.3251)	2.934** (1.311)
PTA t+1			-0.327 (0.7111)	-0.494 (0.7121)			-0.188 (0.7937)	-0.297 (0.7915)			-1.335 (1.6618)	-1.035 (1.671)
Currency		-0.0527 (1.462)		-0.943 (1.4632)						-1.073 (1.5552)		-2.278 (1.6678)
Currency t+1				1.140 (1.4106)								1.220 (1.386)
BIT		2.187*** (0.505)		1.525*** (0.5101)		2.035*** (0.5384)		1.210** (0.5490)		-2.288* (1.2854)		-0.220 (1.2739)
BIT t +1				0.486 (0.4877)				0.820 (0.504)				-2.806** (1.3737)
Constant	-28.055*** (4.682)	-19.58*** (3.801)	-8.99*** (4.538)	-10.56*** (3.0113)	-10.70*** (4.267)	-6.11*** (5.3475)	-14.57*** (4.4591)	-1.245 (4.364)	21.004*** (7.2135)	27.502*** (5.0960)	-11.01*** (2.641)	-2.344 (1.7001)
Obs.	43474	43474	40328	40328	32137	32137	29834	29834	11337	11337	10494	10494
F-test	15.80***	15.95***	13.19***	13.30***	19.17***	19.17***	16.23***	16.02***	310.26***	317.01***	183.11***	197.75***
R^2 (within)	0.351	0.352	0.339	0.340	0.370	0.371	0.360	0.361	0.514	0.514	0.498	0.499

Notes: The dependent variable is the logarithm of (real $FDI_{ijt}+1/(RGDP_i*RGDP_j)$). Clustered robust Huber-White-sandwich standard errors are in parentheses. Coefficient estimates of various fixed effects are not reported for brevity. Statistical significance is indicated by ***p<.01, **p<.05, *p<.1.

Source: Author

Publications of the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE)

Studies

86 *Hampel-Milagrosa, Aimée:* Micro and small enterprise upgrading in the Philippines: the role of the entrepreneur, enterprise, networks and business environment, 169 pp., Bonn 2014, ISBN 978-3-88985-640-1

85 *Zelli, Fariborz / Daniela Erler / Sina Frank / Jonas Hein / Hannes Hotz / Anna-Maria Santa Cruz Melgarejo:* Reducing emissions from deforestation and forest degradation (REDD) in Peru: a challenge to social inclusion and multi-level governance, 178 pp., Bonn 2014, ISBN 978-3-88985-651-7

84 *Fues, Thomas / Jiang Ye (eds.):* The United Nations Post-2015 Agenda for Global Development: perspectives from China and Europe, 373 pp., Bonn 2014, ISBN 978-3-88985-649-4

83 *Horstmann, Britta / Günther Schulz-Heiss:* Providing international adaptation finance for vulnerable communities: a study on potentials and limits of social investment funds, 106 pp., Bonn 2014, ISBN 978-3-88985-647-0

[Price: EUR 10.00; publications may be ordered from the DIE or through bookshops.]

Discussion Papers

36/2014 *Meijer, Karen:* Can supply chain initiatives reduce deforestation? A comparative analysis of cases from Brazil and Indonesia, 38 pp., Bonn 2014, ISBN 978-3-88985-662-3

35/2014 *Brandi, Clara / Max Büge:* A cartography of the new middle classes in developing and emerging countries, 33 pp., Bonn 2014, ISBN 978-3-88985-661-6

34/2014 *Chan, Sander / Pieter Pauw:* A global framework for climate action, Orchestrating non-state and subnational initiatives for more effective global climate governance, 41 pp., Bonn 2014, ISBN 978-3-88985-660-9

33/2014 *Berensmann, Kathrin / Peter Wolff:* The role of international financial institutions in macroeconomic crises: improving the architecture of the World Bank and the IMF for managing shocks in developing countries, 49 pp., Bonn 2014, ISBN 978-3-88985-659-3

32/2014 *Dai, Yixin / Yuan Zhou / Di Xia / Mengyu Ding / Lan Xue:* The innovation path of the Chinese wind power industry, 38 pp., Bonn 2014 ISBN 978-3-88985-658-6

31/2014 *Holzapfel, Sarah:* Boosting or hindering aid effectiveness? An assessment of systems for measuring agency results, 41 pp., Bonn 2014, ISBN 978-3-88985-657-9

[Price: EUR 6.00; publications may be ordered from the DIE or through bookshops.]

For a complete list of DIE publications:
www.die-gdi.de