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Abstract:

This paper analyzes the impact of international trade and investment agreements on foreign direct investment (FDI) activities of Japanese multinationals in developing and emerging economies. Based on transaction cost economics and institutional theory it contributes to the existing empirical literature by distinguishing treaty impact by the size and the asset specificity of the FDI activities. FDI activities are measured as the foreign affiliate employment of Japanese multinational companies aggregated on the industry and host country level. The importance of sunk costs, captured through the size of the affiliates included in the FDI aggregation, for explaining bilateral investment treaty (BIT) effectiveness is shown, but a significant role of the industry averaged R&D intensity of the parent firms, as the measure for asset specificity, for BIT effectiveness is not identified. In the case of preferential trade and investment agreements (PTIAs) concluded by other countries, not involving Japan, a different set of mechanisms is uncovered: smaller sized Japanese affiliates seem to be the ones that gain substantially more from the agreements than the large ones. Also, a link between asset specificity and PTIA effectiveness is established.

1. INTRODUCTION

The importance of developing economies as a destination for foreign direct investment (FDI) has strongly increased during the last couple of years. The share of developing host countries increased from an average of about 20% of worldwide FDI during 1999-2001 to an average of 35% between 2002-2005 (UNCTAD 2006c). Nevertheless, investment into these countries still often faces not only regulatory and legal investment barriers, but also an insecure business environment due to a high level of political instability deterring long-term and high profile corporate involvement. Even though investor home and investment host governments design policies with the purpose of investment barrier and risk reduction, empirical evidence on the fact if these supportive policies eventually exert impact on overseas investment activities is mixed.

One area of such policies is the conclusion of bilateral or plurilateral investment agreements. Their number has been steadily increasing over the past two decades (UNCTAD 2006a). Two types of agreements can be distinguished in this context: bilateral investment treaties (BITs) and preferential trade and investment agreements (PTIAs). BITs mainly deal with investment treatment, its protection, the compensation in the case of expropriation, arbitration in the case of investor-state disputes, but increasingly also with the liberalization of investment entry. FDI relevant provisions within PTIAs provide for increased market access and encompass broader issues influencing the investment entry, treatment and protection. These PTIAs are most often designed as trade agreements which additionally include provisions on investment. Well known examples of regional PTIAs in the case of developing and emerging economies are for instance the Southern Common Market (MERCOSUR) or the Associaton of Southeast Asian Nations Free Trade Area

(AFTA).

Although the agreements, in particular the BITs, are explicitly concluded to raise FDI, it has not been confirmed that these treaties actually attain this objective. Theoretically, international investment treaties are expected to positively influence FDI activities as they help governments to commit themselves credibly to protect and fairly treat existing investment. They also help to liberalize investment related laws and regulation when governments are unable to do this on a domestic scale. Empirically, however, the eventual role of the agreements for investment, in particular with regard to the conditions required for investment attraction, has not been clearly identified.

With respect to the *relevance of BITs for FDI,* studies have multiplied during the past years leading to diverging results – differences in the outcome stem from varying samples, variable specifications, and estimation methodologies. In particular the more recent studies have enlarged the samples analyzed in terms of years and country coverage (e.g., Busse et al. 2008), have developed more detailed measures for the BIT measure (Yackee 2006), and have focused on the role of the domestic and international embeddedness for treaty effectiveness (Neumayer and Spess 2005; Yackee 2006; Desbordes and Vicard 2007; Tobin and Busch 2007; Busse et al. 2008). Also, attempts were undertaken to overcome the problem of reverse causality (Aisbett 2007; Egger and Merlo 2007; Busse et al. 2008). On the individual country level only US BITs and US FDI have been analyzed in more detail though FDI activities were not disaggregated to the industry or firm level (Salacuse and Sullivan 2005; Tobin and Rose-Ackerman 2005; Haftel 2007). In the case of *PTIAs*, existing studies can be divided into three kinds: those that focus on selected regional agreements in detail and analyze their impact on FDI[1]; those that use a dummy variable as the explanatory variable for agreement conclusion, and those that try to fill the black box of agreement conclusion with regard to treaty contents or characteristics of the member nations. The outcome on the relevance of PTIA membership is mixed ranging from insignificant to positive (e.g., Levy et al. 2003; Medvedev 2006; Buethe and Milner 2008). Non-trade provisions of PTIAs, including those related to investment, seem to attract FDI from treaty-outsider countries (Dee and Gali 2003; Te Velde and Bezemer 2006). Moreover, the relevance of market size of the treaty partners has been established (Jaumotte 2004; Medvedev 2006) and the importance of the country positioning within a treaty area highlighted (Levy et al. 2003; Jaumotte 2004; Te Velde and Bezemer 2006).

One major shortcoming of these studies has been that they have only used pooled country-level FDI data. However, based on transaction cost economics and institutional theory, agreement effects are expected to differ according to FDI characteristics. Hence, this paper contributes by distinguishing agreement effects by the size as well as the specificity of the involved assets.

Since reliable disaggregated FDI data on a cross-country basis is not available, one investor nation is focused on – Japan. Japan is one of the top-five investor nations worldwide and has an unusually high share of investment within developing and emerging economies (UNCTAD 2006c). The Japanese government is known to strongly support its companies abroad through targeted foreign aid, strong export financing activities, the provision of information on foreign markets, and its close

[1] Studies emerged with respect to NAFTA (Blomstrom and Kokko 1997; Waldkirch 2003; Buckley et al. 2007), the EU (e.g., Dunning 1997b; 1997a; Brenton et al. 1999; Clegg and Scott-Green 1999; Altomonte 2007; Iwasaki and Suganuma 2007), for MERCOSUR (e.g., Blomstrom and Kokko 1997; Page 2001), and ASEAN (e.g., Haftel 2006).

cooperation with Japanese trading companies (Hatch and Yamamura 1996; Katzenstein 2005). The role of investment agreements for Japanese business activities has only lately received attention as a result of the high activism the Japanese government has shown in concluding bilateral trade and investment agreements.

Overall, FDI activities are measured by aggregating the foreign affiliate employment of Japanese multinational companies by the sector of the Japanese parent firm and by the host country. Two FDI measures, general and large FDI, are used according to the size of the affiliates included in the aggregation. For the period 1990-2004 different specifications controlling for unobserved effects on the industry-host country level are estimated. The importance of sunk costs captured through the size of the affiliates included in the FDI aggregation for BIT effectiveness is supported, but a significant role of the industry averaged R&D intensity of the parent firms – as the measure for asset specificity – for BIT effectiveness is not confirmed. In the case of PTIAs concluded by other countries, not involving Japan, a different set of mechanisms is uncovered: smaller-sized affiliates seem to be the ones that gain substantially more from the agreements than the large ones. A link between asset specificity and PTIA effectiveness is established.

The paper is structured as follows: First, the institutional background is provided and hypotheses are derived. After presenting the FDI data, methodology and an econometric model, findings are discussed. In the conclusion major outcomes are summarized and future research steps are indicated.

2. INSTITUTIONAL BACKGROUND

Multilateral approaches to regulate and protect FDI have not succeeded over the last decades (Sornarajah 2004; Gugler and Tomsik 2007). Instead, a complex web of PTIAs and BITs has emerged governing FDI sometimes even leading to overlapping investment regimes.

PTIA conclusion has rapidly grown since the 1990s. The WTO cites as many as 205 agreements (including enlargements of existing treaties) that were notified to it by May 2008 (WTO 2008). These PTIAs can include both bilateral and plurilateral agreements as well as those confined to regional agglomerations of countries or inter-regional ones. Overall, coverage of PTIAs has increased in scope over the years. Formerly, tariff liberalization and other measures governing trade played an important role in the design. However, as tariff lines have already been highly liberalized, new issues, foremost investment, but also intellectual property rights or government procurement, are increasingly covered (Crawford and Fiorentino 2005). When taking a closer look at seven regional trade and investment agreements (RTIA) covering developing and emerging economies – based on a selection by Te Velde and Bezemer (2006) with a similar research background – differences in treaty design and membership become evident (Table 8 and Table 9 in the appendix). In terms of market size the North American Free Trade Agreement (NAFTA) tops the list while the African agreements - the Common Market for Eastern and Southern Africa (COMESA) as well as the Southern African Development Community (SADC) - and the Caribbean Community (CARICOM) are at the end of the spectrum. With regard to trade liberalization measures NAFTA, the Southern Common Market (MERCOSUR), the Andean Community (ANDEAN), CARICOM and the Association of South East Asian Nations FTA (AFTA) claim to have intra-regional trade which is almost duty-free though they all exclude sensitive industries from the low-tariff regime. All agreements have incorporated some degree of investment clauses. Again, NAFTA has gone furthest. Besides ANDEAN, investment rules of none of the selected treaties can be fully applied by investors from countries outside the relevant region. However, in ANDEAN national exemptions to the regional provisions are permitted rendering a regional approach ineffective.

Also, *BITs* have rapidly proliferated since the first BIT was signed between Germany and Pakistan in 1959 (UNCTAD 2007). In particular during the 1990s BITs were rapidly diffusing though growth has again decreased since 2002. By 2006 they amounted to 2,573 (UNCTAD 2007). Although BITs are negotiated on a bilateral basis leading to a variety of outcomes, they are increasingly converging as FDI exporting nations possess model treaties along which they negotiate, which, over time, have also started to become more similar. Nevertheless, differences between BITs continue to persist (Elkins et al. 2006).

Japan started to adopt a plurilateral and bilateral trade and investment policy only as multilateral trade negotiations within the WTO came to a standstill at the end of the 1990s (Cho 2007), and all other major industrial nations were strongly promoting a large network of bilateral and plurilateral trade and investment agreements (Pempel and Urata 2006). Hence, PTIAs, in Japan referred to as Economic Partnership Agreements (EPAs) – which include both trade and investment issues – have only been concluded since 2002 – of which most of the seven finalized agreements (Singapore, Mexico, Malaysia, Thailand, Brunei, Indonesia and Chile) after 2004. One more has been signed (Philippines) and seven are under negotiation. Due to their recent nature and data availability, it was not possible to include the agreements in the analysis.[2]

Japan is the industrialized country that has signed the lowest number of BITs (UNCTAD 2007) having ratified 13 BITs (Bangladesh, China, Egypt, Hong Kong, Korea, Mongolia, Pakistan, Russia, Sri Lanka, Turkey, Vietnam, Laos and Cambodia) while one more was signed in this August (Uzbekistan). Also, it is currently in negotiations with Saudi-Arabia and Peru as well as on a trilateral basis with China and Korea. Furthermore, talks with Qatar are carried out (MOFA 2008b). Also BIT negotiations have risen strongly with the implementation of the new investment and trade agreement strategy of the Japanese government at the beginning of this millenium. Motivations for treaty conclusion follow the ones found on the global level (Elkins et al. 2006; Neumayer 2006)– besides altruistic and strategic political motives, economic reasons seem to have dominated in particular with the implementation of this new strategy. Lately, energy security has become a major rationale for agreement negotiation (MOFA 2008b). Despite the small number of BITs in which Japan is directly involved, those that have been concluded are of relatively strong nature with respect to treaty contents. All BITs include provisions on investment protection, transparency enhancement and dispute settlement procedures, and the agreements concluded after 2002 also include FDI entry liberalization clauses.[3] Table 10 in the appendix provides an overview of the Japanese

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[2] Though the Singapore agreement is concluded within the period of investigation, including only one treaty as representative for a whole set of agreements was not considered appropriate.

[3] Although the conclusion of BITs started rather late (1978), Commercial Conventions or "Japan Friendship Commerce And Navigation Treaties" served as their antecedents in the period between 1958-1980 (Matsui 1989; Yanase 2003). Of the total of 27 agreements, nine were concluded with developing economies (India, Malaysia, Singapore, Cuba, Pakistan, Peru, Indonesia, El Salvador, Argentina, Mexico). Being relatively broad agreements covering trade and investment issues, the rules on investment were rather weak and due to a lack of procedural provisions only had limited effect (Matsui 1989; Sakurai 1996). When it became more difficult for the Japanese government to conclude general commercial agreements covering wider economic relations, Japan had to turn to

agreements.

3. Hypotheses Development

Literature on FDI determinants in the international business and trade fields is vast and rather inconclusive to such a degree that empirical research on FDI often relies on an ad-hoc specification of FDI determinants that results in diverging outcomes (Chakrabati 2001; Blonigen 2005). One theoretic approach that takes a *macro perspective* and is widely applied in literature is grounded in the international new trade literature and uses gravity theory arguments to FDI (Carr et al. 2001; Markusen and Maskus 2002; Helpman et al. 2004; Braconier et al. 2005).[4]

A different *line of reasoning* focuses on the multinational firm and the micro-level of international business activities in explaining FDI. Here, transaction costs, market imperfections and institutional uncertainties have been highlighted as major reasons for the internalization of activities across borders within one firm through FDI instead of carrying out exporting, licensing or other non-equity regimes to serve foreign markets (Buckley and Casson 1976; Rugman 1981; Hennart 1982; Teece 1986; Henisz and Williamson 1999; Henisz 2003). Reasoning is rooted in the works of Coase (1937) and Williamson (1975). Characteristics along which the transactions and the costs incurred in the different governance regimes vary are the frequency with which the transaction occurs, the uncertainty surrounding the transaction, and the degree to which asset specific investments have to be carried out (Teece 1986; Williamson

BITs (Matsui 1989).

[4] In its origins the gravity model related bilateral trade flows positively to the size of markets, and inversely to factors enhancing or restricting trade flows among two countries (as tariffs or distance) (Andersen and Van Wincoop 2003). When applying it to FDI, the standard gravity explanatory variables have been extended to include relative factor endowment differences between the home and host country besides absolute and relative country size (e.g., Carr et al. 2001; Egger and Pfaffermayr 2004).

1991). The more frequent a transaction, the cheaper it becomes to internalize the cross-border activity within one firm. Furthermore, the higher the asset specificity the more risky inter-firm co-operations become encouraging FDI or simple trading: The asset specificity is high when one or both parties to a transaction invest in equipment which is especially designed to carry out the transaction. It has a much lower second best use value (Williamson 1979) increasing the risk of quasi-rent appropriation. In the case of a highly uncertain environment, firms are expected to avoid ownership. Ownership commits them to one operation that may not be appropriate when a shift in the environment occurs (Williamson 1979). As companies have a higher risk premium when property rights and contracts are poorly enforced, when the risk of civil wars, coups, or involvement in international conflicts is high, and when the investment environment is unpredictable, firms might be inclined to not carry out any investment in such environments, or, if they do, only in small size (Teece 1986; Williamson 1991; Henisz and Williamson 1999; Williamson 2000).

Hence, the reliability of the political environment plays a role in investment decision making. The theory of credible commitment emphasizes reputation-building and institutional design as two channels through which governments can credibly commit themselves and can guarantee a fair definition and eventual enforcement of property rights. In this context delegation of authority from the government to independent agents, such as international agreements, forms an important element (Kydland and Prescott 1977; North and Weingast 1989; Drazen 2000). International agreements help to overcome the problem of time-inconsistent behaviour of governments as they are more credible than purely domestic commitments due to higher costs involved when reneging on them (Teece 1986; Martin and Simmons 1998). However, expropriation also provides rents to a government and one can expect a leveling out of expected gains and losses associated with attracting FDI and the incentive for treaty compliance (Teece 1986; Henisz and Williamson 1999; Ginsburg 2004, 2006; Aisbett 2007).

Hence, investment protection agreements can work as safeguards and raise the level of ownership and the size of FDI involvement: The larger the sunk costs of the investment and the importance of a subsidiary for a company, the higher the relevance of the reliability of the political environment. As BITs have been designed with the purpose of guaranteeing a fair treatment and protection of the foreign investments of Japanese companies in the partner countries, a positive influence is expected for such kind of FDI.

Hypothesis 1: BITs increase large-scale FDI activities.

With regard to the PTIAs entering the sample during the empirical analysis Japan is only an outsider nation. Hence, while BITs exert a commitment effect, PTIAs only signal a more reliable business environment for the investors from the "treaty-outsider" Japan.[5] Although the strength of such signaling effects is disputed (e.g., Waldkirch 2006), empirical research has found investment provisions to play a significant role for agreement outsiders to RTIAs (Dee and Gali 2003; Te Velde and Bezemer 2006). Hence, a signaling impact should exist, but is expected to be weaker than in the case of a credibility effect.

Moreover, the trade clauses included in PTIAs can have various effects on FDI activities also for investors from non-PTIA member countries making it difficult to capture the signaling effect favouring larger-sized affiliates. For Japanese companies that have already established (an) affiliate(s) within the treaty area market-seeking (non-asset-specific) FDI, if it occurs at all, will rather be of smaller size as the

[5] The agreements would have only direct applicability to Japanese investors with respect to investment protection if they included clauses on investment protection for investments from firms from non-member countries. Concerning the seven RTIAs which are looked at in more detail, none has such clauses currently fully implemented (Table 8).

Japanese firms can serve the market from the already existing investment via trade. If multiple affiliates have been existing within a treaty area, Japanese parent firms may also choose to streamline their activities encouraging large affiliates in a certain location. When investment had not entered the treaty area before, the trade-off between gains through lower tariff costs due to the PTIA and the additional up-front costs necessary to establish an investment, is expected to encourage the establishment of rather small affiliates (Te Velde and Fahnbulleh 2003). Due to the multitude of effects occurring, the impact of the PTIAs on the size of the affiliates is not clear cut. Therefore, PTIAs should not increase large FDI to a higher degree than general FDI.

Hypothesis 2: PTIAs will increase large FDI activities to a smaller extent than BITs, and will have equal impact on general, including both small and large, investments.

FDI as opposed to the foreign market entry mode “trade” is more likely to occur when the specificity of the assets transferred to the foreign affiliate rises. The more uncertain and volatile the external environment of a firm, the less likely a firm is to transfer these assets to the country due to the increased appropriability risks (e.g., Anderson and Gatignon 1986). BITs are designed to protect and fairly treat investments and increase the credibility of domestic institutions and policies. Therefore, they should again work as safeguards in this context and raise the investment level.

Hypothesis 3: BITs will lead to a rise in FDI activities in the presence of high asset specificity.

The reduction of tariff and non-tariff barriers in the case of the PTIAs also render intra-corporate transactions cheaper. Hence, whenever there is the necessity for internalizing the transactions, thus when trade is no alternative, and firms also wish to benefit from new market opportunities created through the PTIAs, FDI is expected to increase. As finding market partners is difficult in the case of high asset specificity, forming such a necessity, FDI is expected to increase (Blomstrom and Kokko 1997; Medvedev 2006).

Hypothesis 4: PTIAs will promote highly asset specific FDI.

4. Empirical Set Up

4.1. *The Dependent Variable: Foreign Direct Investment*

The size of FDI activities is captured in terms of *subsidiary employment of Japanese firms in the host countries.* As the interpretation of financial flow or stock FDI measures is difficult due to round-tripping as well as trans-shipment of investment (UNCTAD 2006c), it has become common to use the number of affiliates and data on sales and employment for the measurement of the productive activities of affiliates of multinational companies – constituting FDI – abroad (e.g., Lipsey 2007). Following a recent stream of literature and due to data availability employment has been selected (Zhou et al. 2002; Asiedu 2004; Belderbos and Zou 2006, 2007). Employment is well apt for the analysis of FDI activities in developing countries as investment is expected to be primarily labor-seeking due to the existence of factor price differentials. It should thus provide a good measure for capturing the production occurring in these countries. Furthermore, in terms of policy analysis, the impact of the agreements on multinational enterprise (MNE) employment should be of interest as employment has been highlighted as one means through which FDI spillover takes place. Multinational employment has been found to increase wages, domestic employment figures, lead to transfer of technology and the productivity improvement of the labor force (e.g., Asiedu 2004).

Data stems from the *Toyo Keizai's* annual compendia on Japanese overseas investment (ToyoKeizai Annual volumes 1990-2005) which provide microdata of the subsidiaries of Japanese firms abroad. The dataset is compiled annually from surveys and is supplemented with information from annual reports and media announcements. The survey is sent out to both listed and non-listed firms and thus covers investments by small, medium-sized and large businesses. It reputedly represents the total of Japanese foreign investment activity and enjoys increasing acceptance among academic researchers (e.g., Delios and Henisz 2003; Makino et al. 2004).

The affiliate level employment information is aggregated to two FDI variables Y_{ijt} – one which only includes the employees of large-sized investments Y_{ijt}^{ls} , and one which, on top of these, counts also the ones of the smaller-sized subsidiaries termed general FDI Y_{ijt}^{ge} . Both measure the employment in the affiliates which can be attributed to the investment of Japanese parent firms p in industry j in country i in year t and will be termed "Japanese employment" in the following.

$$(1) \quad Y_{ijt} = \sum_{p=1}^{P} \%\ Japanese\ ownership\ (\min.\ 10\%)_{ijtp}\ *\ Affiliate\ Employment_{ijtp}$$

The employment of each subsidiary is multiplied with the share of overall Japanese ownership in the subsidiary. If several Japanese firms invested in the affiliate, the sum of their ownership stakes was used. Only employment in those subsidiaries is considered for the two measures in which Japanese firms own at least 10%.[6] The resulting employment figures are then aggregated over industry j in country i in year

[6] An interest of 10 percent or more of the stock or voting power of the foreign enterprise has been defined as the threshold level for a long-term interest – as opposed to a short term interest as in the case of portfolio investment – by the OECD FDI benchmark definition (OECD 1996) and in the IMF's Balance of Payments Manual IMF (IMF 1993).

t. General FDI Y_{ijt}^{ge} includes all affiliates – small and large ones – with complete employment and ownership information in the database in the aggregation and with a minimum level of Japanese employment of two. The second variable, *large scale FDI* Y_{ijt}^{ls}, includes only those affiliates which have at least 100 Japanese FDI employees. Twenty-three industry categories *j* were formed based on parent firm affiliation. They encompass non-manufacturing, manufacturing, and service sectors as well as the construction, utilities, wholesale and retail industries.

In order to reduce the skewness in the data, the FDI measures are transformed with a natural logarithm. Table 11 and Table 12 in the appendix show descriptive statistics.

4.2. *Methodology*

The dependent variable Y_{ijt}, employment, is a partly continuous non-negative variable which has a positive probability mass at one point – at zero. Least squares estimation is inconsistent on such corner solution data as it assumes constant partial effects and predicts negative values (Wooldridge 2002). A tobit model can be used in this context incorporating information on the decision whether to go international and on the decision on how much to invest, thus, how many employees to employ (e.g., Carr et al. 2001; Zhou et al. 2002; Verbeek 2004; Buch and Lipponer 2007).

The standard tobit model for a country-industry panel *ij* with random effects is

(2) $$y_{ijt}^{*} = \beta' X_{ijt} + \lambda_{ij} + u_{ijt} \qquad \lambda_{ij} \overset{iid}{\sim} Normal(0, \sigma_{\lambda}^{2})$$

$$u_{ijt} \overset{iid}{\sim} Normal(0, \sigma_{u}^{2})$$

(3) $$y_{ijt} = \max(0, y_{ijt}^{*}) .$$

for $i = 1,..., N; j = 1,..., M; t = 1,..., T$.

The sub-index i refers to the country, j to the industry, and t to year. X_{ijt} refers to the vector of explanatory variables x^k (for k=1,….,K), β to the vector of their coefficients. Subsequently, the vector β also entails K-elements.[7] The country-industry specific effects λ_{ij} and the error u_{ijt} are both normally distributed and independent from each other and the explanatory variables with the respective standard errors σ_{λ} and σ_u.

y^*_{ijt} is the latent dependent variable for the industry-country panel ij in period t which can be interpreted as the propensity that Japanese companies have positive employment in a country in a certain year due to the explanatory variables. The dependent variable y_{ijt} has a minimum value of zero. An indicator function selects the appropriate density for each of the two possible cases – if employment is 0 or if employment takes on a positive value. A normal cumulative distribution function is assumed (Wooldridge 2002). See the appendix for the Log-likelihood function (Appendix 1).

As the regression coefficients only measure the impact of the explanatory variables on the latent dependent variable y^*, *marginal effects* are used to interpret the impact of the explanatory variables on the expected value of the dependent variable y. These partial derivatives can be decomposed into two parts: The impact of an explanatory variable x^k on the change in the dependent variable y given that positive values are observed and the change on the probability that the observation is positive weighted by the expected value of y if above zero (McDonald and Moffit 1980).[8]

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[7] If a constant is included into the equation specification, then $x^1 = 1$ for all countries, industries and years, and β^1 is thus this constant term.

[8] For binary variables (e.g., entry into force of an agreement), the difference between the value when the variable takes on the value1 and when it is 0 is taken.

(4) $$\frac{\partial E[y|X]}{\partial x^k} = P(y>0|X)\cdot\left(\frac{\partial E(y|X,y>0)}{\partial x^k}\right) + E(y|X,y>0)\cdot\left(\frac{\partial P(y>0|X)}{\partial x^k}\right).$$

Defining z as

(5) $$z = \frac{\beta' X}{\sigma} \quad ,$$

and after further transformations (McDonald and Moffitt 1980; Wooldridge 2002) the three following marginal effects for interpretation purposes are reported in the output tables:

(6) $$\frac{\partial E(y|X)}{\partial x^k} = \Phi(z)\cdot\beta^k \text{ as } e,$$

(7) $$\frac{\partial E(y|X,y>0)}{\partial x^k} = \beta^k\left(1 - z\phi(z)/\Phi(z) - \phi(z)^2/\Phi(z)^2\right) \text{ as } y,$$

(8) $$\frac{\partial P(y>0|X)}{\partial x^k} = \phi(z)\cdot\frac{\beta^k}{\sigma} \text{ as } p.$$

If not otherwise noted, these effects are measured at the means of the explanatory variables following conventional literature. In order to get inference on the marginal effects, the delta method, implemented in Stata, is used.

In the case of interaction effects the marginal effects of each of the interacted variables have to be correctly adjusted. Not accounting for the interaction in the marginal effect calculation of the interacted variables, the first derivative, and in the calculation of the interaction itself, the second derivative, will bias coefficients upwards or downwards and change standard errors and significance levels (Braumöller 2004; Brambor et al. 2006; Norton et al. 2004).

The *first derivative* for the interaction between R&D intensity (R&D) and BIT for e is

$$(9)\quad \frac{\Delta E(y|X,y>0)}{\Delta BIT}=\beta_{BIT}+\beta_{INT}\cdot R\&D+\sigma\cdot\left\{\frac{\phi(z_{pos})}{\Phi(z_{pos})}-\frac{\phi(z_{zer})}{\Phi(z_{zer})}\right\}.$$

The interaction term between the two variables is abbreviated with *INT*. For presentation purposes z_{pos} and z_{zer} is defined as

$$(10)\quad z_{pos}=\frac{\tilde{\beta}'\bar{\bar{X}}+\beta_{INT}\cdot\overline{R\&D}\cdot 1+\beta_{BIT}\cdot 1+\beta_{R\&D}\cdot\overline{R\&D}}{\sigma}$$

$$(11)\quad z_{zer}=\frac{\tilde{\beta}'\bar{\bar{X}}+\beta_{INT}\cdot\overline{R\&D}\cdot 0+\beta_{BIT}\cdot 0+\beta_{R\&D}\cdot\overline{R\&D}}{\sigma}=\frac{\tilde{\beta}'\bar{\bar{X}}+\beta_{R\&D}\cdot\overline{R\&D}}{\sigma}.$$

The *second derivative* is approximated through the normed change in treaty effectiveness due to a change from a high to a low level in the R&D intensity

$$(12)\quad \frac{\partial\frac{\Delta E(y|X,y>0)}{\Delta BIT}}{\partial R\&D}\approx\frac{\Delta^2 E(y|X,y>0)}{\Delta BIT\cdot\Delta R\&D}=\frac{\Delta\left\{\sigma\cdot\left\{z_{pos}+\frac{\phi(z_{pos})}{\Phi(z_{pos})}\right\}-\sigma\cdot\left\{z_{zer}+\frac{\phi(z_{zer})}{\Phi(z_{zer})}\right\}\right\}}{\Delta R\&D}.$$

Appendix 2 provides details on the derivations.

4.3. *Empirical Model*

The empirical model is as follows:

$$(13)\quad \log Y_{ij(t+1)}=\max(0,\alpha_0+\beta_F'F_{it}+\beta_X'C_{it}^E+\beta_X'C_{it}^P+\beta_I'I_{jt,}+\beta_t'T_{t+1}+\varepsilon_{ij(t+1)})$$

An *country* i - *industry* j *-year* t *panel* is constructed. The sample includes 135 developing and emerging countries i over 23 (20) manufacturing, primary sector and service (non-service) industries for the years 1990-2004 leading to a total number of observations of $n=\sum_{t=1}^{T}N_t=42{,}067(33{,}853)$ based on 3,105 (2,700) unique country-industry pairs N_t.[9]

The relevant aggregated Japanese affiliate employment Y_{ijt} or the value 0, when no investment has occurred, is assigned to a country i- industry j-year t pair. Though Y_{ijt} are not stationary, the Johansen Cointegration test shows that at least one cointegration relationship exists. The explanatory variables are all lagged by one period to mitigate the reverse causality problem. F_{it} refers to the vector of the focus variables – the international investment and trade agreements. The choice of economic control variables included in the vector C_{it}^{E} has been motivated by gravity reasoning while variables capturing the "new institutional economics" arguments are the political environment C_{it}^{P} and the transaction cost measuring variables on the industry level I_{jt}. The vector of the time dummies T_t contains 14 elements corresponding to dummies for all years t but the first year. They are included to control for global shocks. Interaction terms between the industry measure for asset specificity and the treaties to test hypotheses 3 and 4 are added. Table 14 in the appendix provides information on variable constructions and the datasouces.

The ratification of a BIT with Japan is accounted for with a dummy variable which is 1 if the destination country i has ratified a BIT with Japan in or prior to year t (*Jap. BITs)*. Otherwise it is 0.[10] Five measures for the PTIAs are separately included

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[9] All those countries were included in the set-up that were classified by the World Bank as low and middle income countries in 2005 according to their gross national income (GNI) per capita (World Bank 2007) as well as a selected number of high income emerging economies (Hong Kong, Israel, Korea, Saudi Arabia, Singapore, and Taiwan). Table 13 in the appendix enumerates the sample.

[10] Although it would have been of interest to distinguish the agreements according to content and capture differential treaty impact on FDI in this regard, differentiation was not possible due to the limited number of agreements realized during the investigation period. Also, the commercial treaties concluded prior to the 1980s are not included due to the fact that they were all concluded prior to the investigation period and because contents with respect to investment protection are very limited (Matsui 1989; Sakurai 1996). The only Japanese PTIAs - the EPAs – that has been concluded within the time frame of interest is the one with Singapore. When treating it

in the regressions: A dummy variable which captures membership for country i in year t in at least one PTIA as notified to the WTO (*WTO-PTIAs)* allows for estimating the impact of the multitude of PTIAs that have developed over the years. The regional PTIAs selected by Te Velde and Bezemer (2006) are inserted in a next step via a membership dummy (*Member RTIA*), the additional market size generated through the agreements by taking the natural logarithm of the sum of the total GDP of the partner countries (*Log Reg.GDP*), and the indices of trade (*Trade Index*) and investment liberalization (*Inv. Index*) which have been developed by Te Velde and Bezemer (2006) for these agreements. The values 1 to 3 are assigned to the respective agreement according to the levels of trade or investment liberalization attained (3 being the highest), and 0 relating to no liberalization at all (Table 8).

Economic control variables are modeled after a specification which has been used by Buch et al (2005) omitting interaction effects included by, for instance, Carr et al. (2001): Since the testing of the hypotheses already relies on interactions, the interpretation of the model would have been rendered very complicated. The size of the host economy is proxied by the natural logarithm of the gross domestic product (*Log GDP*). It is proposed that the larger the market, the more market-seeking FDI will be attracted. The natural logarithm of distance is used as a measure for distance related transaction costs such as transportation costs (*Log Distance*) predicting a negative relationship.[11] One further measure for the economic similarity of the host

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as a Japanese BIT, thus as if no preferential trade clauses were included in the treaty and adding it to the BIT dummy variable, the outcome with respect to the impact of the BIT variable does not change. Results are not reported, but are available on request.

[11] In the case of horizontal FDI, FDI should increase with distance to serve a market. In the case of vertical FDI, FDI should decrease as distance related costs grow. Furthermore, in line with geographic distance institutional distance (including psychic and cultural distance) is expected to grow discouraging FDI in general (e.g., Egger and Pfaffermayr 2004). Due to the nature of the dependent variable which captures employment and as such vertical

and home countries (*Similarity*) is included which is measured as the host country's GDP per capita divided by Japanese GDP per capita (Buch et al. 2005). Cost reduction motivated FDI will occur when countries are dissimilar in factor costs while market motivated FDI will happen in the case of similar countries. As labor-seeking FDI should play an important role in developing countries, a negative coefficient is predicted (Markusen and Maskus 2002). Thus, the similarity measure also serves as a proxy for wage differentials between Japan and the host economy.

A country's openness to trade measured as trade related to GDP (*Trade openness*) has also been highlighted as being strongly positively related to FDI in an extreme-bound analysis (Chakrabati 2001) and is thus included in the regression. Further *economic control variables* – inflation, total FDI within a host country, and natural resources – are added during sensitivity checks.

The domestic institutional political environment of each host country at time *t* is measured by the political constraints index (*POLCON*). The index attempts to objectively measure the political institutional stability of an economy through "the extent to which a change in the preferences of any one actor may lead to a change in government policy" (Henisz 2002: 363).[12] The larger the value, the more constraints exist and the more difficult it becomes to change policies making the business environment more predictable for the firm. As an alternative measure the International Country Risk Guide (ICRG) composite index (*ICRG*) is applied. It

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labor-seeking FDI, Japanese FDI activities can be expected to decrease as distance increases.

[12] POLCON measures the number of independent branches of government representing veto players, the party alignment of the executive and legislative branches, and alignment within the legislative branch. An additional veto player decreases the likelihood of a policy change, but with diminishing returns, and the homogeneity of party preferences within an opposition branch of government increases constraints. Spatial modelling techniques are used to derive a value between 0 and 1 (Henisz 2002).

ranges from 0-100 while 0 refers to high risk and 100 to low risk (PRS 1996). The ICRG Index addresses political risk in general. As a proxy for Japanese home government policies, development aid is included measured as the natural logarithm of the amount of *official development assistance* which is disbursed by Japan (*Log Jap. ODA*) in the respective host countries.[13] The positive role of Japanese ODA for FDI through infrastructure development, information generation, business system transplantation, and an investment securing effect has been established in empirical studies (Blaise 2005; Kimura and Todo 2007). To account for a country's trade policies, its commitments to open markets and liberal economic policies membership to the WTO (*WTO member)* is added. As most countries belong to the WTO nowadays, impact of pure membership on a country's FDI attractiveness is questionable per se (Rose 2003). No significant impact is expected.

Industry specific variables I_{jt} are based on averages of the consolidated financial data from listed companies which own foreign affiliates in the respective countries - excluding financial and insurance companies.[14] Except of the agriculture, the mining and the printing industry, a sufficient number of parent firm observations is given. Overall, the higher the average *Net Sales* in an industry, the more productive the industry is expected to be, and the larger the expected foreign investment activities (Helpman et al. 2004). Highly R&D intensive investments, measured as the Research and Development expenses over Net Sales (*R&D Ind. Mean*) are assumed to be particularly asset specific as knowledge takes a long time to build and is organization

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[13] It includes both grants and loans. If in certain years no value for Japanese ODA spending was indicated for a country, but some other donour had provided aid, zero Japanese ODA disbursements were assumed. Negative flows were set to 0 after the positive values were transformed.

[14] These values stem from the industrial financial indicators collected by the Development Bank of Japan (DBJ) for the years 1989-2003. Table 15 in the appendix shows descriptive statistics per industry.

specific. This measure is, however, only a rough proxy as it captures a parent firm instead of the transaction, thus FDI characteristics, and is furthermore aggregated at the industry level. The R&D time series has a structural break due to a change in data-reporting in 1999. As such, an interaction term between the R&D intensity measure with a dummy variable for the years 1999-2004 (*R&D Ind. Mean >=1999*) is added in the relevant regressions.

Table 1: Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable				
Log Employment (General)	0.81	2.19	0	12.323
Log Employment (Large Scale)	0.61	2.02	0	12.3
Country Level				
Log GDP	22.88	1.95	17.452	28.074
Similarity	0.07	0.10	0.00	0.70
Log Distance	9.170	0.49	7.05	9.830
Trade Openness	81.03	49.85	13.24	398.80
POLCON	0..36	0..311	0	0.89
ICRG Composite Index	60.48	12.14	8.50	89.13
BIT	0.0384	0.192	0	1
WTO-PTIAs	0.53	0.50	0	1
Membership in Selected RTIAs	0.2	0.4	0	1
Trade Index	0.46	0.81	0.00	3.00
Investment Index	0.45	0.77	0.00	3.00
Log Japanese ODA	13.57	6.32	0	21.03
Log Japanese ODA (>0)	16.23	2.15	9.09	21.03
Log Japanese ODA p.c. (>0)	0.36	1.87	-7.21	6.21
Trade Restr.	0.46	0.81	0	3
Inv. Index	0.45	0.77	0	3
Log. Inflation	2.34	1.48	-4.6	10.19
Log of Tot. FDI Inflows Host Country	17.28	5.29	0	24.6
Log Natural Resources	2.05	1.91	-7.77	4.60
WTO-Member	0.68	0.47	0	1
Industry Level				
Log Net Sales	18.85	0..83	16.735	21.12
R&D Ind. Mean	0.02	0.01	0	0.06
R&D Ind. Mean >=1999	0.01	0.02	0	0.06

Notes: The descriptive statistics are from the base regression (Table 2 colum 1). Descriptive statistics of all those variables not included in the base regressions are from the relevant regressions.

Overall, in order to test for the relevance of firm heterogeneity regressions are run for both general FDI and large-scale FDI and a measure for asset specificity (R&D specificity) is interacted with the agreements.

5. Results

In all specifications, the control variables have the expected signs – which provides evidence for the reliability of the data and the empirical set-up. Cross-correlations of the variables included in the base regression (Table 2 column 1 shows the output) provide no sign for multicollinearity (Table 16 in the appendix).

BITs should be of relevance in particular for large-scale FDI *(hypothesis 1).* Using *general FDI* as the dependent variable (Table 2 column 1), thus including all affiliates also the smaller-sized ones, the positive impact of BITs is not robustly significant. When limiting the sample to developing countries (column 2), thus to the low and middle income countries according to the World Bank classification, the significance level drops. Replacing the measure for the political environment, POLCON, with the ICRG index, BITs turn insignificant in the case of developing countries (column 3). Further sensitivity checks show that the BITs do not robustly influence general Japanese FDI activities: For instance, when including the total amount of FDI attracted to the host country by all investor nations and the inflation variable, Japanese BITs turn insignificant (column 4). However, when limiting the affiliates included in the dependent variable calculation to those with an *affiliate size of at least 100 Japanese employees*, the agreement is always of 1% significance (Table 2 columns 4-8), also when changing sample sizes and the included variables. BIT impact is also higher for large FDI than in the case of the general FDI estimation. A BIT raises the Japanese employment in the countries with positive employment by about 14-25% at the mean values of the other explanatory variables *(e).* The unconditional effect, including the zero-investment countries, lies at about 2-5% *(y)*. The probability of an industry entering a country is raised by 1% through the conclusion of a BIT *(p)*.

Comparison of the magnitude of the effects with the other studies estimating BIT impact is difficult as these use a whole range of source countries and financial FDI measures. Overall, the estimates obtained in this study are at the lower bound of those estimated by others and thus seem reasonable, e.g., the GMM and OLS estimates in the study by Busse et al. (2007) range between 20 and 40%, Egger and Merlo (2007) estimate an increase of about 44% due to the conclusion of a BIT. Haftel (2007), who studies the relevance of ratified US BITs for US FDI in a fixed effects panel least square set-up, finds an impact of about 18-20%.

Hypothesis 2 relates to the impact of the PTIAs on FDI according to the size of the investment. In the case of *general FDI*, using the index which measures membership in at least one PTIA as notified to the WTO (*WTO-PTIA)*, a positive and significant coefficient is revealed for all sample and variable specifications (Table 2). Being member to an agreement increases Japanese employment by 9-10% given the FDI data is positive at the means of the explanatory variables *(e)*. The probability of an industry entering a country rises by 0.9-1.1% *(p)*. Overall, Japanese employment increases by 3-4% by being member to at least one of the PTIAs *(y)*.

Table 2: Results (1)

	General FDI								Large FDI							
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	All		Dev.		Dev.		All		All		Dev.		Dev.		All	
	Countries	ME(e, y, p)	Countries	ME(e, y, p)	countries	ME (e, y,p)	Countries	ME(e, y, p)	Countries	ME(e, y,p)	Countries	ME (e, y,p)	Countries	ME (e, y,p)	Countries	ME(e, y, p)
Log GDP	3.211***	0.45 ;0.17	3.513***	0.46 ;0.15	3.401***	0.524 ;0.252	3.406***	0.47 ;0.17	4.935***	0.53 ;0.08	5.471***	0.56 ;0.07	5.456***	0.634 ;0.134	4.805***	0.51 ;0.08
	(0.124)	0.05	(0.165)	0.05	(0.152)	0.070	(0.136)	0.05	(0.224)	0.02	(0.187)	0.02	(0.305)	0.032	(0.869)	0.02
Similarity	-6.801***	-0.96 ;-0.37	-12.87***	-1.70 ;-0.54	-13.05***	-2.01 ;-0.97	-7.922***	-1.10 ;-0.40	-14.45***	-1.55 ;-0.25	-30.15***	-3.07 ;-0.39	-29.38***	-3.42 ;-0.72	-15.04***	-1.60 ;-0.24
	(0.936)	-0.12	(2.862)	-0.17	(2.737)	-0.27	(1.210)	-0.13	(1.467)	-0.06	(5.013)	-0.10	(6.210)	-0.17	(2.599)	-0.07
POLCON	0.586***	0.08 ;0.03	0.843***	0.11 ;0.04			0.792***	0.11 ;0.04	1.315***	0.14 ;0.02	1.870***	0.19 ;0.02			1.612***	0.17 ;0.03
	(0.142)	0.01	(0.175)	0.01			(0.169)	0.01	(0.256)	0.01	(0.318)	0.01			(0.316)	0.01
ICRG					0.0115**	0.002 ;0.001							0.027***	0.003 ;0.001		
					(0.00448)	0.000							(0.00772)	0.000		
LogDistance	-3.778***	-0.53 ;-0.20	-3.519***	-0.46 ;-0.15	-3.331***	-0.51 ;-0.25	-3.353***	-0.46 ;-0.17	-5.194***	-0.56 ;-0.09	-4.773***	-0.49 ;-0.06	-4.910***	-0.57 ;-0.12	-4.602***	-0.49 ;-0.07
	(0.302)	-0.06	(0.418)	-0.05	(0.412)	-0.07	(0.333)	-0.05	(0.505)	-0.02	(0.609)	-0.02	(0.654)	-0.03	(0.550)	-0.02
Trade Open	0.017***	0.002 ;0.001	0.0159***	0.002 ;0.001	0.0156***	0.00 ;0.00	0.0193***	0.003 ;0.001	0.0306***	0.003 ;0.001	0.0333***	0.003 ;0.000	0.0309***	0.004 ;0.001	0.0386***	0.004;0.001
	(0.00150)	0.000	(0.00194)	0.000	(0.00198)	0.00	(0.00179)	0.000	(0.00260)	0.000	(0.00344)	0.000	(0.00369)	0.000	(0.00343)	0.000
Jap. BITs	**0.794*** **	**0.12 ;0.05**	**0.420** **	**0.06 ;0.02**	**0.276**	**0.04 ;0.02**	**0.226**	**0.03 ;0.01**	**2.179*** **	**0.25 ;0.05**	**1.789*** **	**0.19 ;0.03**	**1.405*** **	**0.17 ;0.04**	**1.242*** **	**0.14 ;0.02**
	(0.142)	**0.01**	**(0.202)**	**0.01**	**(0.199)**	**0.01**	**(0.178)**	**0.00**	**(0.253)**	**0.01**	**(0.408)**	**0.01**	**(0.396)**	**0.01**	**(0.365)**	**0.01**
WTO-PTIA	**0.608*** **	**0.09 ;0.03**	**0.709*** **	**0.09 ;0.03**	**0.759*** **	**0.117 ;0.056**	**0.717*** **	**0.10 ;0.04**	**0.507*** **	**0.05 ;0.01**	**0.582*** **	**0.06 ;0.01**	**0.641*** **	**0.074 ;0.016**	**0.568*** **	**0.06 ;0.01**
	(0.0781)	**0.01**	**(0.0945)**	**0.009**	**(0.0954)**	**0.016**	**(0.0874)**	**0.011**	**(0.137)**	**0.002**	**(0.168)**	**0.002**	**(0.170)**	**0.004**	**(0.155)**	**0.002**
WTO-Mem.	-0.0602	-0.01 ;0.00	-0.0744	-0.01 ;0.00	-0.0954	-0.015 ;-	-0.123	-0.02 ;-0.01	-0.179	-0.02 ;0.00	-0.290	-0.03 ;0.00	-0.282	-0.033 ;-	-0.200	-0.02 ;0.00
	(0.108)	0.00	(0.133)	-0.001	(0.131)	-0.002	(0.126)	-0.002	(0.183)	-0.001	(0.225)	-0.001	(0.228)	-0.002	(0.218)	-0.001
LogJapODA	0.041***	0.01 ;0.002	0.0571***	0.01 ;0.002	0.0583***	0.009 ;0.004	0.0454***	0.01 ;0.002	0.0463***	0.01 ;0.001	0.0535***	0.005 ;0.00	0.0554***	0.006 ;0.001	0.0529***	0.006 ;0.00
	(0.00494)	0.001	(0.00678)	0.001	(0.00669)	0.001	(0.00570)	0.001	(0.00828)	0.000	(0.0119)	0.000	(0.0119)	0.000	(0.0110)	0.000
Total FDI							0.0227***	0.003 ;0.00							0.0330***	
							(0.00643)	0.000							(0.0105)	0.000
Log Inflat.							-0.00540	0.00 ;0.00							-0.0540	
							(0.0264)	0.000							(0.0453)	0.000
Constant	-50.22***		-60.28***		-59.41***		-59.41***		-86.73***		-103.6***		-102.6***		-89.78***	
	(4.205)		(5.734)		(5.541)		(4.749)		(6.893)		(7.908)		(10.42)		(20.71)	
Obs.	42067		39698		29946		36271		42067		39698		29946		36271	
Co.Ind.Pairs	3105		2944		2277		2921		3105		2944		2277		2921	
Uncensored.	6410		5040		4954		5374		3986		2999		2963		3267	

	General FDI								Large FDI							
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	All Countries	ME(e, y, p)	Dev. Countries	ME(e, y, p)	Dev. countries	ME (e, y,p)	All Countries	ME(e, y, p)	All Countries	ME(e, y,p)	Dev. Countries	ME (e, y,p)	Dev. Countries	ME (e, y,p)	All Countries	ME(e, y, p)
σ_λ	6.173		6.594		6.493		6.304		9.105		9.610		9.491		8.767	
σ_u	1.828		2.030		2.013		1.925		2.449		2.716		2.714		2.565	
LL	-16880		-14154		-13789		-14667		-11889		-9492		-9343		-10047	
Pseudo R2	0.35		0.33		0.33		0.33		0.33		0.31		0.30		0.31	

Results are tobit estimates. The dependent variable Yit is the natural logarithm of the share of employment attributed to the Japanese owners (total employment* investment share of Japanese owners within the company). All explanatory variables are lagged by one year. A group is defined as an industry in a country over time. Standard errors are given in parenthesis. The marginal effects e, y and p at the means of the explanatory variables are reported next to the coefficients. The estimates for year dummies are not reported, they are, however, jointly significant in all of the models. Data is for 1990-2004. *,**,*** indicate significance at the 10%, 5%, and 1% level, respectively. LL refers to the Log-Likelihood, Pseudo R2 is the Mc Fadden R2. It compares the likelihood for the intercept only model M_c to the likelihood for the model with the predictors $M_F : R^2 = 1 - \ln L(M_F) / \ln L(M_c)$.

When turning to the selected seven RTIAs (Table 3), simple membership in the latter leads, for instance, to about a 5% increase in employment at the means of the explanatory variables in those countries where Japanese companies have invested (column 1) *(e)*. The additional GDP generated through the selected regional agreements also plays a significantly positive, but in economic terms minor role (column 2). In all cases, when limiting the dependent variable to *large FDI* only, economic magnitude decreases. In the case of the PTIA variable measuring membership to one of the agreements notified to the WTO (*WTO-PTIAs*) the impact on investment conditioned that it is positive ranges between 5-8% *(e)* while for all countries it falls to a 1% rise in FDI due to the conclusion of a PTIA *(y)* (Table 2). Limiting the agreements to the seven selected by Te Velde and Bezemer (2006) the impact is reduced to 3% for the positive employment countries and to 1% for all countries. Also for large FDI, the additional GDP of the selected regional agreements plays a significantly positive, but minor role. The results using the *investment and trade indices* by Te Velde and Bezemer (2006) also point at the higher relevance of PTIAs for general FDI than for the large FDI activities.

These findings, using data of Japanese FDI activities, confirm results obtained by Te Velde and Bezemer (2006) for UK and US FDI though the estimates in their study are a lot higher. The results also show that smaller-sized subsidiaries seem to drive the positive and significant general FDI results: the marginal PTIA effect is lower for large FDI than for general FDI and the significance levels are also lower when using the selected seven regional agreements. A signaling effect of PTIAs for FDI activities – if existing – is in all cases weaker than the effect of generating or enlarging smaller affiliates. Hence, hypothesis 2 is not supported for PTIAs.

Table 3: Results (2) - Different PTIA Measures

	General FDI								Large FDI			
	(1)	ME (e, y, p)	(2)	ME (e, y, p)	(3)	ME (e, y, p)	(4)	ME (e, y, p)	(5)	ME (e, y, p)	(6)	ME (e, y, p)
Log GDP	3.229***	0.46 ;0.17	3.229***	0.46 ;0.17	3.247***	0.46 ;0.18	3.188***	0.45 ;0.17	4.921***	0.53 ;0.08	4.922***	0.53 ;0.08
	(0.125)	0.06	(0.125)	0.06	(0.122)	0.06	(0.126)	0.05	(0.220)	0.02	(0.221)	0.02
Similarity	-7.192***	-1.01 ;-0.39	-7.173***	-1.01 ;-0.39	-7.177***	-1.01 ;-0.39	-6.891***	-0.97 ;-0.37	-14.72***	-1.58 ;-0.25	-14.71***	-1.58 ;-0.25
	(0.944)	-0.12	(0.945)	-0.12	(0.941)	-0.12	(0.953)	-0.12	(1.452)	-0.07	(1.453)	-0.07
POLCON	0.653***	0.09 ;0.04	0.654***	0.09 ;0.04	0.602***	0.08 ;0.03	0.613***	0.09 ;0.03	1.382***	0.15 ;0.02	1.382***	0.15 ;0.02
	(0.143)	0.01	(0.143)	0.01	(0.143)	0.01	(0.143)	0.01	(0.257)	0.01	(0.257)	0.01
Log Distance	-3.664***	-0.52 ;-0.20	-3.665***	-0.52 ;-0.20	-3.672***	-0.52 ;-0.20	-3.744***	-0.53 ;-0.20	-5.001***	-0.54 ;-0.09	-5.003***	-0.54 ;-0.09
	(0.301)	-0.06	(0.301)	-0.06	(0.300)	-0.06	(0.301)	-0.06	(0.486)	-0.02	(0.487)	-0.02
Trade Openness	0.0173***	0.002 ;0.00	0.0172***	0.002 ;0.00	0.0178***	0.003 ;0.0	0.0152***	0.002 ;0.00	0.0314***	0.003 ;0.00	0.0313***	0.003 ;0.00
	(0.00150)	0.000	(0.00150)	0.000	(0.00149)	0.000	(0.00157)	0.000	(0.00259)	0.000	(0.00259)	0.000
Japanese BITs	**0.779*** **	**0.11 ;0.05**	**0.781*** **	**0.11 ;0.05**	**0.722*** **	**0.10 ;0.04**	**0.812*** **	**0.12 ;0.05**	**2.165*** **	**0.25 ;0.05**	**2.166*** **	**0.25 ;0.05**
	(0.143)	**0.01**	**(0.143)**	**0.01**	**(0.142)**	**0.01**	**(0.143)**	**0.02**	**(0.255)**	**0.01**	**(0.255)**	**0.012**
MemberRTIA	**0.319*** **	**0.05 ;0.02**							**0.319** **	**0.03 ;0.01**		
	(0.0858)	**0.01**							**(0.142)**	**0.00**		
Log Reg.GDP			**0.0121*** **	**0.002 ;0.00**							**0.0119** **	**0.001 ;0.00**
			(0.00322)	**0.000**							**(0.00532)**	**0.000**
Trade Index					**0.193*** **	**0.027 ;0.01**						
					(0.0592)	**0.003**						
Inv. Index							**0.211*** **	**0.03 ;0.01**				
							(0.0412)	**0.00**				
WTO-Member	-0.0808	-0.01 ;0.00	-0.0873	-0.01 ;0.01	-0.129	-0.02 ;-0.01	-0.0947	-0.01 ;-0.01	-0.184	-0.02 ;0.00	-0.192	-0.02 ;0.00
	(0.109)	-0.001	(0.109)	-0.001	(0.110)	-0.002	(0.109)	-0.002	(0.183)	-0.001	(0.183)	-0.001
Log Jap. ODA	0.0401***	0.01 ;0.00	0.0403***	0.01 ;0.00	0.0406***	0.01 ;0.00	0.0408***	0.01 ;0.00	0.0457***	0.01 ;0.00	0.0458***	0.01 ;0.00
	(0.00495)	0.001	(0.00495)	0.001	(0.00495)	0.001	(0.00495)	0.001	(0.00828)	0.000	(0.00828)	0.000
Constant	-51.57***		-51.54***		-51.96***		-49.84***		-87.86***		-87.87***	
	(4.157)		(4.157)		(4.157)		(4.147)		(6.775)		(6.792)	
σ_λ; σ_u	6.165; 1.833		6.167; 1.833		6.155; 1.834		6.199; 1.832		8.967; 2.452		8.974; 2.452	
LL; Pseudo R2	-16903; 0.34		-16903; 0.34		-16905; 0.34		-16898; 0.34		-11893; 0.32		-11893; 0.32	

The sample consists of 3,105 groups and 42,067 observations inc. all sample countries. There are 6410 (3986) uncensored observations for general (large) FDI. Further notes as in Table 2.

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Hypothesis 3 and 4 turn to the role of asset specificity for treaty effectiveness. The two measures for R&D Intensity (*R&D Ind. Mean* and *R&D Ind. Mean >=1999)* and the relevant interaction term to capture the effect of the treaties conditioned on the industry specific measure for asset specificity are added in the regressions.[15] Marginal effects for BIT and PTIA effectiveness are derived at the centiles of R&D intensity. It is expected that these should be higher for high-tech industries than for low-tech ones. The hypothesis can be claimed statistically secured if the second derivative, measured as the normed difference between treaty impact for high-tech (80th centile) and low-tech (20th centile) industries, is positive and significant.

The *R&D variable* itself is insignificant in the case of general FDI, but significant for large FDI. This rejects the idea that asset-specificity per se leads to higher FDI. Only in combination with asset size it shows results. This result is also robust when omitting the three industries with insufficient parent firms.

[15] The interaction between the treaties and the base R&D variable *R&D Ind. Mean* is analyzed. As the calculation of one marginal effect leads to an underestimation of the effect in the period until 1999 and to an overestimation of the effect in and after 1999, one could argue that running two separate regressions would be more meaningful. However, it was preferred to not reduce the period of 15 years, as, among others, one of the focus variables –BITs – is limited in number.

Table 4: Asset Specificity and International Trade and Investment Agreements

	Second Derivative BIT/PTIA - low R&D (20th centile) to high R&D (80th centile)	First Derivatives BIT/PTIA at selected R&D values				
		20	40	60	80	mean
BITs						
(1) General FDI, all countries	0.01 (0.51)	0.12 (0.00)	0.12 (0.00)	0.13 (0.00)	0.13 (0.00)	0.13 (0.00)
(2) General FDI, dev. countries	0.01 (0.64)	0.07 (0.06)	0.07 (0.03)	0.08 (0.02)	0.08 (0.01)	0.08 (0.02)
(3) Large FDI, all countries	0.01 (0.75)	0.26 (0.00)	0.26 (0.00)	0.26 (0.00)	0.27 (0.00)	0.26 (0.00)
(4) Large FDI, dev. countries	-0.01 (0.86)	0.23 (0.00)	0.22 (0.00)	0.22 (0.00)	0.22 (0.00)	0.22 (0.00)
PTIAs						
(5) General FDI, all countries	0.02 (0.09)	0.09 (0.00)	0.09 (0.00)	0.10 (0.00)	0.11 (0.00)	0.10 (0.00)
(6) General FDI, dev.countries countries	0.03 (0.06)	0.09 (0.00)	0.10 (0.00)	0.11 (0.00)	0.12 (0.00)	0.11 (0.00)
(7) Large FDI, all countries	0.03 (0.08)	0.05 (0.00)	0.06 (0.00)	0.07 (0.00)	0.08 (0.00)	0.07 (0.00)
(8) Large FDI, dev. countries	0.05 (0.01)	0.05 (0.02)	0.06 (0.00)	0.08 (0.00)	0.10 (0.00)	0.08 (0.00)

Notes: Reported are the marginal effects of BITs and PTIAs and the respective p-values in parentheses (first derivatives). The marginal effect e refers to the impact of BITs on Japanese FDI activities in those cases when investment is above zero. Marginal effects are calculated at the mean and at the centiles of ***R&D Ind. Mean.*** The second derivative approximated as the normed change in BIT impact due to a move from the 20th to the 80th centile of R&D intensity is reported. Results stem from panel tobit estimations. A group is defined as a an industry in a country over time. The dependent variable Yijt is the natural logarithm of the share of employment attributed to the Japanese owners (total employment* investment share of Japanese owners within the company). In the general FDI variable all affiliates are included in the data aggregation, in the case of large-scale FDI only affiliates with at least 100 employees. All explanatory variables are lagged by one year. Data is for 1990-2004. The model is (here for BITs – por PTIAs, BIT has to replaced with $WTO\text{-}PTIAs$):

$$\log Y_{ij(t+1)} = \max(0, \alpha_0 + \beta_{BIT} BIT_{it} + \beta_{PTIA} PTIA_{it} + \beta_{GDP} GDP_{it} + larity_{it} + \beta_{Trade} TradeOpenness_{it} + \beta_{pol} POLCON_{it} + \beta_{WTO} WTO_{it} + \beta_{aid} Jap.Aid_{it} + \beta'_{R\&D}\text{R\&DInd. Mean}_{jt}$$
$$+\beta'_{Int} * BIT_{it} * R\&D\text{Ind. Mean}_{jt} + \beta'_{R\&D>1999}\text{R\&DInd. Mean } {>=}1999_{jt} + \beta'_t T_{t+1} + \varepsilon_{ij(t+1)}).$$

Investment protecting BITs should be of particular relevance when the asset specificity of the investment is high since such investments are more vulnerable to quasi-rent appropriation (hypothesis 3). The marginal effect calculation (Table 4 rows 1-4) shows that BITs are significant at all levels of R&D intensity. But, overall, the marginal effects of BITs on FDI activities remain almost the same with changing levels of R&D. For instance, in the case of general FDI using the sample that includes all developing and emerging economies (Table 4 row 1), a BIT raises the Japanese employment by 12% at the 20th centile of R&D intensity. In the case of the 80th centile this rises by only 1% to 13%. Consequently, the 2nd derivative is insignificant in all cases. Hence, hypothesis 3 on the relevance of investment protecting BITs in the presence of high R&D intensity is not supported.

Hypothesis 4 turns to the relationship between asset specificity and the PTIAs. The findings show that PTIAs also exert a positive impact at all levels of R&D intensity – for both general and large scale FDI (Table 4 rows 5-8). But here the overall change in the effect at the different R&D levels ranges between 2 and 5 percentage points. The maximum is reached in the case of large scale FDI in developing economies. Here, Japanese employment is expected to grow by 5% at the 20^{th} centile of R&D intensity due to the conclusion of one PTIA while at the 80^{th} centile the marginal effect amounts to 10%. In this case the normed change in the PTIA effect (2nd derivative) is significant at the 1% level. Hence, there seems to be a link between asset specificity and PTIA effectiveness providing some support for hypothesis 4. Overall, one has to be careful in the interpretation of the results as the industry average of the R&D intensity across parent firms is a very poor proxy for the transaction specific asset specificity.

5.1.1 Discussion

Though the tobit estimates allow for the inclusion of all developing countries as possible investment destinations of Japanese firms in the set-up, several weaknesses have been revealed. Among others, only a random effects set-up is possible. Autocorrelation as well as heteroscedasticity can only be practically accounted for by adjusting the standard errors using *weighted-bootstrapped standard errors.* Due to the large sample and the resulting prohibitive costs of carrying out bootstrapping for all data points, the latter has been restricted for the largest industry – the electrical industry (Table 5, columns 5-8). BITs are not significant in the general FDI sample, but they remain significant at the 10% significance level for large FDI. PTIAs remain significant at the 1% significance level for both samples.

In the case of *panel least squares estimation* for the non-zero FDI data (Table 5, columns 9-12) fixed effects are included and it is controlled for autocorrelation and heteroscedasticity using robust standard errors.[16] The outcome resembles the previously estimated marginal effect *e* in terms of significance, though the economic magnitude of the least squares coefficients is larger - in particular with regard to BITs. They remain significant as opposed to the PTIAs.

Conditional Poisson quasi-maximum likelihood estimation (PQMLE) using robust standard errors (e.g., Desbordes and Vicard 2007; Head and Ries

[16] The Breusch and Pagan Lagrangian multiplier test for random effects showed that a random effects specification is preferred to a pooled model, but a Hausman test rejects the random effects in favor of a fixed effects specification.

forthcoming) (Table 5, columns 3-4) generates consistent estimates of the parameters under very general conditions also when the dependent variable is not purely count data.[17] However, time invariant observations are also deleted leading to bias (Martin and Pam 2008). Here, as well, BITs are of relevance while this is not the case for the PTIAs. Hence, when not accounting for those countries which have not yet obtained investment, PTIAs are insignificant.

One major problem in treaty impact analysis is that treaty conclusion can be influenced by the existing or planned FDI activities. Capturing the true influence of the agreements is thus difficult. Though this reverse causality is unlikely to occur in the case of PTIAs as Japan has not been involved in their negotiations, it is an issue for the BITs. Ideally, good instruments for the treaties should be found and applied. However, instruments are quite weak – as a result Aisbett (2007), for instance, turns to country-pair specific dummy variables to control for all unobserved effects in a country pair, and Egger and Merlo (2007) rely on dynamic GMM Arellano Bond estimations using the lags of BIT ratification as instruments.

Here, GMM Arellano-Bond estimation is not feasible since instrumenting the BIT variable with its lags does not pass the Sargan test of overidentifying restrictions. A two stage general squares analysis with both fixed and random effects instrumenting the Japanese BITs with the total number of BITs a host country had concluded showed that BITs remain significant at the 1% level.

Researchers studying US BITs (e.g., Haftel 2007) claim that a good indicator

[17] The code developed by Timothy Simcoe is used available at http://www.rotman.utoronto.ca/timothy.simcoe/xtpqml.txt based on Wooldridge (1999). As dependent variable the level, not the log has to be taken. See Head and Ries (forthcoming).

whether endogeneity can be assumed to be important is how the BIT partner countries fare in overall FDI attractiveness for US investors. They conclude that BITs across all ranges of US FDI stock had been concluded making reverse causality problems less likely. For the Japanese case this argument could also be raised, at least for the agreements concluded until 2002. But since the new trade and investment strategy has been implemented by the Japanese government, treaties have been mainly negotiated based on economic motivations making endogeneity highly likely (MOFA 2008b). As in this study only those agreements ratified until 2003 were included, the endogeneity problem might be less pronounced, but is an issue.

Table 5: Sensitivity (1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Panel 2SLS, FE (log FDI)		PQMLE, FE robust (FDI)		Tobit, electrical industry:standard & bootstrapped (BS) errors (log FDI)				Least Squares Regression (robust) (log FDI, without 0s)			
	Gen. FDI	Large FDI	Gen. FDI	Large FDI	Gen. FDI	(BS)	Large FDI	(BS)	Gen. FDI (F)	Gen.FDI (R)	Large (F)	Large (R)
Log GDP	1.003***	1.090***	9.210***	9.826***	4.742***	4.742***	5.748***	5.748***	2.319***	0.905***	2.492***	0.794***
	(0.0902)	(0.0912)	(3.000)	(3.538)	(0.582)	(0.582)	(0.766)	(1.009)	(0.154)	(0.0522)	(0.144)	(0.0459)
Similarity	-10.79***	-12.31***	0.000***	0.000***	-6.092	-6.092	-13.18**	-13.18	-9.283***	-4.910***	-8.485***	-4.239***
	(0.959)	(0.970)	(0.000)	(0.000)	(4.875)	(4.875)	(5.870)	(8.873)	(0.563)	(0.387)	(0.519)	(0.331)
POLCON	1.083***	1.052***	1.29*	1.337*	2.087***	2.087	3.536***	3.536**	0.202***	0.180**	0.152**	0.123*
	(0.0994)	(0.101)	(0.191)	(0.214)	(0.714)	(0.714)	(1.146)	(1.659)	(0.0747)	(0.0720)	(0.0756)	(0.0703)
Log Distance				1.857***	-2.000	-2.000	-2.983*	-2.983	-	-0.762***		
				(0.227)	(1.459)	(1.459)	(1.742)	(1.962)	-	(0.116)		
Trade Openness	0.000191	0.000881	1.003	1.004	0.0421***	0.0421**	0.0692***	0.0692***	0.005***	0.009***	0.00427***	0.00770***
	(0.000704)	(0.000713)	(0.002)	(0.002)	(0.00785)	(0.00785)	(0.0106)	(0.0241)	(0.000857)	(0.000712)	(0.000796)	(0.000676)
Jap. BITs	**11.53*** **	**11.57*** **	**1.707*** **	**1.857*** **	**3.381*** **	**3.381**	**4.978*** **	**4.978***	**0.484*** **	**0.362*** **	**0.358*** **	**0.184** **
	(0.842)	**(0.851)**	**(0.196)**	**(0.227)**	**(0.699)**	**(0.699)**	**(1.180)**	**(2.568)**	**(0.0827)**	**(0.0780)**	**(0.0871)**	**(0.0783)**
WTO-PTIAs	**0.503*** **	**0.435*** **	**0.977**	**0.974**	**1.868*** **	**1.868** **	**2.332*** **	**2.332*** **	**-0.007**	**0.023**	**-0.0605**	**-0.0649**
	(0.0416)	**(0.0421)**	**(0.108)**	**(0.119)**	**(0.377)**	**(0.377)**	**(0.513)**	**(0.673)**	**(0.0416)**	**(0.0407)**	**(0.0396)**	**(0.0403)**
WTO-Member	0.110**	0.121***	0.930	0.924	-0.270	-0.270	-0.582	-0.582	-0.086	0.047	0.0227	0.195***
	(0.0446)	(0.0451)	(0.094)	(0.106)	(0.610)	(0.610)	(0.757)	(1.235)	(0.0594)	(0.0579)	(0.0485)	(0.0531)
Log Jap. ODA	0.0455***	0.0418***	0.999	0.998	0.00128	0.00128	0.0254	0.0254	0.005**	0.010***	0.00135	0.00426**
	(0.00374)	(0.00378)	(0.004)	(0.004)	(0.0242)	(0.0242)	(0.0295)	(0.0470)	(0.00214)	(0.00216)	(0.00207)	(0.00208)
Log Net Sales							10.52***	10.52***				
							(2.091)	(2.338)				
Constant	-22.98***	-25.16***			-101.7***	-101.7***	-327.3***	-327.3***	-51.74***	-11.19***	-55.58***	
	(2.068)	(2.092)			(22.14)	(22.14)	(57.58)	(69.47)	(3.802)	(1.909)	(3.597)	
Observations	31671	31671	8587	5673	1829	1829	1829	1829	6410	6410	3986	3986
Cou.-Ind. Pairs	2415	2415	586	384	135	135	135	135	602	602	388	388
Log Likelihood					-1182	-1182	-881.4	-881.4				
Uncensored					426	426	426	426				
σ ; σ	3.448	3.559			6.233, 2.236	6.233, 2.236	6.791, 2.486	6.791, 2.486	3.353	1.930	3.300	1.347
R^2									0.110	0.247	0.276	0.119

Sample: All developing and emerging economies, PQMLE: regression reports the incidence rate ratios. The dependent variable Y is the natural logarithm of the share of employment attributed to the Japanese owners (total employment* investment share of Japanese owners within the company). All explanatory variables are lagged by one year. A group is defined as an industry in a country over time (in the case of columns 5 and 6 as a country over time). If not otherwise noted, standard errors are given in parenthesis. The estimates for year dummies are not reported, they are, however, jointly significant in all of the models. Data is for 1990-2004. *,**,*** indicate significance at the 10%, 5%, and 1% level, respectively.

For the *tobit random effects model,* several *other specifications* were tested to check for the sensitivity of the results.

Including dummies for the world regions leaves the signs, significance and magnitude of the marginal effects of the treaties basically unchanged (Table 6 columns 3-4). When including the measure for *natural resources* (Table 6 columns 1-2*)*, the PTIA variable turns insignificant in the case of large FDI (column 2), but in the case of general FDI (column 1) it is still significant. With respect to BIT effectiveness no change occurs. However, the sample size is significantly reduced when including the measure. Furthermore, the variable has its own problems as many of the countries which are assumed to have large oil and mineral exports do not report the figures. When including the *Net Sales* measure as a proxy for the average firm size of an industry, results do not change (Table 6 columns 5-6*)*, also when excluding those industries (agriculture, mining, printing) for which only few parent firms had reported complete information (Table 6 columns 7-8*).*

The base regression specification was rerun (without *Net Sales)*, but excluding the retail and wholesale industry from the analysis (Table 6 columns 9-10*)*. It is a rather heterogeneous industry which, among others, includes the sales offices of those companies which later on possibly establish value adding processes in the host countries and move from the retail industry into one of the other sectors. However, despite of the omission, results remain. Omitting China from the regressions confirms the results as previously obtained (Table 6 columns 11-12*).*

Table 6: Sensitivity (2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Gen. FDI Natural Resources	Large FDI Natural Resources	Gen. FDI Region dummies	Large FDI Region dummies	Gen. FDI W/o Services	Large FDI W/o Service	Gen. FDI w/o agric, mining, printing	Large FDI w/o agric, mining, printing	Gen. FDI W/o Retail	Large FDI W/o Retail	Gen. FDI Dev. Countries w/o China	Large FDI Dev. Countries w/o China
Log GDP	2.991***	4.429***	3.023***	4.062***	3.203***	4.314***	3.172***	4.369***	3.314***	5.109***	3.528***	5.986***
	[0.49]	[0.56]	[0.42]	[0.44]	[0.45]	[0.48]	[0.46]	[0.48]	[0.45]	[0.54]	[0.46]	[0.59]
	(0.119)	(0.290)	(0.105)	(0.351)	(0.124)	(0.137)	(0.119)	(0.300)	(0.137)	(0.232)	(0.157)	(0.288)
Similarity	-5.649***	-11.91***	-7.154***	-14.03***	-7.169***	-13.22*** [-	-6.667***	-12.61***	-6.899***	-15.31***	-13.17***	-34.86***
	[-0.92]	[-1.49]	[-1.00]	[-1.52]	[-1.02]	1.48]	[-0.96]	[-1.38]	[-0.93]	[-1.61]	[-1.72]	[-3.44]
	(0.970)	(1.541)	(0.930)	(1.601)	(0.967)	(1.465)	(0.990)	(1.512)	(0.980)	(1.494)	(2.770)	(5.654)
POLCON	0.431***	0.729***	0.595***	1.355***	0.582***	1.301***	0.542***	1.492***	0.502***	1.171***	0.913***	2.058***
	[0.07]	[0.09]	[0.08]	[0.15]	[0.08]	[0.15]	[0.08]	[0.16]	[0.07]	[0.12]	[0.12]	[0.20]
	(0.150)	(0.265)	(0.144)	(0.258)	(0.146)	(0.251)	(0.150)	(0.264)	(0.153)	(0.260)	(0.181)	(0.333)
Log Distance	-3.640***	-5.196***	-5.109***	-5.577***	-3.932***	-5.147***	-4.014***	-5.473***	-3.979***	-5.308***	-3.999***	-6.088***
	[-0.60]	[-0.65]	[-0.72]	[-0.60]	[-0.56]	[-0.58]	[-0.58]	[-0.60]	[-0.54]	[-0.56]	[-0.52]	[-0.60]
	(0.302)	(0.563)	(0.439)	(0.733)	(0.307)	(0.361)	(0.304)	(0.467)	(0.320)	(0.503)	(0.434)	(0.724)
Trade Openness	0.0140***	0.0243***	0.0173***	0.0323***	0.0172***	0.0299***	0.0170***	0.0301***	0.0172***	0.0302***	0.0159***	0.0330***
	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]
	(0.00164)	(0.00278)	(0.00151)	(0.00264)	(0.00154)	(0.00273)	(0.00157)	(0.00269)	(0.00161)	(0.00264)	(0.00200)	(0.00375)
Jap. BITs	**0.452*** **	**1.448*** **	**0.771*** **	**2.085*** **	**0.824*** **	**2.224*** **	**0.860*** **	**2.324*** **	**0.755*** **	**2.083*** **	**0.491** **	**2.113*** **
	[0.08]	**[0.19]**	**[0.11]**	**[0.24]**	**[0.12]**	**[0.26]**	**[0.13]**	**[0.27]**	**[0.10]**	**[0.23]**	**[0.07]**	**[0.22]**
	(0.143)	**(0.258)**	**(0.141)**	**(0.259)**	**(0.146)**	**(0.251)**	**(0.150)**	**(0.261)**	**(0.149)**	**(0.256)**	**(0.206)**	**(0.413)**
WTO-PTIAs	**0.367*** **	**0.214**	**0.608*** **	**0.508*** **	**0.644*** **	**0.555*** **	**0.603*** **	**0.611*** **	**0.677*** **	**0.560*** **	**0.768*** **	**0.775*** **
	[0.06]	**[0.03]**	**[0.08]**	**[0.05]**	**[0.09]**	**[0.06]**	**[0.09]**	**[0.07]**	**[0.09]**	**[0.06]**	**[0.10]**	**[0.08]**
	(0.0833)	**(0.146)**	**(0.0780)**	**(0.135)**	**(0.0802)**	**(0.136)**	**(0.0818)**	**(0.140)**	**(0.0836)**	**(0.140)**	**(0.0996)**	**(0.183)**
WTO-Member	-0.113	-0.216	-0.0775	-0.140	-0.134	-0.427**	-0.147	-0.358*	-0.0781	-0.131	-0.00532	-0.170
	[-0.02]	[-0.03]	[-0.01]	[-0.02]	[-0.02]	[-0.05]	[-0.02]	[-0.04]	[-0.01]	[-0.01]	[0.00]	[-0.02]
	(0.116)	(0.202)	(0.108)	(0.183)	(0.111)	(0.181)	(0.114)	(0.189)	(0.118)	(0.186)	(0.147)	(0.276)
Log Jap.ODA	0.0283***	0.0344***	0.0360***	0.0418***	0.0398***	0.0529***	0.0456***	0.0606***	0.0398***	0.0433***	0.0587***	0.0531***
	[0.005]	[0.004]	[0.001]	[0.001]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.01]	[0.01]
	(0.00522)	(0.00876)	(0.00503)	(0.00837)	(0.00506)	(0.00832)	(0.00519)	(0.00854)	(0.00526)	(0.00843)	(0.00690)	(0.0122)

	(1) Gen. FDI Natural Resources	(2) Large FDI Natural Resources	(3) Gen. FDI Region dummies	(4) Large FDI Region dummies	(5) Gen. FDI W/o Services	(6) Large FDI W/o Service	(7) Gen. FDI w/o agric, mining, printing	(8) Large FDI w/o agric, mining, printing	(9) Gen. FDI W/o Retail	(10) Large FDI W/o Retail	(11) Gen. FDI Dev. Countries w/o China	(12) Large FDI Dev. Countries w/o China
Natural Resources	-0.200***	-0.318***										
	[-0.03]	[-0.04]										
	(0.0443)	(0.0823)										
America			3.209***	4.498***								
			[0.49]	[0.53]								
			(0.436)	(0.736)								
Asia			-0.0779	1.532*								
			[-0.01]	[0.17]								
			(0.520)	(0.879)								
Europe			-1.594***	-2.114**								
			[-0.21]	[-0.22]								
			(0.495)	(1.034)								
Pacific			1.041 [0.15]	3.902* [0.48]								
			(1.180)	(2.119)								
Net Sales					0.336***	0.0257	0.731***	0.774***				
					[0.05]	[0.003]	[0.11]	[0.08]				
					(0.114)	(0.178)	(0.132)	(0.224)				
Constant	-44.87***	-72.22***	-33.92***	-62.26***	-54.83***	-71.60***	-60.38***	-83.21***	-51.28***	-90.13***	-56.36***	-104.5***
	(4.080)	(7.992)	(5.134)	(11.58)	(4.701)	(5.780)	(4.823)	(9.593)	(4.574)	(7.105)	(5.108)	(9.881)
Observations	29348	29348	42067	42067	38409	38409	32922	32922	40238	40238	39353	39353
Cou.-Ind. Pairs	2806	2806	3105	3105	2835	2835	2430	2430	2970	2970	2921	2921
Uncensored	5655	3586	6410	3986	6021	3813	5535	3543	5775	3692	4700	2707
σ_λ ; σ_u	5.912, 1.749	8.695, 2.370	5.981, 1.827	7.903, 2.443	6.147, 1.807	8.473, 2.408	5.722, 1.767	7.638, 2.352	6.237, 1.857	9.212, 2.394	6.690, 2.092	10.30, 2.797
Log-Likelih.	-14630	-10565	-16847	-11865	-15686	-11271	-14178	-10274	-15327	-10880	-13489	-8740
Mc Fadden Pseudo R2	0.34	0.32	0.34	0.32	0.34	0.33	0.33	0.31	0.34	0.34	0.34	0.32

Sample includes all developing & emerging economies. The marginal effects e at the means of the explanatory variables are reported in brackets.

To check for the validity of the *interaction between asset specificity and the agreements,* inflation and total FDI were included as well as those industries with an insufficient number of observations were omitted (agriculture, mining and printing) (Table 7). In all cases, the second derivative for the interaction between R&D intensity of the industry and BITs is insignificant and for the one with PTIAs manages robustly the 10% level.

Hence, results are quite robust – overall the BIT variable is significant at all specifications for large FDI and the effect is always larger than in the case of general FDI. The PTIA variable is relevant for general FDI, but not always for large FDI. Also, the marginal effect of the PTIA variable is lower for large FDI than for general FDI. The interaction between R&D and BITs is not significant while the one with PTIAs at least manage robustly the 10% level. Thus, robust support for hypothesis 1 and 4 and for the rejection of hypothesis 2 and 3 is found.

Table 7: Sensitivity (3)

BIT	Second Derivative BIT/ PTIA - low (20th centile) to high R&D (80th centile)	First Derivatives BIT/ PTIA at selected R&D values				
BITs						
(1) Large Scale FDI, developing countries, + Inflation and total FDI	0.00 (0.83)	0.17 (0.00)	0.17 (0.00)	0.17 (0.00)	0.17 (0.00)	0.17 (0.00)
(2) Large Scale FDI, developing countries, without industries with low number of observations (Agriculture, Mining, Printing)	-0.01 (0.88)	0.23 (0.00)	0.23 (0.00)	0.23 (0.00)	0.23 (0.00)	0.23 (0.00)
PTIAs						
(6) General FDI, developing countries, + Inflation and total FDI	0.03 (0.10)	0.10 (0.00)	0.11 (0.00)	0.12 (0.00)	0.13 (0.00)	0.12 (0.00)
(7) General FDI, developing countries, without industries with low number of observations (Agriculture, Mining, Printing)	0.04 (0.04)	0.08 (0.00)	0.09 (0.00)	0.10 (0.00)	0.12 (0.00)	0.10 (0.00)
(8) Large FDI, developing countries, + Inflation and total FDI	0.04 (0.04)	0.05 (0.01)	0.06 (0.00)	0.08 (0.00)	0.10 (0.00)	0.08 (0.00)

Table 4 presents details.

6. Conclusion

This study has analyzed the impact of international trade and investment agreements on FDI in developing and emerging economies using evidence from Japanese companies. It contributes to the existing literature by capturing differential impact of PTIAs and BITs according to FDI characteristics.

There is relatively robust evidence that Japanese BITs have increased FDI in the partner countries in the form of larger affiliates. For PTIAs large FDI is also affected, but to a lower degree than in the case of BITs. In the case of PTIAs also trade liberalization effects are at work which make it difficult to disentangle size effects, the latter seemingly favoring smaller investments. The asset specificity has not been identified as a major characteristic that differentiates BIT or PTIA impact. Only for PTIAs evidence in this respect is generated: investment of high-tech industries is to a higher degree attracted to countries which have concluded PTIAs than low-tech industries.

However, the economic magnitude of the treaty effects is quite low as compared to the impact of many of the control variables and the results underlie several limitations. Reverse causality between BITs and FDI may occur. It is rudimentarily taken account of by using lagged explanatory variables, but it is in the nature of the treaties that they are concluded not only with the purpose of investment promotion, but also then, when companies are most likely to take advantage of them. Moreover, due to the few BITs the question arises in how far these results can be generalized for other source or host countries. Further limitations are the rather strong assumptions involved when applying the random effects Tobit model.

In spite of these limits, results have proven to be quite robust and follow theoretic predictions. The work substantially extends existing literature by supporting the role of sunk cost for carrying out FDI in explaining treaty effects. Further research should find ways around the endogeneity problem. Conducting such disaggregated analyses for other major investment source countries which have concluded a larger number of BITs in the past and are also directly involved in PTIAs with developing and emerging economies would also be promising.

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8. BIBLIOGRAPHY

Aisbett, E. (2007). "Bilateral Investment Treaties and Foreign Direct Investment: Correlation versus Causation." MPRA Paper No. 2255.

Altomonte, C. (2007). "Regional Economic Integration and the Location of Multinational Firms." Review of World Economics **143**(2): 1610-2878.

Andersen, J. E. and E. Van Wincoop (2003). "Gravity with Gravitas: A Solution to the Border Puzzle." American Economic Review **93**(1): 170-92.

Anderson, E. and H. Gatignon (1986). "Modes of foreign entry: A transaction cost analysis and propositions." Journal of International Business Studies **17**(3).

Asiedu, E. (2004). "The Determinants of Employment of Affiliates of US Multinational Enterprises in Africa." Development Policy Review **22**(4): 371-9.

Belderbos, R. and J. Zou (2006). "Foreign Investment, Divestment and Relocation by Japanese Electronics Firms in East Asia." Asian Economic Journal **20**(1): 1-27.

Belderbos, R. and J. Zou (2007). "On the Growth of Foreign Affiliates: Multinational Plant Networks, Joint Ventures, and Flexibility " Journal of International Business Studies **38**(7): 1095-112.

Blaise, S. (2005). "On the link between Japanese ODA and FDI in China: a microeconomic evaluation using conditional logit analysis " Applied Economics **37**(1).

Blomstrom, M. and A. Kokko (1997). "Regional Integration and Foreign Direct Investment: A Conceptual Framework and Three Cases " World Bank Policy Research Working Paper 1750.

Blonigen, B. (2005). "A Review of the Empirical Literature on FDI Determinants " NBER Working Papers No. 11299.

Braconier, H., P.-J. Norbäck and D. Urban (2005). "Reconciling the Evidence on the Knowledge-Capital Model." Review of International Economics **13**(4): 770-86.

Brambor, T., W. R. Clark and M. Golder (2006). "Understanding Interaction Models: Improving Empirical Analyses." Political Analysis **14**: 63–82.

Braumöller, B. (2004). "Hypothesis Testing and Multiplicative Interaction Terms." International Organization **58**: 807-20.

Brenton, P., F. Di Mauro and M. Lücke (1999). "Economic Integration and FDI: An Empirical Analysis of Foreign Investment in the EU and in Central and Eastern Europe." Empirica **26**: 95-121.

Bruno, G. (2004). Limited Dependent Panel Data Models: A Comparative Analysis of classical and Bayesian Inference among Econometric Packages, Bank of Italy

Buch, C. M., J. Kleinert, A. Lipponer and F. Toubal (2005). "Determinants and effects of foreign direct investment: evidence from German firm-level data." Economic Policy **20**(41): 51–110.

Buch, C. M. and A. Lipponer (2007). "FDI versus exports: Evidence from German banks " Journal of Banking & Finance **31**(3): 805-26.

Buckley, P. and M. Casson (1976). The Future of the Multinational Enterprise. London, Homes & Meier.

Buckley, P., J. Clegg, N. Forsans and K. Reilly (2007). "A Simple and Flexible Dynamic Approach to FDI Growth: The Canada-United States Relationship in the Context of Free Trade." World Economy **30**(2): 267-91.

Buethe, T. and H. Milner (2008). "The Politics of Foreign Direct Investment into Developing Countries: Increasing FDI through International Trade Agreements?" American Journal of Political Science **52**(4): 741-62.

Busse, M., J. Königer and P. Nunnenkamp (2008). "FDI promotion through Bilateral Investment Treaties: More Than a Bit?" Kiel Working Papers, Feb 2008.

Butler, J. and R. Moffit (1982). "A computationally efficient quadrature procedure for the one factor multinomial probit model." Econometrica **50**: 761-4.

Carr, D. L., J. R. Markusen and K. E. Maskus (2001). "Estimating the Knowledge-Capital Model of the Multinational Enterprise." American Economic Review **91**: 693-708.

Chakrabati, A. (2001). "The Determinants of Foreign Direct Investment: Sensitivity Analyses of Cross-Country Regressions." Kyklos **54**(1): 89-114.

Cho, S. (2007). "Doha's Development." Berkeley Journal of International Law **25**(2): 165-202.

Clegg, J. and S. Scott-Green (1999). "The Determinants of New FDI Capital Flows into the EC: A Statistical Comparison of the USA and Japan." Journal of Common Market Studies **37**(4): 597-616.

Coase, R. H. (1937). "The Nature of the Firm." Economia **4**(16): 386-405.

Crawford, J.-A. and R. V. Fiorentino (2005). "The Changing Landscape of Regional Trade Agreements." WTO Discussion Paper No.8.

Dee, P. and J. Gali (2003). "The Trade and Investment Effects of Preferential Trading Arrangements." NBER Working Paper Series **No. 10160**.

Delios, A. and W. J. Henisz (2003). "Political Hazards and the Sequence of Entry by Japanese Firms." Journal of International Business Studies **34**(3): 227-41.

Desbordes, R. and V. Vicard (2007). "Foreign Direct Investment and Bilateral Investment Treaties, an International Political Perspective." Centre National de la Recherche Scientifique Working Papers 2007.45.

Drazen, A. (2000). Political Economy in Macroeconomics. Princeton, Princeton University Press.

Dunning, J. (1997a). "The European Internal Market Programme and Inbound Foreign Direct Investment." Journal of Common Market Studies **35**: 189-223.

Dunning, J. (1997b). "The European Internal Market Programme and Inbound Foreign Direct Investment." Journal of Common Market Studies **35**: 1-30.

Egger, P. and V. Merlo (2007). "BITs and FDI Dynamics." World Economy **30**(10): 1536-49.

Egger, P. and M. Pfaffermayr (2004). "Distance, trade, and FDI: A Hausman-Taylor SUR Approach " Journal of Applied Econometrics **19**: 227–46.

Elkins, Z., A. T. Guzman and B. A. Simmons (2006). "Competing for Capital: The Diffusion of Bilateral Investment Treaties, 1960–2000." International Organization **60**: 811–46.

Ginsburg, T. (2004). "International Substitutes for Domestic Institutions: Bilateral Investment Treaties and Governance." University of Illinois Collage of Law Working Paper.

Ginsburg, T. (2006). "Locking in Democracy: Constitutions, Commitment, and International Law." University of Illinois Law & Economics Research Paper No. LEO06-14.

Gugler, P. and V. Tomsik (2007). General Agreement on Investment: Departure from the Investment Agreement Patchwork. Four Decades of International Business at Reading. Reading, UK.

Haftel, Y. (2007). "The effects of US BITs on FDI Inflows to Developing Countries: Signalling or Credible Commitment?" Working Paper.

Haftel, Y. Z. (2006). Regional Integration, Signaling, and Foreign Direct Investment: The Case of ASEAN. 47th International Studies Association Annual Convention. San Diego, California.

Hatch, W. and K. Yamamura (1996). Asia in Japan's Embrace: Building a Regional Production Alliance. Cambridge, Cambridge University Press.

Head, K. and J. Ries (forthcoming). "FDI as an outcome of the Market for Corporate Control: Theory and Evidence." Journal of International Economics.

Helpman, E., M. J. Melitz and S. R. Yeaple (2004). "Export versus FDI." American Economic Review **94**(1): 300-16.

Henisz, W. J. (2002). "The Institutional Environment for Infrastructure Investment." Industrial and Corporate Change **11**(2).

Henisz, W. J. (2003). "The power of the Buckley and Casson thesis: the ability to manage institutional idiosyncrasies." Journal of International Business Studies **34**: 173-84.

Henisz, W. J. and O. Williamson (1999). "Comparative Economic Organization - Within and Between Countries " Business and Politics **1**(3): 261-77.

Hennart, J.-F. (1982). A theory of multinational enterprise Ann Arbor University of Michigan Press.

IMF (1993). Balance of Payments Manual, 5. Edition.

Iwasaki, I. and K. Suganuma (2007). EU Enlargement and Foreign Direct Investment into Transition Economies. The International Symposium of the Joint Research Study Group "EU Economy" of the EUIJ-Tokyo Consortium. Tokyo, Japan.

Jaumotte, F. (2004). "Foreign direct investment and regional trade agreements: The market size effect revisited." Working Paper 04/206, International Monetary Fund

Katzenstein, P. J. (2005). A World of Regions: Asia and Europe in the American Imperium. Ithaca, New York, Cornell University Press.

Kimura, H. and Y. Todo (2007). "Is Foreign Aid a Vanguard of FDI? A Gravity-Equation Approach." RIETI Discussion Paper Series **07-E-007**.

Kydland, F. and E. Prescott (1977). "Rules Rather than Discretion: The Inconsistency of Optimal Plans." Journal of Political Economy **83**(s): 473-91.

Levy, E., E. Stein and C. Daude (2003). "Regional Integration and the Location of FDI." Inter-American Development Bank Research Department Working Paper No. 492.

Lipsey, R. E. (2007). "Defining and Measuring the Location of FDI Output." NBER Working Paper 12996.

Makino, S., P. W. Beamish and N. B. Zhao (2004). "The characteristics and performance of Japanese FDI in less developed and developed countries." Journal of World Business **39**(4): 377.

Markusen, J. R. and K. E. Maskus (2002). "Discriminating Among Alternative Theories of the Multinational Enterprise." Review of International Economics **10**(4): 694-707.

Martin, L. L. and B. A. Simmons (1998). "Theories and Empirical Studies of International Institutions." International Organization **52** (4): 729-57.

Martin, W. and C. S. Pam (2008). Estimating the Gravity Model when Zero Trade Flows are Frequent. 2008 North American Summer Meeting of the Econometric Society. Pittsburgh.

Matsui, Y. (1989). "Japan's International Legal Policy for the Protection of Foreign Investment." The Japanese Annual of International Law **32**: 1-17.

McDonald, J. F. and R. A. Moffit (1980). "The uses of Tobit analysis." The Review of Economics and Statistics **62**(2): 318-21.

McDonald, J. F. and R. A. Moffitt (1980). "The Uses of Tobit Analysis." Review of Economics & Statistics **62**(2): 318-21.

Medvedev, D. (2006). "The Impact of Preferential Trade Agreements on Foreign Direct Investment Inflows." World Bank Policy Research Working Paper 4065.

MOFA (2008a). Ministry of Foreign Affairs Japan.

MOFA (2008b). "*Nikokukan toshi kyotei (BIT) no senryakuteki katsuyo ni tsuite: Needs ni kotaeta sekkyokuteki suishin no tameni*" [Strategic Utilization of BIT: Driving Forward BIT in Response to Demand].

Neumayer, E. (2006). "Self-interest, foreign need, and good governance: Are bilateral investment treaty programs similar to foreign aid allocation?" Foreign Policy Analysis **2**: 245-67.

Neumayer, E. and L. Spess (2005). "Do Bilateral Investment Treaties Increase Foreign Direct Investment to Developing Countries?" World Development **33**(10): 1567-85.

North, D. C. and B. Weingast (1989). "Constitutions and Commitment: Evolution of Institutions Governing Public Choice." Journal of Economic History **49**(4): 803-32.

Norton, E. C., H. Wang and C. Ai (2004). "Computing interaction effects and standard errors in logit and Probit models." The Stata Journal **4**(2): 154-67.

OECD (1996). OECD (Organisation for Economic Cooperation and Development) Benchmark Definition of Foreign Direct Investment, Third Edition.

Page, S. (2001). Regional Integration and the Investment Effect Regional Integration in Latin America and the Caribbean: The Political Economy of Open Regionalism. V. Bulmer-Thomas. London, Institute of Latin American Studie: 45-64.

Pempel, T. J. and S. Urata (2006). Japan: A new move toward bilateral trade arrangements. Bilateral Trade Agreements in the Asia-Pacific: Origins, Evolution, and Implications. T. J. Pempel. Londong, Routledge: 75-94.

PRS (1996). "The ICRG Rating System: Political Risk Services."

Rose, A. (2003). Notes on the Effects of WTO Membership on FDI and Services.

Rugman, A. (1981). Inside the multinationals: The economics of internal markets New York, Columbia University Press.

Sakurai, M. (1996). Japanese law and policy for globalization of industry and the corporation : measures for relief from investment and trade frictions Trilateral perspectives on international legal issues: relevance of domestic law and policy. M. K. Young and Y. Iwasawa. New York, Transnational Publishers: 299-312.

Salacuse, J. W. and N. P. Sullivan (2005). "Do BITs Really Work?: An Evaluation of Bilateral Investment Treaties and Their Grand Bargain." Harvard International Law Journal **46**(1): 67-130.

Sornarajah, M. (2004). The New World Economic Order and Equity. Dynamics of International Law in the New Millenium. R. Dixit. New Delhi, Indian Society of International Law.

Te Velde, D. W. and D. Bezemer (2006). "Regional Integration and Foreign Direct Investment in Developing Countries." Transnational Corporations **15**(2).

Te Velde, D. W. and M. Fahnbulleh (2003). Investment Related Provisisions in Regional Trade Agreements. U. D. f. I. Development.

Teece, D. J. (1986). "Transactions Cost Economics and the Multinational Enterprise." Journal of Economic Behavior and Organization **7**.

Tobin, J. and M. L. Busch (2007). A BIT is Better Than a Lot: Bilateral Investment Treaties and Preferential Trade Agreements, Public Policy Institute, Georgetown University, Washington, DC.

Tobin, J. and S. Rose-Ackerman (2005). "Foreign Direct Investment and the Business Environment in Developing Countries: the Impact of Bilateral Investment Treaties." Yale Law School Center for Law, Economics and Policy Research Paper No. 293.

Toyo Keizai (1990-2005). Japanese overseas investment (per country), Kaigai shinshutsu kigyou souran (kuni-betsu).

ToyoKeizai (Annual volumes 1990-2005). Kaigai shinshutsu kigyou souran (kuni-betsu).

UNCTAD (2006a). "The Entry into Force of Bilateral Investment Agreements (BITs)." International Investment Agreement MONITOR No. 3

UNCTAD (2006b). "Investment provisions in economic integration agreements." UNCTAD/ITE/IIT/2005/10.

UNCTAD (2006c). World Investment Report 2006: FDI from Developing and Transition Economies: Implications for Development. New York and Geneva, United Nations.

UNCTAD (2007). "Recent developments in international investment agreements." IIA MONITOR No. 3

Verbeek, M. (2004). A Guide to Modern Econometrics. Hoboken, Wiley & Sons Inc.

Waldkirch, A. (2003). "The 'New Regionalism' and Foreign Direct Investment: the Case of Mexico " Journal of International Trade and Development **12**(2): 151-84.

Williamson, O. (1975). Markets and Hierarchies: Analysis and Antitrust Implications. New York, Free Press.

Williamson, O. (1979). "Transaction Cost Economics: The Governance of Contractual Relations." The Journal of Law and Economics and Politics **22**(2): 233-61.

Williamson, O. (1991). "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives." Administrative Science Quarterly **36**: 269-96.

Williamson, O. (2000). "The New Instiutional Economics: Taking Stock, Looking Ahead." Journal of Economic Literature **38**: 595-613.

Wooldridge, J. M. (2002). Econometric Analysis of Cross Section and Panel Data. Cambridge, MA, MIT Press.

WorldBank (2007). World Development Indicators 2007, World Bank.

WTO. (2008, May 2008). "Regional Trade Agreements Notified to the GATT/WTO and in Force." Retrieved 5/28/2008, 2008.

Yackee, J. (2006). "Sacrificing Sovereignty: Bilateral Investment Treaties, International Arbitration, and the Quest for Capital " USC Center in Law, Economics and Organization Research Paper No. C06-15.

Yanase, S. (2003). Bilateral Investment Treaties of Japan and Resolution of Disputes with Respect to Foreign Direct Investment. International Commercial Arbitration: Important Contemporary Questions, ICCA International Arbitration Congress. A. J. v. d. Berg. The Hague, London, New York, Kluwer Law International**:** 426-43.

Zhou, C., A. Delios and J. Y. Yang (2002). "Locational Determinants of Japanese Foreign Direct Investment in China" Asia Pacific Journal of Management **19**(1): 63-86.

9. Appendix

Table 8: Selected PTIAs

Agreement		COMESA	SADC	NAFTA	MERCOSUR	ANDEAN	CARICOM	ASEAN
General Data								
Entry into Force [1]		2000	1992	1994	1995	1993	2001	1992
Average GDP of the Partner Countries [2]		156	160	10,500	890	258	30.4	548
Trade Clauses								
Liberalization	Zero tariffs on Intra-regional trade	l	l	c	l/c	l/c	l/c	l/c
	Common external tariff regime	-	-	-	l	l	l	-
Investment Clauses								
Liberalization	Establishment Right	y	-	y	y	-	y*	y
	Prohibition of Restrictions on the Transfer of Funds	y	-	y	y	y	y*	-
	Prohibition of Performance Requirements	-	-	y	y	-	-	-
Legal Protection After Entry	- NT	-	-	y	y	(y)	(y)*	y
	- MFN	-	-	y	y	(y)	y*	y
	Fair, Equal Treatment	y	-	y	y	-	-	-
	Expropriation	y	-	y	y	y	-	-
	Intellectual Property	-	-	y	-	-	y*	-
Dispute Settlement	- State-State	y	y	y	y	y	y*	y
	- Investor-State	-	y	y	y	y	y*	y
Treaty Outsider?		-	-	p	p	y	-	-
Te Velde and Bezemer Classification								
Investment Index [3]		1(1994)	1(1992)	3(1994)	2(1994)	1(1987) 2(1991)	1(1982) 2(1997)	1(1987) 2(1996) 3(1998)
Trade Index [4]		1(1994)	1(1992)	2(1994)	3(1991)	1(1987) 2(1993)	2 (1982) 3 (1997)	1(1980)

Own, based on UNCTAD (2006b), Te Velde and Fahnbulleh (2003), Te Velde and Bezemer (2006), World Bank (2007) & others. Table 9 provides details on member countries.

l = exists, but list of exclusions; c= far-reaching/ (almost) complete; y= included; (y)=included, but can be regulated in national law; *=not ratified by all members; p= partially; -=not included

[1] Date of entry into force of the major agreement according to official sources – can differ from the dates by Te Velde and Bezemer (2006).

[2] Calculated as the GDP of the region minus the GDP of the individual member country. Values in billion US$ constant 2000, mean value for all member countries 1990-2004. This variable will occur (natural logarithm transformed) in the estimations as *Log Add. Reg.GDP*.

[3] Investment Index: 0 if not member of group; 1 if some investment provisions in region; 2 if advanced investment provisions in region; 3 if complete investment provisions in region; -1 if more restrictive provisions (Te Velde and Bezemer 2006).

[4] Trade Index: 0 if not member of group; 1 if some trade provisions (e.g., tariff preferences); 2 if low Most Favored Nation (MFN) tariffs, (close to) zero intra-regional tariffs; 3 if high MFN tariffs, (close to) zero intra-regional tariffs (Te Velde and Bezemer 2006).

Table 9: Selected PTIAs: Member Countries

	Date of entry into force and member countries
COMESA	2000: Angola, Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia, and Zimbabwe
SADC	1992: Angola, Botswana, the Democratic Republic of Congo (1997), Lesotho, Madagascar (2005), Malawi, Mauritius (1995), Mozambique, Namibia, South Africa (1994), Seychelles (1997-2003), Swaziland, United Republic of Tanzania, Zambia, Zimbabwe,
MERCOSUR	1995: Argentina, Brazil, Paraguay (1996), Uruguay (1996), [Venezuela (2006)]
ANDEAN	1993: Bolivia, Colombia, Ecuador, Peru (except 1992– 1997) and Venezuela [until 2006],
CARICOM	2001: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti (2002-2003), Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago
NAFTA	1994: US, Canada, Mexico
ASEAN	1992 AFTA: Brunei, Cambodia (1999), Indonesia, Laos (1997), Malaysia, Myanmar (1997), Philippines, Singapore, Thailand, Vietnam (1995)

Sources: Various

Notes: Date of entry into force of the major agreement according to official sources. If countries joined the grouping at a later stage or left it, the years are indicated in parentheses after the respective country.

Table 8 provides for further information on the agreements.

Table 10: International Trade and Investment Agreements Japan (as of Aug 2008)

	Signature	In Force	Status-quo
Bilateral investment treaties BITs			
Bangladesh	1998	1999	
China	1988	1989	
Egypt	1977	1978	
Hong Kong	1997	1997	
Korea	2002	2003	
Mongolia	2001	2002	
Pakistan	1998	2002	
Russia	1998	2000	
Sri Lanka	1982	1982	
Turkey	1992	1993	
Vietnam	2003	2004	
Cambodia	2007 (April)	2008 (July)	
Laos	2008 (Jan)	2008 (July)	
Uzbekistan	2008 (Aug)		
Saudi-Arabia			Under negotiation
Qatar	2008		About to start negotiations
Trilateral investment treaties			
China, Korea, Japan			Third round of discussion 11/2007
Economic Partnership Agreements (Preferential trade and investment agreements PTIA)			
Singapore	2002	2002	In 03/2007 signature of a Protocol amending the Agreement, entry into force in 01/2008
Mexico	2004	2005	In 09/2006 an additional protocol was signed, entry into force 04/2007
Malaysia	2005	2006	
Philippines	2006		Ratified by the Japanese Diet 12/2006, not yet ratified by the Philippines
Chile	2007 (March)	2007 (Sept)	
Thailand	2007 (April)	2007 (Nov)	
Brunei	2007 (June)	2008 (July)	
Indonesia	2007 (August)	2008 (July)	
Korea			"Official negotiations" – negotiations have halted last round ended in 11/2004
ASEAN			Agreement finalized 04/2008
Gulf Cooperation Council			2nd round of negotiations in 01/ 2007.
Vietnam			- 7th meeting in April 2008. - First round of negotiations in 01/2007
India			9th meeting September 2008 Negotiations started in 01/2007
Switzerland			7th round,negotiations 06/ 2008
Australia			2nd round of negotiations 09/2007.
ASEAN+3 (Japan, China, Korea), ASEAN 10+5 (+ Hong Kong, Taiwan)			"Discussion in the future"
Comprehensive Economic Partnership in East Asia.(ASEAN+3, India, Australia, and New Zealand)			Proposed in August 2006 (Bridges Weekly 2006).

Source: MOFA (2008a)

Table 11: General FDI per Industry: Japanese Employment (Natural Logarithm)

	Mean	Median	Max	Min.	Std. Dev.	Obs.
Agriculture, forestry, and fisheries	4.69	4.86	8.32	1.16	1.74	272
Ceramic, stone and clay products	6.33	6.94	9.04	0.69	1.70	228
Chemical, Petroleum, Coal, Rubber, etc.	6.19	6.49	10.46	0.69	2.46	369
Construction	4.60	4.73	8.26	0.69	2.18	396
Electrical machinery, Equipment and Supply	7.09	7.21	12.32	0.84	2.85	430
Fabricated metal products	6.76	7.05	9.55	1.39	1.52	185
Finance and insurance	4.76	4.77	8.69	0.69	2.17	294
Food, beverages, tabacco and prepared an	6.34	6.56	9.94	2.59	1.84	260
General Machinery	6.38	7.07	10.58	0.69	2.24	284
Iron and Steel	5.20	5.36	8.49	1.22	1.61	294
Lumber and wood products and Pulp, paper	5.63	5.40	9.19	2.11	1.83	202
Mining	5.02	5.58	7.62	1.61	1.34	138
Miscellaneous industries	4.92	4.98	9.33	0.69	2.26	451
Miscellaneous manufacturing industries	5.55	6.10	8.98	1.10	2.20	325
Non-ferrous metals and products	6.48	6.83	9.31	2.60	1.75	240
Precision instruments and machinery	7.23	7.48	10.17	2.77	1.55	192
Printing and Allied Industry	5.41	5.76	7.78	0.69	1.64	117
Real estate	3.95	3.80	7.00	0.69	1.59	165
Stock holding and Controlling Companies	5.09	5.27	8.69	0.69	2.35	109
Textile mill products and Apparel	6.71	6.94	11.04	2.13	1.96	318
Transport, electricity, gas, heat supply	5.08	5.00	8.85	0.97	2.13	346
Transportation Equipment	6.62	7.17	10.71	0.69	2.52	429
Wholesale and retail trade	5.20	5.25	9.94	0.69	2.21	675
All	5.72	5.77	12.32	0.69	2.28	6719

Source: Toyo Keizai (1990-2005). Statistics for positive observations for developing and emerging economies. Japanese employment (at least 10% ownership) for the selected country sample (1990-2004) per industry.

Table 12: Large FDI per Industry: Japanese Employment (Natural Logarithm)

	Mean	Median	Max	Min.	Std. Dev.	Obs.
Agriculture, forestry, and fisheries	6.15	6.14	8.22	4.62	0.86	122
Ceramic, stone and clay products	6.95	7.01	8.84	4.63	0.94	177
Chemical, Petroleum, Coal, Rubber etc.	7.25	7.47	10.20	4.61	1.42	258
Construction	6.13	6.17	7.86	4.62	1.01	170
Electrical machinery, Equipment and Supply	8.38	8.52	12.30	4.63	2.18	310
Fabricated metal products	6.97	6.69	9.36	4.71	1.01	153
Finance and insurance	6.42	6.68	8.63	4.61	1.16	108
Food, beverages, tabacco and prepared an	6.98	6.79	9.83	4.66	1.30	196
General Machinery	7.36	7.32	10.43	4.61	1.27	203
Iron and Steel	6.04	5.96	8.41	4.61	0.98	168
Lumber and wood products and Pulp, paper	6.97	7.11	9.07	4.83	1.07	104
Mining	5.73	5.76	7.62	4.61	0.59	91
Miscellaneous industries	6.28	6.11	9.04	4.62	1.16	247
Miscellaneous manufacturing industries	6.83	6.84	8.94	4.61	1.22	207
Non-ferrous metals and products	7.09	7.24	9.25	4.61	1.26	187
Precision instruments and machinery	7.49	7.47	10.13	4.77	1.19	175
Printing and Allied Industry	6.42	6.61	7.77	4.61	0.83	72
Real estate	5.38	5.30	6.12	4.72	0.37	36
Stock holding and Controlling Companies	6.50	6.72	8.68	4.62	1.14	65
Textile mill products and Apparel	7.27	7.28	10.96	4.91	1.63	255
Transport, electricity, gas, heat supply	6.55	6.78	8.65	4.62	1.22	154
Transportation Equipment	7.82	7.75	10.64	4.61	1.50	312
Wholesale and retail trade	6.50	6.01	9.51	4.61	1.47	303
All	6.95	6.84	12.30	4.61	1.49	4073

Source: Toyo Keizai (1990-2005). Statistics for positive observations for developing and emerging economies. Japanese employment (at least 10% ownership) for the selected country sample (1990-2004) per industry.

Table 13: Sample Countries

Albania Algeria Angola Argentina Armenia Azerbaijan Bangladesh Belarus Benin Bhutan Bolivia Bosnia and Herzegovina Botswana Brazil Bulgaria Burkina Faso Burundi Cambodia Cameroon Cape Verde Central African Republic Chad Chile China Colombia Comoros Congo, Dem. Rep. Congo, Rep. Costa Rica Cote d'Ivoire Croatia Czech Republic Djibouti Dominica Dominican Republic Ecuador Egypt, Arab Rep. El Salvador Equatorial Guinea Eritrea Estonia Ethiopia Fiji Gabon Gambia, The Georgia Ghana Grenada Guatemala Guinea Guinea-Bissau Guyana Haiti Honduras Hong Kong, China Hungary India Indonesia Iran, Islamic Rep. Israel Jamaica Jordan Kazakhstan Kenya Korea, Rep. Kyrgyz Republic Lao PDR Latvia Lebanon Lesotho Liberia Libya Lithuania Macao Macedonia, FYR Madagascar Malawi Malaysia Maldives Mali Mauritania Mauritius Mexico Moldova Mongolia Morocco Mozambique Namibia Nepal Nicaragua Niger Nigeria Oman Pakistan Palau Panama Papua New Guinea Paraguay Peru Philippines Poland Romania Russian Federation Rwanda Sao Tome and Principe Saudi Arabia Senegal Serbia and Montenegro Seychelles Sierra Leone Singapore Slovak Republic Slovenia South Africa Sri Lanka Sudan Swaziland Syrian Arab Republic Taiwan Tajikistan Tanzania Thailand Togo Trinidad and Tobago Tunisia Turkey Turkmenistan Uganda Ukraine Uruguay Uzbekistan Venezuela, RB Vietnam Yemen, Rep. Zambia Zimbabwe

Note: Countries entering the baseline regressions (Table 2 column 1).

Table 14: Overview: Variables, Expected Impact, and Datasources

Variable	Definition	Expected Impact	source
Dependent Variable			
Log Employment	Natural logarithm of the total employment* investment share of Japanese owners within the company if the Japanese investment share amounts to at least 10%.		Toyo Keizai
Focus Variables			
Jap. BIT	A dummy which is 1 if the destination country i ratified a bilateral investment treaty with Japan in year t and all following years.	+	UNCTAD
WTO-PTIAs	A dummy variable which captures membership (year of entry-into force) for country i in year t in at least one trade and investment agreement as notified to the WTO and all the following years	+	WTO (2006)
Membership RTIA	Dummy for membership in at least one of the selected regional trade and investment agreement and all the following years.	+	Te Velde and Bezemer (2006) & various sources
Log Add. Reg.GDP	The natural logarithm of the sum of the total GDP of the RTIA partner countries (own GDP is not included) in the years a country is member to the respective selected regional trade and investment agreement	+	Te Velde and Bezemer (2006), WDI & various sources
Trade Index	Index of Trade Liberalization which takes a value from 0-3 depending on the degree of trade liberalization prevailing in one of the respective RTIAs in which a country is a member.	+	Te Velde and Bezemer (2006)
Invest. Index	Index of Investment Liberalization which takes a value from 0-3 depending on the degree of trade liberalization prevailing in one of the respective RTIAs in which a country is a member.	+	Te Velde and Bezemer (2006)
Economic Controls			
Log GDP	The natural logarithm of the Gross Domestic Product - in constant prices for the year 2000 in US Dollar	+ (market seeking)	WDI 2007
Log Distance	Natural logarithm of the circle distance between the capital of the destination country and Tokyo	-	CEPII distance measures
Similarity	Host country's GDP per capita divided by Japanese GDP per capita measured in constant US Dollar for the year 2000 values	- (labour-seeking)	WDI 2007
Trade openness	(Exports plus imports in US Dollar for the year 2000)/ GDP measured in constant US Dollar for the year 2000	+/-	WDI 2007
Log of Total FDI Inflows Host Country	The amount of total FDI inflows into a host country by all investor nations as recorded in the host country's Balance of Payments (natural logarithmic transformation) measured in constant US Dollar for the year 2000 values.	+	WDI 2007

Variable	Definition	Expected Impact	source
Inflation	The size of inflation in a host country indicates the level of macroeconomic instability. A natural logarithmic transformation is applied.	-	WDI 2007
Natural Resources	The natural resource intensity of a country measured as the fuel and mineral share in overall exports of a country.	+/-	WDI 2007
Political Controls			
POLCON	The political constraints index (POLCON) measures the political institutional stability of an economy. It ranges from 0-1 – the higher the value, the less feasible is policy change.	+	Henisz (2002)
ICRG	The International Country Risk Guide (ICRG) composite index measures political risk as perceived by country experts and ranges from 0-100 while 0 refers to high risk and 100 to low risk	+	PRS (1996)
Log Japanese ODA	Natural logarithm of positive values of total Official Development Assistance provided by Japan (in constant US Dollar for the year 2000). Negative values are replaced by 0. 0 values are inserted for those countries where no values for Japan are reported while other donours have provided aid.	+	OECD Develop-ment Statistics
WTO Member	A dummy variable that reflects membership in the GATT/ WTO: it turns 1 in the year a country has joined the GATT or WTO and all following years.	0	WTO
Industry Controls			
R&D Ind. Mean (R&D Ind. Mean >=1999)	Research and Development expenses over Net Sales of listed parent firms (Research and Development expenses over Net Sales of listed parent firms for the years from 1999)	+	DBJ
Net Sales	Net Sales as obtained from the company's financial statements and reported in the database	+	DBJ

WDI= World Development Indicators; DBJ= Development Bank of Japan; CEPII= Centre d'Etudes Prospectives Internationales; PRS = Political Risk Services Group.

Constant Values were deflated using the US GDP deflator from the WDI.

+ = positive, - = negative, 0 = no significant impact

Table 15: Descriptive Statistics – per Parent Firm (DBJ)

Industry	No of Listed Parent Firms	Mean R&D expenses over Net Sales	Median R&D expenses over Net Sales	Mean Net Sales (in billion Yen)	Median Net Sales (in billion Yen)
	Averages across Listed Parent Firms (with available data) 1989-2003				
Agriculture, forestry, fisheries	2	0.010	0.010	24.2	21.2
Ceramic, stone, clay	47	0.021	0.018	108	45.9
Chemical, Petroleum, Coal, Rubber and allied products	158	0.051	0.041	171	70.2
Construction	82	0.003	0.003	309	189
Electrical	200	0.039	0.028	259	47.4
Fabricated metal products	43	0.018	0.012	72.6	24.1
Food, beverages, tabacco et al.	63	0.014	0.010	267	154
General machinery	151	0.026	0.020	139	40.0
Iron and steel	30	0.012	0.010	294	91.5
Lumber, wood, pulp, paper	23	0.010	0.006	122	42.1
Mining	5	0.011	0.010	51.5	41.2
Miscellaneous industries	113	0.033	0.009	61.5	28
Miscellaneous manufacturing	70	0.027	0.018	83.3	43.0
Non-ferrous metals & products	29	0.021	0.017	194	115
Precision inst. & machinery	41	0.041	0.035	67.4	39.2
Printing and allied Industry	10	0.013	0.011	348	114
Textile and apparel	45	0.023	0.014	89.1	44.8
Transport, electricity et al.	78	0.010	0.007	298	69.5
Transportation Equipment	111	0.023	0.015	386	73
Wholesale and retail trade	240	0.004	0.002	730	105
Finance and insurance	--	--	--	--	--
Real estate	--	--	--	--	--
Stock Holdings	--	--	--	--	--

Source: DBJ 2004

Table 16: Correlation Matrix: Base Model Specification

	Mean	S.D.	Min	Max	Log GDP	Similarity	POLCON	Log Distance	Trade Openness	Japanese BITs	WTO-PTIAs	WTO-Member	Log Jap. ODA
Log GDP	22.88	1.95	17.45	28.07	1.000								
Similarity	0.07	0.10	0.00	0.70	0.425	1.000							
POLCON	0.36	0.31	0.00	0.89	0.344	0.260	1.000						
Log Distance	9.17	0.49	7.05	9.83	-0.328	-0.265	-0.026	1.000					
Trade Openness	81.03	49.85	13.24	398.80	-0.122	0.476	0.102	-0.206	1.000				
Japanese BITs	0.04	0.20	0.00	1.00	0.265	0.065	0.003	-0.265	-0.019	1.000			
WTO-PTIAs	0.53	0.50	0.00	1.00	0.092	0.033	0.268	0.160	0.123	-0.092	1.000		
WTO-Member	0.68	0.47	0.00	1.00	0.117	0.072	0.314	0.272	-0.025	0.051	0.163	1.000	
Log Jap. ODA	13.57	6.32	0.00	21.03	-0.148	-0.329	-0.179	0.108	-0.238	0.036	-0.085	0.122	1.000

Table 2 column 1 reports the coefficient and marginal effects.

Appendix 1: Log-Likelihood Function of Tobit

The standard tobit model with random effects in a panel context has a joint density for the *ij*th panel and correspondingly panel level likelihood ℓ_{ij} of

$$(14)\quad f\left(y_{ij1},\ldots,y_{ijT}\;\middle|X_{ij1},\ldots,X_{ijT}\right)=\int_0^\infty \frac{e^{-\lambda_{ij}^2/2\sigma_\lambda^2}}{\sqrt{2\pi}\sigma_\lambda}\left\{\prod_{t=1}^{T}F\left(y_{ijt},\beta' X_{ijt}+\lambda_{ij}\right)\right\}d\lambda_{ij},$$

where

$$(15)\quad F\left(y_{ijt}\middle|\beta' X_{ijt}+\lambda_{ij}\right)=\begin{cases}\Phi\left(-\dfrac{(\beta' X_{ijt}+\lambda_{ij})}{\sigma_u}\right) & \text{if} \quad y_{ijt}=0\\ (\sqrt{2\pi}\sigma_u)^{-1}\exp^{-(y_{ijt}-(\beta' X_{ijt}+\lambda_{ij}))^2/(2\sigma_u^2)} & \text{if} \quad y_{ijt}>0\end{cases};$$

e refers to the exponential function, π is a mathematical constant which is the ratio of the circumference of a circle to its diameter and equals approximately 3.14159, and $\Phi(.)$ the cumulative distributive function of the standard normal distribution.

Thus, the likelihood function for the whole sample (135 developing and emerging countries *i* and 23 industries *j)* is the product of the joint densities across individuals *ij*. The log-likelihood is therefore:

$$(16)\quad L=\sum_{i=1}^{135}\sum_{j=1}^{23}\log\left(f\left(y_{ij1},\ldots,y_{ijT}\;\middle|X_{ij1},\ldots,X_{ijT}\right)\right)$$

The log-likelihood is computed with the M-Point Gauss-Hermite quadrature as suggested by Butler and Moffit (1982) and is maximized (Bruno 2004).

Appendix 2: Marginal Effect Calculation for Interactions in Tobit

Since Norton et al. (2004) have emphasized the need for *correctly calculating* the marginal effects and standard errors in the case of logit and probit models with interaction terms, this topic has been an issue when using non-linear models. However, the correct derivations in the case of a tobit model have not been provided. Therefore, the logic of Norton et al. (2004) is applied using the formulas as provided in Wooldridge (2002) and McDonald and Moffitt (1980) to derive the respective expressions for the marginal effects.

In the context of this study interaction occurs between one continuous variable (the measure for R&D intensity) and one dichotomous 0-1 dummy variable (BIT or PTIA conclusion). For illustrative purposes, the example of the interaction of BIT conclusion *(BIT)* and the R&D intensity *(R&D)* is used. The interaction term between the two is abbreviated with *INT*.

The formulas with regard to the impact of the interacted variables and other control variables x^k on the change of the dependent variable y_{ijt} given that positive values are observed are provided - the conditional marginal effect, previously defined as *e*

$$\frac{\partial E(y|X, y>0)}{\partial x^k}.$$

z in the example looks like

$$(17)\quad z = \frac{\tilde{\beta}'\bar{\bar{\tilde{X}}} + \beta_{INT} \cdot \overline{R\&D} \cdot \overline{BIT} + \beta_{BIT} \cdot \overline{BIT} + \beta_{R\&D} \cdot \overline{R\&D}}{\sigma},$$

where $\tilde{X}$ refers to the *K-3* long vector of the independent variables which remain in the regression in addition to the interacted variables, $\tilde{\beta}$ denotes the corresponding coefficients, and the dash refers to the mean value of the explanatory variables $\tilde{X}$, *R&D*, and *BIT* across all countries, industries, and years.

The first derivatives for the interacted variables are the following:

- For the continuous interacted variable, in this example R&D intensity (*R&D*), the marginal effect is not simply the adjusted coefficient $\beta_{R\&D}$, but may be substantially higher or lower in proportion to the coefficient of the interaction term.

(18) $$\frac{\partial E(y|X, y>0)}{\partial R\&D} = (\beta_{R\&D} + \beta_{INT} * \overline{BIT}) * \left(1 - z * \phi(z)/\Phi(z) - \phi(z)^2/\Phi(z)^2\right)$$

- For the dichotomous variable BIT the marginal effect is calculated as:

(19) $$\frac{\Delta E(y|X, y>0)}{\Delta BIT} = E(y|X, BIT=1, y>0) - E(y|X, BIT=0, y>0).$$

As the expected value of positive FDI is defined as

(20) $$E(y|X, y>0) = \beta' X + \sigma \cdot \frac{\phi(z)}{\Phi(z)},$$

The expected value of positive FDI when a BIT is concluded, thus at the value of 1 for BIT, and when a BIT has not been concluded – at the value zero is defined. The other explanatory variables are kept at their mean values. For presentation purposes consider z_{pos} and z_{zer}

(21) $$z_{pos} = \frac{\tilde{\beta}' \bar{\tilde{X}} + \beta_{INT} \cdot \overline{R\&D} \cdot 1 + \beta_{BIT} \cdot 1 + \beta_{R\&D} \cdot \overline{R\&D}}{\sigma}$$

(22) $$z_{zer} = \frac{\tilde{\beta}' \bar{\tilde{X}} + \beta_{INT} \cdot \overline{R\&D} \cdot 0 + \beta_{BIT} \cdot 0 + \beta_{R\&D} \cdot \overline{R\&D}}{\sigma} = \frac{\tilde{\beta}' \bar{\tilde{X}} + \beta_{R\&D} \cdot \overline{R\&D}}{\sigma}.$$

Then,

(23) $$\frac{\partial E(y|X,y>0)}{\partial BIT} = \sigma \cdot \left\{ z_{pos} + \frac{\phi(z_{pos})}{\Phi(z_{pos})} \right\} - \sigma \cdot \left\{ z_{zer} + \frac{\phi(z_{zer})}{\Phi(z_{zer})} \right\}$$

Opening the brackets and simplifying yields:

(24) $$\frac{\partial E(y|X,y>0)}{\partial BIT} = \beta_{BIT} + \beta_{INT} \cdot \overline{R\&D} + \sigma \cdot \left\{ \frac{\phi(z_{pos})}{\Phi(z_{pos})} - \frac{\phi(z_{zer})}{\Phi(z_{zer})} \right\}.$$

The eventual magnitude of the adjusted marginal effects strongly depends on the interaction term.

Second derivative for the R&D intensity *e*. The second derivative focusing on the R&D intensity measures the change in impact of R&D intensity on FDI activities due to the conclusion of a BIT:

(25) $$\frac{\partial^2 E(y|X,y>0)}{\partial R\&D * \partial BIT} = \frac{\Delta \frac{\partial E(y|X,y>0)}{\partial R\&D}}{\Delta BIT} = \frac{\Delta\left\{(\beta_{R\&D} + \beta_{INT} * \overline{BIT}) * \left(1 - z * \phi(z)/\Phi(z) - \phi(z)^2/\Phi(z)^2\right)\right\}}{\Delta BIT}.$$

Using the notation as introduced in equation (21) and (22) transforms equation (25) to:

(26) $$\frac{\Delta \frac{\partial E(y|X,y>0)}{\partial R\&D}}{\Delta BIT} = (\beta_{R\&D} + \beta_{INT}) * \left(1 - z_{pos} * \phi(z_{pos})/\Phi(z_{pos}) - \phi(z_{pos})^2/\Phi(z_{pos})^2\right) - \beta_{R\&D} \cdot \left(1 - z_{zer} \cdot \phi(z_{zer})/\Phi(z_{zer}) - \phi(z_{zer})^2/\Phi(z_{zer})^2\right)$$

.

Opening the brackets and rearranging yields:

$$\frac{\Delta \frac{\partial E(y|X, y>0)}{\partial R\&D}}{\Delta BIT} = \beta_{INT} \cdot \left(1 - z_{pos} * \phi(z_{pos}) / \Phi(z_{pos}) - \phi(z_{pos})^2 / \Phi(z_{pos})^2\right)$$

$$(27) \quad + \beta_{R\&D} \cdot \begin{pmatrix} z_{zer} \cdot \phi(z_{zer}) / \Phi(z_{zer}) + \phi(z_{zer})^2 / \Phi(z_{zer})^2 - z_{pos} * \phi(z_{pos}) / \Phi(z_{pos}) \\ -\phi(z_{pos})^2 / \Phi(z_{pos})^2 \end{pmatrix}.$$

The second derivative focusing on BITs measures the change in impact of the BITs on FDI activities due to a change in the R&D intensity.

$$(28) \quad \frac{\partial^2 E(y|X, y>0)}{\partial BIT \cdot \partial R\&D} = \frac{\partial \frac{\Delta E(y|X, y>0)}{\Delta BIT}}{\partial R\&D}.$$

The derivative is approximated through a difference term:

$$(29) \quad \frac{\partial \frac{\Delta E(y|X, y>0)}{\Delta BIT}}{\partial R\&D} \approx \frac{\Delta^2 E(y|X, y>0)}{\Delta BIT \cdot \Delta R\&D} = \frac{\Delta \left\{ \sigma \cdot \left\{ z_{pos} + \frac{\phi(z_{pos})}{\Phi(z_{pos})} \right\} - \sigma \cdot \left\{ z_{zer} + \frac{\phi(z_{zer})}{\Phi(z_{zer})} \right\} \right\}}{\Delta R\&D}.$$

Thus, the analysis is restricted to the influence of a move from low to high R&D intensity on BIT effectiveness. Four terms – z_{pos_high}, z_{zero_high}, z_{pos_low}, z_{zero_low} – are defined in this context. They differ if a BIT is concluded and takes the value 1 or if it is not, then taking the value 0, and if the R&D intensity is defined as high ($R\&D^{high}$) or low ($R\&D^{low}$). High values are calculated as the 80th centile value of the R&D intensity, thus, the value at or below which 80% of all industries are found with respect to their R&D intensity. Low values use the 20% centile value. Maximum and minimum values were not used to calculate the second derivatives in order to not distort the results due to outliers. Thus,

$$(30)\quad z_{pos\_high} = \frac{\tilde{\beta}'\bar{\tilde{X}} + \beta_{INT} \cdot R\&D^{high} + \beta_{BIT} + \beta_{R\&D} \cdot R\&D^{high}}{\sigma};$$

$$(31)\quad z_{zer\_high} = \frac{\tilde{\beta}'\bar{\tilde{X}} + \beta_{R\&D} \cdot R\&D^{high}}{\sigma};$$

$$(32)\quad z_{pos\_low} = \frac{\tilde{\beta}'\bar{\tilde{X}} + \beta_{INT} \cdot R\&D^{low} + \beta_{BIT} + \beta_{R\&D} \cdot R\&D^{low}}{\sigma};$$

$$(33)\quad z_{zer\_low} = \frac{\tilde{\beta}'\bar{\tilde{X}} + \beta_{R\&D} \cdot R\&D^{low}}{\sigma}.$$

Taking differences with respect to the R&D intensity leads to

$$(34)\quad \begin{aligned} \frac{\Delta^2 E(y|X, y>0)}{\Delta BIT \cdot \Delta R\&D} = & \frac{\sigma \cdot \left\{ z_{pos\_high} + \frac{\phi\left(z_{pos\_high}\right)}{\Phi\left(z_{pos\_high}\right)} \right\} - \sigma \cdot \left\{ z_{zer\_high} + \frac{\phi\left(z_{zer\_high}\right)}{\Phi\left(z_{zer\_high}\right)} \right\}}{\Delta R\&D} \\ & - \frac{\left\{ \sigma \cdot \left\{ z_{pos\_low} + \frac{\phi\left(z_{pos\_low}\right)}{\Phi\left(z_{pos\_low}\right)} \right\} - \sigma \cdot \left\{ z_{zer\_low} + \frac{\phi\left(z_{zer\_low}\right)}{\Phi\left(z_{zer\_low}\right)} \right\} \right\}}{\Delta R\&D}. \end{aligned}$$

Simplifying yields:

$$(35)\quad \frac{\Delta^2 E(y|X, y>0)}{\Delta BIT \cdot \Delta R\&D} = \beta_{INT} + \frac{\sigma \cdot \left\{ \frac{\phi\left(z_{pos\_high}\right)}{\Phi\left(z_{pos\_high}\right)} - \frac{\phi\left(z_{zer\_high}\right)}{\Phi\left(z_{zer\_high}\right)} - \frac{\phi\left(z_{pos\_low}\right)}{\Phi\left(z_{pos\_low}\right)} + \frac{\phi\left(z_{zer\_low}\right)}{\Phi\left(z_{zer\_low}\right)} \right\}}{\Delta R\&D}$$

.