

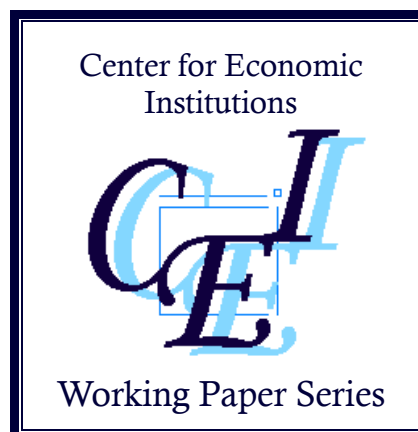
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A Meta-Analysis”**

**Josef C. Brada, Zdenek Drabek, and Ichiro Iwasaki**

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Institute of Economic Research  
Hitotsubashi University  
2-1 Naka, Kunitachi, Tokyo, 186-8603 JAPAN  
<http://cei.ier.hit-u.ac.jp/English/index.html>  
Tel:+81-42-580-8405/Fax:+81-42-580-8333

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# Does Investor Protection Increase Foreign Direct Investment? A Meta-Analysis<sup>†</sup>

Josef C. Brada,<sup>a b</sup> Zdenek Drabek,<sup>b</sup> and Ichiro Iwasaki<sup>c ‡</sup>

<sup>a</sup> *Arizona State University, Tempe, AZ, USA*

<sup>b</sup> *CERGE-Economic Institute of the Czech Academy of Sciences and Charles University, Prague, Czech Republic*

<sup>c</sup> *Hitotsubashi University, Tokyo, Japan*

**Abstract:** We undertake a meta-analysis of the effects of international investment agreements for the protection of foreign investors on foreign direct investment using 2107 estimates drawn from 74 studies. Our meta-analysis finds robust evidence that effect of international investment agreements is so small as to be considered zero. However, our results do not rule out the possibility that the effect of these agreements is, in fact, positive and that current research methods are insufficiently powerful or precise to identify the underlying genuine effect. FDI from developed countries appears to be more responsive to the existence of investment protection, and there is evidence of publication-selection bias in favor of studies that find a positive effect for investor protection.

**Keywords:** meta-analysis, foreign direct investment, investor protection, bilateral investment treaty

**JEL Classification Numbers:** F21, F23, F53

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<sup>‡</sup> Corresponding author: 2-1 Naka, Kunitachi City, Tokyo 186-8603, JAPAN; Tel.: +81-42-580-8366; Fax: +81-42-580-8333; E-mail address: iiwasaki@ier.hit-u.ac.jp

## 1. Introduction

For host countries, FDI is seen as a means of accelerating economic growth and exports through increases in the capital stock, better access to advanced technology, and improvements in the skills of host-country workers and managers (Gonzalez and Kusek, 2018). Moreover, FDI is widely seen as creating productivity spillovers to upstream and downstream host-country firms (Havránek and Iršová, 2011; Newman et al., 2015) albeit with the magnitude of effects differing by the nature of the investments and of the host economy. FDI may also improve and stabilize the host country's balance of payments situation because FDI is seen as more "patient" than portfolio capital and thus less susceptible to sudden surges in capital inflows or outflows. For multinational corporations (MNCs), FDI has served as means of expanding sales in foreign markets, of exploiting firm-specific competitive advantages, of obtaining access to foreign resources and of creating cross-country supply chains to reduce costs at multiple stages of the production and distribution process (Baldwin and Lopez-Gonzales, 2015).

FDI also carries costs and risks for both foreign investors and for host countries. The risks to investors include *de jure* or *de facto* expropriation (Hajzler, 2012), host-country restrictions on foreign investors, regulatory interference with the MNC's activities by host-country authorities, discrimination in favor of local firms, limits on profit repatriation (Vandervelde, 2009), etc. For host countries, disadvantages of FDI include the possibility that MNCs will use their market power in the host country to harm local firms and the local economy, to keep wages low, to encourage corrupt behavior, and to reap excessive profits. Thus, home-country oversight of foreign firms is to some extent necessary and justified. These potential conflicts between investor interests and home-country sovereignty can reduce FDI inflows unless host countries can credibly commit to restrain their exercise of arbitrary or predatory behavior while balancing this commitment with their legitimate sovereign regulatory and oversight duties.

To encourage FDI by reducing the risks of arbitrary host-country actions, home and host countries have developed arrangements for protecting foreign investors. Perhaps the most numerous of such arrangements are bilateral investment treaties (BITs) of which more than 3000 have been negotiated. Under the terms of these treaties, MNCs that believe they have been treated unfairly by the host country can file for arbitration. Most arbitral proceedings are held under the auspices of the World Bank Group's International Center for the Settlement of Investment Disputes (ICSID) often following the rules of ICISD or the United Nations Commission on International Trade Law (UNCITRAL). The arbitrators decide whether the

MNC's claim is legitimate and, if so, what damages are to be paid to the MNC by the host country. In addition to BITs, protection for foreign investors is also provided through multilateral investment treaties (MITs), which include provisions like those of BITs but cover several home and/or host countries. Bilateral trade treaties (BTTs) and multilateral trade treaties (MTTs) sometimes also include protection for FDI between the signatories (Büthe and Milner, 2008). For the sake of brevity, we refer to all these arrangements as International Investment Agreements (IIAs).

There are several reasons why IIAs are thought to promote FDI inflows. One is that they address the problem of time inconsistency. Host governments may not be able to commit credibly to equitable treatment of the foreign investor after the investment is made because, once the investor has located largely immovable assets in the host country, power shifts from the foreign investor to the host government, which may come to feel that the original terms granted the foreign investor were too generous and seek to change the terms of its commitment by raising taxes, constraining the MNC's operations or even by expropriation. This is in part related to the well-known concept of the obsolescing bargain (Vernon, 1971), which was developed to explain host country-investor disputes in investments in the exploitation of natural resources, but which also applies to franchise sectors such as banking and telecommunications, and, less tellingly, to investments in sectors such as manufacturing (Kobrin, 1987). IIAs provide protection for the investor against such government actions, thus reducing risk and providing for greater security for the MNC's future profits. A second benefit to foreign investors is that IIAs protect their investments in countries where the rule of law is weak and where government predation is high. The ability to seek redress in an impartial arbitral setting is thus a way of importing the evenhanded and effective application of international law into a country whose courts are weak and inefficient or that serve the interests of the host government (Dupont et al., 2016). Finally, IIAs also protect the foreign investor against political and economic uncertainty in the host country. Revolutions, coups and even changes in government brought about by elections can change government policies toward foreign investors, and IIAs provide some measure of protection for foreign investors against such unexpected changes in their treatment by the host-country government. Similarly, in periods of economic instability such as balance of payments crises, the host government may be tempted to impose unfavorable conditions on foreign investors such as taxing them at higher rates or preventing the repatriation of profits, and IIAs are way of protecting the foreign investor against such measures (Bellak and Leibrecht, 2019).

The costs of ceding some sovereignty by host countries that are inherent in investment protection treaties could be offset if the economic gains from FDI are positive and if investor protection treaties attract sufficient FDI. However, the literature on whether and to what extent investor protection treaties increase FDI inflows is quite controversial, with some studies finding large positive effects, others insignificant effects and yet others negative effects. Reasons for this lack of agreement stem in part from the difficulties in conceptualizing, measuring and modeling FDI flows and stocks and in part from the fact that the measurement of the effect of investment treaties on FDI has engaged the interest of scholars from the fields of economics, the law and political science. Each of these disciplines tends to apply different theoretical frameworks and empirical strategies and to emphasize different aspects of the relationship between investment treaties and FDI. This lack of a common framework makes it difficult to evaluate the many studies of the effect of investment protection on FDI.

In this paper we conduct a meta-analysis to synthesize the empirical findings in the literature that examines the relationship between IIAs and FDI. We also examine which study characteristics generate heterogeneity in the empirical evidence and look for sources of bias in the results reported in the literature by performing a multivariate meta-regression analysis. In addition, we test for the presence of publication-selection bias and genuine empirical evidence in the literature using a funnel plot and meta-regression models designed for this purpose. In Section 2 we briefly survey the nature of the studies of the effects of IIAs and summarize the previous literature that has sought to synthesize the empirical research on this topic. In Section 3, we describe how we selected the studies used in our meta-analysis and present the basic results on the effects reported in the literature. The meta-synthesis of the reported results is carried out in Section 4, and we find that, after adjusting for heterogeneity and possible bias, all types of IIAs have only a negligible effect on FDI inflows. In Section 5 we use meta-regression analysis to explore the causes of heterogeneity among the studies analyzed, and we identify the nature of the home countries of investors as the most important sources of heterogeneity. The possibility of publication-selection bias in the published results is examined in Section 6. Using the FAT-PET-PEESE approach advocated by Stanley and Doucouliagos (2012), we conclude that publication bias does not overturn our conclusions regarding the ineffectiveness of IIAs in promoting FDI. Section 7 concludes.

## **2. Literature Survey**

### ***2.1. Studies of the effect of IIAs on FDI***

To provide some context for our approach to the evaluation of the effect of IIAs on FDI, we briefly review the nature of the studies available. The literature on the effect of IIAs falls into two categories. The first, so-called monadic, category examines the experience of one or several host countries following the signing of IIAs. The dependent variable is FDI, either inward stock or flow, often normalized by host-country GDP. The explanatory variables are host-country characteristics such as the level of, or the changes in, GDP, the exchange rate, inflation, openness to trade and measures of country risk and political instability. To these is added the number of IIAs the country has signed with all, or with a sample of, home countries. Some of these studies address econometric issues such as lags between the signing of treaties and changes in FDI, possible endogeneity issues, etc. The effect of IIAs on FDI is then measured by the coefficient of the variable measuring the number of IIAs a country has negotiated or has in force. If this coefficient is positive and significant, then IIAs are interpreted as having a positive effect on FDI. Comparisons can be over time, that is before and after a country has signed IIAs, or cross sectional, comparing a country with IIAs to similar countries that have a different number of IIAs.

The second category of studies, called dyadic, examines FDI flows or stocks for country pairs. Often, some form of the gravity equation is used. Thus, home and host country economic potential, often measured by GDP, and a measure of resistance, often the distance between two countries, are included in the specification. To this basic equation a variety of additional explanatory variables is added. These include adjacency, similarities in language and legal systems, similarities or differences in levels of corruption, political and economic stability, trade barriers, etc.<sup>1</sup> Finally, a dummy variable is included, equal to one if there is an IIA treaty between the two countries and zero if there is not. A positive and significant coefficient for this dummy is taken as evidence that IIAs increase FDI. Some of these studies examine bilateral FDI from a group of home countries, often developed countries, to a group of host countries while others examine FDI among all countries in the sample.

While this brief overview does not do justice to the richness or sophistication of the literature, it does highlight two key features that have relevance for our meta-analysis. The first is that there is a large variety of dependent variables and specifications used to determine

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<sup>1</sup> Although there is large literature on FDI using these additional explanatory variables, Blonigen and Piger (2014) identify the correlates that properly belong in a gravity model explaining bilateral FDI stocks. Many of the studies included in our meta-analysis do not make use of Blonigen and Piger's results and may thus be misspecified. Moreover, there is no comparable study for the appropriate correlates of FDI flows in a gravity equation setting.

whether IIAs have any effect on FDI. Thus, any attempt at a meta-analysis must deal with this variety. Given the lack of theoretical guidance on the specification of monadic or dyadic models of FDI, it is difficult to judge whether some specifications are more appropriate than others. The second somewhat unique aspect of the literature on IIAs is that, unlike meta-analyses that focus on the coefficient of a continuous explanatory variable in a structural equation, such as an indication of outcome elasticity with respect to the explanatory variable, in IIA studies, the dummy variable in question takes on values of zero or one in dyadic studies or an integer in monadic studies. This means that the dummy variables measure the extent to which IIAs lead to levels of FDI that differ from the “normal” or baseline estimate, which then places a heavy burden on getting the baseline estimate of FDI right.

## ***2.2. Survey of studies of the effects of IIAs on FDI***

Given the policy relevance of the effect of investment protection treaties on FDI and the differences in methodologies used to study the topic, scholars have sought to systematize and evaluate the conclusions that the literature throws up in two ways. One is through critical surveys of the numerous studies available in the literature. Recent surveys of the literature include Jacobs (2017) and Pohl (2018). Jacobs (2017) criticizes monadic studies on the grounds that they do not properly account for the economic characteristics of the countries with which the host country has signed BITs, nor do they effectively account for other host country policies toward FDI that may have effects as, or more, important as the signing of BITs. He faults the results of dyadic studies as well, arguing that the protection afforded by BITs between countries depends critically on the terms incorporated in the BITs; studies that do not account for these differences in BITs lead to faulty conclusions about their effect on FDI.

Pohl (2018) presents a more extensive survey in which he examines over 30 studies. He concludes that:

“...the vast majority of the existing studies do not offer a satisfying answer to the question whether IIAs influence capital allocation in treaty partners. This is due to conceptual problems regarding the notions of FDI on the one hand, and IIA-based investment protection on the other, which are common to all reviewed studies. Many of these problems are likely to be nonrandomly associated with variables of interest, thus leading to important bias and invalid results for the research question.” (Pohl, 2018, p.19)

Pohl is critical of FDI data because of their shortcomings in reflecting the economic activity of MNCs in host countries. His concerns are echoed by Kerner (2018) who sets out the likely errors in FDI flow data. One is that measured FDI does not measure the resources that a foreign investor devotes to the host country because the data ignore the investor’s borrowing

from host-country sources. There is also co-mingling of fixed and liquid assets in what the investor places in the host country, so some of what is recorded as FDI is really a form of portfolio investment. He also points out that FDI data do not always reflect the true origin of such investments due to roundtripping and treaty shopping.<sup>2</sup> Pohl also notes that FDI stock data are influenced by changes in the valuation of FDI stocks that are unrelated to investment activity. Finally, he notes the failure of many studies to account for protection afforded investors by international agreements other than BITs, which is why, in this study, we address the effects of these other forms of investor protection to the extent permitted by the available studies.

In contrast, Echandi et al. (2015) argue that, while the criticisms of the early papers on the topic have some validity, over time researchers have come to address many of the concerns such as those that Pohl raises, concluding that newer studies try “to address one or more of these (methodological) concerns and suggests that IIAs can be important mechanisms in attracting investors” (p. 21).

In the face of such conflicting evaluations of the evidence, meta-analysis offers a less subjective and more rigorous approach to the evaluation of the effect of IIAs on FDI. The only meta-analysis of which we are aware is that of Bellak (2015), who examines the effect of BITs on FDI using a sample of 40 studies. Bellak uses only studies that allow him to calculate the semi-elasticity of FDI with respect to the presence of BITs. This focus on semi-elasticity is attractive in the sense that calculating the semi-elasticity of FDI with respect to the existence of a BIT directly addresses the question of how large the effect of BITs on FDI is. However, the use of the semi-elasticity as the variable of interest imposes some severe restrictions on how the available studies can be used for meta-analysis. Thus, Bellak analyzes studies that use the stock of FDI separately from those that use FDI flows as the dependent variable, and, for the former, there are only 11 studies, making robust hypothesis testing difficult.<sup>3</sup> These

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<sup>2</sup> Roundtripping refers to host country residents who move funds offshore to be invested back in the country of origin but with the added protection or anonymity of being classified as FDI rather than as domestic investment. In treaty shopping, an MNC from country A wishing to invest in country B will first establish an affiliate in country C, whose BIT with country B provides greater protection for the foreign investor than does the BIT between countries A and B. The affiliate in country C then undertakes the investment (Lee, 2015). Blanchard and Acalin (2016) caution “that ‘measured’ FDI gross flows are quite different from true FDI flows and may reflect flows through rather than to the country, with stops due in part to (legal) tax optimization. This must be a warning to both researchers and policymakers.”

<sup>3</sup> Bellak also uses other criteria to eliminate studies from the meta-analysis, such as requiring that studies included in the analysis use only ratified BITs as the explanatory variable.



restrictions reduce the total number of semi-elasticities calculated to 309, and, for analytical purposes, these have to be further subdivided based on the way in which FDI is measured in the various studies. Bellak finds a strong publication bias in favor of studies that find a positive effect of BITs on FDI, and, once the results are adjusted for this bias, the mean values of the semi-elasticities, ranging from 4 to 13%, are sharply reduced so that, for FDI flows, the semi-elasticity falls to 2.3%, which, while statistically significant, leads Bellak to conclude that "... the empirical evidence on the basis of a meta-analysis suggests that the FDI promotion effect of BITs seems to be economically and statistically negligible" (Bellak, 2015, p. 76).

The meta-analysis presented in this paper differs in sample, methodology and findings from those of Bellak. First, we include more recent studies. Of the 74 studies included in our meta-analysis and listed in the Supplement, 28 were published in 2015 or later, and thus were not available to Bellak. These more recent studies, in addition to potentially providing longer time spans over which to measure the effects of BITs, address many of the shortcomings of previous studies mentioned in the literature surveys referenced above and thus should yield more precise estimates of the effect of IIAs on FDI. There are also methodological differences; we take advantage of advances in meta-analysis techniques that enable us to analyze studies with different dependent variables within a single framework. By using the partial correlation coefficient (PCC) of each study's results rather than the semi-elasticity we can analyze within a single framework all available studies on the effects of IIAs on FDI regardless of the specification or measure of FDI used. As a result, we are able to examine simultaneously studies that use stocks or flows of FDI or its ratio to GDP, studies that make use of interactions between covariates and the IIA dummy, and studies that use dynamic specifications that seek to uncover the long-term effects of IIAs. In all, our study analyzes 2107 separate estimates of the effects of BITs and other IIAs on FDI.

### **3. Procedure for Literature Selection and Overview of Studies Selected for Meta-Analysis**

#### ***3.1. Procedure for literature selection***

As a first step toward identifying relevant studies that provided empirical estimates of the FDI-promoting effects of international agreements, we used EconLit, Web of Science, and academic press website databases.<sup>4</sup> The final literature search was performed in March 2020. When using these electronic databases, we employed as search terms combinations of one of *foreign direct*

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<sup>4</sup> These websites include: Oxford University Press Website, Science Direct, Springer Link, Taylor and Francis Online, and Wiley Online.

*investment* and *FDI* and one of *international agreement*, *investment treaty*, and *trade agreement*. This mechanical search generated close to 450 hits. Then, judging from each title, abstract, and other related information, we narrowed the list to more than 150 studies.

In the second step, we examined the contents of the above research works one by one and limited our literature list to those containing estimates that could be subjected to meta-analysis in this paper, and we obtained a total of 74 studies dating from Egger and Pfaffermayr (2004) to Jung and Kim (2020).<sup>5</sup> As reported in Table 1, these 74 selected works consist of 5 book chapters, 54 journal articles, and 15 unpublished manuscripts including one Ph.D. thesis. They have been published continuously over the past 15 years, but the year 2016 saw the most publications, with nine papers. The next most productive year was 2009, with eight papers published, followed by 2007, with seven works. These 74 selected works provide estimates based on data that cover 48 years from 1970 to 2017. The average period covered by each study is 20.1 years, and the median is 19.<sup>6</sup>

From these 74 studies, we extracted a total of 2,107 estimates (mean: 28.5 per study; median: 18).<sup>7</sup> Table 1 also gives a breakdown of the collected estimates by international agreement type. A closer examination of the studies showed that some authors had taken care to identify, separately, estimates of the effects of bilateral investment treaties (BIT), multilateral investment treaties (MIT), bilateral trade agreements (BTA) and regional trade agreements (RTA), the latter two of which often contain some provisions for FDI protection. The rationale for this is, as, for example, Hallward-Driemeier (2003) argues, that some investor protection is included in broader international treaties such as NAFTA that also liberalize trade among participating countries. Thus, there would be two effects of NAFTA on FDI, one due to the change in bilateral trade resulting from the reduction in trade barriers and the other due

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<sup>5</sup> We included available working papers that were subsequently published as journal articles or book chapters in our sample if there were differences between the estimates in the former and the latter. We also included unpublished working papers to get as broad a range of estimates as possible.

<sup>6</sup> The literature search was carried out by a research assistant and all the authors. Selection of articles for close examination was carried out by all authors, and the selection and coding of the studies was carried out by two of the authors in general conformity with the guidelines published in Havránek et al. (2020).

<sup>7</sup> We take estimates in a paper as differing from one another if they differ in terms of at least one of the following elements: the dependent variable, the explanatory variables, the time period or countries covered, specification of the regression equation, and method of estimation.

to the increased protection of foreign investors.<sup>8</sup> Consequently, to attribute the entire change in bilateral FDI among NAFTA members to the treaty's provision of investor protection alone would lead to an upward bias in the estimate of the effects of investor protection on FDI, and, thus, the effects of investor protection in arrangements such as NAFTA should be evaluated separately from those of simple BITs. While the focus of our analysis is on the literature dealing with the effects of BITs, we take the opportunity to analyze the effects of investor protection included in these other types of arrangements as well, to the extent that they are addressed in the available studies.

As Table 1 shows, there are 1,290 extracted estimates (61.2%) of the FDI-enhancing effect of BITs, reflecting the high level of interest in this agreement type among researchers. Evidence regarding the effect of bilateral trade agreements that provide some measure of investor protection for FDI takes the second largest share with 358 estimates (17.0%). Those regarding the impacts of regional trade agreements such as NAFTA that also provide explicit protection for foreign investors accounted for 279 (13.2%) and those of multilateral investment treaties for 180 (8.5%). Although there exists a large gap between the number of bilateral investment treaty effect estimates and the number of estimates for the other three types of international, the number of estimates is sufficient to synthesize and compare the effect size of these four types of international agreements on FDI using meta-analytic techniques.

### ***3.2. Overview of studies selected for meta-analysis***

Taking  $K$  as the number of independent estimates provided by the analyzed studies, we calculated the partial correlation coefficient (PCC) of each of the  $K$  estimates. The PCC is a measure of the association between the dependent variable and the independent variable of interest, the existence of some form of IIA, when all other explanatory variables are held constant. Letting  $t_k$  and  $df_k$  be the  $t$ -value and the degrees of freedom of the  $k$ -th estimate,  $r_k$ , the PCC of the  $k$ -th estimate is calculated as:

$$r_k = \frac{t_k}{\sqrt{t_k^2 + df_k}}, \quad k = 1, 2, \dots, K \quad (1)$$

and the standard error,  $SE_k$ , of  $r_k$  is given by:

$$SE_k = \sqrt{(1 - r_k^2)/df_k} \quad (2)$$

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<sup>8</sup> The effect of reduced trade barriers on bilateral FDI flows is ambiguous. On the one hand, lower tariffs and other trade barriers reduce the need for FDI to serve the foreign market, but reduced tariff barriers can also be a stimulus for greater FDI, particularly of the vertical, resource-seeking type, as was evident in the automobile sectors in Canada, Mexico and the US after the implementation of NAFTA.

Table 2 reports descriptive statistics and statistical test results of the PCCs, while Figure 1 displays the individual kernel densities of the PCCs for each of the four types of IIAs as well as for all IIAs taken together. The kernels show positive skewness and appreciable kurtosis. Moreover, the largest positive PCCs tend to be bigger in absolute value than the negative PCCs, suggesting that some studies were able to find relatively large effects for the effects of investor protection on FDI. Table 2 confirms what is visible in Figure 1 regarding skewness and kurtosis. Although the null hypothesis that the unadjusted means are zero is rejected by the corresponding *t*-tests, as we discuss below, the values of the means are so small that the practical impact of any of the IIA types on FDI is negligible, and, given the large number of estimates in our sample, the statistical significance of the positive values of the PCCs does not imply a meaningful economic effect (Cohen, 1994).

While the means of the PCCs are statistically significant, a more important question is whether these means signify an important economic effect of IIAs on FDI. Doucouliagos (2011) examines 22,141 empirical studies in economics and finds that, for all studies, the 25<sup>th</sup> percentile PCC is 0.07. Studies with PCCs less than this value can be considered as reporting “very small” effects in Doucouliagos’ terminology. Because the effects reported by in Table 2 fall well short of the 25<sup>th</sup> percentile cutoff, it is clear that the surveyed literature finds that the effect of BITs and other forms of investor protection on FDI is negligible or nonexistent in economic terms. Moreover, because the measured effects of all types of IIAs are negligible, it follows that the differences between their effects on FDI mentioned above are of no practical importance for policy makers. It now remains to adjust the mean PCCs presented in Table 2 through meta-synthesis.

#### 4. Meta-Synthesis

The results of meta-synthesis of the collected estimates are reported in Table 3. If we assume that the PCC of the *k*-th estimate,  $r_k$ , is characterized by a mean and standard deviation given by  $\theta_k$  and  $s_k$  respectively and that  $\theta_1 = \theta_2 = \dots = \theta_K = \theta$ , then each study included in our meta-analysis estimates the common underlying population effect and the estimates differ only by random sampling errors. An asymptotically efficient estimator of the unknown true population parameter  $\theta$  is the mean of the estimates of all *K* of the  $r_k$  weighted by the inverse variance of each estimate:

$$\bar{R} = \frac{\sum_{k=1}^K w_k r_k}{\sum_{k=1}^K w_k} \quad (3)$$

where  $w_k = 1/v_k$  and  $v_k = s_k^2$ . The variance of  $\bar{R}$  is  $1/\sum_{k=1}^K w_k$ . This is called the meta-fixed-effect model, and we denote estimates of the fixed-effect model by  $\bar{R}_f$ . Estimates are reported in Column 2 of Table 3. In order to utilize this method to synthesize the PCCs, it is necessary to confirm that the estimates are homogeneous by means of a test statistic that has a Chi-square distribution with  $K-1$  degrees of freedom as given by Equation 4:

$$Q_r = \sum_{k=1}^K w_k (r_k - \bar{R}_f)^2 \sim \chi^2(K-1). \quad (4)$$

The null hypothesis is rejected if  $Q_r$  exceeds the critical value as the results reported in Column 4 of Table 3 indicate.

Because we reject this null hypothesis, heterogeneity exists among the studies, and we adopt as more appropriate a random-effects model that incorporates sampling variation resulting from an underlying population of differing effect sizes as well as the study-level sampling error. If the deviation between estimates is expressed as  $\delta_\theta^2$ , the unconditional variance of the  $k$ -th estimate is given by  $v_k^u = (v_k + \delta_\theta^2)$ . In this meta-random-effects model, the population parameter  $\theta$  is estimated by replacing the weight  $w_k$  with the weight  $w_k^u = 1/v_k^u$  in Eq. (3). For the between-studies variance component, we use the method of moments estimator computed by Equation 5 using the value of the homogeneity test value  $Q_r$  obtained from Eq. (4):

$$\hat{\delta}_\theta^2 = \frac{Q_r - (K-1)}{\sum_{k=1}^K w_k^u - (\sum_{k=1}^K w_k^{u^2} / \sum_{k=1}^K w_k^u)}. \quad (5)$$

Hereafter, we denote the estimates of the meta-random-effects model as  $\bar{R}_r$ .

In addition to this traditional approach to meta-synthesis method described above, we also utilize the unrestricted weighted least squares weighted average (UWA) method proposed by Stanley and Doucouliagos (2017) who argue that UWA is less subject to influence from excess heterogeneity than are fixed effects and has less publication-selection bias than do random effects. The UWA takes as the synthesized effect size a point estimate obtained from a regression where the standardized effect size is the dependent variable and the estimation precision is the independent variable. Thus, we estimate Eq. 6, in which there is no intercept term, and the coefficient  $\alpha$  is the synthesized value of the PCCs:

$$t_k = \alpha(1/SE_k) + \varepsilon_k, \quad (6)$$

where  $\varepsilon_k$  is the residual. These estimates of  $\alpha$  in Equation (6) have the same values as the estimated value of  $\bar{R}_f$ , but UWA accounts for heterogeneity, while  $\bar{R}_f$  does not. Values are

reported in Column 5 of Table 3. While the  $t$ -values decline relative to those of fixed-effects estimates, the coefficients remain significant at the 1% level.

In a related article, Stanley et al. (2017) argue for computing a UWA of only those estimates whose statistical power exceeds a threshold of 0.8, and they call this estimation method the weighted average of the adequately powered estimates (WAAP). According to Stanley et al. (2017), the WAAP estimate is more robust against publication selection bias than is the random-effects estimate of  $\overline{R}_r$ , and, thus WAAP may prove superior to other weighted averages including fixed-effects, random-effects and UWA.<sup>9</sup>

The tests for homogeneity, reported in Column 4, reject the null hypothesis in all five cases. Note that the fixed-effect estimates in Column 2 are smaller than the unweighted estimates reported in Table 2, which reflects the latter's greater susceptibility to the effects of bias. Therefore, we consider the synthesized effect size  $\overline{R}_r$  of the random-effects model reported in Column 3 of Table 3 as the more appropriate estimate of the effect of IIAs on FDI although the random-effects model will yield more biased estimates in the presence of publication bias or if small sample studies yield large effect estimates. Note that, relative to the mean values of the PCCs reported in Table 2, the synthesized random-effects values for the PCCs for all IIAs except for bilateral trade agreements are smaller. The fact that random effects estimates are smaller than the means reported in Table 2 suggests publication selection bias.

Table 3 also provides synthesis results based on the UWA methodology proposed by Stanley and Doucouliagos (2017). The coefficient estimates for the UWAs of all types of IIAs are statistically significant, but the decline in coefficient estimates relative to the random effects estimates also suggests publication-selection bias. Finally, WAAP, the UWA of adequately powered estimates, generates synthesized effect similar to those obtained from both the fixed-effect and the random-effects estimation. It is worth noting that the number of adequately powered estimates represents about 10% of all estimates used in our meta-analysis. This corresponds to the incidence of adequately powered estimates in much of empirical economics research (Ioannidis et al., 2017).<sup>10</sup>

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<sup>9</sup> For the appropriateness of WAAP for economic research, see Ioannidis et al. (2017).

<sup>10</sup> In the case of studies of the effects of IIAs, low power is the result of the small effect of IIAs on FDI, small sample sizes, especially in monadic studies where the time period and number of countries in the sample is usually small, and a relatively high level of data variability.

To sum up, the meta-synthesis of the PCCs shows that the effect of all types of IIAs on FDI is negligible. The analysis also suggests the presence of heterogeneity and publication-selection bias in the results, and it is to these issues that we now turn.

## 5. Meta-Regression Analysis

### 5.1. MRA models and their results

We undertake a meta-regression analysis (MRA) to explore the factors causing heterogeneity among the studies analyzed. We estimate a meta-regression model:

$$r_k = \beta_0 + \sum_{n=1}^N \beta_n x_{kn} + e_k, \quad k = 1, \dots, K \quad (7)$$

where  $x_{kn}$  is the  $n$ -th meta-independent variable that captures a relevant characteristic of the  $k$ -th PCC and explains its systematic variation from other PCCs in the sample;  $\beta_n$  denotes the meta-regression coefficient to be estimated;  $N$  is the number of meta-independent variables; and  $e_k$  is the meta-regression disturbance term. To check the statistical robustness of coefficient  $\beta_n$ , we perform our MRA using the following five estimators: (1) the cluster-robust ordinary least squares (OLS) estimator, which clusters the collected estimates by study and computes robust standard errors; (2) weighed least squares weighing by the inverse of the standard error ( $1/SE$ ) as a measure of estimate precision; (3) weighing by the degrees of freedom ( $d.f.$ ) to account for the large sample size differences among the studies; (4) weighing by the inverse of the number of estimates reported per study ( $1/EST$ ) as an analytical weight<sup>11</sup>; and (5) the cluster-robust fixed-effects panel estimator following Stanley and Doucouliagos (2012), Iwasaki et al. (2020), and other meta-analyses in economics. For our purposes, we accept  $\beta_n$  as being significantly different from zero if at least three of the estimates of  $\beta_n$  obtained by the above five estimation methods are statistically significant.

In view of the wide variety of approaches to measuring the effect of IIAs on FDI in terms of model specification, type of data on FDI, IIAs covered, country coverage and control variables considered relevant by researchers, we identified 31 meta-independent variables for

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<sup>11</sup> The use of  $1/EST$  for the WLS estimation addresses the so-called “over-representativeness” issue in meta-analysis. The number of reported estimates in the analyzed papers varies greatly and, thus, papers with many reported estimates may drive the results of our MRA. WLS with  $1/EST$  allows us to account for this possibility. See Havránek and Sokolová (2020) for the development of this approach. As a robustness check, we report stepwise and bootstrap estimations to test if the results are dominated by a few papers with many estimates in Appendix Table A1.

inclusion. These are the variables that we judged as most likely to lead to differences in results among the studies in our sample, and they also reflect many of the criticisms found in the literature of one or another type of study. We group these variables into 16 categories that collect the variables by the nature of the source of heterogeneity such as econometric methodology, data type, etc. The variables and their coding are reported in Table 4.

The estimation results are reported in Table 5. In the first category, “International agreement variable type”, we take the estimate for BITs as the baseline estimate and the next three rows report on whether estimates of coefficients for the three other types of IIAs differ from those obtained for BITs using the significance criterion mentioned above. The coefficient for the category of bilateral trade agreements has a negative and statistically significant estimate in three out of five models. Hence the effect size of bilateral trade treaties is by our criterion significantly smaller than that of BITs. For the other measures to protect investors, there is no difference in effect size between them and BITs, *ceteris paribus*.<sup>12</sup>

The second category relates to the definition of the IIA variable. The baseline is represented by studies that use a zero-one dummy to indicate the presence of an IIA. Other studies, however, look at the cumulative number of IIAs that a country has signed and estimate the effects of the cumulative number, usually on aggregate inward FDI. The reported estimates show that this difference in modelling approach does not lead to any systematic differences in the estimates of the effect of IIAs. The similar effect of a single IIA on FDI from one country compared to that of a set of IIAs with several countries points to a certain degree of commonality among different IIAs. This does not necessarily mean that all IIAs are the same or that they contain identical rules. Nevertheless, it appears that the IIA provisions embodied in different agreements tend to have a similar effect.

The third category deals with the treatment of the existence of IIAs. Some authors do not specify whether the IIAs used in their estimations are ratified or signed or they use both categories.<sup>13</sup> Other authors prefer to use signed agreements as the explanatory variable on the assumption that signed agreements are likely to be ratified in due course, and thus they serve as a signal to foreign investors that they will have greater protection in the host country in the future for investments that they may undertake now. Yet other authors, however, choose to use

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<sup>12</sup> We also check whether there are differences between estimates for trade agreements versus investment treaties and between multilateral and bilateral agreements using both all and only robust meta-independent variables. The results, reported in Appendix Table A3, find no differences between the effects of these categories.

<sup>13</sup> Treaties only come into effect when they are ratified by the countries that are parties to the treaty.



only ratified agreements as these are the only agreements that do confer tangible protection to investors. Again, the reported results show that there is no systematic difference in the estimates obtained using these various measures of the existence of IIAs.

Category 4 covers aspects of the specification used by researchers to measure the effect of IIAs. The coefficients of dummies for studies that use a lagged value of signed agreements are also not significant. The use of lagged agreements in studies is due to the fact that the decision by an MNC to undertake FDI in a host country that has just signed an IIA with the MNC's home country requires some time to plan and execute, whether the investment takes the form of an acquisition in the host country or a greenfield investment. Finally, the inclusion of interaction terms, usually between the measure of IIAs and host- or home-country characteristics does not yield a significant difference in the effects reported.

In category 5, we consider the effect of how FDI is measured. The default option is the use the log of FDI flows or stocks. This can be a problem, especially in in dyadic models, because FDI may be zero or even negative, which forces researchers to drop observations or to insert arbitrarily small positive values for non-positive observations.<sup>14</sup> Other authors use the monetary value of FDI or the ratio of FDI to host-country GDP or population. However, none of these choices lead to significantly different estimates of the effects of IIAs. In category 6, we consider the way in which FDI is conceptualized. The baseline is FDI inflows, but the coefficient for FDI stocks is not significantly different from zero. Thus, however fraught the controversy over the appropriateness of stocks or flows in these studies may be, the choice does not lead to different estimates of the effects of IIAs.

Categories 7 through 10 deal with the potential effects of the type of countries included in the study on the results obtained. Category 7 examines the effect of the number of home countries in the sample on the effect estimates. The number of home countries included in a study has a statistically significant coefficient in all five models, but the average of the coefficients is less than 0.002, meaning that the effect is unimportant in economic terms. The largest significant coefficients in the meta-regression analysis relate to Category 8, the composition of the home countries in the studies. Compared to studies that use both advanced and emerging-market countries, which we take as the baseline, we find that studies that use advanced countries or the EU as the home countries or country produce larger positive effects. If the home countries are advanced economies (Advanced home country), the average of the

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<sup>14</sup> Silva and Teneyro (2006) discuss some of the econometric problems that these practices create.

significant coefficients is 0.052, and, if the study uses the EU as the home countries, then the average of the coefficients is 0.061, which comes close to a genuine small effect of IIAs on FDI in Doucouliagos' (2011) terminology, and suggests that the choice of home countries has an important effect on the estimated effects of IIAs. This should not be surprising because a major objective of IIAs is to facilitate investments from developed countries that are the major sources of FDI to emerging-market countries. Thus, focusing on the effects of this subset of IIAs and on flows from wealthy to developing countries should show a greater effect of IIAs. These results also suggest that IIAs among developed countries may be intended more to promote reciprocal market access or to avoid state-state conflicts over the treatment of foreign investors rather than to increase FDI flows. Thus, the choice of home countries critically influences the results obtained by studies of the IIA-FDI relationship.

The number of host countries in a study, category 9, has no significant effect on the estimated effect of IIAs. Moreover, the nature of the host countries, category 10, also does not affect the results systematically. Whether a study uses a mixture of developed or developing host countries, which is the baseline, or whether host countries in the sample are limited to either developed or developing countries has no systematic effects on the estimates.

Categories 11 and 12 relate to the nature of the data used in studies. Category 11 shows that there is no significant difference between studies that use panel data and those that use cross-section or time series data. This is somewhat surprising in that panel estimates using fixed effects to control for unobservable country differences that do not vary with time should lead to more robust estimates. Neither the first year covered by a study nor the length of the time covered by a study has any systematic effect on the reported effect.

Categories 13 through 15 investigate the effects of econometric choices researchers make in seeking to estimate the effects of IIAs on FDI. In category 13, we take the gravity equation as the baseline specification because it is a widely used model not only for bilateral trade but also for bilateral FDI (Blonigen and Piger, 2014). Any specification that has as covariates the level or logs of the GDPs of the two countries and the distance between them falls into this category. However, the results show that there are no significant differences between the results obtained by the gravity equation and by other specifications. Likewise, the studies using the OLS estimator do not differ from those obtained by other means, category 14, nor does controlling for the potential endogeneity of investment protection effect the size of reported PCCs, category 15. Finally, we consider the precision of the studies as measured by the standard errors of the PCCs, but this, too, has no effect on the results reported.

Because we do not know the true model for the estimates provided in Table 5 and because the large number of meta-independent variables may cause multicollinearity, following Havránek and Iršová (2016) and Havránek and Sokolová (2020), we use Bayesian model averaging (BMA) to identify robust meta-independent variables. Appendix Table A2 presents the results of this exercise, and we select those meta-independent variables that have a PIP greater than 0.80 as robust. Those variables are “Number of host countries”, “Aggregate model” and “OLS”. Estimates with these robust meta-independent variables are reported in Table 6. The estimates for agreement types are very similar to those reported in Table 5; bilateral trade agreements have smaller effect size than do other types of agreements, but all effects are negligible. Coefficient values for the other variables increase in magnitude relative to the values reported in Table 5 and retain their statistical significance. Thus, the meta-synthesis results are supported by the MRA presented in both Tables 5 and 6.

We also estimated the meta-effects using a best-practice analysis, and the results are reported in Appendix 4. Table A4 shows that best practice estimates of the effects of IIAs are larger than the estimates based on all studies reported in Tables 5 and 6, and the best practice estimates rise to the level of Doucouliagos’ (2011) small but practically relevant effects.

### ***5.2. Implications of the meta-regression analysis***

The results of the meta-regression analysis lead to several conclusions. The first is that many aspects of the large variety of models and data used to measure the effect of IIAs on FDI do not affect the findings of these studies in a systematic way despite frequent criticism in the literature of various modelling choices made by researchers. One could conclude that this variety of approaches can be interpreted as an extensive robustness test in that the results of numerous and quite different approaches all lead to similar conclusions regarding the effects of IIAs. Alternatively, the wide variety of models used may inflate the variance of the estimates, making it more difficult to identify the true effect of IIAs. The second conclusion concerns a somewhat broader issue, which is what should be the objective of studies seeking to identify the effects of IIAs. In view of the fact that there are over 3000 BITs in existence, it follows that these BITs and other IIAs encompass very different sorts of provisions among pairs of countries with differing institutions, legal systems, levels of economic development and objectives in entering into IIAs. Thus, focusing on broad country coverage requires that researchers include in their specifications covariates that appropriately capture these differences, which may be difficult. As the coefficients for studies dealing with the EU and with other advanced economies as sources of FDI suggest, it may be more appropriate to look

for large effects of IIAs among samples of countries where the home countries all have similar economic characteristics as should the host countries, although the characteristics of the home countries should differ from those of the host countries. Although the reported effects of IIAs are negligible, if the research covered in this meta-analysis is to be of any policy relevance, it is not the average effect of all IIAs but rather the effect expected by specific home and host country pairs that matters, and, therefore, a more focused selection of home and host countries may be more relevant for policy makers.

## **6. Assessment of Publication-Selection Bias**

To conclude our analysis, in this section we examine whether the studies in our sample are influenced by publication selection bias, which can occur because papers that produce results with the “expected” sign or conclusion are more likely to be accepted for publication by journals. We first address this issue by using funnel plots of the reported PCCs and then by estimating a set of meta-regression models that are designed to identify publication bias.

The funnel plot is a scatter plot with the effect size, the PCC, on the horizontal axis and the precision of the estimate, measured by  $1/SE$ , on the vertical axis. In the absence of publication-selection bias, effect sizes reported by independent studies should vary randomly and symmetrically around the true effect. Moreover, statistical theory suggests that the dispersion of effect sizes is negatively correlated with the precision of the estimate. Therefore, the shape of the plot should have the appearance of an inverted funnel. If the funnel plot is not bilaterally symmetrical and is skewed to one side, then publication bias is suspected in the sense that estimates in favor of a specific conclusion, i.e., estimates with the expected sign, are published more frequently. Figure 2 shows the funnel plot of the estimates for all studies of all IIA as well as plots of the PCCs by type of investor protection regime. The panels, which represent different IIA types show the expected funnel shape. For all types of IIAs, the distribution of PCCs is skewed to the right, suggesting the predominance of positive results in the literature.

To further clarify the results presented in Figure 2, we perform univariate tests of publication-selection bias for all IIAs and by IIA type, the results of which are reported in Table 7. These tests confirm the impression gained from visual inspection of Figure 2. According to this Table, if the true effect is assumed to be zero, the goodness-of-fit test rejects at a 1% level the null hypothesis that the number of positive and negative estimates is equal for all studies of IIAs. Under the assumption that the true effect size takes the WAAP value, the null hypothesis is also rejected in all cases except for bilateral trade agreements.

To examine publication-selection bias in a more rigorous manner, Stanley and Doucouliagos (2012) propose estimating Equation 8 and testing for the null hypothesis that the coefficient  $\beta_0$  is equal to zero where

$$t_k = \beta_0 + \beta_1(1/SE_k) + \epsilon_k, \quad (8)$$

and  $\epsilon_k$  is the error term. If the intercept term  $\beta_0$  is not zero, the distribution of the effect sizes is asymmetric, suggesting the possibility of publication bias. For this reason, this test is called the funnel-asymmetry test (FAT). The rejection of the null hypothesis implies the presence of a genuine (i.e., statistically significant non-zero) effect. As Panel (a) of Table 8 shows, the results of the FAT test generally support the hypothesis that publication-selection bias exists. The unrestricted WLS and cluster-robust unrestricted WLS reject the hypothesis of no publication bias that  $\beta_0=0$ , and only the cluster-robust random-effects model panel GLS fails to reject the hypothesis.

The existence of publication-selection bias does not rule out the possibility that a genuine effect exists in the literature. Stanley and Doucouliagos (2012) propose a way of identifying such a true effect by testing the null hypothesis that the coefficient  $\beta_1$  in Equation 8 is equal to zero. The rejection of the null hypothesis suggests the existence of a genuine effect. They call this test the precision-effect test (PET). To test the robustness of the regression coefficients obtained for the PET test, we estimate Equation (8) using the same three estimators. As can be seen in Panel (a) of Table 8, the PET test leads to the rejection of the null hypothesis regardless of which estimator is used. Note, however, that the effects remain trivially small. Moreover, Stanley and Doucouliagos (2012) also note that an estimate of the publication-selection-bias-adjusted effect size can be obtained by estimating Eq. (9), which has no intercept. If the null hypothesis of  $\gamma_1 = 0$  is rejected, then a non-zero true effect exists in the literature, and the coefficient  $\gamma_1$  can be regarded as its estimate where

$$t_k = \gamma_0 SE_k + \gamma_1(1/SE_k) + \epsilon_k. \quad (9)$$

Stanley and Doucouliagos (2012) call the hypothesis test for Eq. (9) the precision-effect estimate with standard error (PEESE) approach. As reported in Panel (b) of Table 8, the PEESE result shows that the coefficient  $\gamma_1$  in Eq. (9) is statistically significantly different from zero for all but one estimate. Therefore, we conclude that the true value of the measured effect of IIAs on FDI is in the range of 0.0184 and 0.0207 when adjusted for publication bias, which means that, after adjusting for publication bias, the literature covered by this meta-analysis reports trivial effects of IIAs on FDI.

We also carried out the FAT-PET-PEESE procedure by agreement type. The results are summarized in Table 9. As this Table shows, the FAT test detected publication-selection bias only in the case of studies of regional trade agreements, suggesting that the likelihood of publication selection bias is generally low in the literature we survey. The PET tests suggested the presence of trivial effects of the four subcategories of IIAs, and the PEESE method confirms these results, which is largely consistent with the results of the meta-synthesis reported in Table 3. It is noteworthy that the estimated true effects provided by the PEESE approach are consistent with the WAAP estimates reported in Table 3, as simulation tests in the literature predict (Stanley and Doucouliagos, 2017; Stanley et al., 2017). Overall, our assessment of publication-selection bias in this section indicates that the possibility of publication selection bias further supports our conclusion that the literature provides evidence of only a negligible effect of IIAs on FDI.

## **7. Conclusions**

In this paper we have carried out a meta-analysis of 74 studies, yielding 2,107 estimates, of the effects of international investment treaties on foreign direct investment. Our meta-synthesis, presented in Table 3, indicates that, based on either random-effects or WAAP estimates of the partial correlation coefficients of these studies, all types of international treaties, bilateral investment treaties, multilateral investment treaties, bilateral trade agreements and multilateral trade agreements have an effect on FDI that is so small as to be considered as negligible or zero. However, this does not rule out the possibility that the effect of these agreements is, in fact, positive and that current research methods and measures are insufficiently powerful or precise to identify the underlying genuine effect. We find some evidence that better research methods do find a small positive effect (see model [2] Table A4). Finally, the FAT-PET-PEESE approach to publication-selection bias revealed that any such bias in the existing literature does not overturn the main conclusions.

Given the widespread interest devoted to the effect of IIAs and the intuitively appealing notion that providing a measure of protection for foreign investors should reduce the riskiness of FDI and thus increase it, it is worthwhile to reflect on why the measured effect of IIAs is so negligibly small. One possibility is that the protection provided to investors by IIAs is in fact insufficient to alter their investment decisions. This could be because investors find the cost of arbitration under IIAs to be too costly (potentially in excess of \$5 million); too risky (in that they have no better than a 50:50 chance of winning in arbitration); or that the arbitral awards are inadequate compensation for their losses (arbitrators often award amounts that are less than

the plaintiff firms claim as losses).<sup>15</sup> A second possibility could be the proliferation of IIAs. Over 3,000 BITs have been signed and to these should be added the investor protection mechanisms embodied in the other types of treaties we have discussed in this paper. Thus, as the number of IIAs increases, their marginal effect on FDI should fall, perhaps rapidly. Early treaties were negotiated between host countries that saw themselves as potentially attractive hosts and those countries that were a major source of FDI. Successive treaties had to include host countries that were less attractive targets for FDI for reasons other than the risks they posed to foreign investors and potential investors' home countries that were less important sources of FDI. There are also IIAs signed between pairs of countries that are both net importers of capital and FDI, and the effect of such IIAs is likely nil. Thus, the importance of choosing appropriate home and host countries and their IIAs for study is important for the results obtained.

Another problem for the available literature is that there is no theory that links IIA's to FDI in a way that can be captured in a model of investor behavior. The effects of IIAs are captured by a dummy variable or variables, placing a heavy burden on the specification that determines "normal" FDI. As a result, much of the literature on the effects of IIAs has focused on tweaking the results by accounting for differences in specification such gravity vs. aggregate models; signed vs. ratified treaties; accounting for endogeneity of IIAs; etc. Our finding that many aspects of the large variety of models and data used to measure the effect of IIAs on FDI do not affect the findings of these studies in a systematic way despite frequent criticism in the literature of the modelling choices made by researchers should be seen as a useful guideline for future research. Minor changes in specifications or in econometric techniques are unlikely to overturn the existing evidence of the ineffectiveness of IIAs and a reevaluation of methodology based the results of our "best practice estimates" is in order. Our analysis also shows that a major source of heterogeneity in the reviewed studies stems from differences in the source countries of FDI used by different researchers. This finding suggests that further research is needed to address these issues by better controlling for the makeup of the countries that are the sources and recipients of FDI.

A final reason why studies find small effects of IIAs may be faulty data. Clearly, errors in the right-hand-side variables will cause biased results and the bias reduces the size of the

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<sup>15</sup> Brada et al. (2020) show that positive awards have a significant positive effect on the share prices of firms that win even partial awards in arbitration, suggesting that IIAs do provide investors with valuable compensation for their losses from IIAs.

estimated coefficients (Hausman, 2001). While explanatory variables such as the distance between countries or the number of IIAs they have signed can be measured with precision, for other “softer” variables often used in studies of IIA effects, such as levels of host-country corruption, government stability, the provisions contained in different IIAs, etc., there may be a large gap between the true value of the variable and the observed value, which is often derived from international rankings based on potentially arbitrary and subjective criteria. Thus, the coefficients for the IIA dummies are likely underestimated as well. A bigger problem is the presence of errors in measuring FDI discussed in Section 2 of this paper. While errors in the dependent variable reduce the precision of parameter estimates in OLS estimates, they should not bias these estimates. However, Kerner (2018) makes a strong argument that FDI mismeasurement is accompanied by bias, and, if the measurement errors of FDI are biased, then the OLS parameter estimates must be biased also, in this case downward.<sup>16</sup> Our results show no difference in results between studies that use stock or flow data, and it is generally the flow data that are seen as more flawed. Thus, this argument, at least insofar as it affects the estimates of the size of the effect of IIAs, too, is not supported by the meta-analysis.<sup>17</sup>

Our meta-analysis also has policy implications. When the home countries are advanced economies or EU countries, the effects of investment treaties are less likely to be negligible. Thus, policymakers seeking to attract more FDI for their countries would be well-advised to focus on signing treaties with the largest sources of FDI rather than on maximizing the number of investment treaties that they sign. In addition, our findings suggest that the differences among various IIAs are outweighed by the similarity in their lack of effect on FDI. This finding could go a long way in helping policy makers to harmonize investment rules in future negotiations of IIAs since minor changes in treaty provisions are unlikely to have a tangible effect on FDI. There is a message in our results for researchers as well. With over 3000 bilateral investment treaties in existence, should the focus of research be on the effects of all these treaties or should the focus be on the effect of treaties signed with the main sources of foreign direct investments? While the former question may be more interesting from a scientific standpoint, the latter is of greater practical importance.

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<sup>16</sup> Card (2001) shows that, in a different context, such bias can be quite large.

<sup>17</sup> This may reflect the counter-bias caused by the large proportion of underpowered studies among the studies we analyze. Ioannidis et al. (2015) find that underpowered studies tend to inflate reported effects.



## **Appendix 1. Meta-regression analysis: Step-wise and boot-strapping estimation**

See Table A1.

## **Appendix 2. Bayesian model averaging analysis of model uncertainty**

See Table A2.

## **Appendix 3. Meta-regression analysis: Estimation of agreement characteristic variables**

See Table A3.

## **Appendix 4. Best practice estimate of the effect of investor protection**

Our multiple meta-regression models (MRAs) reported in Table 5 confirm an economically trivial effect of investor protection on FDI. In this Appendix, we substitute plausible values for the MRA's independent variables to summarize our multiple MRA findings into a single estimate following the procedure employed in Havránek (2015) and Leonard and Stanley (2020).

First, we set *S.E.* equal to zero because *S.E.* likely represents publication selection bias. Hence, this operation enables us to grasp the effect size of investor protection on FDI without this bias. Second, in order to minimize other types of bias, we define “best research practice”. As does Havránek (2015), we put quotes around the term best research practice because the definition of best practice is obviously subjective. To avoid injecting excessive subjectivity into the analysis, we adopt a definition that should be acceptable to most researchers. That is, best research practice should employ panel data, estimate a model by using a non-OLS estimator, and control for possible endogeneity between FDI and the existence of international agreements. More specifically, we enter a value of 0 for the meta-independent variables of *Non-panel data*, *OLS*, and a value of 1 for *Control for endogeneity*. We set all other variables to their sample means.

Table A4 displays the resulting estimate of the effect of investor protection. It is a linear combination of regression parameters conditional on  $S.E. \rightarrow 0$  and our definition of best research practice. In this table, we show two sets of estimates as Model [1] and [2], focusing on the results of the cluster-robust WLS estimation using  $1/SE$  as an analytical weight reported

in Column [2] of Table 5 and the cluster-robust fixed-effects panel estimation in Column [5] of Table 5, respectively. In Table A4, the point estimates in Model [1] are much smaller than those in Model [2] for all international agreement types. This may be related to the fact that WLS-MRA does not account for the dependence among multiple estimates within a study, while the FE panel MRA can deal with it by filtering out the potential bias arising from unobserved and/or un-coded methods and other factors (Leonard and Stanley, 2020). The estimates in Model [2] demonstrate that the meta-effect from “best research practice” is larger than the average effect from the full sample and rises to the level termed by Doucouliagos (2012) as small but economically meaningful. Thus, the best practice estimates imply that there may be room for improvements in the methodology to estimate the effect of investor protection on FDI that could uncover economically meaningful effects of IIAs.

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Table A1. Meta-regression analysis: Step-wise and boot-strapping estimation

Estimator (Analytical weight in brackets)	Cluster-robust WLS [1/SE]				Boot-strapping OLS
	[1]	[2]	[3]	[4]	[5] <sup>a</sup>
Meta-independent variable (Default)/Model					
International agreement type (bilateral investment treaty)					
Multilateral investment treaty	-0.01951 (0.0121)	-0.01831 * (0.0101)	-0.01718 (0.0122)	-0.01002 (0.0120)	-0.02396 (0.0250)
Bilateral trade agreement	-0.00328 (0.0086)	-0.00922 (0.0060)	-0.00970 (0.0072)	-0.00401 (0.0062)	-0.02453 ** (0.0099)
Regional trade agreement	-0.00035 (0.0089)	-0.00103 (0.0052)	-0.00450 (0.0071)	-0.00704 (0.0051)	-0.00711 (0.0128)
Definition of international agreement variable (binary dummy)					
Cumulative number	0.01145 (0.0072)				-0.00587 (0.0179)
Scope of international agreement (unspecified)					
Ratified agreement	-0.00073 (0.0092)				-0.00375 (0.0166)
Signed agreement	0.01018 (0.0099)				0.01102 (0.0160)
Other characteristics of international agreement variable					
Lagged variable	-0.00649 (0.0069)				-0.02117 (0.0203)
With an interaction term(s)	-0.00165 (0.0062)				-0.00491 (0.0088)
FDI variable type (log transformed)					
Nominal investment value		-0.02012 *** (0.0065)			-0.00339 (0.0166)
To GDP		0.01533 (0.0171)			-0.02472 (0.0243)
Per capita		0.01208 (0.0173)			0.04050 (0.0446)
FDI variable base category (FDI inflow)					
FDI stock		0.01217 (0.0075)			-0.00763 (0.0205)
Number of home countries					
Number of home countries			0.00032 *** (0.0001)		0.00029 * (0.0002)
Target home countries (global)					
Advanced home country			0.02492 ** (0.0102)		0.03695 (0.0236)
Developing home country			0.01371 (0.0100)		0.02739 (0.0269)
United States			0.03476 * (0.0195)		0.05242 (0.0574)
EU			0.05799 *** (0.0110)		0.03998 (0.0408)
Number of host countries					
Number of host countries			-0.00013 (0.0001)		-0.00024 (0.0002)
Target host countries (global)					
Advanced host countries			0.00510 (0.0108)		-0.00192 (0.0194)
Developing host countries			-0.00539 (0.0082)		-0.00661 (0.0185)
Data type (panel data)					
Non-panel data				0.01221 (0.0154)	0.01299 (0.0508)
Estimation period					
Average year of estimation period				-0.00164 ** (0.0007)	-0.00075 (0.0019)
Length of estimation period				-0.00060 (0.0006)	-0.00012 (0.0012)
Equation type (gravity model)					
Aggregate model				0.01542 * (0.0088)	0.04478 (0.0276)
Dyadic model				-0.00233 (0.0081)	0.00698 (0.0146)
Time-series model				-0.07711 (0.0484)	-0.05090 (0.0906)
Estimator (estimators other than OLS)					
OLS				0.01061 (0.0081)	0.01835 (0.0194)
Control for endogeneity					
Control for endogeneity				-0.00997 (0.0099)	-0.01387 * (0.0080)
S.E.	0.57948 ** (0.2505)	0.59590 *** (0.2144)	0.33855 (0.2430)	0.67636 ** (0.2599)	0.12402 (0.5182)
Intercept	0.01511 (0.0104)	0.02029 *** (0.0044)	0.00523 (0.0145)	3.30736 ** (1.3558)	1.50324 (3.7453)
Number of studies	74	74	74	74	74
K	2107	2107	2107	2107	2107
R <sup>2</sup>	0.060	0.089	0.100	0.092	0.086

Notes:

Figures in parentheses beneath the regression coefficients are robust standard errors clustered by study. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Table 4 for the definition and descriptive statistics of meta-independent variables.

**Table A2.** Bayesian model averaging analysis of model uncertainty

Meta-independent variable	Coef.	S.E.	<i>t</i> value	PIP
Multilateral investment treaty	-0.0088621	0.0117066	-0.76	0.42
Bilateral trade agreement	-0.0251779	0.0062565	-4.02	0.99
Regional trade agreement	-0.0001091	0.0012517	-0.09	0.03
Cumulative number	-0.0001428	0.0014549	-0.10	0.03
Ratified agreement	-0.0000018	0.0012319	0.00	0.02
Signed agreement	0.0061851	0.0086209	0.72	0.39
Lagged variable	-0.0020632	0.0069741	-0.30	0.11
With an interaction term(s)	-0.0000005	0.0014811	0.00	0.02
Nominal investment value	-0.0000734	0.0009896	-0.07	0.03
To GDP	-0.0196125	0.0165147	-1.19	0.66
Per capita	0.0074416	0.0187403	0.40	0.17
FDI stock	-0.0004109	0.0020834	-0.20	0.06
Number of home countries	0.0000665	0.0001093	0.61	0.32
Advanced home country	0.0128871	0.0125034	1.03	0.61
Developing home country	-0.0003181	0.0036625	-0.09	0.04
United States	0.0089656	0.0168560	0.53	0.26
EU	0.0000825	0.0058836	0.01	0.03
Number of host countries	-0.0002482	0.0000491	-5.06	1.00
Advanced host countries	0.0003724	0.0022701	0.16	0.05
Developing host countries	-0.0003041	0.0017453	-0.17	0.05
Non-panel data	0.0047354	0.0090341	0.52	0.26
Average year of estimation period	-0.0001899	0.0004467	-0.43	0.19
Length of estimation period	-0.0000070	0.0001055	-0.07	0.04
Aggregate model	0.0548343	0.0099323	5.52	1.00
Dyadic model	0.0000248	0.0012203	0.02	0.03
Time-series model	-0.0005647	0.0056843	-0.10	0.04
OLS	0.0277159	0.0074876	3.70	0.99
Control for endogeneity	-0.0002285	0.0023619	-0.10	0.03
<i>S.E.</i>	0.1729574	0.1512030	1.14	0.67
Intercept	0.4107427	0.8961465	0.46	1.00
<i>K</i>		2107		
Model space		536,870,912		

Note: S.E. and PIP denote standard errors and posterior inclusion probability, respectively.

See Table 4 for the definition and descriptive statistics of meta-independent variables.

**Table A3.** Meta-regression analysis: Estimation of agreement characteristic variables

(a) With all meta-independent variables

Estimator (Analytical weight in brackets)	Cluster-robust OLS	Cluster-robust WLS [1/SE]	Cluster-robust WLS [d.f.]	Cluster-robust WLS [1/EST]	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (Default)/Model	[1]	[2]	[3]	[4]	[5] <sup>a</sup>
International agreement characteristics					
Trade agreement (investment treaty)	-0.01375 (0.0086)	-0.00286 (0.0069)	0.00184 (0.0059)	-0.04167 ** (0.0172)	-0.00913 (0.0106)
Multilateral agreement (bilateral agreement)	-0.00596 (0.0108)	-0.00387 (0.0069)	-0.00262 (0.0053)	0.01311 (0.0165)	0.00356 (0.0190)
<i>S.E.</i>	0.17148 (0.3396)	0.37059 (0.3097)	0.09499 (0.3715)	0.49059 (0.3935)	-1.88610 (1.4885)
Intercept	1.99176 (2.9637)	1.35415 (1.9736)	2.15919 (1.7255)	4.15095 (4.9796)	-6.71060 (8.1145)
Control for study conditions					
Number of studies	Yes	Yes	Yes	Yes	Yes
<i>K</i>	74	74	74	74	74
<i>R</i> <sup>2</sup>	2107	2107	2107	2107	2107
	0.095	0.150	0.232	0.231	0.010

(b) With robust meta-independent variables<sup>b</sup>

Estimator (Analytical weight in brackets)	Cluster-robust OLS	Cluster-robust WLS [1/SE]	Cluster-robust WLS [d.f.]	Cluster-robust WLS [1/EST]	Cluster-robust fixed-effects panel LSDV
Meta-independent variable/Model	[1]	[2]	[3]	[4]	[5] <sup>c</sup>
International agreement characteristics					
Trade agreement	-0.01437 ** (0.0071)	-0.00565 (0.0052)	0.00150 (0.0040)	-0.03344 ** (0.0130)	-0.00423 (0.0068)
Other study conditions					
Number of host countries	-0.00022 ** (0.0001)	-0.00020 ** (0.0001)	-0.00017 ** (0.0001)	-0.00038 *** (0.0001)	0.00043 *** (0.0001)
Aggregate model	0.05143 *** (0.0132)	0.03431 *** (0.0086)	0.01758 ** (0.0082)	0.06571 *** (0.0215)	0.00072 (0.0068)
OLS	0.02849 ** (0.0113)	0.02485 *** (0.0073)	0.02392 ** (0.0109)	0.02934 * (0.0149)	0.00183 (0.0162)
Intercept	0.04205 *** (0.0079)	0.03599 *** (0.0081)	0.02980 *** (0.0075)	0.06505 *** (0.0154)	0.01117 (0.0110)
Number of studies	74	74	74	74	74
<i>K</i>	2107	2107	2107	2107	2107
<i>R</i> <sup>2</sup>	0.063	0.070	0.061	0.128	0.002

Notes:

<sup>a</sup> Breusch–Pagan test:  $\chi^2=150.62$ ,  $p=0.0000$ ; Hausman test:  $\chi^2=87.16$ ,  $p=0.0000$ <sup>b</sup> Meta-independent variables with PIP of 0.80 or more according to the results of Bayesian model averaging analysis (not reported, but similar to those in Table A2)<sup>c</sup> Breusch–Pagan test:  $\chi^2=138.88$ ,  $p=0.0000$ ; Hausman test:  $\chi^2=19.01$ ,  $p=0.0008$ 

Figures in parentheses beneath the regression coefficients are robust standard errors clustered by study. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

See Table 4 for the definition and descriptive statistics of meta-independent variables.

**Table A4.** Best practice estimates of the investor protection

International agreement type	Number of estimates ( <i>K</i> )	[1] Cluster-robust WLS [1/SE]			[2] Cluster-robust fixed-effects panel LSDV		
		Estimate ( <i>t</i> value)	[95% confidence interval]		Estimate ( <i>t</i> value)	[95% confidence interval]	
All international agreements	2107	0.0104 *** (21.61)	0.0095	0.0114	0.1044 *** (72.76)	0.1016	0.1072
Bilateral investment treaty	1290	0.0153 *** (23.68)	0.0140	0.0165	0.1118 *** (58.89)	0.1081	0.1155
Multilateral investment treaty	180	0.0020 *** (2.83)	0.0006	0.0034	0.0606 *** (92.35)	0.0593	0.0619
Bilateral trade agreement	358	0.0004 (0.41)	-0.0017	0.0026	0.0946 *** (27.99)	0.0880	0.1013
Regional trade agreement	279	0.0063 *** (5.77)	0.0042	0.0085	0.1109 *** (28.15)	0.1031	0.1186

Notes: Estimation using multiple meta-regression results reported in Column [2] and [5] of Table 5. \*\*\* denotes statistical significance at the 1% level.

**Table 1.** Overview of collected estimates

International agreement type	Number of studies	Publication type			Estimation period covered	Number of estimates ( <i>K</i> )	Average number of estimates per study
		Book chapter	Journal article	Unpublished manuscript			
All international agreements	74	5	54	15	1970-2017	2107	28.5
Bilateral investment treaty	73	5	54	14	1970-2017	1290	17.7
Multilateral investment treaty	9	1	7	1	1980-2008	180	20.0
Bilateral trade agreement	18	1	14	3	1970-2017	358	19.9
Regional trade agreement	15	1	11	3	1970-2009	279	18.6

**Table 2.** Descriptive statistics of the partial correlation coefficients, *t* test and Shapiro–Wilk normality test of collected estimates by international agreement type and univariate comparative analysis between four international agreement types

International agreement type	<i>K</i>	Mean <sup>a</sup>	Median <sup>b</sup>	S.D.	S.E.	Max.	Min.	Kurtosis	Skewness	<i>t</i> test <sup>c</sup>	Shapiro-Wilk normality test ( <i>W</i> ) <sub>d</sub>
All international agreements	2107	0.039	0.026	0.097	0.002	0.919	-0.676	14.835	1.149	18.330 ***	0.816 †††
Bilateral investment treaty	1290	0.047	0.032	0.103	0.003	0.717	-0.676	10.565	0.612	16.214 ***	0.854 †††
Multilateral investment treaty	180	0.020	0.010	0.050	0.004	0.262	-0.076	6.758	1.405	5.384 ***	0.908 †††
Bilateral trade agreement	358	0.023	0.015	0.092	0.005	0.659	-0.480	18.013	1.635	4.752 ***	0.758 †††
Regional trade agreement	279	0.035	0.018	0.094	0.006	0.919	-0.514	35.839	3.216	6.219 ***	0.652 †††

Notes:

<sup>a</sup> ANOVA:  $F=8.260, p=0.000$ ; Bartlett's test:  $\chi^2=115.962, p=0.000$

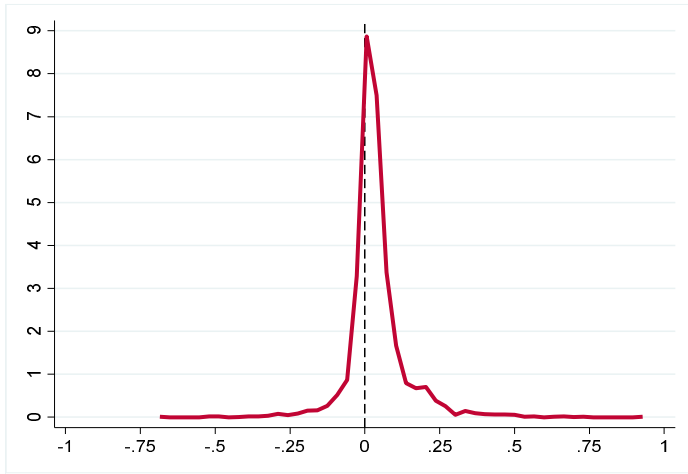
<sup>b</sup> Kruskal-Wallis rank-sum test:  $\chi^2=61.524, p=0.0001$

<sup>c</sup> \*\*\*: Null hypothesis that mean is zero is rejected at the 1% level.

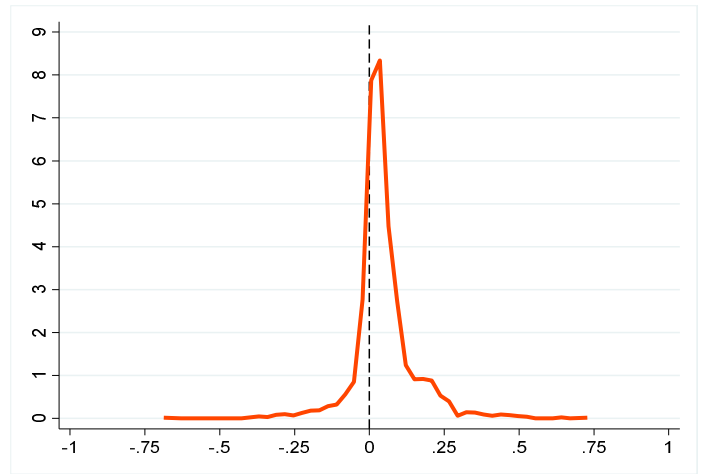
<sup>d</sup> †††: Null hypothesis of normal distribution is rejected at the 1% level.

**Figure 1.** Kernel density estimation of partial correlation coefficients by international agreement type

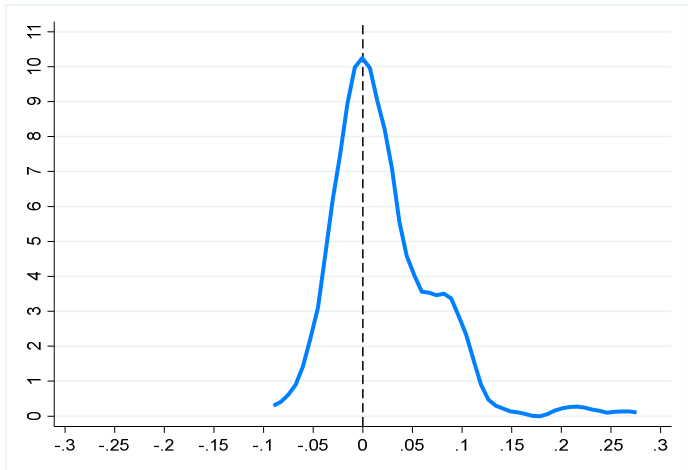
(a) All international agreements ( $K=2107$ )



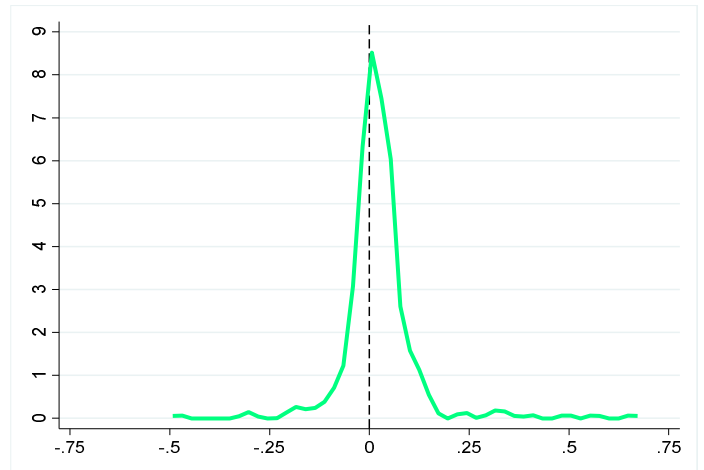
(b) Bilateral investment treaty ( $K=1290$ )



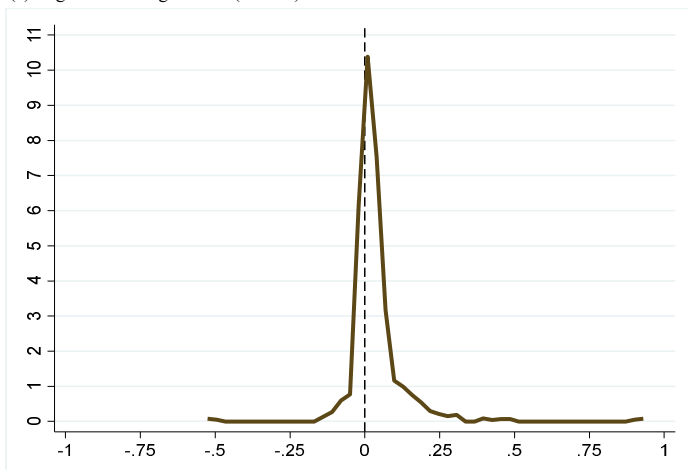
(c) Multilateral investment treaty ( $K=180$ )



(d) Bilateral trade agreement ( $K=358$ )



(e) Regional trade agreement ( $K=279$ )



Note: Vertical axis is kernel density. Horizontal axis is partial correlation coefficient.



**Table 3.** Synthesis of estimates

International agreement type	Number of estimates ( <i>K</i> )	(a) Traditional synthesis method			(b) Unrestricted weighted least squares average (UWA)				
		Fixed-effect model ( <i>z</i> value) <sup>a</sup>	Random-effects model ( <i>z</i> value) <sup>a</sup>	Homogeneity test <i>Q</i> statistic ( <i>p</i> value) <sup>b</sup>	UWA of all estimates ( <i>t</i> value) <sup>a,c</sup>	Number of the adequately powered estimates <sup>d</sup>	WAAP (weighted average of the adequately powered estimates) ( <i>t</i> value) <sup>a</sup>	Median S.E. of estimates	Median statistical power
All international agreements	2107	0.019 *** (81.37)	0.032 *** (23.98)	23930.400 *** (0.00)	0.019 *** (24.14)	210	0.017 *** (10.56)	0.020	0.159
Bilateral investment treaty	1290	0.018 *** (63.15)	0.039 *** (19.96)	16593.140 *** (0.00)	0.018 *** (17.60)	146	0.014 *** (8.14)	0.021	0.138
Multilateral investment treaty	180	0.015 *** (11.06)	0.014 *** (0.01)	577.810 *** (0.00)	0.015 *** (6.16)	0	- (-)	0.018	0.127
Bilateral trade agreement	358	0.019 *** (35.12)	0.024 *** (9.78)	3133.050 *** (0.00)	0.019 *** (11.85)	51	0.018 *** (5.59)	0.021	0.150
Regional trade agreement	279	0.026 *** (37.33)	0.028 *** (8.01)	3510.120 *** (0.00)	0.026 *** (10.51)	56	0.031 *** (6.41)	0.016	0.374

Notes:

<sup>a</sup> Null hypothesis: The synthesized effect size is zero.

<sup>b</sup> Null hypothesis: Effect sizes are homogeneous.

<sup>c</sup> Synthesis method advocated by Stanley and Doucouliagos (2017) and Stanley et al. (2017).

<sup>d</sup> Denotes number of estimates with statistical power of 0.80 or more which is computed referring to the UWA of all collected estimates.

\*\*\* denotes statistical significance at the 1% level.

**Table 4.** Name, definition, and descriptive statistics of meta-independent variables

Variable name	Definition	Descriptive statistics		
		Mean	Median	S.D.
Multilateral investment treaty	1 = if estimate captures the effect of multilateral investment treaty on FDI, 0 = otherwise	0.085	0	0.280
Bilateral trade agreement	1 = if estimate captures the effect of bilateral trade agreement on FDI, 0 = otherwise	0.170	0	0.376
Regional trade agreement	1 = if estimate captures the effect of regional trade agreement on FDI, 0 = otherwise	0.132	0	0.339
Trade agreement	1 = if estimate captures the effect of trade agreement on FDI, 0 = otherwise	0.302	0	0.459
Multilateral agreement	1 = if estimate captures the effect of multilateral agreement on FDI, 0 = otherwise	0.210	0	0.407
Cumulative number	1 = if international agreement variable represents the cumulative number of concluded agreements, 0 = otherwise	0.264	0	0.441
Ratified agreement	1 = if international agreement variable covers ratified agreements, 0 = otherwise	0.372	0	0.483
Signed agreement	1 = if international agreement variable covers signed agreements, 0 = otherwise	0.231	0	0.421
Lagged variable	1 = if a lagged international agreement variable is used for estimation, 0 = otherwise	0.048	0	0.215
With an interaction term(s)	1 = if estimation is carried out with an interaction term(s) of international agreement variable, 0 = otherwise	0.089	0	0.284
Nominal investment value	1 = if the unit of the FDI variable is nominal investment value, 0 = otherwise	0.278	0	0.448
To GDP	1 = if the unit of the FDI variable is share of FDI to GDP, 0 = otherwise	0.065	0	0.246
Per capita	1 = if the unit of the FDI variable is per capita FDI, 0 = otherwise	0.010	0	0.099
FDI stock	1 = if base category of FDI variable is the value of the stock of FDI, 0 = otherwise	0.356	0	0.479
Number of home countries	Total number of FDI home countries	50.286	24	60.601
Advanced home country	1 = if target home country limited to advanced countries, 0 = otherwise	0.604	1	0.489
Developing home country	1 = if target home country limited to developing countries, 0 = otherwise	0.035	0	0.183
United States	1 = if target home country limited to the United States, 0 = otherwise	0.082	0	0.275
EU	1 = if target home country limited to EU member countries, 0 = otherwise	0.010	0	0.099
Number of host countries	Total number of FDI host countries	65.862	63	54.777
Advanced host countries	1 = if target host country limited to advanced countries, 0 = otherwise	0.154	0	0.361
Developing host countries	1 = if target host country limited to developing countries, 0 = otherwise	0.467	0	0.499
Non-panel data	1 = if non-panel data is used for estimation, 0 = otherwise	0.153	0	0.360
Average year of estimation period	Average year of estimation period	1996.095	1995.5	5.743
Length of estimation period	Years of estimation period	19.974	19	8.770
Aggregate model	1 = if aggregate model is used for estimation, 0 = otherwise	0.186	0	0.389
Dyadic model	1 = if dyadic model is used for estimation, 0 = otherwise	0.366	0	0.482
Time-series model	1 = if a time-series models is used for estimation, 0 = otherwise	0.056	0	0.230
OLS	1 = if OLS estimator is used for estimation, 0 = otherwise	0.220	0	0.414
Control for endogeneity	1 = if endogeneity between FDI and conclusion of international agreement is controlled for, 0 = otherwise	0.036	0	0.187
<i>S.E.</i>	Standard error of partial correlation coefficient	0.037	0.020	0.044

Table 5. Meta-regression analysis: Estimation with all meta-independent variables

Estimator (Analytical weight in brackets)	Cluster-robust OLS	Cluster-robust WLS [1/SE]	Cluster-robust WLS [d.f.]	Cluster-robust WLS [1/EST]	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (Default)/Model	[1]	[2]	[3]	[4]	[5] <sup>a</sup>
International agreement type (bilateral investment treaty)					
Multilateral investment treaty	-0.02396 (0.0161)	-0.01966 (0.0187)	-0.01051 (0.0218)	-0.02442 (0.0203)	-0.01289 (0.0312)
Bilateral trade agreement	-0.02453 ** (0.0108)	-0.00805 (0.0073)	0.00063 (0.0056)	-0.05306 *** (0.0190)	-0.02018 ** (0.0095)
Regional trade agreement	-0.00711 (0.0116)	-0.00186 (0.0077)	0.00063 (0.0071)	-0.01709 (0.0196)	0.00775 (0.0122)
Definition of international agreement variable (binary dummy)					
Cumulative number	-0.00587 (0.0133)	0.00611 (0.0072)	0.01428 ** (0.0057)	0.00480 (0.0184)	-0.02200 (0.0238)
Scope of international agreement (unspecified)					
Ratified agreement	-0.00375 (0.0117)	0.00321 (0.0074)	0.00530 (0.0061)	-0.01091 (0.0197)	-0.00474 (0.0128)
Signed agreement	0.01102 (0.0165)	0.00713 (0.0087)	0.00210 (0.0061)	-0.01440 (0.0230)	-0.01211 (0.0149)
Other characteristics of international agreement variable					
Lagged variable	-0.02117 (0.0129)	-0.01248 (0.0119)	-0.01534 (0.0132)	-0.02152 (0.0205)	-0.02586 ** (0.0124)
With an interaction term(s)	-0.00491 (0.0100)	-0.00136 (0.0063)	-0.00227 (0.0041)	-0.02298 (0.0138)	-0.00376 (0.0090)
FDI variable type (log transformed)					
Nominal investment value	-0.00339 (0.0134)	-0.01959 *** (0.0072)	-0.01973 *** (0.0057)	0.02409 (0.0233)	-0.01351 (0.0102)
To GDP	-0.02472 (0.0183)	-0.00859 (0.0134)	-0.00620 (0.0153)	-0.00705 (0.0255)	-0.03485 *** (0.0104)
Per capita	0.04050 (0.0292)	0.02890 (0.0263)	0.04528 (0.0311)	0.00174 (0.0393)	dropped
FDI variable base category (FDI inflow)					
FDI stock	-0.00763 (0.0135)	0.01086 (0.0079)	0.01663 *** (0.0057)	-0.04289 *** (0.0163)	0.00477 (0.0102)
Number of home countries					
Number of home countries	0.00029 ** (0.0001)	0.00030 ** (0.0001)	0.00028 ** (0.0001)	0.00039 ** (0.0002)	0.00109 *** (0.0002)
Target home countries (global)					
Advanced home country	0.03695 ** (0.0171)	0.02339 (0.0148)	0.01660 (0.0150)	0.05166 ** (0.0223)	0.06824 *** (0.0089)
Developing home country	0.02739 * (0.0154)	0.01241 (0.0127)	0.00243 (0.0153)	0.02036 (0.0321)	0.05045 *** (0.0045)
United States	0.05242 ** (0.0246)	0.03377 (0.0221)	0.03133 (0.0245)	0.02124 (0.0330)	0.04835 *** (0.0101)
EU	0.03998 (0.0388)	0.05042 ** (0.0217)	0.05392 ** (0.0223)	0.07803 ** (0.0382)	dropped
Number of host countries					
Number of host countries	-0.00024 (0.0002)	-0.00017 (0.0001)	-0.00016 (0.0001)	-0.00042 ** (0.0002)	0.00056 ** (0.0003)
Target host countries (global)					
Advanced host countries	-0.00192 (0.0157)	-0.00376 (0.0111)	-0.00228 (0.0094)	-0.02771 (0.0230)	0.02507 ** (0.0108)
Developing host countries	-0.00661 (0.0128)	-0.01124 (0.0079)	-0.01421 ** (0.0066)	-0.03362 (0.0221)	0.06158 *** (0.0175)
Data type (panel data)					
Non-panel data	0.01299 (0.0278)	0.02340 (0.0154)	0.02617 ** (0.0129)	-0.03745 (0.0484)	0.04900 (0.0386)
Estimation period					
Average year of estimation period	-0.00075 (0.0015)	-0.00053 (0.0010)	-0.00103 (0.0009)	-0.00178 (0.0025)	0.00329 (0.0040)
Length of estimation period	-0.00012 (0.0011)	0.00063 (0.0008)	0.00043 (0.0007)	-0.00119 (0.0015)	0.00078 (0.0023)
Equation type (gravity model)					
Aggregate model	0.04478 * (0.0233)	0.00628 (0.0090)	0.00002 (0.0052)	0.04700 * (0.0268)	0.02491 (0.0189)
Dyadic model	0.00698 (0.0115)	0.00739 (0.0105)	0.00406 (0.0107)	0.00329 (0.0187)	-0.00034 (0.0043)
Time-series model	-0.05090 (0.0604)	-0.03932 (0.0455)	0.01046 (0.0431)	0.05507 (0.0708)	dropped
Estimator (estimators other than OLS)					
OLS	0.01835 (0.0195)	0.00953 (0.0110)	0.00699 (0.0079)	0.02897 * (0.0171)	-0.00693 (0.0253)
Control for endogeneity					
Control for endogeneity	-0.01387 (0.0114)	-0.01106 (0.0123)	-0.00575 (0.0131)	-0.03836 *** (0.0137)	0.00322 (0.0099)
S.E.					
	0.12402 (0.3403)	0.32723 (0.3078)	0.08447 (0.3739)	0.44821 (0.3889)	-1.86085 (1.4723)
Intercept					
	1.50324 (3.0004)	1.05602 (2.0157)	2.05409 (1.8215)	3.61412 (5.0662)	-6.63773 (8.0858)
Number of studies	74	74	74	74	74
K	2107	2107	2107	2107	2107
R <sup>2</sup>	0.199	0.151	0.131	0.235	0.008

Notes:

<sup>a</sup> Breusch-Pagan test:  $\chi^2=162.82, p=0.0000$ ; Hausman test:  $\chi^2=96.78, p=0.0000$

Figures in parentheses beneath the regression coefficients are robust standard errors clustered by study. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Table 4 for the definition and descriptive statistics of meta-independent variables.

**Table 6.** Meta-regression analysis: Estimation with robust meta-independent variable

Estimator (Analytical weight in brackets)	Cluster-robust OLS	Cluster-robust WLS [1/SE]	Cluster-robust WLS [df.]	Cluster-robust WLS [1/EST]	Cluster-robust fixed-effects panel LSDV
Robust meta-independent variable <sup>a</sup> /Model	[1]	[2]	[3]	[4]	[5] <sup>b</sup>
International agreement type					
Bilateral trade agreement	-0.02382 ** (0.0097)	-0.00853 (0.0082)	-0.00193 (0.0068)	-0.05649 *** (0.0149)	-0.01972 ** (0.0076)
Other study conditions					
Number of host countries	-0.00024 ** (0.0001)	-0.00021 ** (0.0001)	-0.00017 ** (0.0001)	-0.00042 *** (0.0001)	0.00043 *** (0.0001)
Aggregate model	0.05175 *** (0.0135)	0.03387 *** (0.0089)	0.01770 ** (0.0082)	0.06717 *** (0.0217)	0.00218 (0.0061)
OLS	0.03062 *** (0.0115)	0.02554 *** (0.0072)	0.02403 ** (0.0109)	0.02841 * (0.0143)	0.00151 (0.0163)
Intercept	0.04260 *** (0.0082)	0.03619 *** (0.0082)	0.03134 *** (0.0078)	0.06650 *** (0.0153)	0.01306 (0.0114)
Number of studies	74	74	74	74	74
<i>K</i>	2107	2107	2107	2107	2107
<i>R</i> <sup>2</sup>	0.067	0.071	0.061	0.137	0.003

Notes:

<sup>a</sup> Meta-independent variables with PIP of 0.80 or more according to the results of a Bayesian model averaging analysis (Appendix A2)

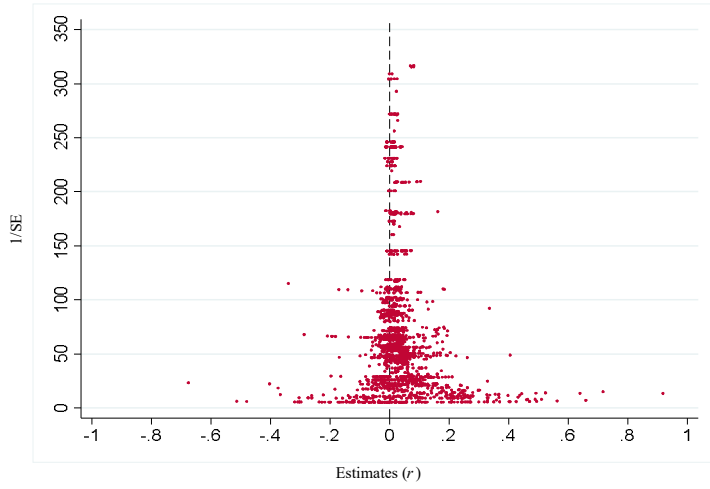
<sup>b</sup> Breusch–Pagan test:  $\chi^2=232.08$ ,  $p=0.0000$ ; Hausman test:  $\chi^2=18.08$ ,  $p=0.0012$

Figures in parentheses beneath the regression coefficients are robust standard errors clustered by study. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

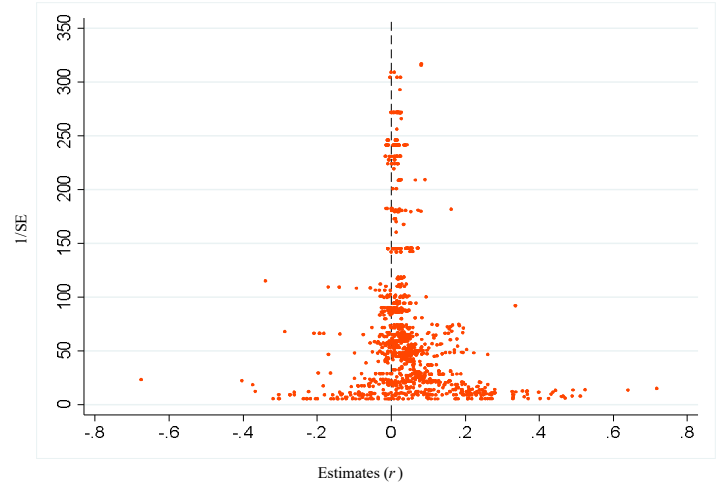
See Table 4 for the definition and descriptive statistics of meta-independent variables.

Figure 2. Funnel plot of partial correlation coefficients by international agreement type

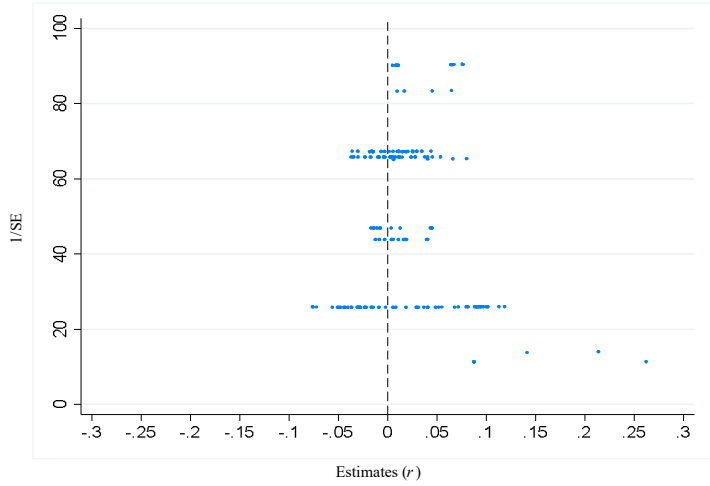
(a) All international agreements ( $K=2107$ )



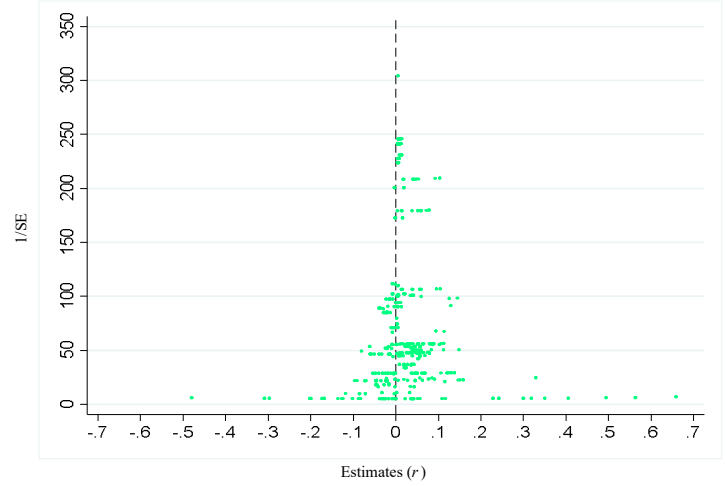
(b) Bilateral investment treaty ( $K=1290$ )



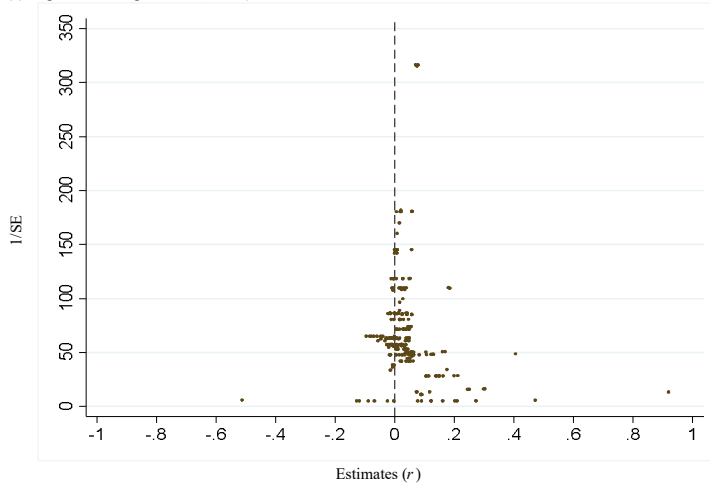
(c) Multilateral investment treaty ( $K=180$ )



(d) Bilateral trade agreement ( $K=358$ )



(e) Regional trade agreement ( $K=279$ )



**Table 7.** Univariate test of publication selection bias by international agreement type

International agreement type	Number of estimates ( $K$ )	Under the assumption that the true effect size is zero			Under the assumption that the true effect size is the WAAP estimate ( $x$ ) <sup>a</sup>		
		Number of estimates		Goodness-of-fit $z$ test ( $p$ value) <sup>b</sup>	Number of estimates		Goodness-of-fit $z$ test ( $p$ value) <sup>c</sup>
		$PCC_k < 0$	$PCC_k > 0$		$PCC_k < x$	$PCC_k > x$	
All international agreements	2107	538	1569	22.4609 *** (0.000)	884	1223	7.3853 *** (0.000)
Bilateral investment treaty	1290	270	1020	20.8817 *** (0.000)	423	867	12.3620 *** (0.000)
Multilateral investment treaty	180	68	112	3.2796 *** (0.001)	104	76	-2.0870 ** (0.037)
Bilateral trade agreement	358	119	239	6.3422 *** (0.000)	187	171	-0.8456 (0.398)
Regional trade agreement	279	81	198	7.0046 *** (0.000)	171	108	-3.7717 *** (0.000)

Notes:

<sup>a</sup> For multilateral investment treaty, the UWA of all estimates is used instead of the WAAP.

<sup>b</sup> Null hypothesis: The ratio of the positive versus negative values is 50:50.

<sup>c</sup> Null hypothesis: The ratio of estimates below  $x$  versus those over  $x$  is 50:50.

\*\*\* and \*\* denote statistical significance at the 1% and 5% levels, respectively.

**Table 8.** Meta-regression analysis of publication selection(a) FAT (publication selection bias) -PET (genuine effect) test (Equation:  $t = \beta_0 + \beta_1(1/SE) + \epsilon$ )

Estimator	Unrestricted WLS	Cluster-robust unrestricted WLS	Cluster-robust random-effects panel GLS
Model	[1]	[2]	[3] <sup>b</sup>
Intercept (FAT: $H_0: \beta_0 = 0$ )	0.8231 *** (0.106)	0.8231 *** (0.298)	0.7031 (0.503)
1/SE (PET: $H_0: \beta_1 = 0$ )	0.0126 *** (0.002)	0.0126 *** (0.005)	0.0191 ** (0.008)
Number of studies	74	74	74
$K$	2107	2107	2107
$R^2$	0.0543	0.0543	0.0543

(b) PEESE approach for estimation of publication-selection-bias adjusted effect size (Equation:  $t = \beta_0 SE + \beta_1(1/SE) + \epsilon$ )

Estimator	Unrestricted WLS	Cluster-robust unrestricted WLS	Random-effects panel ML
Model	[4]	[5]	[6]
$SE$	6.1815 *** (0.751)	6.1815 * (3.541)	0.4805 (4.893)
1/SE ( $H_0: \beta_1 = 0$ )	0.0184 *** (0.001)	0.0184 *** (0.004)	0.0207 *** (0.002)
Number of studies	74	74	74
$K$	2107	2107	2107
$R^2$	0.2251	0.2251	-

Notes:

<sup>a</sup> Breusch-Pagan test:  $\chi^2 = 2046.19$ ,  $p = 0.000$ ; Hausman test:  $\chi^2 = 0.01$ ,  $p = 0.9240$ 

Figures in parentheses beneath the regression coefficients are standard errors. Models [2] [3] and [5] report standard errors clustered by study. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 9.** Summary of publication selection bias test

International agreement type	Number of studies	Number of estimates ( $K$ )	Test results <sup>a</sup>		
			Funnel asymmetry test (FAT) ( $H_0: \beta_0=0$ )	Precision-effect test (PET) ( $H_0: \beta_1=0$ )	Precision-effect estimate with standard error (PEESE) ( $H_0: \beta_1=0$ ) <sup>b</sup>
All international agreements	74	2107	Rejected	Rejected	Rejected (0.0184/0.0207)
Bilateral investment treaty	73	1290	Rejected	Rejected	Rejected (0.0159/0.0172)
Multilateral investment treaty	9	180	Not rejected	Not rejected	Rejected (0.0120/0.0154)
Bilateral trade agreement	18	358	Not rejected	Rejected	Rejected (0.0191/0.0194)
Regional trade agreement	15	279	Not rejected	Not rejected	Rejected (0.0253/0.0378)

Notes:

<sup>a</sup> The null hypothesis is rejected when more than two of three models show a statistically significant estimate. Otherwise not rejected.<sup>b</sup> Figures in parentheses are PSB-adjusted estimates. If two estimates are reported, the left and right figures denote the minimum and maximum estimate, respectively.