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Preventing pollution havens? Environmental Provisions in Preferential Trade Agreements and Foreign Direct Investment

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Abstract

The present paper re-visits the link between cross-border mergers and acquisitions (M&As) and bilateral trade liberalization. It presents new evidence on the extent to which investment related environmental provisions (IEP) embedded in Preferential Trade Agreements (PTAs) moderate the impact of PTAs on cross-border M&As. To this end, we estimate a gravity model. Our findings suggest that IEPs diminish the positive effect of PTAs on bilateral M&As. We show that IEP undermines the positive effect of PTAs on investments flows between countries with high environmental stringency.

JEL codes: F13, F21, F23, Q58

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1 Introduction

The growing number of preferential trade agreements (PTAs) has been referred to as “the main change to the international trading system since the mid-1990s” (Baccini and Dür, 2015, p. 617). Almost every country has entered into more than ten PTAs. In fact, several countries, including Brazil and Mexico, participate in over fifty PTAs. In certain cases, particularly in Europe, some nations are involved in as many as seventy to ninety trade agreements.

Since 1947, more than 770 PTAs have been established, incorporating progressively heterogeneous and extensive environmental provisions (Brandi and Morin, 2023). Recent studies have found that the conclusion of PTAs with environmental provisions is related to the adoption of domestic environmental regulation (Brandi et al., 2019), the reduction of carbon dioxide emissions (Baghdadi et al., 2013; Sorgho and Tharakan, 2022), the decrease in suspended particulate matter (Martínez-Zarzoso and Oueslati, 2018; Zhou et al., 2017), and improvements in overall environmental performance (Bastiaens and Postnikov, 2017). While incorporating environmental provisions in PTAs may generate trade-offs between economic and environmental objectives, it can also create synergies. For example, environmental provisions that reduce trade barriers for environmental goods can generate economic and environmental benefits (Brandi et al., 2020).

Although there have been considerable strides in understanding the relationship between PTAs and the environment by now, there are still several open questions that remain contested. One key question in this context is how PTAs, with and without relevant environmental provisions, affect foreign direct investment (FDI) - despite the fact that multiple PTAs include environmental provisions that focus specifically on FDI.

How environmental provisions in PTAs affect firm activities and investors’ decisions is a multi-faceted question. On the one hand, stronger environmental regulations could increase operational and compliance costs for multinational companies (MNCs), which could undermine their entry into a new market or their expansion in a given country. Conversely, environmental provisions can also stimulate FDI among PTA partners by lowering transaction costs and enhancing productivity. Additionally, MNCs that prioritize corporate

responsibility may favor countries that include clear environmental commitments in their PTAs, giving nations with stricter environmental regulations a competitive edge. Empirical evidence on this question remains inconclusive (See [Di Ubaldo and Gasiorek, 2022](#); [Lechner, 2018](#); [Rojas-Romagosa, 2023](#)).

This article seeks to contribute to the literature that delves into the effect of PTAs with environmental provisions on FDI in two main ways. First, this paper identifies investment-related environmental provisions (IEP) and investigates their role. IEPs are a specific subset of ten environmental provisions that seek to protect the environment from the potential negative consequences that foreign firms' investment and the resulting economic activity could have on the environment. Thus, in contrast to previous related literature, the present study puts the spotlight on specific types of environmental provisions directly linked to FDI.

IEPs include prohibiting the relaxation of environmental standards to attract trade or investment and requiring alignment between domestic trade, investment, and environmental policies. Also, they empower countries to enact environmentally protective policies that may affect FDI, conduct environmental impact assessments before establishing foreign firms, and mandate the use of technologies meeting environmental standards. These provisions also ensure that environmental measures are not considered expropriation, and that in case these types of measures are adopted they can be excluded from investor-state dispute settlement mechanisms. Besides, these provisions allow countries to impose FDI bans or restrictions in specific sectors for environmental reasons. Collectively, these stringent environmental requirements could deter MNCs investment as they may increase the perceived risk of doing business, they may impose higher compliance costs, and may limit investments incentives.

Second, the present work studies the effect of IEPs on bilateral M&As, a mode of MNCs' investment that has not been considered in the previous literature on PTAs and environmental provisions. Cross-border M&As are the main mode of FDI from developed countries, and represent a significant share of global FDI [UNCTAD \(2021\)](#). Besides, it is likely that M&As react differently to trade liberalization than greenfield investments

(Nocke and Yeaple, 2007).

The empirical analysis presented in this paper is based on a sample of more than 100 countries during the period from 1995 until 2019. In line with the latest advancements of the gravity model for international trade and FDI (e.g. Bradley et al., 2023; Head and Mayer, 2021; Kox and Rojas-Romagosa, 2020; Yotov, 2024), we estimate a gravity model with cross-border and domestic M&As, and a full set of fixed effects. The inclusion of domestic M&As is especially important for the empirical question that the present paper seeks to address; it allows us to control for the possibility that PTAs foster cross-border M&As at the expense of domestic M&As (Bjorvatn, 2004; Horn and Persson, 2001; Norbäck and Persson, 2004).

Our findings suggest that PTAs promote bilateral M&As, and that IEPs undermine this positive effect. We also find that IEPs only undermine the positive effect of PTAs on M&As between countries with high environmental policy stringency. Our results are robust to a battery of tests, which includes accounting for the depth of PTAs, controlling for the existence of other provisions embedded in PTAs, and replacing the count of M&As projects by bilateral FDI flows.

The remainder of this paper is structured as follows. Section 2 presents a brief literature review on the link between trade agreements and FDI and M&As, as well as the role of environmental regulation. Section 3 and 4, respectively, describe the data and empirical methodology. Section 5 discusses the results, and Section 6 concludes.

2 Literature review

2.1 Trade liberalization and FDI

The previous literature has widely considered trade agreements to be a likely determinant of FDI in general and, by mode of investment, of greenfield investment and M&As (see for instance Blonigen and Piger (2014), di Giovanni (2005), or Paniagua and Sapena (2014)). In theory, the expected effect of trade agreements on bilateral FDI is an open empirical question. On the one hand, bilateral trade liberalization may limit horizontal

and tariff-jumping FDI ([Horstmann and Markusen, 1987](#)). In these cases, MNCs invest abroad in order to save trade costs and serve the host market. As the reduction of trade barriers reduces trade costs and promotes international trade, this type of cross-border investment becomes less likely in the case of trade liberalization. On the other hand, trade liberalization favors the ability of multinationals to form and exploit global value chains and improve their presence in the host markets they seek to serve. In fact, existing literature indicates that exporting precedes FDI when serving a market ([Conconi et al., 2016](#)). Accordingly, bilateral trade liberalization may foster vertical FDI, export platform FDI and export supporting FDI ([Ekholm et al., 2007](#); [Hanson et al., 2005](#); [Krautheim, 2013](#); [Neary, 2009](#)).

In the specific context of M&As, the theoretical works presented by [Horn and Persson \(2001\)](#), [Bjorvatn \(2004\)](#), and [Norbäck and Persson \(2004\)](#) suggest that bilateral trade liberalization promotes cross-border M&As. The intuition is that higher trade costs can favor domestic M&As to a larger extent than foreign ones as they make domestic production more profitable and thus spur the demand for domestic assets. Alternatively, lower trade costs can generate higher competition and entail a lower acquisition price for potential target firms. In this context, MNCs seeking to enter (or improve their presence in) a market are willing to pay a higher price than domestic firms. In this way, these theoretical models suggest that trade liberalization spurs cross-border M&As at the expense of domestic ones.

Previous empirical literature tends to find a positive link between bilateral trade liberalization and FDI (e.g. [Berger et al., 2013](#); [Hijzen et al., 2008](#); [Hyun and Kim, 2010](#); [Paniagua and Sapena, 2014](#)) although studies that find a negative relationship or a non-significant one are not uncommon (e.g. [di Giovanni, 2005](#); [Di Ubaldo and Gasiorek, 2022](#); [Jang, 2011](#); [Ouyang and Rajan, 2017](#)). It is worth noting that most of the previous literature does not account for domestic investment in their analysis. This might represent a caveat for two reasons. First, as indicated above, PTAs may foster cross-border M&As at the expense of domestic M&As. Second, not including domestic investment implies not controlling for the globalization effect on FDI, that is, the increasing propensity to invest

abroad relative to domestically (Bradley et al., 2023; Head and Mayer, 2021). In this regard, the recent trade literature suggests that not accounting for domestic trade underestimates the effect of PTAs on international trade (Larch and Yotov, 2024). Kox and Rojas-Romagosa (2020) for FDI, Gil-Pareja et al. (2022) for greenfield investments, and Bradley et al. (2023) for M&As are, to the best of our knowledge, some of the few studies that gauge the effect of PTAs at the same time that they include domestic investment. In these cases, results are also mixed.

Several studies attempted to shed light on the mechanisms behind these mixed results on the link between trade liberalization and FDI (greenfield investments or M&As). They demonstrate that factors such as countries' level of development, sector of investment, the presence of investment provisions or other non-trade provisions, or depth of trade agreements moderate the link between PTAs and FDI (Coeurdacier et al., 2009; Di Ubaldo and Gasiorek, 2022; Gamsö and Grosse, 2021; Garrett, 2016; Kim, 2021; Lechner, 2018; Osnago et al., 2016; Paniagua and Sapena, 2014). One factor that has been mostly overlooked by the previous literature is the presence of environmental provisions in trade agreements in general, and in particular the ones that are specifically geared towards FDI.

2.2 Trade liberalization, FDI and environmental regulation

One concern with varying levels of national environmental regulation is the potential emergence of pollution havens in developing countries. The pollution haven hypothesis, first proposed by Copeland and Taylor (1994), suggests that removing trade and investment barriers increases the likelihood of pollution havens as liberalization shifts environmentally harmful production stages from high-income countries with strict environmental regulations to developing countries with more lenient regulation. While empirical evidence is mixed, several studies support the pollution haven hypothesis (e.g. Cherniwchan, 2017; Kolcava et al., 2019; Li and Zhou, 2017). In the context of the link between MNCs investment decisions and environmental regulation, several works also find that stricter environmental regulation may hamper countries' capacity to attract FDI in general, or greenfield investments or M&As in particular (e.g. Bialek and Weichenrieder,

2021; Saussay and Zugravu-Soilita, 2023; Tang, 2015). Besides the pollution haven hypothesis, Rojas-Romagosa (2023) posits that environmental provisions embedded in PTA may hamper FDI as they may represent higher compliance costs for the MNCs.

In contrast, the Porter hypothesis posits that environmental regulation does not harm competitiveness but instead incentivizes companies to innovate, thereby enhancing productivity (Porter and Linde, 1995). Insofar as environmental provisions in trade agreements lead to stricter domestic environmental regulations (Brandi et al., 2019), they prompt firms to develop greener technologies. These innovations can offset or even exceed the costs of adhering to new regulation (Porter and Linde, 1995). While some studies indicate that regulation can encourage innovation (Johnstone et al., 2012), the impact of environmental regulation on competitiveness remains uncertain (Berman and Bui, 2001; Dechezleprêtre and Sato, 2017; Lanoie et al., 2008; Palmer et al., 1995). Furthermore, stricter environmental regulation may attract investment from MNCs with strong corporate responsibility and social awareness (Poelhekke and Van der Ploeg, 2015; Rojas-Romagosa, 2023). In this line, some works find that countries' stricter environmental regulations have a positive effect on their capacity to attract FDI into certain sectors (e.g. Bialek and Weichenrieder, 2021; Poelhekke and Van der Ploeg, 2015).

What do empirical analyses indicate about the effect of PTAs with environmental provisions on FDI? To the best of our knowledge, Lechner (2018) is the first to attempt to answer this empirical question. Lechner (2018) addresses the impact of environmental provisions embedded in PTAs on US outward FDI at the sectoral level in 36 partner countries in the period between 1982 and 2015. She finds that environmental provisions have different effects across sectors, decreasing US outward FDI in polluting sectors while increasing it in environmentally clean sectors. Rojas-Romagosa (2023) focuses on the case of country-level bilateral FDI stock for a sample of 206 countries in the period between 2001 and 2012. The author concludes that adding environmental provisions to a PTA does not reduce bilateral FDI. Alternatively, Di Ubaldo and Gasiorek (2022) study the effect of environmental provisions present in PTA on greenfield investment for a sample of 169 destination countries and 145 origin countries in the period between 2003 and 2017.

The authors show that environmental provisions negatively impact FDI flows, especially in middle- and low-income countries.

The present study contributes to the above-mentioned empirical question in several ways. First, it identifies the effect of a specific group of environmental provisions embedded in PTAs that are directly linked to FDI. Secondly, it is the first to focus on the case of cross-border M&As. Thirdly, it considers a relatively long period of analysis (1995-2019) and a broad sample of countries (over a hundred).

3 Data

The analysis in this study examines the impact of PTAs and IEPs on bilateral M&As. Descriptive statistics of all employed variables described in the present section are available in Table [A.1](#) from the appendix.

We collected data on cross-border and domestic M&As for the period 1995-2019 from Eikon Thomson Reuters. Our sample of analysis consists of 121 source (acquirer) and 138 destination (target) countries and comprises only M&As that lead to controlling a majority ownership of the target firm. The list of countries is available in the appendix.

Eikon Thomson Reuters' M&A data has been widely used in previous literature that addresses the drivers of M&As and is the data source employed by UNCTAD's World Investment Reports ([UNCTAD, 2015](#)). A caveat of Eikon Thomson Reuters' M&As data is that the value of M&As are missing for 60% of the recorded transactions; for this reason, our empirical analysis focuses on the number of M&As projects. At the same time, as a sensitivity analysis, we replicate our empirical analysis at the country level using bilateral FDI flows fetched from OECD.

The data on the signature of PTAs between countries is obtained from the Design of Trade Agreements (DESTA) database from [Dür et al. \(2014\)](#). We identify country pairs having a PTA with an indicator variable, and the PTA's depth index available in the DESTA database is used in our sensitivity analysis.

In order to identify the PTAs that include the relevant environmental provisions, we combine DESTA with the Trade and Environment database (TREND) from [Morin](#)

[et al. \(2018\)](#). The latest version of the TREND database identifies and classifies 298 environmental provisions present in PTAs for the period 1948-2021. Out of the different environmental provisions available in TREND database we identify ten provisions that are directly related to FDI. For ease of replicability of our study, we include in parenthesis the code of each provision available in the codebook of the TREND database ([Morin, 2019](#)). These provisions seek to:

- Limit the inappropriate encouragement of trade or investment by relaxing environmental measures (2.01.01 and 2.01.02).
- Ensure a coherence with domestic trade and/or investment policies with environmental policies (4.02).
- Enables the country to enact policies that protect the environment and that affect investment (8.03.01).
- Specific measures for establishment of foreign firms, which includes measures authorizing governments to conduct environmental impact assessments of investment prior the establishment (8.03.02).
- Investment should use or transfer a technology that meets environmental requirements (8.03.03).
- Measures that seek to protect the environment should not be considered as expropriation or nationalization (8.03.04).
- FDI ban from specific sectors related to the environment or FDI restrictions on investment for environmental reasons (8.03.05 and 8.03.06).
- Exclusion of investor state dispute settlement in case the government adopts measures that protect the environment (8.03.07).

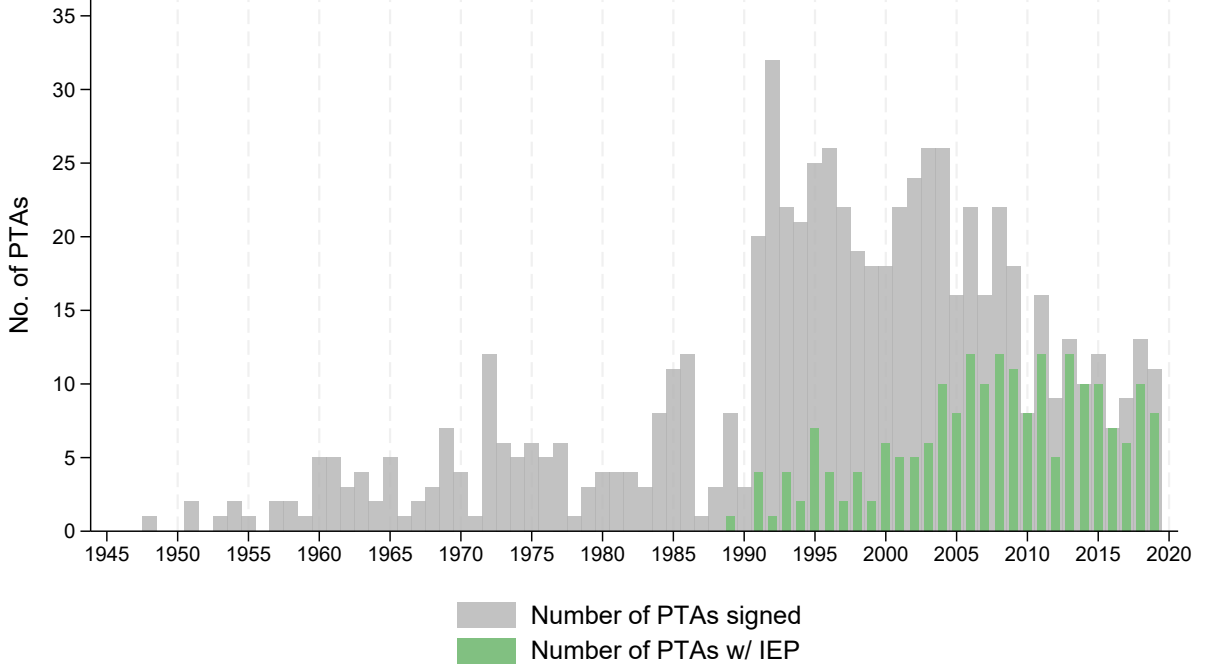
In our empirical analysis, the inclusion of at least one of the above-described provisions implies that the PTA incorporates IEPs. Figure 1 illustrates the evolution of PTAs and IEPs. Figure 1 shows the first PTA with at least one IEP was signed in 1989. Since then,

their relevance has been increasing. In fact, the majority of PTAs signed since 2010 have at least one IEP. This feature of the evolution of IEPs makes it possible to identify their effect as there is a large number of PTAs with and without IEPs. From the TREND database we also identify specifically trade-related environmental provisions (TEP) that focus on directly affecting trade.¹ From the DESTA database we obtain the information regarding those PTAs that include investment provisions (IP), and the depth of PTAs. These variables are employed with the aim of testing the sensitivity of our results. We exclude from the analysis those PTAs for which we do not have information regarding their depth in the DESTA database or information related to their environmental provisions. This restriction coupled with our sample of bilateral M&As implies that our analysis considers 328 PTAs.

In addition to PTAs and IEPs, our empirical analysis incorporates Bilateral Investment Treaties (BIT). We make use of an indicator variable that takes the value one when a country pair has a BIT in force is constructed based on the information available in UNCTAD's Investment Agreements Navigator.

¹The environmental trade specific provisions are 20 provisions present in the TREND database that exclusively affect international trade. According to the coding from [Morin \(2019\)](#), these provisions are: the ones present in sections 1.04, 1.10, 1.11, 2.04, 7.06, 7.07, 8.01, 8.02, 8.08 and 8.10, and the provisions with the codes 8.05.01, 8.05.02, 8.05.03 and 10.24.01.

Figure 1: Evolution of the number of signed PTAs with and without IEPs



Note: Authors' own elaboration based DESTA and TREND databases. PTA refers to Preferential Trade Agreements and IEP to environmental investment provision.

4 Methodology

The present paper relies on the gravity model in order to address the impact of PTAs on bilateral M&As. The gravity model has been the workhorse for gauging the effect PTAs on international trade (e.g. [Brandi et al., 2020](#); [Kohl et al., 2016](#); [Larch and Yotov, 2024](#)) or FDI (e.g. [Hyun and Kim, 2010](#); [Kox and Rojas-Romagosa, 2020](#); [Meinhart, 2024](#)). Besides, it has solid theoretical foundations for addressing the drivers of FDI in general, and M&As in particular ([Head and Ries, 2008](#); [Kox and Rojas-Romagosa, 2020](#)). Our baseline specification only gauges the effect of PTAs and BITs on M&As:

$$MA_{ijt} = \exp(\beta_1 PTA_{ijt} + \gamma_1 BIT_{ijt} + \lambda_{ij} + \lambda_{it} + \lambda_{jt} + INT_{ijt}) \times \varepsilon_{ijt} \quad (1)$$

where MA_{ijt} is the number of M&As projects from country i to country j in year

t . The dependent variable includes both, domestic ($i = j$) and cross-border M&As ($i \neq j$). PTA_{ijt} is an indicator variable that takes the value one when a pair of countries has a preferential trade agreement, and BIT_{ijt} when a pair of countries have a bilateral investment treaty.

In line with the latest recommendations on the gravity model specification (Larch et al., 2025; Yotov, 2024), the model incorporates a rich set of fixed effects. First, λ_{ij} are the directional country pair fixed effects, which control for the traditional bilateral time-invariant determinants of M&As (e.g. geographic distance or sharing a language) usually included in the previous literature (e.g. di Giovanni, 2005). These fixed effects also incorporate the border effect on M&As, i.e. the extent to which domestic M&As is larger than cross-border M&As (Bradley et al., 2023). Furthermore, this set of fixed effects serves to minimize the potential endogeneity bias that might be present between cross-border M&As and PTAs and BITs (Baier and Bergstrand, 2009; Bergstrand and Egger, 2013).

Second, λ_{it} and λ_{jt} are source country-year and destination country-year fixed effects. These fixed effects account for all country specific time-varying drivers of outward and inward M&As, respectively. Thus, for example, they account for the role of economic size, exchange rate and institutional quality in the host country in determining inward M&As. In addition, these fixed effects represent the multilateral resistance term; the relative capacity that a country has to invest abroad or receive investment from abroad (Head and Ries, 2008; Kox and Rojas-Romagosa, 2020). Properly controlling for the multilateral resistance term is important as otherwise it may bias our estimates since third-country effects are not taken into account (Head and Mayer, 2014). By incorporating the multilateral resistance term, we are able to control for the fact that the signature of a bilateral agreement such as a PTA may divert investment from non-signing countries into those that have signed.

Third, INT_{ijt} is a set of fixed effects that control for the evolution of the border effect (Bergstrand et al., 2015). They are a yearly indicator variable that takes the value one when investment is international, and zero when is domestic. More broadly, the specific

role of each of the above-described fixed effects, they all serve for minimizing the potential omitted variable bias.²

Specification (1) is modified in order to address the specific effect that environmental investment provisions present on PTAs may have on M&As. To this end, we interact PTA with an indicator variable (IEP_{ijt}) that takes the value one when PTA includes an investment related environmental provision:

$$MA_{ijt} = \exp(\beta_1 PTA_{ijt} + \alpha_1 IEP_{ijt} + \gamma_1 BIT_{ijt} + \lambda_{ij} + \lambda_{it} + \lambda_{jt} + INT_{ijt}) \times \varepsilon_{ijt} \quad (2)$$

In specification (2) β_1 gauges the effect that PTA have on M&As for the reference group; the countries which have signed a PTA without IEPs, and β_2 gauges the differential effect that PTAs with IEP have relative to the reference group. The sum of β_1 and β_2 show the overall effect that PTAs with IEP have on bilateral M&As. This is our main specification, although variation of it are going to be also present in the analysis for ruling out that the effect estimated for β_2 is not driven by other provisions present in PTAs. Standard errors are clustered at the country pair level.

5 Results

5.1 The impact of PTAs and IEP on M&As

Table 1 presents the overall effect of PTAs on M&As (specification (1)) and the differential effect that PTAs with IEP have on M&As (specification (2)). Estimates in column (1) show that PTAs have a positive and significant effect on bilateral M&As. The signature of a PTA is associated with an increase of bilateral M&As by 12% ($(e^{0.113} - 1) * 100$). Column (2) indicates that the positive effect of PTAs is statistically larger when the

²In the Appendix B we show that deviating from this empirical strategy affects our main results. Excluding domestic investments from the analysis generates qualitatively similar results but leads to a smaller effect of PTAs and IEP on bilateral M&As. At the same time, as expected, not properly controlling for bilateral investments costs and the multilateral resistance term lead to estimates that are not in line with our main results.

trade agreements do not include any IEPs. A PTA without IEPs promotes bilateral M&As by 28%, while a PTA with IEPs is associated with an increase of M&As by 10.6% ($((e^{(0.247-0.146)} - 1) * 100)$).

In terms of size, these estimates are in line with previous ones reported in the literature. For instance, [Kox and Rojas-Romagosa \(2020\)](#) considers the impact of PTAs during the period 2001-2012 on bilateral FDI stock. During this period of analysis, IEPs in PTAs were still uncommon (see [Figure 1](#)). Although comparisons must be made with caution, as we study the number of M&As, authors obtain a significant estimated coefficient of 0.279 (see [Table 2](#) from [Kox and Rojas-Romagosa \(2020\)](#)), which implies PTAs are associated with a 32.2% increase in bilateral FDI stock. This estimated effect is also similar to the one we obtain for PTA without IEP in our sensitivity analysis with bilateral FDI flows (see [Table 4](#)).

From a policy perspective, this finding can be interpreted as encouraging as it suggests that the specific IEPs that seek to limit countries to make environmental policies laxer to attract FDI or that give a relevant role to environmental regulation in relation with FDI are working. These provisions indeed represent an additional barrier to the entrance of foreign capital, and they effectively achieve this objective. At the same time, this in itself does not imply that IEPs lead to overall better environmental outcomes.

At least two aspects need be taken into account in order to determine whether this additional barrier to M&As (or FDI in general, as we show in our sensitivity analysis) is positive in terms of environmental impacts. Firstly, particularly in the case of cross-border M&As, if a firm is not acquired by an MNC original from the partner country with which the PTA with IEP provisions has been signed, this potential target firm might (1) not be acquired, (2) be acquired by a MNC from a different country or (3) be acquired by a domestic firm. It is an open empirical question beyond the scope of this paper which of these alternative scenarios are better in terms of environmental impacts. We can only point out that existing evidence suggests that FDI or cross-border M&As can have positive effects on the environment (e.g. [Ashraf et al., 2021](#); [Brucal et al., 2019](#); [Demena and Afesorgbor, 2020](#)). Secondly, the impact of IEPs in PTAs might not be

homogeneous across sectors, and might have unintended consequences on some sectors' capacity to attract foreign investment.

In columns (3) and (4) we extend specification (2) in order to ensure that the negative effect of IEPs is robust to include an indicator variable that takes one if the PTA includes investment provisions (IP) and if it includes specifically trade-related environmental provisions (TEP).³ These estimates need to be taken with caution as these additional indicator variables are highly correlated with the IEP dummy (i.e. most PTAs that include at least one IEP also include general investment provisions and at least one TEP). All in all, estimates in columns (3) and (4) confirm that the presence of IEPs undermines the positive effect that a PTA has on bilateral M&As. Finally, estimates show that the presence of a BIT has a positive effect on bilateral M&As, indicating that such treaties promote them by nearly 12%.

Table 1: The impact of PTAs and IEP on M&As

	(1)	(2)	(3)	(4)
$\beta_1 PTA_{ijt}$	0.113*** (0.041)	0.247*** (0.070)	-0.006 (0.062)	-0.081 (0.064)
x $\alpha_1 IEP_{ijt}$		-0.146** (0.063)	-0.422*** (0.080)	-0.510*** (0.082)
x $\alpha_2 IP_{ijt}$			0.537*** (0.088)	0.548*** (0.086)
x $\alpha_3 TEP_{ijt}$				0.136*** (0.032)
$\gamma_1 BIT_{ijt}$	0.112** (0.053)	0.108** (0.053)	0.123** (0.053)	0.122** (0.053)
Observations	79517	79517	79517	79517

Note: The dependent variable is the number of M&As projects. IEP refers to investment related environmental provisions, IP to investment provisions, and TEP to trade related environmental provisions. All estimates include Origin \times Destination, Origin \times Year, Destination \times Year and INT \times Year fixed effects. Standard errors clustered at origin and destination level are in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2 The impact of PTAs and IEPs on M&As between countries with laxer and stricter environmental policies

The previous analysis shows that PTAs that include an IEP have a statistically lower effect on M&As than those PTAs that do not include an IEP. Now, we turn to shed light on one possible mechanism behind this finding by exploring the effect of PTAs and IEPs on M&As between countries depending on their level of environmental policy stringency.

³IP refers to investment in general, independent of any links to environmental issues. See footnote 1 for the list of provisions included in TEP.

Unfortunately, to the best of our knowledge, there is no available data for measuring countries' environmental policy stringency for our sample of countries during the period 1995-2019. In order to overcome this limitation, we employ the data gathered from the Executive Opinion Survey of the World Economic Forum since 2008, which has been used in the previous literature (e.g. [Poelhekke and Van der Ploeg, 2015](#)). This survey includes two different questions posed to business CEOs in several countries around the world about the stringency and enforcement of environmental policies and calculates two indices that represent both mentioned dimensions of environmental policies. In order to account for both dimensions, we multiply both indices, and we then classify countries as being characterized by stringent environmental policy if they belong to the top quartile in 2008.⁴ The list of countries classified as having stricter environmental policies are present in [Table A.2](#) from the Appendix, as it can be gathered, most are high income countries.

This time-invariant classification is used to divide bilateral M&As flows into four groups: (1) M&As between countries with higher environmental policy stringency (hh), (2) M&As from countries with higher environmental policy stringency into those with lower environmental policy stringency (hl), (3) M&As from countries with lower environmental policy stringency into countries with higher (lh) and (4) M&As between countries with have lower environmental policy stringency (ll). We estimate the effect of PTAs for each of these four groups:

$$\begin{aligned}
 MA_{ijt} = & \exp(\beta_1 PTA_{ijt}^{hh} + \beta_2 PTA_{ijt}^{hl} + \beta_3 PTA_{ijt}^{lh} + \beta_4 PTA_{ijt}^{ll} + \gamma_1 BIT_{ijt} \\
 & + \lambda_{ij} + \lambda_{it} + \lambda_{jt} + INT_{ijt}) \times \varepsilon_{ijt}
 \end{aligned}
 \tag{3}$$

Results of this specification are reported in column (1) from [Table 2](#). Our findings show that PTAs appear to have a positive effect on M&As between countries with stringent environmental policy, and for M&As from countries with higher environmental policy into countries with lower environmental policy stringency. PTAs promote bilateral M&As by 11.6% and 27.6% respectively.

⁴For the countries for which the indices are not available for 2008, we employ the next year in which data is available.

Specification (3) is extended by interacting the four specified PTAs dummies by the IEP indicator variable; estimates are presented in column (2). Results confirm that the inclusion of IEPs diminishes the positive effect of PTAs on bilateral M&As between countries with higher environmental policy stringency while in the remaining cases the IEPs do not seem to have a significant effect. In the case of M&As between countries with higher environmental policy stringency, PTA without IEPs promotes cross-border M&As by 42.3%, while PTA with IEPs are associated with a 10.8% increase. From a policy perspective, this finding is interesting as it suggests that IEPs limit bilateral M&As between countries which already have stringent environmental regulation in place. This finding is likely to be driven by the fact that these countries are the ones more likely to effectively make use of and enforce the IEPs embedded in their PTAs. In this line, the estimate of IEP for investments from countries with low environmental regulation stringency into those with high is negative and close to the standard levels of significance.

Table 2: The impact of PTAs and IEP on M&As in countries with high and low environmental regulation stringency

	(1)	(2)
$\beta_1 PTA_{ijt}^{hh}$	0.110** (0.049)	0.353*** (0.125)
x $\alpha_1 IEP_{ijt}^{hh}$		-0.250** (0.116)
$\beta_2 PTA_{ijt}^{hl}$	0.244*** (0.072)	0.303*** (0.114)
x $\alpha_2 IEP_{ijt}^{hl}$		-0.073 (0.099)
$\beta_3 PTA_{ijt}^{lh}$	-0.162 (0.202)	0.040 (0.201)
x $\alpha_3 IEP_{ijt}$		-0.233 (0.145)
$\beta_4 PTA_{ijt}^{ll}$	0.048 (0.156)	0.055 (0.183)
x $\alpha_3 IEP_{ijt}^{ll}$		-0.004 (0.105)
$\gamma_1 BIT_{ijt}$	0.113** (0.053)	0.108** (0.053)
Observations	79517	79517

Note: The dependent variable is the number of M&As projects. IEP refers to investment related environmental provisions. *hh* refers to M&As between countries with higher environmental policy stringency, *hl* to M&As from countries with higher environmental policy stringency into those with lower environmental policy stringency, *lh* to M&As from countries with lower environmental policy stringency into countries with higher, and *ll* to M&As between countries with have lower environmental policy stringency. All estimates include Origin \times Destination, Origin \times Year, Destination \times Year and INT \times Year fixed effects. Standard errors clustered at origin and destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3 Sensitivity analysis

As a sensitivity analysis we account for the depth of PTAs, to this end we replace the PTA indicator dummy by the depth index available in the DESTA database. Estimates are reported on Table 3, and confirm that IEPs undermine the positive effect of PTAs on M&As.

Due to the prevalence of missing data in the value of M&As transactions, as a sensitivity analysis we study the impact of PTAs and IEPs on bilateral FDI flows. The FDI flows database is constructed based on OECD's inward and outward FDI statistics.⁵ This FDI flows database covers the period 1985-2019 and includes 190 source and destination countries. However, it does not include FDI flows between non-OECD countries. As in Gil-Pareja et al. (2022) and Heid and Márquez-Ramos (2019), we approximate domestic investment by employing gross capital formation. The number of bilateral cross-border M&As projects are positively and significantly correlated with bilateral FDI capital flows. For the sample of countries and years in which M&As projects and FDI flows are available, the correlation is 0.35. Estimates are presented in Table 4 confirm our main findings. PTAs without IEP promote bilateral FDI flows by 34.6%, while PTA with IEP are likely to have a non-significant effect.

Table 3: The effect of the depth of PTAs and IEPs on M&As

	(1)	(2)	(3)	(4)
$\beta_1 PT A_{depth_{ijt}}$	0.032** (0.013)	0.103*** (0.026)	-0.020 (0.027)	-0.081*** (0.031)
$\alpha_1 IEP_{ijt}$		-0.073*** (0.025)	-0.159*** (0.033)	-0.216*** (0.035)
$\times \alpha_2 IP_{ijt}$			0.211*** (0.041)	0.258*** (0.043)
$\times \alpha_3 TEP_{ijt}$				0.066*** (0.015)
$\gamma_1 BIT_{ijt}$	0.115** (0.053)	0.109** (0.053)	0.123** (0.053)	0.124** (0.054)
Obs.	79517	79517	79517	79517

Note: The dependent variable is the number of M&As projects. IEP refers to investment related environmental provisions, IP to investment provisions, and TEP to trade related environmental provisions. Estimates include Origin \times Destination, Origin \times Year, Destination \times Year and INT \times Year fixed effects. Standard errors clustered at origin and destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

⁵The FDI database is constructed employing the BMD3 and the BMD4 inward and outward FDI flows data from OECD. We use both, inward and outward FDI data to input missing values. Negative values are replaced with a 0.

Table 4: The effect of PTAs and IEP on FDI flows

	(1)	(2)	(4)	(5)
$\beta_1 PTA_{ijt}$	0.079 (0.076)	0.297*** (0.091)	0.027 (0.107)	-0.153 (0.117)
x $\alpha_1 IEP_{ijt}$		-0.237*** (0.079)	-0.352*** (0.102)	-0.445*** (0.117)
x $\alpha_2 IP_{ijt}$			0.397*** (0.102)	0.358*** (0.107)
x $\alpha_3 TEP_{ijt}$				0.266*** (0.094)
$\gamma_1 BIT_{ijt}$	0.209** (0.093)	0.196** (0.093)	0.222** (0.094)	0.194** (0.093)
Observations	100926	100926	100926	100926

Note: The dependent variable is bilateral FDI flows. IEP refers to investment related environmental provisions, IP to investment provisions, and TEP to trade related environmental provisions. All estimates include Origin \times Destination, Origin \times Year, Destination \times Year and INT \times Year fixed effects. Standard errors clustered at origin and destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Conclusions

This paper contributes to the literature that gauges the effect of environmental provisions present in PTAs on bilateral FDI. To this end, we identify IEPs, a set of ten environmental provisions that can be present in PTAs and that directly affect FDI. In addition, the present paper puts the spotlight on the effect of PTAs and IEPs on cross-border M&As. We find that the inclusion of IEPs diminishes the overall positive effect of PTAs on cross-border M&As. This is particularly the case between countries with stringent environmental policies.

From a policy perspective, our findings are encouraging because they show that the design of PTAs matters. Specific IEPs that seek to link FDI to environmental protection (e.g. by preventing countries from relaxing environmental policies to attract FDI) do in fact act as effective barriers to the entrance of foreign capital and can contribute to preventing pollution havens. The findings also suggest that IEPs are effective in limiting bilateral FDI between countries that already have stringent environmental regulation in place, which in turn suggests that these countries are the ones that are more likely to effectively make use of and enforce the IEPs embedded in their PTAs.

Yet, the fact that IEPs reduce the increase in FDI that can usually be expected due to PTAs does not necessarily mean that IEPs lead to overall better environmental outcomes. In addition, we cannot discard the possibility that IEPs are also deterring

M&As into economic activities that promote the decarbonization of the economy. Future research with FDI sectoral data may shed light on whether the deterrent effect of IEPs on FDI is positive from an environmental perspective or not.

Moreover, future research could focus on the impact of IEPs on international trade. MNCs are responsible for a large share of international trade, and if IEPs have negative consequences on M&As (and FDI in general) as shown in the present paper, they are also likely to affect international trade. Furthermore, investigating the long-term environmental outcomes of these provisions would be beneficial to understand their broader implications. Overall, our study underscores the importance of carefully designing PTAs with effective environmental provisions to balance economic and environmental goals.

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A Appendix

Table A.1: Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
No. Of M&As projects	79,517	6.62	124.98	0	8702
PTA	79,517	0.45	0.50	0	1
IEP	79,517	0.12	0.33	0	1
BIT	79,517	0.42	0.49	0	1
IP	79,517	0.29	0.46	0	1
TEP	79,517	0.29	0.45	0	1
PTA depth	79,517	0.91	1.19	0.00	3.59

Note: Note: Authors' own elaboration. PTA refers to Preferential Trade Agreement, IEP to investment related environmental provisions, IP to investment provision, TEP to trade related environmental provisions and BIT to bilateral investment treaties.

Table A.2: Country sample

Stricter environmental policy	Laxer environmental policy			
Australia	Albania	Egypt	<i>Mali</i>	Suriname
Austria	Algeria	El Salvador	Malta	<i>Tajikistan</i>
Belgium	Angola	Eswatini	Mauritania	Tanzania
Canada	Argentina	Ethiopia	<i>Mauritius</i>	Thailand
Czechia	Armenia	<i>Gabon</i>	Mexico	Trinidad & Tobago
Denmark	Azerbaijan	Georgia	Moldova	Turkey
Estonia	Bangladesh	Ghana	<i>Mongolia</i>	Uganda
Finland	Barbados	Greece	Montenegro	Ukraine
France	<i>Benin</i>	Guatemala	Morocco	Uruguay
Germany	Bolivia	<i>Guinea</i>	<i>Mozambique</i>	<i>Uzbekistan</i>
Ireland	Bosnia & Herzegovina	<i>Guyana</i>	Myanmar (Burma)	Venezuela
Israel	Botswana	<i>Haiti</i>	Namibia	Vietnam
Japan	Brazil	Honduras	Nepal	Zambia
Luxembourg	Brunei	Hungary	Nicaragua	Zimbabwe
Malaysia	Bulgaria	India	Nigeria	
Netherlands	<i>Burkina Faso</i>	Indonesia	<i>North Macedonia</i>	
New Zealand	<i>Burundi</i>	Iran	Pakistan	
Norway	Cambodia	Italy	Panama	
Oman	Cameroon	Jamaica	Paraguay	
Portugal	<i>Cape Verde</i>	Jordan	Peru	
<i>Rwanda</i>	<i>Chad</i>	Kazakhstan	Philippines	
Singapore	Chile	Kenya	Poland	
Slovakia	China	Kyrgyzstan	Romania	
Slovenia	Colombia	Laos	Russia	
South Korea	Congo - Kinshasa	Latvia	Saudi Arabia	
Sweden	Costa Rica	Lebanon	<i>Senegal</i>	
Switzerland	Croatia	<i>Lesotho</i>	Serbia	
Tunisia	Cyprus	<i>Libya</i>	<i>Sierra Leone</i>	
United Arab Emirates	Côte d'Ivoire	Lithuania	South Africa	
United Kingdom	Dominican Republic	<i>Madagascar</i>	Spain	
United States	Ecuador	<i>Malawi</i>	Sri Lanka	

Note: Countries in italics are the ones that are only present in the sample as a destination.

B Alternative model specification

As in the case of [Larch and Yotov \(2024\)](#) for international trade, estimates presented in [Table A.3](#) illustrate that the specification underscores the importance of the model specification when estimating the effect of PTA and IEP on bilateral M&As. For ease of comparison, estimates of our preferred specification are presented in column (1), and from columns (2) to (5) are available the estimates of the alternative specifications with less fixed effects. In column (2) we exclude the international-year dummies (INT_{ijt}) that

control for the evolution of the border effect. Estimates are similar to the ones presented in column (1), with the slight changes on the size of the effect.

Estimates in column (3) are based on only cross-border M&As (i.e. without domestic investment). In this case, the effect of PTAs is substantially lower than in our preferred specification. This finding is consistent with [Larch and Yotov \(2024\)](#) who find a lower effect of trade agreements in international trade when domestic trade is not taken into account. Besides, the change in the size of the estimated coefficient is also consistent with previous literature that highlights the role of domestic M&As when considering the impact of bilateral trade liberalization on cross-border M&As ([Bjorvatn, 2004](#); [Horn and Persson, 2001](#); [Norbäck and Persson, 2004](#)).

In column (4) we replace the directional country pair-fixed effects (λ_{ij}) by time-invariant determinants of M&As, namely the logarithm of geographic distance, and two indicator variables that take the value one when a country pair shares a geographic border or a language.⁶ In this case, the PTA estimate is negative and weakly significant and the estimate of IEP loses significance. These substantial changes in the PTA and IEP estimates are driven by endogeneity and omitted variable biases ([Baier and Bergstrand, 2009](#); [Bergstrand and Egger, 2013](#)). Furthermore, directional country pair fixed effects are better for approximating bilateral trade and investment costs than country pair variables such as distance as it implies assuming that the effect is homogeneous between country pairs ([Egger and Nigai, 2015](#)). It implies assuming that, for instance, the effect of geographic distance is the same between investment flows from Argentina to Germany than between Germany and Argentina. Finally, in column (5) the multilateral resistance terms ($\lambda_{it}, \lambda_{jt}$) are replaced by country specific time varying variables⁷, the country fixed effects (λ_i, λ_j) and year fixed effects (λ_t). Estimates are similar to the ones presented in column (4), although the coefficient associated to PTA loses significance.

⁶These variables are obtained from CEPII [Conte et al. \(2022\)](#).

⁷The logarithm of GDP in the source and destination country, and the difference of logarithm of GDP per capita between country pairs. These variables are fetched from the World Bank's Development Indicators database.

Table A.3: Alternative model specification

	(1)	(2)	(3)	(4)	(5)
$\beta_1 PTA_{ijt}$	0.247*** (0.070)	0.255*** (0.070)	0.117* (0.062)	-0.262** (0.133)	-0.204 (0.125)
$\alpha_1 IEP_{ijt}$	-0.146** (0.063)	-0.133** (0.063)	-0.117** (0.059)	0.020 (0.139)	0.042 (0.120)
$\gamma_1 BIT_{ijt}$	0.108** (0.053)	0.096* (0.051)	0.044 (0.056)	-0.139 (0.106)	-0.070 (0.103)
$\gamma_2 Distance_{ijt}$ (log)				-0.805*** (0.060)	-0.784*** (0.059)
$\gamma_3 Contiguity_{ij}$				0.055 (0.099)	0.047 (0.100)
$\gamma_4 Language_{ij}$				0.832*** (0.084)	0.840*** (0.089)
$\gamma_5 GDP_{jt}$ (log)					0.310 (0.212)
$\gamma_6 GDP_{it}$ (log)					0.747*** (0.267)
$\gamma_7 Diff.GDP_{pcijt}$					0.118 (0.253)
Observations	71914	71914	66296	65667	67467
Domestic M&As	YES	YES	NO	NO	NO
Fixed effects:					
Origin (λ_j)					X
Destination (λ_j)					X
Year (λ_t)					X
Origin-year (λ_{it})	X	X	X	X	
Destination-year (λ_{jt})	X	X	X	X	
Country pair (λ_{ij})	X	X	X		
International-year (INT_{ijt})	X				

Note: The dependent variable is the number of M&As projects. Standard errors clustered at origin and destination level are in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$