Kick-starting diffusion:
Explaining the varying frequency of PTAs' environmental clauses by their initial conditions

Jean-Frédéric Morin
Canada Research Chair in International Political Economy
Université Laval, Canada
Jean-Frédéric.Morin@pol.ulaval.ca

Dominique Blümer
ETH Zurich, Switzerland
German Development Institute/ Deutsches Institut für Entwicklungspolitik (DIE)

Clara Brandi
German Development Institute/ Deutsches Institut für Entwicklungspolitik (DIE)

Axel Berger
German Development Institute/ Deutsches Institut für Entwicklungspolitik (DIE)

Abstract: Most recent preferential trade agreements (PTAs) include environmental provisions. While a number of these environmental provisions remain rare and are incorporated in just a few PTAs, others are widely popular and are duplicated in more than 100 PTAs. We still lack a convincing explanation for this varying frequency. While the diffusion literature typically tries to explain how diffusion occurs, we investigate why certain provisions diffuse more often than others. We hypothesise that the initial conditions under which provisions first emerge determine the scope of their diffusion. Our results support this hypothesis and indicate that provisions originating from intercontinental agreements diffuse more often than others. At the same time, provisions first designed by economically powerfully or environmentally credible countries are not related to more frequent occurrences of diffusion. These findings are of interest for the literatures on international institutions' design, interaction, and diffusion.

JEL codes: F18, F02, F13, F14, K32, K33, Q56

1 Introduction

Recent preferential trade agreements (PTAs) include ever more far-reaching provisions on environmental protection (Milewicz et al., 2016; Lechner, 2016; Morin et al., 2018). Such PTA provisions do not just appear in the form of exceptions to trade commitments for environmental purposes, modelled on Art. XX of the General Agreement on Tariffs and Trade (GATT). Rather, they include specific prescriptions, requiring states to adopt high environmental standards. Some of these provisions address specific environmental issues, such as the protection of fish stocks, deforestation, and the mitigation of CO2 emissions. Other environmental provisions promote the harmonisation of environmental policies, encourage trade in environmental goods, reinforce multilateral environmental agreements (MEAs), or call for the transfer of green technologies to developing countries. Modern PTAs also include various instruments to support the implementation of these environmental provisions, ranging from intergovernmental committees to binding dispute settlement mechanisms.

Negotiators rarely reinvent the wheel when integrating environmental provisions in new PTAs. Most of the time, they copy environmental provisions that have been included in their earlier PTAs, their trading partners' PTAs or even third countries' PTAs (Alschner et al., 2017; Allee and Elsig, 2016; Baccini et al., 2014). For example, while the Transpacific Partnership concluded in 2015 entails a record number of environmental provisions, only one of them, on fisheries, is really a new provision (Morin et al., 2017).[1] All the other provisions included in the 26-page long chapter devoted to the environment were duplicated from previous PTAs.

This uncoordinated spread of similar policy models among interdependent political units is often referred to as policy diffusion (e.g. Elkins and Simmons, 2005: 34-35). Consider the following diffusion of a provision that states that certain MEAs shall prevail over the trade agreement in case of legal inconsistency. This provision was first introduced in the trade system with the conclusion of the North American Free Trade Agreement (NAFTA) in 1992 (article 104). It was subsequently replicated in dozens of trade agreements, including in PTAs that involve none of the NAFTA partners, such as the 2008 agreement between ASEAN and Japan.

While some environmental provisions were duplicated in more than 100 PTAs, other environmental provisions are only rarely included in subsequent PTAs or are unique to only one PTA (Morin and Gauthier-Nadeau 2017). For example, the requirement to ratify the

[1] Due to the withdrawal of the US from the agreement the other 11 signatories signed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership. The main text, including the environmental provisions, of the new agreement remains largely unchanged.

Montreal Protocol on the Ozone Layer is unique to the 1993 agreement establishing the Common Market for Eastern and Southern Africa. No other PTA has replicated this requirement. This article addresses this puzzle and investigates why certain environmental provisions diffuse more than others.

Explaining the diffusion rate of environmental provisions in PTAs matters for several reasons. First, a number of studies suggest that the inclusion of environment-related content in PTAs is linked to improved environmental performance (Baghdadi et al., 2013; Jinnah and Morgera, 2016; Bastiaens and Postnikov, 2017; Martinez-Zarzoso 2018). Thus, understanding the conditions of their diffusion matters for those who care about environmental performance and would like to see more of these provisions diffusing into the trade regime. Second, it is important to study the diffusion of environmental provisions in order to better understand how the increasingly fragmented trade governance architecture remains coherent and relatively ordered (Biermann et al., 2009). While the entropic forces that contribute to fragmentation are relatively well known, including coalitions obstructing multilateralism and power asymmetries fuelling bilateralism, the forces that glue the trade regime together and prevent it from falling into a regulatory chaos are less well understood. Third, it is necessary to understand under which conditions environmental provisions diffuse in order to assess the prospect and the legitimacy of a potential future multilateralisation of environmental provisions (Morin et al. 2019). If the diffusion of environmental PTA provisions is driven merely by powerful countries taking advantage of asymmetrical power relations, then their multilateralisation might be viewed as a hegemonic enterprise. If the diffusion of environmental provisions is instead driven by environmental leaders, then the fragmentation of trade governance could be regarded as productive from the perspective of environmental protection.

In this article, we hypothesise that the initial conditions under which provisions first emerge in the trade system determine the scope of their diffusion. In doing so, this article makes two key contributions to current scholarship. First, the existing literature on trade negotiations tends to explore the diffusion of PTAs in general or the diffusion of certain PTA models. We depart from this literature by analysing the diffusion of specific provisions. This fine-grained analysis allows us to offer micro-level insights that are distinct –but related – to the more macro diffusion of PTA models and PTAs in general.

Second, most of the literature on policy diffusion tries to explain how the process of diffusion takes place and assesses the explanatory power of different causal mechanisms (Gilardi, 2013). Elkins and Simmons, for example, make it clear that they study the process of diffusion, not its

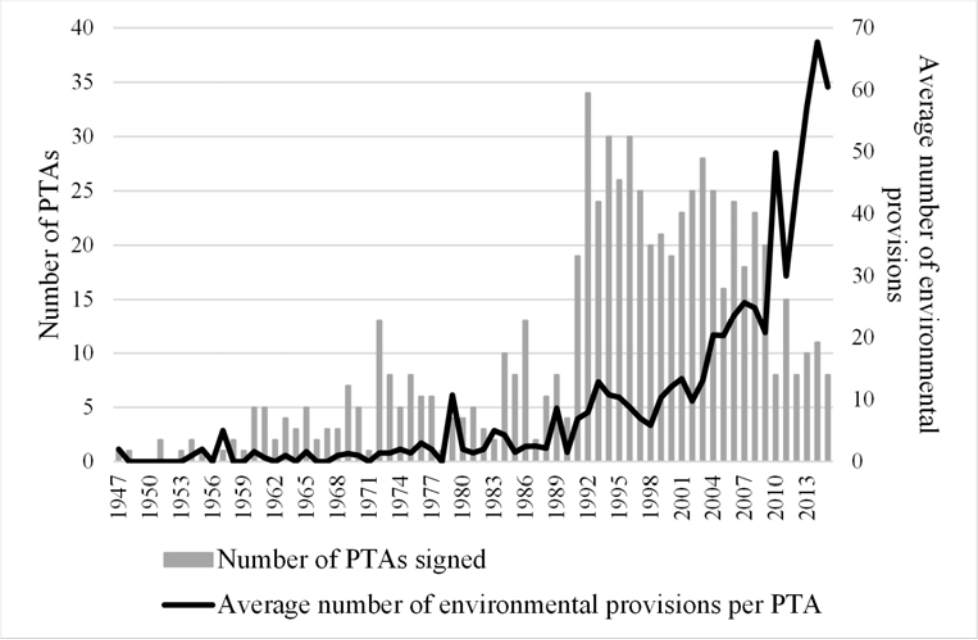
outcome (2005: 33). We take a different but complementary approach by investigating why certain provisions diffuse more often than others rather than how provisions are diffusing. Our aim is to explain the diffusion outcome, not document the diffusion process.

The remainder of this article is structured as follows. Section 2 provides a review of the relevant strands of literature. Section 3 outlines hypotheses about the determinants of diffusion outcomes. Section 4 contains a description of the data and methodology used for the empirical analysis. Section 5 presents our findings on the determinants of diffusion outcomes, and Section 6 undertakes some sensitivity analysis to assess the robustness of the results. Section 7 concludes and discusses the contributions of this research.

2 Institutional design, interaction and diffusion

This article builds on three distinct strands of literature. First, it contributes to the literature on the design of PTAs (e.g., Hafner-Burton, 2009; Büthe and Milner, 2014; Baccini et al., 2015; Bearce et al., 2016). In earlier studies, PTAs were grouped by whether they favour deep or shallow commitments (Dür et al., 2014), positive or negative integration (Kim and Manger, 2013), and WTO-plus or WTO-extra obligations (Horn et al., 2010; Kohl et al., 2016). This article looks more specifically at environmental provisions as an increasingly important subset of PTA design features. Figure 1 plots the number of PTAs signed since 1947 as well as the average number of environmental provisions per agreement. The importance of environmental provisions becomes evident since the 1990s, with a sharp increase in the most recent decades.

Figure 1: Average number of environmental provisions per agreement



Some studies have already documented the incorporation of environmental provision as an increasing feature of PTA design. Many of these studies analyse the design of only a small and unrepresentative sample of PTAs (Jinnah and Morgera, 2013; Bastiaens and Postnikov, 2017; OECD, 2007). Those that have looked at a more comprehensive collection of PTAs ask why PTAs include environmental provisions and do not offer any explanation why some provisions diffuse more often than others (Lechner, 2016; Milewicz et al., 2016; Morin et al., 2018).

The second strand of scholarship informing this article is on institutional interactions. This literature argues that international agreements are not negotiated in an institutional vacuum and do not develop in isolation from one another, as initially assumed by the earlier regime theory and some of the treaty design literature. Instead, this literature emphasises that new institutions are embedded in a broader complex and interact with each other (Raustiala and Victor, 2004; Keohane and Victor, 2011).

The relation between the trade and the environment regimes is one of the most puzzling and widely studied institutional interactions (e.g. Oberthür and Gehring, 2006; Zelli et al., 2013; Jinnah and Morgera, 2016; Bastiaens and Postnikov, 2017; Johnson, 2015; Hauer and Runge, 1999; Melser and Robertson, 2005; Egger et al., 2013). While one might presume that trade and environmental agreements are in frequent opposition as each has adverse consequences for the other, they co-evolve with little open conflict or blatant legal incompatibility. This co-evolution occurs in part thanks to the gradual introduction of environmental provisions into PTAs, mitigating the risk of legal conflict. These provisions include exceptions to specific trade commitments to fulfil the requirement of an environmental agreement, the appointment of environmental experts to assist trade arbitrators, and the explicit prevalence of a set of environmental agreements over an entire trade agreement. Yet, some of these rules are not widely replicated and it remains unclear how they can further diffuse in the trade system to increase the predictability of these institutional interactions.

The third main source of inspiration for this article is the policy diffusion literature. Much of this literature focuses on the processes driving the diffusion of policies from one country to another. These processes can be grouped into four main categories, namely coercion, competition, learning and emulation (Dobbin et al., 2007; Elkins and Simmons, 2005; Gilardi, 2013). Studies have assessed the explanatory power of these processes to account for the diffusion of environmental (Tews et al., 2013) and trade policies (Simmons and Elkins, 2004). Several contributions to this literature claim that characteristics of the source or the adopting

actor make diffusion more or less likely (Gilardi, 2010; Fay and Wenger, 2015; Martin, 2010; Makse and Volden, 2011; Mesequer, 2006; Neumayer and Plümper, 2012; Shipan and Volden, 2008).

Yet, this article adds to the policy diffusion literature in different ways. Most studies ask how policies diffuse rather than why certain policies diffuse more often than others. As such, they look at cases of successful diffusion, rather than cases with varying degrees of diffusion. Also, diffusion experts tend to look at international treaties as part of the causal process driving diffusion from one domestic legal system to another, but not as the original source nor the final destination of the diffusion process, as this article does.

In short, this article speaks to the treaty design literature by seeking to explain the frequency of certain treaty provisions, to the institutional interaction literature by building on the assumption that some earlier treaties influence the content of later ones, and to the policy diffusion literature by studying the conditions that can kick-start a diffusion process.

Other studies have blended similar strands of literature. Building on the policy diffusion and institutional interaction literature, some studies explain the dyadic presence or the absence of a PTA between two countries by a contagion effect, by which countries are induced to sign an agreement if their neighbours or their peers have previously signed a similar agreement (Baccini and Dür, 2012; Egger and Larch, 2008; Chen and Joshi, 2010; Tobin and Busch, 2010; Baldwin and Jaimovich, 2012). These studies, however, tend to ignore the design of PTAs and assume that all PTAs are similar. Only recently have studies implemented a finer grained level of investigation, thanks to new databases offering more specific information on the content of PTAs. For example, Milewicz et al. (2016) explain the diffusion of comprehensive PTAs addressing non-trade issues by network pressures created by earlier PTAs. This article privileges an ever-finer grain of analysis. Rather than studying the diffusion of PTAs in general or the diffusion of certain models of PTAs, it looks at what drives the diffusion rate of specific provisions.

Digging into a fine-grained level of analysis is important to understand trends at higher levels of analysis. Research can be conducted at the macro-level of a treaty (e.g. sign or not sign), the meso-level of a treaty class (e.g. negative or positive integration), or the micro-level of specific provisions (e.g. the inclusion of the precautionary principle or not). Competition between various models of PTAs at the meso-level can fuel the proliferation of PTAs in general at the macro-level. In turn, we can assume that competition among PTA models is fuelled by the diffusion of some specific provisions at the micro-level.

Other recent studies at this micro level have looked at the diffusion outcomes of a few specific PTA provisions. For example, Kim and Manger (2016) and Pelc (2016) studied diffusion of exceptions to service liberalisation and escape clauses, respectively. They found that strong path-dependence explains the success of the most widely diffused provisions. In contrast to these studies, however, we do not focus on a few specific provisions that have successfully diffused, but we look at several different environmental provisions, some of them have widely diffused while others have not. In doing so, we hope to contribute to the uncovering of the inter-institutional determinants of diffusion outcomes in PTA design.

3 Explaining successful diffusion by conditions of emergence

We expect that the scope of diffusion of a specific environmental provision is related to the conditions of its first introduction in the trade system. This expectation is consistent with studies on policy diffusion across domestic systems (Miller, 2003) and international norms dynamics (Finnemore and Sikkink, 1998).[2] These strands of literature argue that the origin of a policy or a norm will likely impact its acceptance and its reproduction rate by making it either more appealing, more prominent, or more competitive. Following this line of argument, we look at the agency as well as the institutional dimension of the emergence of an environmental provision to predict its diffusion outcome. More specifically, we expect two different types of conditions to determine the diffusion outcomes of PTA environmental provisions: i) the characteristics of the country that first introduced them and ii) the characteristics of the agreement in which they first appeared.

First, we expect that the diffusion of environmental provisions can be explained by characteristics of the innovating country that first introduced it in a PTA. We believe that two characteristics of the innovating country matter. The first is its bargaining power. Whether through imperialistic, coercive, or knowledge-based means, the stream of diffusion usually proceeds from the most powerful actor to the least powerful one (Ikenberry and Kupchan 1990). While less powerful countries are not merely passive containers of alien norms, they do not have the same capacity to diffuse their norms globally as powerful countries do (Dobbin et al., 2007). The NAFTA agreement is a case in point. While the agreement was highly innovative, with about half of its environmental provisions being actually unprecedented, the agreement would probably not have had such an impact on the international trading system without the

[2] At the same time, the policy diffusion literature typically pays little attention to the initial factors that influence the diffusion (or non-diffusion) of certain policy models (Holzinger and Knill 2005; Meseguer and Gilardi 2009; Graham *et al*. 2013).

US being its main architect. Many of the NAFTA environmental provisions have been replicated by the US in its subsequent treaties with other countries, as the US has the capacity to impose its template agreement on its partners. Knowing that NAFTA provisions would likely become expected standards in trade negotiations, thirds countries have themselves replicated these provisions in their own PTAs. Powerful countries, therefore, may have clear leverage in influencing the uptake of their novel provisions in PTAs that they themselves negotiate with a weaker partner. Moreover, we expect that the legal innovations introduced by powerful countries are more likely to attract attention and can be expected to become global standards. Third countries might want to duplicate these innovations in their own template, especially if they hope to conclude a PTA with these more powerful partners in the future. Thus, our first hypothesis relating to the agency dimension is the following:

> *H1a: Environmental provisions that are first introduced by a powerful country diffuse more often than those introduced by less powerful countries.*

Second, we expect that countries with a strong environmental credibility record are more likely to see the environmental provisions that they have originally designed be duplicated by other countries. If environmentally credible countries are considered "norm entrepreneurs," they might prompt other countries to take up their standards (Finnemore and Sikkink, 1998). The adoption of environmental PTA provisions by environmentally credible countries sends a signal to other countries about the importance and the expected effectiveness of such a policy innovation. Countries that want to improve their own environmental credibility are likely to emulate countries they perceive to be the most credible. For example, the European Union, which is seen as a credible player on climate change policy, has recently announced that it will systematically include a reference to the Paris Agreement in its future trade agreements (Stone 2018). This will likely set a new standard in trade negotiations for countries that care about climate change. Therefore, our second hypothesis relating to agency is the following:

> *H1b: Environmental provisions that are first introduced by a country with a good environmental record diffuse more often than those introduced by countries with a weak record.*

A second set of hypotheses puts the spotlight on the institutional characteristics of PTAs in which the environmental provision was first included. One expectation is that negotiators are likely to duplicate the provisions that they know best or that are closest to them. As DiMaggio and Powell point out (1983), the proliferation of institutions provides negotiators with strong incentives to favour "institutional isomorphism". By duplicating existing provisions, they have

already endorsed, negotiators can rationalise their limited resources while engaging in simultaneous negotiations, and they can reduce transaction and management costs that arise from the supervision of several negotiations (Allee and Elsig, 2016). Other studies have found that the number of entities that have previously adopted a policy influences the subsequent uptake by other entities (Levi-Faur, 2002). We therefore expect that the more countries have signed up to a certain design feature, the stronger the signal is that is sent to the other countries that have not yet adopted this policy.

> *H2a: Environmental provisions diffuse more often if they were first introduced by a PTA with a large number of parties.*

The policy diffusion literature shows that countries often adopt the policies of other countries from their region (Weyland, 2005; Simmons et al., 2008). For example, if a Caribbean country signed up to a set of specific environmental provisions, then other Caribbean countries may conclude that these provisions are also acceptable or even helpful given their specific needs, capacities, and preferences. This might explain that the literature on network analysis (e.g., Cao, 2010; Hollway and Koskinen, 2015) and the literature on contagion (Egger and Larch, 2008; Chen and Joshi, 2010; Baldwin and Jaimovich, 2012; Baccini et al., 2012; Baccini and Dür, 2012) have found that that cross-regional agreements can better pollinate different regions. Insofar as countries are induced to sign an agreement if their neighbours have previously signed a similar agreement, cross-regional PTAs are more likely to pollinate more than one region. We can expect that the inclusion of certain provisions in intercontinental agreements sends out a stronger signal to other countries within the regions involved, by drawing more attention to the content of these agreements, making these pieces of information more readily available for policy learning (Poulsen, 2014). Moreover, when countries from more than one region with varying social, economic, cultural and ecological conditions are involved in the introduction of a new provision, this consensus makes the relevant provisions more likely to be of interest for and accepted by many – and thus likely diffuse successfully.

> *H2b: Environmental provisions that are first introduced in an intercontinental PTA diffuse more often than those introduced in PTAs that entail only parties from one region.*

4 Data, methodology and descriptive statistics

Our analysis relies on the TREND dataset (Morin et al., 2018). This comprehensive dataset covers 685 trade agreements signed between 1945 and 2016 and identified by the Design of

Trade Agreements (DESTA) project (Dür et al., 2014)[3]. TREND also stands out because of its fine-grained content-based coding of 283 different environmental provisions, some of which are very common while others are found in only one or two agreements. In our analysis, we incorporate 259 provisions that are sufficiently distinct from each other to be treated as independent observations.[4]

Our dependent variable, *total diffusion*, is defined as the number of times an environmental provision is adopted in further agreements after its first introduction. Diffusion can also be defined more exclusively to cover only the adoption of a design feature in treaties concluded between third parties, not treaties involving those countries that have participated in the original development of the design feature (Elkins and Simmons, 2005). We therefore propose an alternative definition of the dependent variable, *external diffusion*, which is defined such that we count only those treaties after the provision's first introduction in which none of the innovating parties is involved.[5] For example, if a clause first appeared in the trade law system with the conclusion of NAFTA in 1992, its reproduction in the 2003 US-Chile agreement would be included in *total diffusion*, but it would not count as an occurrence of *external diffusion*. However, the reproduction of the same clause in the 2002 agreement between the European Union and Chile would be included in external diffusion, as neither the European Union nor Chile are parties to NAFTA.

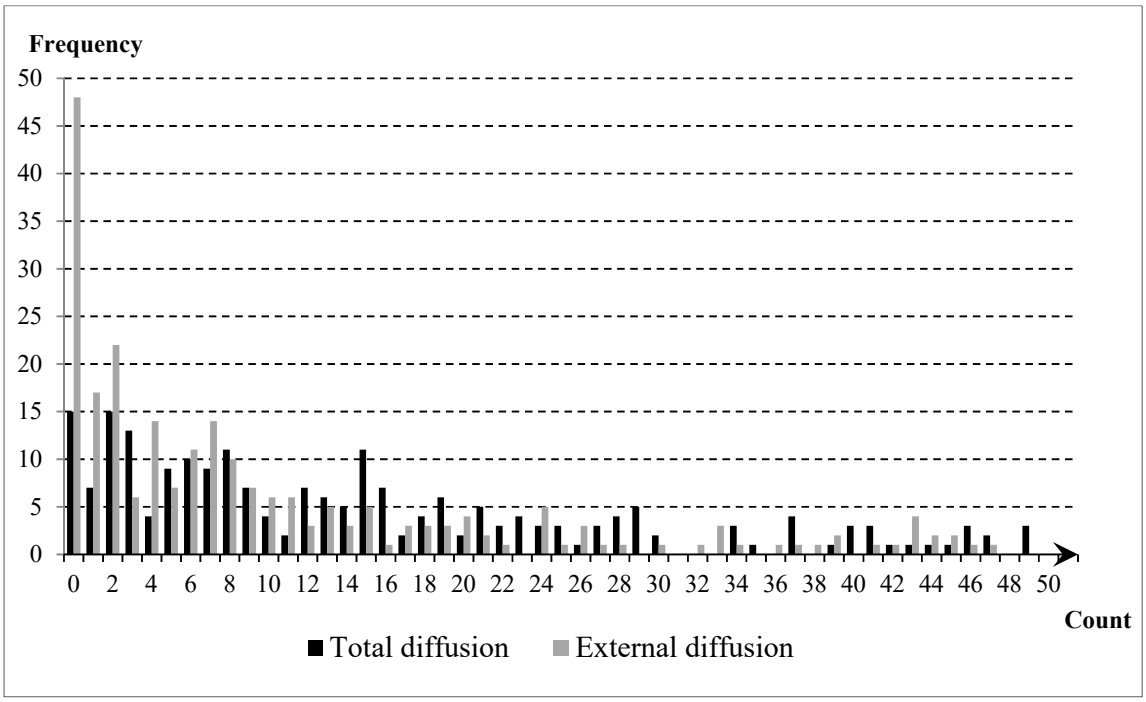
Figure 2 illustrates the distribution of the independent variables. Both dependent variables, total and external diffusion, are right-skewed, indicating that a large number of provisions diffuse only a couple of times after their first introduction. We therefore opt for a count data approach in our empirical analysis of diffusion outcomes. The test for equidispersion rejects the Poisson distribution as a good fit for our data in all specifications, leading to our choice of the negative binomial.

[3] The TREND dataset, which supports the findings of this study, is openly available at www.trend.ulaval.ca.

[4] In such cases where two related provisions depend on each other and can only occur together, we treat them as one.

[5] We assume that the policy decisions that lead to the uptake of environmental provisions are interdependent. It is unlikely that two sets of negotiators will design the same specific provision independently, a process often referred to as spurious diffusion (e.g. Braun and Gilardi 2006: 305; Kelemen and Sibbitt 2004). This is mainly due to the nature of our fine-grained data: we assume that spurious diffusion is unlikely with highly specific and narrowly defined design features. This is further supported by evidence that negotiators closely monitor third countries' trade agreements to find inspiration for their environmental provisions (OECD 2007; Morin and Rochette 2017: 28).

Figure 2: Frequency of diffusion counts



Note: For better readability, the x-axis was cut off at 50. There are, however, some provisions that have diffused significantly more often. For total diffusion, the mean diffusion count is 28.5, the median is 15. For external diffusion, the mean diffusion count is 16.8, the median is 7. Please refer to Table 1 for summary statistics of the independent and dependent variables.

Our data allows us to identify exactly how many times diffusion could have occurred. In our empirical analysis of (external) diffusion counts, we therefore include the number of (external) PTAs signed after the environmental provision's first introduction as the exposure variable. We use robust standard errors for all our estimations to remedy potential misspecification of the variance. As a measure for the goodness of fit we calculate the squared correlation coefficients between the fitted and the actual counts.

The level of observation is the provision, as opposed to the agreement or the dyad in earlier studies. This means that our approach entails investigating how well we can predict the dependent variable (the diffusion counts of each provision *i*) by the conditions of its emergence, namely the characteristics of the country first introducing provision i and the characteristics of the agreement first introducing provision i.

In defining the innovating country for H1a and H1b, we need to make assumptions about which country was the driving force behind the introduction of a new environmental provision. We

propose two alternative logics to define the innovator.[6] First, we assume that the country with the most economic power drives the inclusion of a new environmental provision. The country with the most economic power is assumed to be most capable of designing new PTA elements and convincing the negotiating partners to agree to them. We measure economic power by GDP, divided by world GDP, at the time of signature, based on the World Development Indicators (World Bank, 2016). As an alternative for measuring economic power, we use GDP per capita in constant USD (World Bank, 2016). Second, we propose that the PTA member with the best environmental track record was the one asking for the introduction of new environmental provisions into the PTA. We thus identify the innovator as the country with the highest environmental credibility among PTA members. We calculate an indicator based on the International Environmental Agreements (IEA) database (Mitchell, 2017) and measure environmental credibility by the share of MEAs the country has ratified up to the year of the PTA signature, assuming the country that performs best in terms of MEA ratification is also the one bringing environmental norms to the table in trade negotiations. In most cases, the most powerful country in economic terms is also the environmental leader, i.e. there is a substantial overlap between the two definitions of the innovating country. In 22.4 % of the PTAs, we select different countries as innovators depending on the definition we choose. In the case of the China-Switzerland PTA signed in 2013, for example, the first assumption leads us to attribute all new provisions introduced to efforts of China, the more powerful partner in economic terms. Based on this assumption, we tested H1a and H1b using the country characteristics of China. The alternative assumption suggests that legal innovations were the result of Switzerland's entrepreneurship, as Switzerland is the most environmentally credible partner of the China-Switzerland PTA. For this reason, H1a and H1b were tested again with the country characteristics of Switzerland. We acknowledge the disadvantages of making strong assumption about the innovating country in a PTA. Against this background, using different definitions of the innovating country also serves as a means to test how sensitive our results are to these different assumptions.

To test for the determinants of diffusion outcomes and identify which of the innovating country's characteristics are associated with higher adoption in other agreements (H1a and H1b), we use our measures of economic power and environmental credibility as explanatory variables. The EU is treated as one country, since it operates as a single actor in trade

[6] These two alternative assumptions related to power and environmental credibility should be distinguished from our hypotheses related to power and environmental credibility. The former are used in a first stage to identify the innovative country, the latter are tested in a second stage to explain the frequency of diffusion.

negotiations. Exceptions are the European integration treaties in which the interests of each member state come into play separately, so we consider the country level more appropriate.

To circumvent the problem of finding the one innovator for a given innovative agreement, we use PTA averages of GDP and environmental credibility. However, these averages would mask the outstanding characteristics of individual countries that H1a and H2b predict to contribute to kick-starting diffusion processes. As an additional check to unpack the power dynamics, we thus investigate whether the involvement of an EU country or the US in the innovating PTA has an impact on the frequency of a provision's diffusion.

As discussed in Section 3, we also hypothesize that the characteristics of the innovating agreement play a role in the diffusion of provisions. We therefore include the number of member states to test H2a and a dummy for intercontinental agreements to test H2b. This information is based on the DESTA dataset provided by Dür et al. (2014).

Since there is significant heterogeneity across environmental provisions, we control for the objective of different types of environmental provisions. While some provisions are clearly related to environmental governance and are deprived of trade implications, others focus more clearly on trade governance or on the coherence across different policy realms. To control for these different objectives, we sort all environmental provisions of the TREND database into eight dimensions according to their main objective, namely promoting environmental protection (i.e., general principles related to environmental protection, obligations for the sustainable use and conservation of natural resources, and clauses on very specific environmental issue areas), ensuring policy coherence between environmental regulation and other policy areas, promoting development-related aspects (i.e., establishing means to support capacity building, technology transfers, disaster relief, etc.), reinforcing MEAs, safeguarding regulatory space for environmental measures, levelling the playing field between countries (e.g., by harmonising their environmental standards), and implementing and enforcing environmental provisions (see Appendix A for details).

We also control for the nature of the innovative provision by taking the specificity of provisions into account. We expect that provisions that are more specific will diffuse less often. One reason is that some specific provisions (such as environmental exceptions for services, public procurement, and intellectual property rights) will only show up in future agreements if these areas are covered in the agreements in the first place. Another reason is that specific environmental issues, such as forestry, fisheries, desertification, nuclear accidents, and oil

spills, may only be of interest to a few countries. We use a dummy variable with a value of 1 when the environmental provision deals with a specific issue or relates to a specific PTA chapter that is not prevalent in all PTAs, and a value of 0 otherwise. Table 1 provides descriptive statistics for the dependent, explanatory, and control variables.

Table 1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Total diffusion	259	28.4672	40.1645	0	323
External diffusion	259	16.6988	27.0617	0	190
Total diffusion (excluding intra-EU)	259	27.5599	39.6976	0	323
External diffusion (excluding intra-EU)	259	16.4015	26.8784	0	190
PTAs since innovation	259	381.3398	196.1159	1	684
PTAs since innovation (excluding intra-EU)	259	375.0541	192.6196	0	670
External PTAs since innovation	259	314.9344	169.7370	0	598
External PTAs since innovation (excluding intra-EU)	259	312.1815	168.6026	0	586
Number of parties	259	23.5174	30.8862	2	123
Intercontinental agreement	259	0.3784	0.4859	0	1
Economic power of innovator (defined by GDP/world GDP)	256	0.1873	0.1119	0.0003	0.3087
Economic power of innovator (defined by GDPpc)	256	34034.39	15128.85	851.07	78699.23
Economic power of innovator (defined by environmental credibility)	256	0.1773	0.1301	0.0002	0.3415
Economic power (GDP, PTA average)	251	25.34	2.31	21.25	30.34
Environmental credibility of innovator (defined by GDP/world GDP)	256	0.2541	0.0701	0.0041	0.4762
Environmental credibility of innovator (defined by GDPpc)	255	0.2712	0.0773	0.0213	0.3484
Environmental credibility of innovator (defined by environmental credibility)	259	0.2816	0.0751	0.0385	0.4762
Environmental credibility (PTA average)	259	0.1796	0.0812	0.0086	0.3081
MEAs	259	0.2239	0.4177	0	1
Enforcement	259	0.0965	0.2959	0	1
Development	259	0.0579	0.2340	0	1
Environmental protection	259	0.2548	0.4366	0	1
Level playing field	259	0.0502	0.2188	0	1
Policy coherence	259	0.0849	0.2793	0	1
Implementation	259	0.1042	0.3062	0	1
Regulatory space	259	0.1274	0.3341	0	1
Issue-specific	259	0.5792	0.4947	0	1
EU involved	259	0.4298	0.4947	0	1
US involved	259	0.3205	0.4676	0	1

5 Empirical analysis: Determinants of diffusion outcomes

Table 2 presents the average marginal effects from the negative binomial models for total diffusion counts. We report the results for different definitions of the innovating country, economic power and environmental credibility.

The first variables address characteristics of the innovating country. Contrary to H1a, higher economic power of the innovating country does not translate into stronger diffusion for any of the specifications. Likewise, the involvement of the EU or US does not result in a higher frequency of diffusion. These results go against the expectation, widely shared in the literature, that power is an important factor for explaining diffusion. However, these results do not rule out that bargaining power does play an important role during the negotiation process. It may be the case that environmental provisions are included in a PTA in the first place due to the insistence of a powerful country. What our results suggest is that the bargaining power of the innovating country do not play a significant role for the diffusion of these provisions in subsequent agreements.

Our results on the innovating country's environmental credibility are more in line with our expectations (H1b). The positive and significant marginal effect in Columns 1 indicates that higher environmental credibility of the innovator can translate into better diffusion outcomes. When we assume that the innovator of a new environmental provision is the most powerful country among the PTA members, provisions are more frequently adopted if those countries are more environmentally credible and potentially less suspect to green protectionism. However, the positive effect of environmental credibility of the innovator is not consistent across the different specifications. When we define the innovating country based on environmental credibility, GDP per capita or when using PTA averages, none of the country characteristics seem to matter for explaining diffusion outcomes. We therefore conclude that neither economic power nor environmental credibility are good predictors of explaining the varying frequency of provisions.

Regarding characteristics of the innovating agreement, the sign of the marginal effect on the number of member states contradicts H2a: it suggests that the more member states involved in the innovating agreement, the less often the environmental provisions diffuse. However, PTAs with a large number of members are frequently intercontinental ones, i.e. it is possible that the dummy indicating intercontinental agreements picks up the positive effects that we expected from the number of member states. Moreover, the size of the average marginal effect is negligible; one additional party to the agreement introducing the provision correlates with diffusion to about 0.2 fewer agreements, that is, a reduction of five parties would be needed for diffusion to one additional PTA.

Importantly, we find that provisions introduced in an intercontinental agreement diffuse significantly more often. This is in line with our expectation that when diverse partners are

involved in the introduction of a new provision this consensus makes it more likely to be widely accepted by those involved, and by external countries in later agreements (H2b). According to our calculation of average marginal effects, provisions introduced by intercontinental agreements diffuse an additional 18-20 times in the case of total diffusion, and an additional 11-13 times in the case of external diffusion.

Moreover, we find that innovative provisions that deal with countries' regulatory spaces diffuse significantly more often than provisions belonging to the base category (references to MEAs). This finding is statistically significant at the 1% level and robust across all model specifications. It indicates that several countries have an interest in explicitly safeguarding their right to regulate in environmental matters and protecting themselves from trade disputes in this area. We also find that provisions that are strictly on environmental protection as well as those on policy coherence diffuse more often and, in the case of external diffusion, so do provisions on development and implementation (see Appendix A for a description of these categories of environmental provisions).

Interestingly, provisions that aim at levelling the playing field do not diffuse significantly more often across all specifications. These provisions include obligations to harmonise and not lower environmental standards. Insofar as these types of provisions represent the specific offensive interests of economically powerful countries, they might not be designed in ways that are appealing to a broad range of countries.

As expected, provisions that deal with specific issues diffuse significantly less often than general ones. On average, they diffuse to 10-11 fewer agreements than more general provisions. Less specific provisions might not only speak to a broader set of actors, but also imply reduced risks, in the sense that the more precise the rules are, the more parties have their hands tied.

The vast majority of our results are valid irrespective of the type of diffusion (see Table 3). In particular, our results indicating that provisions diffuse more often when the innovating PTA is intercontinental and the innovating country is environmentally credible hold both for total diffusion (counting all occurrences of the provisions including for PTAs where the same members are involved as in the innovating PTA) and external diffusion (counting only occurrences in third countries not involved in the innovating PTA). This suggests that, in both cases, similar mechanisms are at work for kick-starting diffusion processes.

Overall, the empirical findings suggest that institutional factors play a more important role for the diffusion of environmental provisions in PTAs than agency factors. In particular, provisions

that are first designed in an interregional context, and with a focus on regulatory space or policy coherence, tend to be more "successful" in their diffusion. We conclude that the institutional characteristics of the base agreement and the type of provision introduced matter more than the characteristics of the countries who are introducing new provisions.

Table 2: Total diffusion (negative binomial regression, average marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)
Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-40.16**		-15.00			
	(15.82)		(10.87)			
Economic power (GDP/world GDP)		2.74e-05				
		(0.000132)				
Economic power (GDP, PTA average)				1.089		
				(1.004)		
Environmental credibility	64.52***	7.464	25.90	-8.013		
	(21.58)	(22.42)	(17.40)	(31.48)		
EU country involved					-1.234	
					(4.315)	
US involved						-0.744
						(3.839)
Intercontinental agreement	18.15***	19.18***	19.83***	18.32***	20.45***	20.26***
	(4.311)	(4.328)	(4.280)	(4.510)	(4.519)	(4.605)
Number of member states	-0.188**	-0.254***	-0.254***	-0.210***	-0.253***	-0.265***
	(0.0753)	(0.0708)	(0.0726)	(0.0757)	(0.0856)	(0.0756)
Enforcement	-2.749	-3.431	-2.613	-2.523	-3.705	-3.431
	(4.509)	(4.383)	(4.587)	(4.355)	(4.417)	(4.622)
Development	9.871	7.128	8.511	7.007	6.566	6.258
	(6.744)	(6.490)	(6.549)	(6.587)	(6.212)	(6.188)
Environmental protection	6.789*	6.568	6.637*	6.577*	6.578*	6.325
	(3.789)	(4.032)	(3.763)	(3.656)	(3.901)	(3.960)
Level playing field	5.516	3.241	3.849	3.920	3.118	2.988
	(6.168)	(5.849)	(6.002)	(5.725)	(5.744)	(5.795)
Policy coherence	12.87**	14.40**	14.63**	14.96**	13.96**	13.84**
	(5.529)	(6.011)	(5.900)	(5.928)	(5.764)	(5.897)
Implementation	7.343	6.408	6.710	4.387	5.918	5.779
	(5.690)	(5.690)	(5.522)	(5.219)	(5.391)	(5.326)
Regulatory space	24.81***	30.06***	25.26***	28.83***	29.96***	30.38***
	(7.010)	(8.055)	(6.997)	(7.239)	(7.642)	(7.720)
Issue-specific	-11.34**	-11.89**	-11.12**	-11.76**	-12.55**	-12.65**
	(5.019)	(5.159)	(5.119)	(4.930)	(4.952)	(4.924)
Squared correlation coefficient	0.4356	0.4034	0.4043	0.3978	0.4283	0.4273
Observations	256	255	256	251	259	259

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 3: External diffusion (negative binomial regression, average marginal effects)

	(7)	(8)	(9)	(10)	(11)	(12)

Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-47.93***		-24.97***			
	(14.21)		(9.306)			
Economic power (GDPpc)		2.19e-05				
		(0.000114)				
Economic power (GDP, PTA average)				0.411		
				(0.803)		
Environmental credibility	31.79*	-23.10	-1.719	-44.98*		
	(16.80)	(18.30)	(13.13)	(23.55)		
EU country involved					-4.896	
					(3.122)	
US involved						-4.940
						(3.155)
Intercontinental agreement	11.36***	11.71***	12.45***	10.52***	11.92***	11.40***
	(3.437)	(3.545)	(3.496)	(3.722)	(3.617)	(3.657)
Number of member states	-0.112*	-0.172***	-0.161***	-0.217***	-0.130*	-0.184***
	(0.0626)	(0.0619)	(0.0614)	(0.0746)	(0.0675)	(0.0666)
Enforcement	-1.593	-3.150	-1.914	-2.603	-3.269	-2.322
	(3.058)	(2.881)	(3.081)	(2.866)	(2.796)	(3.060)
Development	9.295*	6.666	7.996*	6.358	6.914*	5.564
	(4.785)	(4.371)	(4.480)	(4.660)	(4.189)	(4.008)
Environmental protection	7.773**	7.483**	7.695**	7.065**	7.504**	6.713**
	(3.029)	(3.238)	(3.041)	(2.922)	(2.962)	(3.043)
Level playing field	4.617	2.510	3.343	3.338	3.570	3.502
	(4.433)	(3.939)	(4.108)	(4.103)	(3.805)	(4.262)
Policy coherence	9.368**	10.32**	10.55**	9.609**	10.95**	10.32**
	(4.448)	(4.799)	(4.786)	(4.745)	(4.965)	(4.988)
Implementation	7.240*	5.465	6.326*	3.301	6.592*	5.706
	(3.993)	(3.882)	(3.825)	(3.536)	(3.916)	(3.692)
Regulatory space	22.43***	26.12***	22.77***	29.57***	26.77***	30.39***
	(5.816)	(6.938)	(5.919)	(7.359)	(6.408)	(7.235)
Issue-specific	-10.34***	-11.28***	-10.56***	-10.46***	-10.61***	-11.40***
	(4.010)	(3.913)	(3.953)	(3.849)	(3.491)	(3.950)
Squared correlation coefficient	0.4017	0.3432	0.3448	0.3454	0.3818	0.3754
Observations	255	254	255	250	258	258

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

6 Empirical analysis: Sensitivity checks

Exclusion of intra-EU treaties from the sample

One may argue that intra-EU trade agreements are not true international treaties but rather European ones comparable with national law. In that sense, they influence EU PTAs in the same way as national law influences the PTAs of other countries. Therefore, as a further robustness check, we exclude all intra-EU treaties (signed after the 1957 Treaty of Rome) from

the diffusion counts (Appendix B, Table B1 and B2). The results are very robust to this alternative specification.

Controlling for the signature period

The negative binomial models presented in Table 2 implicitly consider the impact of time by including the number of PTAs signed after a provision's first introduction as an exposure variable. In addition, we create a categorical variable indicating the period during which the innovating PTA was signed. The results suggest that environmental provisions introduced by PTAs signed between 1981 and 1990, 1991 and 1995, and since 1995 all diffuse significantly less often compared with provisions introduced before 1980 (See Appendix B, Tables B4 and B5). This means that even when controlling for diffusion opportunities through the subsequent number of PTAs as an exposure variable, "old" provisions diffuse more often. It seems these provisions have achieved a certain status that causes them to be replicated in a large number of PTAs. The conclusions with regard to our main hypothesis remain the same: the results are robust to the inclusion of period indicators.

Different model specifications

As can be seen in Figure 2, the dependent variables are skewed to the right. For external diffusion in particular, there seems to be a large number of zero observations. In fact, roughly 19% of environmental provisions in our dataset do not diffuse at all. Since the negative binomial is not designed to handle mass points at zero, we consider the zero-inflated negative binomial as a robustness check. The zero-inflated model assumes that there are "excess zeroes" that originate from a process that is distinct from the process explaining the number of times diffusion occurs. More precisely, a binary process defines whether a provision diffuses or not, while a separate, count process defines the number of times diffusion occurs. We assume that the most sensible argument for non-diffusion is a lack of opportunity to do so. We approximate this lack of opportunity by the number of (external) PTAs signed after the first introduction of the environmental provision and feed this into the binary part of the zero-inflated negative binomial model. We report the results in Appendix B, Tables B5 and B6, respectively. The results are very similar, suggesting that the results are quite robust regarding model specification and that there is no reason to believe that the zero-inflated models are more suitable to describe the underlying process.

7 Conclusion

This article investigates the drivers of diffusion outcomes for PTAs' environmental provisions and identifies a number of factors related to the conditions of emergence that kick-start successful diffusion processes. Environmental provisions diffuse significantly more often when they are introduced through intercontinental agreements. It seems that when more diverse country partners are involved in the introduction of a new provision, this consensus makes it more likely for the provision to be widely accepted in the future and to pollinate external countries across regions. Overall, our findings indicate that institutional factors matter more for the diffusion of environmental provisions in PTAs than agency factors: The type of PTA and the type or provision in question are more relevant for explaining diffusion than who is inserting a new provision .

Against this background, this article contributes to three streams of literature. First, it adds to the policy diffusion literature by investigating the conditions that kick-start diffusion. To the best of our knowledge, this article provides the first statistical analysis of the conditions for successful diffusion outcomes at the provision level in a population of international treaties. Second, this article contributes to the literature on trade and the environment interactions by providing a highly fine-grained empirical analysis of when different types of environmental provisions diffuse successfully across trade agreements. Third, this article speaks to the treaty design literature by pointing to the fact that key sources of influence for treaty designers are credible foreign countries and intercontinental agreements.

Our findings of diffusion outcomes can be explained by various channels and these possible channels should be at the heart of further research on the process of diffusion. At the same time, assessing our findings from the perspective of the literature on diffusion mechanisms provides some preliminary insights. Provisions introduced by powerful countries do not diffuse more often than others. Using the terminology of the policy diffusion literature, our results do not provide empirical support for explanations based on coercion or competition. Instead, our results are consistent with explanations based on learning. Our findings that environmental provisions introduced in intercontinental agreements are more frequently adopted suggest that countries are learning incrementally from the international environment, thus complementing the existing empirical evidence from Gilardi that "tends to support the idea that policy-makers are more likely to adopt a policy if it was successful elsewhere, which suggests that they learn from the experience of others" (2013, 466). Thus, it might be the case that the competition among various models of PTAs (at the meso level), which drives the proliferation of PTAs in

general (at the macro level), is itself fuelled by learning processes (at the micro level). The model that is the most likely to prevail might be the one that appears as the most appropriate to the greatest number of countries, based on lessons from intercontinental agreements.

For future research, we envision investigations on the details of the pertinent mechanisms of diffusion and, more specifically, the process of diffusing across PTAs. In particular, future research could analyse in depth the different driving forces that may explain the adoption of certain provisions or classes of provisions. Complementing our statistical analysis with qualitative methods will help us to shed more light on the relevant mechanisms and the causal processes that fuel diffusion and to investigate more deeply why some provisions diffuse while others do not. Moreover, since most of our hypotheses about diffusion are general in nature, they may be used in studies analysing the drivers and the effects of diffusion of other types of provisions as well, including in other large sets of international treaties, such as provisions found in bilateral investment treaties, double taxation agreements, or regional fisheries management agreements.

References

Allee, T., & Elsig, M. (2016). Are the contents of international treaties copied-and-pasted? Evidence from preferential trade agreements. World Trade Institute Working Paper No 8.

Alschner, W., Seiermann, J., & Skougarevskiy, D. (2017). Text-as-data analysis of preferential trade agreements: mapping the PTA landscape. UNCTAD Research Paper, No. UNCTAD/SER.RP/2017/5, United Nations Conference on Trade and Development.

Baccini, L., & Dür, A. (2012). The new regionalism and policy interdependence. *British Journal of Political Science*, 42(1), 57–79.

Baccini, L., Dür, A., & Elsig, M. (2015). The politics of trade agreement design: revisiting the depth-flexibility nexus. *International Studies Quarterly*, 59(4).

Baccini, L., Dür, A. & Haftel, Y.Z. (2014). Contagion and innovation in international governance: The diffusion of trade agreement design. In *Trade Cooperation: The Purpose, Design and Effects of Preferential Trade Agreements*, edited by A. Dür & M. Elsig, 167-194. Cambridge: Cambridge University Press.

Baghdadi, L., Martinez-Zarzoso, I., & Zitouna, H. (2013). Are RTA agreements with environmental provisions reducing emissions? *Journal of International Economics*, 90(2), 378–390.

Baldwin, R., & Jaimovich, D. (2012). Are free trade agreements Contagious? *Journal of International Economics,* 88(1), 1–16.

Bastiaens, I., & Postnikov, E. (2017). Greening up: The effects of environmental standards in EU and US trade agreements. *Environmental Politics,* 26(5), 847–869.

Bearce, D.H., Eldredge, C.D, & Jolliff, B.J. (2016). Does institutional design matter? A study of trade effectiveness and PTA flexibility/rigidity. *International Studies Quarterly*, 60(2), 307–316.

Biermann, F., Pattberg, P., van Asselt, H., & Zelli, F. (2009). The fragmentation of global governance architectures: A framework for analysis. *Global Environmental Politics,* 9(4), 14–40.

Braun, D., & Gilardi, F. (2006). Taking 'Galton's Problem' seriously: towards a theory of policy diffusion. *Journal of Theoretical Politics*, 18(3), 298–322.Büthe, T., & Milner, H. (2014). Foreign direct investment and institutional diversity in trade agreements: credibility, commitment, and economic flows in the developing world, 1971–2007. *World Politics,* 66(1), 88–122.

Cao, X. (2010). Networks as channels of policy diffusion: explaining worldwide changes in capital taxation, 1998–2006. *International Studies Quarterly,* 54(3), 823–854.

Chen, M.X., & Joshi, S. (2010). Third-country effects on the formation of free trade agreements. *Journal of International Economics,* 82(2), 238–248.

DiMaggio, P., & Powell, W.W. (1983). The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160.

Dobbin, F., Simmons, B. & Garrett, G. (2007). The global diffusion of public policies: social construction, coercion, competition, or learning? *Annual Review of Sociology*, 33: 449–472.

Dür, A., Baccini, L., & Elsig, M. (2014). The design of international trade agreements: Introducing a new dataset. *Review of International Organizations,* 9(3), 353–75.

Egger, P., & Larch, M. 2008. Interdependent preferential trade agreement memberships: an empirical analysis. *Journal of International Economics,* 76(2), 384–399.

Egger, P., Jessberger, C., & Larch, M. (2013). Impacts of trade and the environment on clustered multilateral environmental agreements. *The World Economy*, 36(3), 331-348.

Elkins, Z., & Simmons, B. (2005). On waves, clusters and diffusion: A conceptual framework. *The Annals of the American Academy of Political and Social Science,* 598(1), 33–51.

Fay, D. L., & Wenger, J. B. (2016). The political structure of policy diffusion. *Policy Studies Journal*, *44*(3), 349-365.

Finnemore, M., & Sikkink, K. (1998). International norm dynamics and political change. *International Organization* 52(4), 887–917.

Gilardi, F. (2010). Who learns from what in policy diffusion processes?. *American Journal of Political Science*, 54(3), 650-666.

Gilardi, F. (2013). Transnational diffusion: norms, ideas, and policies, in: W. Carlsnaes T. Risse, and B. Simmons (eds.), *Handbook of International Relations*, London: Sage, 453–477.

Graham, E.R., Shipan, C. & Volden, C. (2013). The diffusion of policy diffusion research in political science. *British Journal of Political Science,* 43(3), 673–701.

Hafner-Burton, E.M. (2009). *Forced to be good: Why trade agreements boost human rights*. Ithaca, N.Y.: Cornell University Press.

Hauer, Grant, & Runge, C. F. (1999). Trade-environment linkages in the resolution of transboundary externalities. *The World Economy*, *22*(1), 25-39.

Hollway, J., & Koskinen, J. (2015). Multilevel bilateralism and multilateralism: states' bilateral and multilateral fisheries treaties and their secretariats, in *Multilevel Network Analysis for the Social Sciences – Theory, Methods and Applications*, edited by E. Lazega, & T. Snijders. Berlin: Springer.

Holzinger, K., & Knill, C. (2005). Causes and conditions of cross-national policy convergence. *Journal of European Public Policy,* 12(5), 775–796.

Horn, H., Mavroidis, P.C., & Sapir, A. (2010). Beyond the WTO? An anatomy of EU and US preferential trade agreements. *World Economy,* 33(11), 1565–1588.

Ikenberry, J., & Kupchan, C. (1990). Socialization and hegemonic power. *International Organization,* 44(3), 283–315

Jinnah, S., & Morgera, E. (2013). Environmental provisions in American and EU free trade agreements: A preliminary comparison and research agenda. *Review of European Community and International Environmental Law,* 22(3), 324–339.

Johnson, T. (2015). Information revelation and structural supremacy: The World Trade Organization's incorporation of environmental policy. *Review of International Organizations,* 10(2), 207–229.

Kelemen, R. D., & Sibbitt, E. C. (2004). The globalization of American law. *International Organization*, 58(4), 103–136.

Keohane, R.O., & Victor, D.G. (2011). The regime complex for climate change. *Perspectives on Politics,* 9(1), 7–23.

Kim, S.Y., & Manger, M.S. (2016). Hubs of governance: path-dependence and higher-order effects of trade agreement formation. *Political Science Research and Methods,* 5(3), 467–488.

Kohl, T., Brakman, S., & Garretsen, H. (2016). Do trade agreements stimulate international trade differently? Evidence from 296 trade agreements. *The World Economy*, 39(1), 97-131.

Lechner, L. (2016). The domestic battle over the design of non-trade issues in preferential trade agreements. *Review of International Political Economy,* 23(5).

Levi-Faur, D. (2002). Herding towards a new convention. On herds, shepherds and lost sheep in the liberalization of the telecommunications and electricity industries. Paper presented at the workshop 'Theories of Regulation', Nuffield College, University of Oxford.

Makse, T., & Volden, C. (2011). The role of policy attributes in the diffusion of innovations. *The Journal of Politics*, 73(1), 108-124.

Martin, C. W. (2010). Interdependence and political ideology: The conditional diffusion of cigarette taxation in US states. *World Political Science*, *6*(1).

Melser, D., & Robertson, P.E. (2005). Eco-labelling and the trade-environment debate. *The World Economy*, 28(1), 49-62.

Meseguer, C., & Gilardi, F. (2009). What is new in the study of policy diffusion? *Review of International Political Economy,* 16(3), 527–543.

Milewicz, K., Hollway, J., Peacock, C., & Snidal, D. (2016). Beyond trade. The expanding scope of the nontrade Agenda in trade agreements. *Journal of Conflict Resolution*.

Miller, J.M. (2003). A typology of legal transplants: using sociology, legal history and Argentine examples to explain the transplant process. *American Journal of Comparative Law,* 51(4), 839–85.

Mitchell, R. (2017). International Environmental Agreements Database Project, Available at http://iea.uoregon.edu/.

Martinez-Zarzoso, I. (2018). *Assessing the Effectiveness of Environmental Provisions in Regional Trade Agreements.* OECD Trade and Environment Working Papers, 2018/02.

Morin, J.-F. and R. Gauthier-Nadeau (2017). Environmental Gems in Trade Agreements: Little-known Clauses for Progressive Trade Agreements. CIGI Papers 148.

Morin, J.-F., Dür, A. & Lechner, L. (2018). Mapping the trade and environment nexus: Insights from a new data set. *Global Environmental Politics,* 18(1), 122-139.

Morin, J.-F., Pauwelyn, J. & Hollway, J. (2017), 'The trade regime as a complex adaptive system: exploration and exploitation of environmental norms in trade agreements, *Journal of International Economic Law*, 20, 2, 365–390.

Morin, J.-F., Brandi, C. & Berger, A. (2019, forthcoming): The Multilateralization of PTAs' Environmental Clauses: Scenarios for the Future? In *The Shifting Landscape of Global Trade Governance: World Trade Forum*, edited by M. Elsig, M. Hahn, & G. Spilker. Cambridge: Cambridge University Press.

Neumayer, E., & Plümper, T. (2012). Conditional spatial policy dependence: theory and model specification. *Comparative Political Studies*, 45(7), 819-849.

Oberthür, S., & Gehring, T. (2006). Institutional interaction in global environmental governance: the case of the Cartagena Protocol and the World Trade Organization. *Global Environmental Politics,* 6(2), 1–31.

OECD (Organisation for Economic Co-operation and Development) (2007). *Environment and Regional Trade Agreements*, Paris, OECD.

Pelc, K.J. (2016). *Making and bending international rules: The design of exceptions and escape clauses in trade law*. Cambridge: Cambridge University Press.

Poulsen, L.N. (2014). Bounded rationality and the diffusion of modern investment treaties. *International Studies Quarterly,* 58(1), 1–14.

Raustiala, K. & Victor, D.G. (2004). The regime complex for plant genetic resources. *International Organization,* 58, 277–309.

Shipan, C.R., & Volden, C. (2008). The mechanisms of policy diffusion. *American Journal of Political Science*, 52(4), 840-857.

Simmons, B A., & Elkins, Z. (2004). The globalization of liberalization: policy diffusion in the international political economy. *American Political Science Review*, 98(1), 171–189.

Simmons, B. A., Dobbin, F. & Garrett, G. eds (2008). *The global diffusion of markets and democracy*. Cambridge: Cambridge University Press.

Stone, J. (2018). EU to refuse to sign trade deals with countries that don't ratify Paris climate change accord. Independent. Monday 12 February 2018.

Tews, K., Busch, P-O., & Jörgens, H. (2003). The diffusion of new environmental policy instruments. *European Journal of Political Research*, 42(4), 569–600.

Tobin, J., & Busch, M. (2010). A BIT is better than a lot: bilateral investment treaties and preferential trade agreements. *World Politics*, 62(1), 1–42.

Weyland, K. (2005). Theories of policy diffusion lessons from Latin American pension reform. *World Politics*, 57(2), 262–295.

World Bank (2016). World Development Indicators, available at http://data.worldbank.org/data-catalog/world-development-indicators.

Zelli, F., Gupta, A., & van Asselt, H. (2013). Institutional interactions at the crossroads of trade and environment: the dominance of liberal environmentalism? *Global Governance*, 19(1), 105–118

Appendix A: Types of environmental provisions in trade agreements

The environmental provisions can be sorted into eight different categories according to their main *objective*:

1. The category *environmental protection* collects all provisions that can be clearly assigned an environmental protection purpose. It includes general principles related to environmental protection, obligations on the sustainable use and conservation of natural resources, and clauses on very specific environmental issue areas.
2. The category *regulatory space* incorporates provisions that more or less explicitly deal with preserving countries' regulatory spaces related to the environment. It includes general and more specific exceptions to liberalisation commitments, exclusions of specific issue areas, as well as the sovereign right to adopt environmental measures ("right to regulate").
3. The *level playing field* category covers provisions that help to establish a level playing field between the parties. These provisions implicitly address the fear that lower environmental standards in other countries create a comparative advantage and encourage trade and investment flows to their detriment. They include obligations to harmonise and not lower

environmental standards as well as requirements to base environmental measures on scientific facts and not use them for green protectionism.

4. The category *policy coherence* deals with coherence between environmental regulation and other policy areas. More precisely, these provisions specify the relationship between the environment and trade and investment rules as well as the interaction between the environment and more specific issue areas, such as transport, tourism or social issues.
5. Provisions in the *development* category take into account the role of economic development. They include provisions acknowledging different development levels of the parties and establishing means to support capacity building, technology transfers, disaster relief, etc. Moreover, this category covers provisions that protect the interests of developing countries, e.g., their sovereignty over genetic resources.
6. The category *multilateral environmental agreements* refers to provisions that make reference to international agreements that address rather specific environmental issues. The provisions in this category may oblige the parties to ratify or implement a certain MEA, and they include specifications on whether the MEA prevails over the trade agreement at hand.
7. The category *implementation* incorporates provisions that specify how the agreement, and more precisely its environmental content, will be implemented. It includes cooperation on establishing institutions for implementation, as well as procedures ensuring public participation and transparency.
8. The *enforcement* category covers provisions that regulate the enforcement of environmental regulations stipulated in the trade agreement as well as domestic environmental measures.

Annex B: Sensitivity Analysis

- Average marginal effects from the negative binomial regression excluding intra-EU PTAs, i.e. amendments or accession agreement of the European Community (Table B1 and B2)
- Average marginal effects from the negative binomial regression taking the period of signature into account (Table B3 and B4)
- Average marginal effects from the zero-inflated negative binomial regression (Table B5 and B6

Table B2: Total diffusion, excluding intra-EU agreements (negative binomial regression, average marginal effects)

	(13)	(14)	(15)	(16)	(17)	(18)
Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-39.20**		-13.67			
	(15.58)		(10.68)			
Economic power (GDPpc)		3.26e-05				
		(0.000131)				
Economic power (GDP, PTA average)				1.169		
				(0.982)		
Environmental credibility	64.73***	4.769	22.30	-10.30		
	(21.51)	(22.07)	(17.43)	(30.96)		
EU country involved					-2.263	
					(4.302)	
US involved						-0.346
						(3.798)
Intercontinental agreement	18.22***	19.27***	19.84***	18.21***	20.63***	20.44***
	(4.243)	(4.254)	(4.213)	(4.446)	(4.460)	(4.554)
Number of member states	-0.184**	-0.249***	-0.249***	-0.205***	-0.239***	-0.261***
	(0.0738)	(0.0692)	(0.0714)	(0.0741)	(0.0840)	(0.0742)
Enforcement	-4.189	-4.761	-4.122	-3.851	-5.152	-4.950
	(4.063)	(3.968)	(4.105)	(3.930)	(3.963)	(4.166)
Development	9.635	6.848	7.992	6.982	6.311	5.926
	(6.769)	(6.493)	(6.537)	(6.595)	(6.220)	(6.221)
Environmental protection	6.356*	6.221	6.221*	6.324*	6.263	5.953
	(3.723)	(4.006)	(3.689)	(3.611)	(3.836)	(3.895)
Level playing field	5.159	2.842	3.387	3.637	2.914	2.641
	(6.171)	(5.846)	(5.965)	(5.747)	(5.748)	(5.795)
Policy coherence	11.85**	13.28**	13.39**	13.94**	12.79**	12.84**
	(5.526)	(5.987)	(5.855)	(5.927)	(5.719)	(5.901)
Implementation	7.468	6.456	6.641	4.576	6.050	5.893
	(5.697)	(5.633)	(5.462)	(5.192)	(5.391)	(5.321)
Regulatory space	24.83***	30.02***	25.74***	29.02***	29.89***	30.41***
	(7.073)	(8.122)	(7.131)	(7.319)	(7.668)	(7.791)
Issue-specific	-10.83**	-11.48**	-10.78**	-11.31**	-12.06**	-12.14**
	(5.006)	(5.153)	(5.080)	(4.931)	(4.923)	(4.909)
Squared correlation coefficient	0.4318	0.3976	0.4013	0.3946	0.4296	0.4267
Observations	255	254	255	250	258	258

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 3: External diffusion, excluding intra-EU agreements (negative binomial regression, average marginal effects)

	(19)	(20)	(21)	(22)	(23)	(24)
Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-46.81***		-24.49***			
	(14.01)		(9.127)			
Economic power (GDPpc)		3.09e-05				
		(0.000112)				
Economic power (GDP, PTA average)				0.591		
				(0.789)		
Environmental credibility	30.31*	-23.75	-2.223	-48.70**		
	(16.53)	(18.08)	(13.04)	(23.25)		
EU country involved					-4.749	
					(3.073)	
US involved						-5.094
						(3.151)
Intercontinental agreement	11.53***	11.79***	12.56***	10.38***	12.01***	11.54***
	(3.410)	(3.484)	(3.465)	(3.675)	(3.577)	(3.627)
Number of member states	-0.109*	-0.166***	-0.157***	-0.209***	-0.126*	-0.180***
	(0.0618)	(0.0603)	(0.0607)	(0.0728)	(0.0662)	(0.0656)
Enforcement	-2.841	-4.113	-3.105	-3.645	-4.171	-3.498
	(2.698)	(2.596)	(2.729)	(2.539)	(2.548)	(2.711)
Development	9.072*	6.627	7.829*	6.290	6.819*	5.440
	(4.738)	(4.327)	(4.440)	(4.665)	(4.142)	(3.995)
Environmental protection	7.753***	7.548**	7.662**	7.156**	7.469**	6.708**
	(3.009)	(3.211)	(3.011)	(2.897)	(2.925)	(3.027)
Level playing field	4.566	2.536	3.359	3.510	3.559	3.532
	(4.429)	(3.906)	(4.109)	(4.132)	(3.780)	(4.293)
Policy coherence	9.093**	10.06**	10.21**	9.425**	10.62**	9.996**
	(4.371)	(4.714)	(4.695)	(4.715)	(4.879)	(4.908)
Implementation	7.277*	5.653	6.397*	3.548	6.675*	5.787
	(3.975)	(3.860)	(3.803)	(3.537)	(3.898)	(3.681)
Regulatory space	22.48***	25.94***	22.86***	29.47***	26.68***	30.41***
	(5.777)	(6.839)	(5.906)	(7.225)	(6.338)	(7.192)
Issue-specific	-10.12**	-11.03***	-10.34***	-10.23***	-10.33***	-11.19***
	(3.968)	(3.866)	(3.913)	(3.825)	(3.446)	(3.923)
Squared correlation coefficient	0.3956	0.3431	0.3467	0.3467	0.3847	0. .3793
Observations	255	254	255	250	258	258

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table B4: Total diffusion including period indicators (negative binomial regression, average marginal effects)

	(25)	(26)	(27)	(28)	(29)	(30)
Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-42.22**		-7.160			
	(18.23)		(11.51)			
Economic power (GDPpc)		0.000232				
		(0.000155)				
Economic power (GDP, PTA average)				0.771		
				(1.037)		
Environmental credibility	76.59***	-6.387	28.40*	26.00		
	(27.85)	(25.09)	(17.14)	(33.63)		
EU country involved					-2.168	
					(4.449)	
US involved						-0.374
						(4.134)
Intercontinental agreement	17.51***	18.73***	18.89***	18.22***	19.89***	19.73***
	(4.410)	(4.450)	(4.256)	(4.519)	(4.618)	(4.698)
Number of member states	-0.202**	-0.265***	-0.265***	-0.191**	-0.255***	-0.272***
	(0.0863)	(0.0766)	(0.0805)	(0.0813)	(0.0901)	(0.0856)
Enforcement	-0.975	-0.482	-0.815	-0.918	-1.709	-1.404
	(4.958)	(4.777)	(4.942)	(4.627)	(4.910)	(5.122)
Development	9.223	7.582	7.193	7.126	5.205	4.975
	(6.768)	(6.194)	(6.261)	(6.211)	(6.104)	(6.064)
Environmental protection	8.135**	9.123**	7.730**	7.846**	7.774*	7.585*
	(4.097)	(4.166)	(3.896)	(3.724)	(4.078)	(4.214)
Level playing field	9.004	6.552	6.671	6.622	6.488	6.318
	(6.983)	(6.536)	(6.530)	(6.189)	(6.594)	(6.625)
Policy coherence	15.03**	18.08**	16.75**	17.74***	15.77**	15.99**
	(6.377)	(7.062)	(6.777)	(6.832)	(6.616)	(6.720)
Implementation	2.844	3.379	2.760	1.820	2.025	2.139
	(4.784)	(4.705)	(4.682)	(4.500)	(4.718)	(4.690)
Regulatory space	25.48***	28.97***	26.91***	27.73***	29.42***	29.92***
	(7.166)	(7.409)	(7.525)	(6.900)	(7.552)	(7.666)
Issue-specific	-10.23**	-9.783*	-9.780*	-10.02**	-11.11**	-11.24**
	(5.036)	(5.140)	(5.072)	(4.775)	(4.984)	(4.929)
1981-1990	-22.07***	-25.24***	-20.62***	-21.49***	-20.57***	-20.52***
	(5.336)	(6.280)	(5.259)	(5.703)	(5.136)	(5.074)
1991-1995	-18.38***	-21.48***	-17.27***	-18.52***	-17.26***	-16.62***
	(5.871)	(6.030)	(5.410)	(6.123)	(5.167)	(5.263)
>1996	-15.58***	-20.17***	-14.11***	-16.03***	-14.43***	-13.72***
	(5.700)	(6.947)	(5.418)	(6.048)	(5.402)	(5.319)
Squared correlation coefficient	0.4997	0.4776	0.4979	0.4894	0.4762	0.4720
Observations	256	255	256	251	259	259

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table B5: External diffusion including period indicators (negative binomial regression, average marginal effects)

	(31)	(32)	(33)	(34)	(35)	(36)

Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-47.36***		-20.06**			
	(16.58)		(9.914)			
Economic power (GDPpc)		0.000156				
		(0.000134)				
Economic power (GDP, PTA average)				0.275		
				(0.774)		
Environmental credibility	35.38*	-32.87	0.0922	-26.73		
	(19.58)	(21.12)	(12.89)	(23.96)		
EU country involved					-5.731*	
					(3.230)	
US involved						-4.538
						(3.307)
Intercontinental agreement	10.49***	10.58***	11.07***	9.343**	10.12***	9.984***
	(3.811)	(3.756)	(3.700)	(3.755)	(3.707)	(3.807)
Number of member states	-0.0983	-0.163**	-0.150**	-0.178**	-0.111	-0.157**
	(0.0689)	(0.0658)	(0.0667)	(0.0780)	(0.0715)	(0.0726)
Enforcement	-0.490	-1.549	-0.961	-1.690	-2.296	-1.152
	(3.323)	(3.119)	(3.280)	(2.963)	(3.040)	(3.307)
Development	8.458*	6.743	6.732	5.861	5.769	4.696
	(4.671)	(4.453)	(4.198)	(4.210)	(4.226)	(3.753)
Environmental protection	8.566***	8.900***	8.206***	7.760***	8.235***	7.624**
	(3.136)	(3.380)	(3.066)	(2.919)	(3.071)	(3.121)
Level playing field	7.079	4.334	5.206	5.153	5.442	5.976
	(5.123)	(4.575)	(4.717)	(4.641)	(4.652)	(5.067)
Policy coherence	10.29**	11.22**	11.01**	10.02**	10.09**	10.68**
	(4.956)	(5.390)	(5.258)	(4.922)	(5.124)	(5.147)
Implementation	4.234	3.008	3.516	1.856	3.122	3.359
	(3.224)	(3.090)	(3.116)	(2.974)	(3.120)	(3.114)
Regulatory space	22.76***	24.84***	23.85***	28.25***	26.16***	29.46***
	(5.932)	(6.207)	(6.322)	(6.941)	(6.380)	(7.171)
Issue-specific	-9.501**	-9.501**	-9.552**	-9.463**	-9.427***	-10.43***
	(3.933)	(3.819)	(3.888)	(3.697)	(3.488)	(3.825)
1981-1990	-13.90***	-16.07***	-12.41***	-11.40***	-12.75***	-13.02***
	(3.938)	(5.447)	(3.955)	(4.211)	(4.080)	(3.658)
1991-1995	-10.62**	-15.25***	-10.82***	-9.856**	-13.32***	-10.09**
	(4.346)	(4.863)	(3.938)	(4.351)	(3.770)	(4.042)
>1996	-8.617**	-13.82**	-8.235**	-6.800	-9.819**	-6.896*
	(4.200)	(5.747)	(3.924)	(4.359)	(4.150)	(4.111)
Squared correlation coefficient	0.4943	0.4397	0.4726	0.4492	0.4894	0.4761
Observations	255	254	255	250	258	258

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table B6: Total diffusion (zero-inflated negative binomial regression, average marginal effects)

	(37)	(38)	(39)	(40)	(41)	(42)
Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-39.11**		-14.58			
	(15.85)		(10.88)			
Economic power (GDPpc)		2.60e-05				
		(0.000133)				
Economic power (GDP, PTA average)				1.051		
				(1.004)		
Environmental credibility	62.84***	6.454	24.52	-6.716		
	(21.68)	(22.70)	(17.65)	(31.83)		
EU country involved					-1.204	
					(4.363)	
US involved						-0.641
						(3.865)
Intercontinental agreement	18.75***	20.00***	20.51***	19.23***	21.24***	21.07***
	(4.436)	(4.448)	(4.386)	(4.641)	(4.608)	(4.704)
Number of member states	-0.197**	-0.264***	-0.262***	-0.220***	-0.264***	-0.275***
	(0.0765)	(0.0719)	(0.0735)	(0.0769)	(0.0867)	(0.0767)
Enforcement	-2.867	-3.523	-2.742	-2.615	-3.811	-3.561
	(4.522)	(4.428)	(4.604)	(4.390)	(4.443)	(4.641)
Development	9.551	6.855	8.194	6.751	6.307	6.024
	(6.733)	(6.522)	(6.562)	(6.584)	(6.203)	(6.182)
Environmental protection	6.901*	6.724*	6.761*	6.710*	6.732*	6.485
	(3.808)	(4.059)	(3.780)	(3.677)	(3.930)	(3.995)
Level playing field	5.307	3.086	3.667	3.821	2.980	2.857
	(6.172)	(5.884)	(6.007)	(5.760)	(5.748)	(5.796)
Policy coherence	12.82**	14.25**	14.48**	14.87**	13.84**	13.74**
	(5.533)	(6.009)	(5.890)	(5.935)	(5.766)	(5.906)
Implementation	7.166	6.248	6.531	4.294	5.798	5.681
	(5.673)	(5.717)	(5.513)	(5.250)	(5.389)	(5.323)
Regulatory space	25.25***	30.57***	25.80***	29.34***	30.43***	30.83***
	(7.135)	(8.160)	(7.122)	(7.363)	(7.739)	(7.815)
Issue-specific	-11.42**	-11.97**	-11.21**	-11.75**	-12.57**	-12.65**
	(5.062)	(5.236)	(5.175)	(5.002)	(5.010)	(4.971)
Squared correlation coefficient	0.4326	0.4038	0.4060	0.3994	0.4295	0.4282
Observations	256	255	256	251	259	259

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table B7: External diffusion (zero-inflated negative binomial regression, average marginal effects)

	(43)	(44)	(45)	(46)	(47)	(48)
Definition of innovating country based on	Economic power (GDP/world GDP)	Economic power (GDPpc)	Environmental credibility	PTA average	n.a.	n.a.
Economic power (GDP/world GDP)	-41.31***		-22.19**			
	(13.62)		(9.330)			
Economic power (GDPpc)		4.09e-05				
		(0.000111)				
Economic power (GDP, PTA average)				0.733		
				(0.816)		
Environmental credibility	25.89	-28.76	-4.404	-41.17*		
	(15.84)	(19.07)	(13.12)	(23.33)		
EU country involved					-4.436	
					(3.225)	
US involved						-4.138
						(3.330)
Intercontinental agreement	13.32***	14.00***	14.46***	12.08***	13.72***	13.46***
	(3.416)	(3.551)	(3.512)	(3.707)	(3.588)	(3.667)
Number of member states	-0.144**	-0.198***	-0.188***	-0.220***	-0.158**	-0.208***
	(0.0632)	(0.0632)	(0.0628)	(0.0735)	(0.0690)	(0.0676)
Enforcement	-2.597	-4.283	-2.978	-3.446	-4.337	-3.457
	(3.210)	(3.160)	(3.279)	(3.020)	(3.083)	(3.305)
Development	7.873*	5.378	6.642	5.354	5.501	4.510
	(4.698)	(4.509)	(4.526)	(4.654)	(4.291)	(4.109)
Environmental protection	6.797**	6.563*	6.648**	6.087**	6.262**	5.692*
	(3.098)	(3.468)	(3.143)	(2.984)	(3.151)	(3.145)
Level playing field	3.784	1.762	2.631	2.872	2.795	2.870
	(4.517)	(4.213)	(4.283)	(4.274)	(4.079)	(4.462)
Policy coherence	8.712*	9.054*	9.510*	9.162*	9.787*	9.353*
	(4.580)	(4.868)	(4.855)	(4.955)	(5.086)	(5.112)
Implementation	5.932	4.129	5.050	2.596	5.213	4.610
	(4.011)	(4.096)	(3.935)	(3.692)	(4.062)	(3.890)
Regulatory space	24.32***	27.32***	24.94***	30.43***	27.98***	31.32***
	(6.209)	(7.284)	(6.286)	(7.420)	(6.763)	(7.517)
Issue-specific	-10.49***	-11.69***	-10.77***	-10.44***	-10.65***	-11.33***
	(4.053)	(4.065)	(4.025)	(3.934)	(3.592)	(3.990)
Squared correlation coefficient	0.3816	0.3318	0.3437	0.3455	0. .3770	0.3718
Observations	255	254	255	250	258	258

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1