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Developing Countries in the Lead—What Drives the Diffusion of Plastic Bag Policies?

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Abstract: While diffusion patterns are quite well understood in the context of the Global North, diffusion research has only been applied to a limited extent to investigate how policies spread across developing countries. In this article, we therefore analyze the diffusion patterns of plastic bag bans and plastic bag taxes in the Global South and Global North to contribute to the further refinement of diffusion theory by specifically addressing the under-researched Global South. Moreover, with an in-depth investigation of plastic bag policies through the lens of diffusion research, the article provides insights in the rather new and still underexplored policy field of plastic pollution. We find that industrialized countries have mostly adopted plastic bag taxes, while developing countries have mainly introduced plastic bag bans and thus more stringent legislation than countries in the Global North. So far, the key driving force for the diffusion of plastic bag policies in the Global North has been the global public pressure. In the Global South, where plastic bag litter is much more visible and harmful due to limited waste collection and recycling rates, national problem pressure has been much more influential.

Keywords: case study research; plastic bags; regulation; policy diffusion; policy transfer; policy learning; sustainable development; marine litter

1. Introduction

Estimates regarding the number of plastic bags used worldwide per year vary from 500 billion to the staggering amount of 5 trillion [1,2]. At the same time, less than five percent of plastics are recycled worldwide, according to US Environmental Protection Agency (EPA) [3].

While the production of plastics comes with environmental and climatic impacts stemming from the required energy and use of fossil fuel resources, the persistence and non-biodegradable nature of plastic bags as well as their leakage into the environment pose a particular problem. Once plastic bags have leaked into the environment, they are particularly difficult to manage due to their light weight and parachute-shaped design which allows them to travel easily through the air and in waterways. In South Africa, for instance, plastic bags were for years called "national flowers" as they littered the environment and were found everywhere—on every fence, in every bush and tree, etc. [4]. In addition, plastic bags pose a public health and safety threat mainly in the Global South, as they clog sewers and storm-water drains, which not only increase the risk of flooding but also act as breeding grounds for malaria-carrying mosquitoes [5]. Moreover, plastic bags, alongside other macroplastic items such as fishing nets and gear or beverage bottle caps, were rated as most harmful among the 20 most common marine debris items to (marine) wildlife due to the risk of entanglement [6]. Finally, when plastic bags do ultimately break down, they photodegrade into so-called microplastics. While long-term effects on soil and water quality are not yet clear, recent studies suggest that microplastics attract, absorb, and later release various toxins and chemical pollutants, including persistent organic pollutants

(POPs) [7–10]. In addition, microplastics can be ingested by wildlife and, further along the food chain, humans. Research regarding the impacts of this ingestion is still at an early stage.

Plastic was long perceived as a cheap, functional, and universal material. In fact, the 1987 Brundtland report [11] emphasized the opportunities "new" materials like high-performance plastic would bring about and did not mention plastics as an environmental problem. Yet, it already highlighted the importance of recycling for sustainable development. In subsequent years, the attitude toward plastics incrementally changed, led by discussions on marine litter–an issue that has become quite prominent on the international agenda in recent years and has even been said to cost $13 billion a year in damages by threatening marine life, tourism and fisheries [12].

Against this background, it is not surprising that an increasing number of policies and legislation aiming to reduce plastic bags in the environment has been adopted all over the world. In fact, since 1999, 51 countries and states adopted a ban on the production, sale or use of plastic bags, and another 39 adopted a tax on the sale since 1991 (data as of April 2018, see Figure A1 and Table A1 in Appendix A). The question is, therefore, whether the increase in the number of such policies occurred independently or whether there is some pattern behind the spread of those policies. Diffusion theory helps us to answer this question.

At the core of the diffusion research is the observation that some instruments, policies, ideas, etc. spread over time. Subsequently, this strand of research investigates why this happens and why governments sometimes make the same (or very similar) decisions one after another in a temporal sequence. Political scientists use the term "diffusion" in two different ways. One understanding is broader and used equivalent to the terms "spread" or "dissemination." The other one is more narrow and implies that the adoption of a certain policy is proof of multilateral interdependence and can be described by certain transfer mechanisms [13]. Rogers, who wrote the influential work "Diffusion of innovations", describes diffusion as a process where an innovation is communicated through certain channels over a certain period of time between the members of a social system [14]. Such a diffusion can be graphically illustrated by an ideal, S-shaped diffusion curve [14], which shows the accumulated number of adopters plotted over time. While Rogers does not explicitly discuss the mechanisms leading to diffusion, we deduce that diffusion does not simply describe the spreading of an innovation, but rather its spreading through uncoordinated adjustment processes. This implies that the voluntary nature is crucial for diffusion [13]. Hence, policy convergence resulting from coordinated adjustment processes like coercion or harmonization is not considered as diffusion in this article. Instead, diffusion implies the dissemination of innovations through mechanisms such as policy learning, communication, competition, or mimicry [15–17]. (Although these mechanisms are usually presented as analytically separate and distinct from one another, both conceptually and empirically, it is difficult to draw clear lines separating the operation of one mechanism from another. Thus, empirical testing remains difficult [17].)

"Diffusion" is thereby a "neutral" term since it includes the description and analysis of ideas, approaches, institutional innovations, as well as results without implying a certain diffusion mechanism like other concepts do (e.g., "lesson drawing," "policy transfer," "policy learning," "policy borrowing," or "harmonization") [18].

Some scholars use "transfer" and "diffusion" synonymously. However, while both concepts focus on "the process by which knowledge about policies, administrative arrangements, institutions and ideas in one political system (past or present) is used in the development of policies, administrative arrangements, institutions and ideas in another political system" [19] (p. 5), transfer analytically focuses on the micro-level, investigating transfer content and the transfer process as dependent variables, while diffusion focuses on the macro-level, investigating the adoption patterns (see Table 1). It should be noted, however, that knowledge about a policy does not automatically lead to its implementation. Therefore, it is a necessary, not a sufficient, condition for its adoption and thus ultimately for diffusion [16].

Table 1. Comparison of the concepts transfer, diffusion, and convergence.

	Policy Transfer	Policy Diffusion	Policy Convergence
Analytical focus	process	process	effects
Dependent Variable	transfer content transfer process	adoption pattern	similarity change
Level of Analysis	micro-level	macro-level	macro-level

Adapted from [13] (p. 17).

Diffusion patterns are well researched in a large number of different policy fields such as environmental and social policy. However, plastic policies are a relatively new policy area, which has received limited scholarly attention to date. Existing studies usually focus on one specific case (or sometimes cases) of a plastic bag policy enacted at the national [20–28], state [29], or local level [30–32] and its effectiveness, including for instance motivational and behavioral responses. A few studies have taken a slightly broader focus and have looked at regulations concerning the whole life cycle of plastic bags [33] or ways to reduce the carbon, energy and water footprints of the current plastic bag management system [34]. Finally, some scholars have decided for an "artificial" experimental design to test the effects of normative messages or a voice prompt intervention at the supermarket cashier [35,36].

The most relevant research on plastic bag policies for this article has been published by Xanthos and Walker (2017) as well as Clapp and Swanston (2009) [5,37]. Xanthos and Walker conducted a systematic literature review to provide an overview and assess existing policies to reduce single-use plastics, more specifically plastic bags and microbeads. Clapp and Swanston interpret the increase of plastic bag policies as a sign for the emergence of a new environmental norm. They look at patterns and characterize the emergence of plastic bag policies as a South to North, non-networked, bottom-up and multi-scalar series of events that shows differences in policy outcomes–differences that the authors explain with material interests of industry actors and variations in domestic norm interpretation. While the analysis of these explaining factors remains limited as the authors base their argument mainly on two case studies (US and Bangladesh), their finding that developing countries were among the first to introduce plastic bag policies has been one starting point for our analysis. In fact, out of the 51 countries and states that have to date adopted plastic bag bans, 36 (70.6%) are located in the Global South. (Countries were categorized based on the OECD (Organization for Economic Cooperation and Development) Development Assistance Committee's list of countries eligible for Official Development Assistance [38].) Regarding countries that have adopted a tax on plastic bags only 11 (or 28.2%) out of 39 are located in the Global South. Thus, the majority of developing countries adopted more stringent legislation than countries in the Global North. As the existing diffusion literature has paid little attention to developing countries [17], this makes plastic bag policies particularly interesting to be studied through the lens of diffusion theory. (However, there are some exceptions to the general lack of diffusion research regarding developing countries [39–44].)

While addressing a highly relevant topic, the aim of this work is twofold: on the one hand, we want to gain insights into why and how plastic bag policies spread. On the other hand, we aim at advancing the diffusion research by shedding light on the question of why—different to findings in other environmental policy diffusion processes—countries located in the Global South were among the first to adopt plastic bag policies. We argue that this is mainly due to national problem pressure.

The article is structured as follows: Section 2 explains the methodology used for the analysis of diffusion patterns as well as the press coverage analysis. In Section 3, (potential) explaining factors for the diffusion of plastic policies are analyzed along three types of characteristics, namely that of the international system, of the potential adopter countries, and the characteristics of the innovation itself. Moreover, hypotheses regarding the diffusion of plastic policies are presented. In addition to secondary literature, this Section draws on primary sources such as plastic production data or data on press coverage. The discussion summarizes and critically reflects on the findings and links them back to existing research. This section also indicates needs for future research.

2. Materials and Methods

We focus on identifying different independent variables that could potentially explain the diffusion of plastic bag policies, as there is not enough research on the diffusion of plastic bag policies to date in order to systematically test hypotheses derived from literature. We analyze the relevance of these variables based on existing available data with the aim to reinforce or rebut some existing hypotheses and generate new ones. In other words, we take an exploratory approach not intended to provide conclusive evidence but rather a better understanding of the spread of plastic bag policies. We do so by following four analytical steps:

- Step 1: Identify potentially relevant variables;
- Step 2: Collect and analyze data in order to classify the influential character of the relevant variables;
- Step 3: Discuss the explanatory power of the variables;
- Step 4: Develop hypotheses.

Tews (2002) describes three types of characteristics to identify potentially relevant explanatory variables: (1) the characteristics of the international system, (2) the characteristics of potential adopter countries explaining why some countries are more likely to adopt innovations than others, and (3) the characteristics of the innovation itself, which explain why some innovations spread faster than others [45]. We adopt this threefold distinction but complement Tews' subcategories with (potentially) relevant factors identified by other researchers [5,46]. This process led to the identification of the following list of variables that are analyzed as potential explaining factors for the diffusion of plastic bag policies:

- Characteristics of the international system or context;
    - global problem pressure (Problem pressure is understood here as the "seriousness of an issue." Its operationalization varies between different policy fields. Environmental quality indicators, social and economic indicators are frequently used [47].) (plastic production) & global public pressure (Public pressure is the intersubjective pressure of the (political) public on politicians that can be measured. For a detailed discussion of the term, see [48].) (press coverage; campaigns by non-governmental organizations (NGOs));
    - international political agenda.
- Characteristics of potential adopter countries;
    - (national) industry lobby groups (e.g., PlasticsEurope, American Chemistry Council);
    - national problem pressure (recycling rates, waste collection rates).
- Characteristics of the innovation itself.
    - complexity of political problem;
    - political feasibility;
    - technical feasibility.

Governmental interventions to reduce the use of plastic bags vary in range and scope. For this article, policies are included in the analysis, if they cover at least the state level, while initiatives at the municipal or regional level (as for instance in San Francisco and the Buenos Aires Province) are excluded. Policies were categorized as "ban", "tax", or "voluntary agreement". The category "ban" includes bans on the import, production, sale and/or use of bags, while the category "tax" includes customer charges for bags or taxes paid by the stores that sell plastic bags. If a country has a plastic bag tax and a plastic bag ban in place, both policies are counted separately. Moreover, if a country has adopted different policies over time, and the new policy reinforced former legislation considerably,

this has been counted as a newly adopted policy. It should be noted that existing plastic bag policies usually target lightweight, single-use plastic bags only but do not cover thicker plastic bags that are used several times—at least hypothetically. At the same time, definitions of what constitutes a lightweight plastic bag differ between countries and usually vary between >20 µm and >50 µm [37].

The list of plastic bag policies collected by Xanthos and Walker [37] was used as a starting point to put together a comprehensive list of plastic bag policies. Policies were then added based on a regularly updated map of countries with plastic bag policies published on Wikipedia [49]. The provided information was verified and complemented (e.g., when the date was missing) by key word searches (country AND type of plastic bag policy) using Google.

The analysis of the international press coverage of plastic bag policies and the issue of marine litter was conducted using the research database LexisNexis® Academic. (Marine litter is defined as "any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment" by UNEP [50] and was chosen as a search term, as the current discussions regarding plastics in the oceans are framed under this term.) The database includes newspapers such as ABC, Los Angeles Times, The Boston Globe, Chicago Tribune, Corriere della Sera, Daily Telegraph, The Daily Yomiuri, Le Figaro, Guardian, Hindustan Times, Independent, Irish Examiner, Irish Independent, Irish Times, Japan Times, Jerusalem Post, Le Monde, El Muno, The New York Times, Observer, El País, Die Presse, La Stampa, Der Standard, Times of India, USA Today, The Wallstreet Journal, The Washington Post, Die Zeit, and hundreds more. The LexisNexis® Foreign Language News Search Form limited the choice of languages: apart from English language newspapers, newspapers in German, French, Spanish, and Portuguese were included in the search. This choice ensures coverage of newspapers in both the Global South and the Global North.

The search was limited to newspapers and conducted for the period 1989–2017 (see Table 2). Search terms for analysis of press coverage.

Table 2. Search terms for analysis of press coverage.

	English	German	French	Spanish	Portuguese
Plastic bag policies	Plastic bag ban Plastic bag levy Plastic bag tax	Plastiktueten verbot Plastiktueten verbieten Plastiktueten kosten	Sac plastique interdit Sac plastique interdiction Sac plastique achat	Cobrar bolsa de plástico bolsa plástica Cobro obligatorio de bolsa de plástico bolsa plástica Prohibición de bolsa de plástico bolsa plástica Prohibir bolsa de plástico bolsa plástica	Taxa sobre os sacos de plástico os sacos plásticos as sacolas plásticas as sacolas de plástico Sacos de plásticos pagos sacos plásticos pagos sacolas plásticas pagas sacolas de plástico pagas Prohibição dos sacos de plástico dos sacos plásticos das sacolas plásticas das sacolas de plástico Proibir sacos de plástico sacos plásticos sacolas plásticas sacolas de plástico
Marine litter	Marine litter	Muell Meer Meeresmuell Abfall Meer	Déchets marins Déchets mer Détritus marins	Residuos marinos Basura marina Desechos marinos	Lixo marinho Detrito marinho

Today, in 2017, newspapers are no longer the singularly dominant source of news. However, the internet together with web 2.0 applications as well as social media channels like Twitter, Facebook, etc. were not yet established as alternatives to newspapers, particularly not before 2004. Nevertheless, we did a search using google trends in order to assess how the search for the terms "marine litter" as well as "plastic bag ban" and "plastic bag tax" varied between 2004 and 2017. The result showed that there were regular highs and lows in the searches, but no clear peaks or low points or developments over time. Consequently, the search remained exclusive to newspapers.

3. Results

The adoption of plastic bag policies started in the early 1990s (with taxes in Germany and Denmark) and took off in the early 2000s (see Figure 1). Though Germany and Denmark were in fact the first countries to introduce plastic bag taxes in 1991 and 1994, only Denmark can be considered a pioneer of plastic bag policy [51,52]. Meanwhile, the tax in Germany covered packaging in general and was introduced due to earlier policy developments on waste collection but not as part of the debate surrounding (marine) plastic litter [53]. Furthermore, it is obvious from the diffusion curve that the policy interventions in Denmark and Germany had no direct effect on the diffusion of plastic bag policies in subsequent years. The spread of plastic bag policies in both, the Global South and the Global North, over the past 30 years corresponds to the diffusion curve introduced by Rogers in 2003 [14]. Yet, the steeper curve for countries and states in the Global South indicates that plastic bag policies have spread to more developing countries than industrialized countries. However, one should note that 156 countries and territories belong to the Global South, based on the OECD Development Assistance Committee's list, whereas less than 50 countries belong to the Global North (see Table A1). Hence, the percentage share of policies in countries of the Global North is higher than the share in countries of the Global South. Nevertheless, it is uncommon that countries in the Global South adopt environmental policies simultaneously with countries in the Global North. Data for 2018 to 2020 (dotted line) includes policies that were already adopted and are being or will be implemented in the respective years. Thus, the curve does not provide a prognosis about the future spread of policies and it is likely that additional countries will adopt policies, especially for 2019 and 2020. Thus, the representation in Figure 1 is not meant to imply that the curve is likely to level off in the near future.

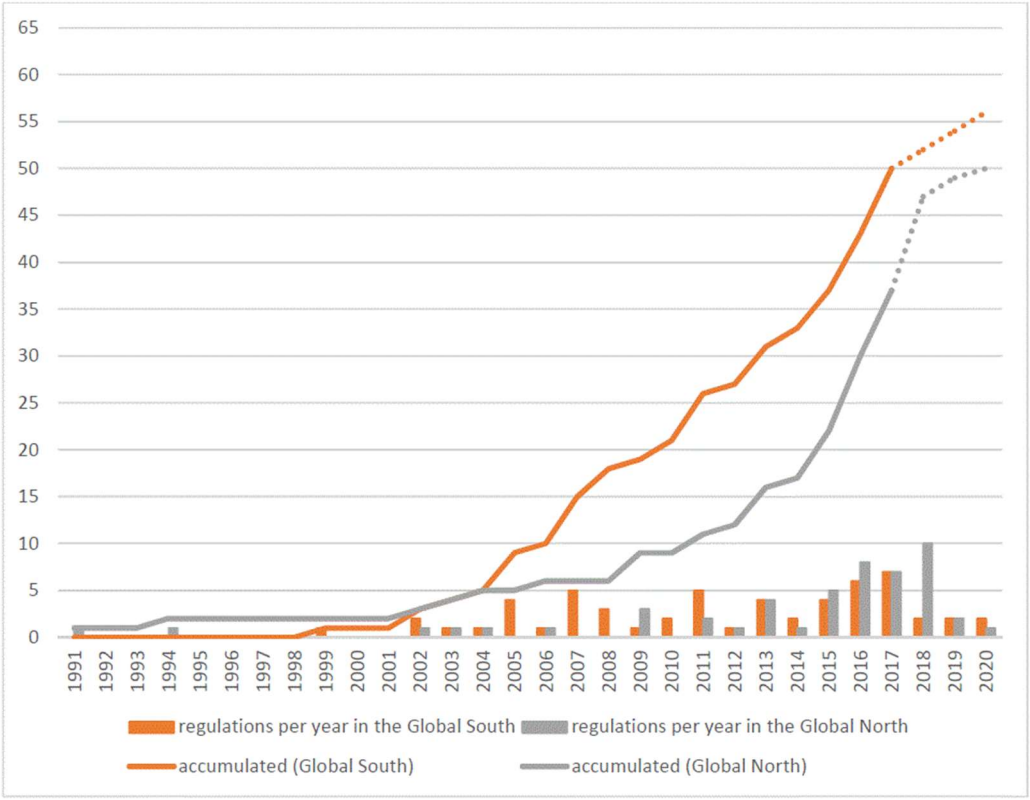

Figure 1. Anti-plastic bag policies in the Global South and Global North.

Similar to the results in Figure 1, both the introduction of plastic bag bans and plastic bag taxes displayed in Figure 2 show a diffusion pattern. Worldwide, more plastic bag bans than plastic bag

taxes have been adopted and the gap in numbers has expanded especially since 2013. Countries that adopted plastic bag policies in the late 1990s and early 2000s were mainly located in the Global South. In contrast, most northern industrialized countries adopted policies only more recently. While countries in the Global South mostly implemented plastic bag bans, countries in the Global South often opted for less stringent regulation (see Figure 2 and Table A1). This observation also corresponds to the findings of Clapp and Swanston [5]. In 2015, the EU adopted Directive 2015/720, [54] which aims to reduce the consumption of lightweight plastic carrier bags. This lead to a visible increase in plastic bag taxes in Europe and thus the number of policies in the Global North.

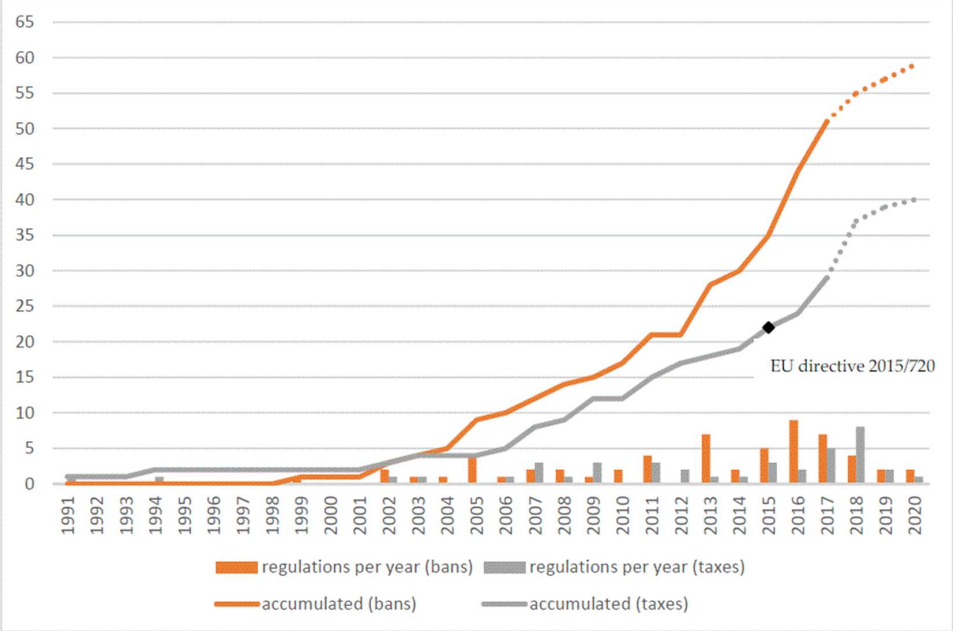

Figure 2. Plastic bag bans and plastic bag taxes on a global scale.

In the following section, we systematically discuss which of the potential descriptive factors introduced above indicate to have explanatory power regarding the spread of plastic bag policies and the emerging diffusion patterns.

3.1. Characteristics of the International System or the Context

The characteristics of the international system or the context might explain the diffusion of plastic bag policies. This argument holds up even if an individual country does not directly experience plastic as a problem (e.g., because the country has a well-functioning waste collection system). This is because new policies may also be taken up if it is commonly acknowledged that (a) there is a collective, i.e., global problem and (b) the respective policies could help solve this problem. Furthermore, policies might also diffuse due to the international political agenda. For instance, in the run up to international conferences, there might be pressure to justify what has been done nationally to address a certain problem.

3.1.1. Global Problem Pressure and Global Public Pressure

Problem pressure could have an influence on the diffusion pattern of plastic bag policies as it was identified as an explanatory factor for other diffusion processes [13,46,55,56]. Although Busch and Jörgens argue that problem pressure alone cannot explain a diffusion pattern [51], the perceived problem pressure can still explain the speed and course of a diffusion.

If we look at the total amount of plastic produced every year, the annual global polymer resin and fiber production has been growing steadily since 1989, apart from a minor decrease in production

numbers in 2008 and 2009. This was due to the global financial crisis that resulted in the so-called Great Recession leading to a lower demand in primary and converted plastics (see Figure 3).

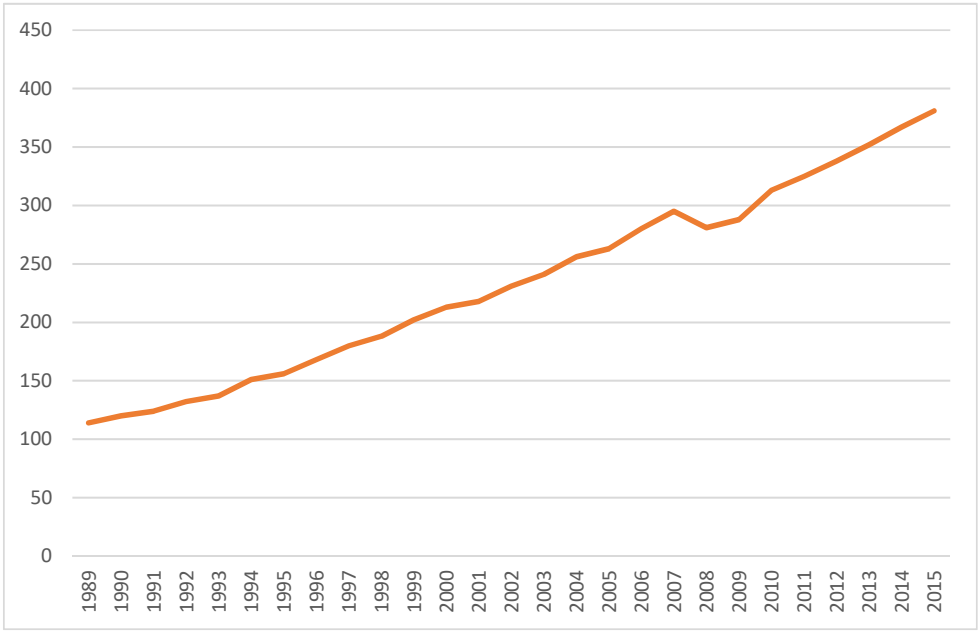

Figure 3. Annual global polymer resin and fiber production in million metric tons. Data on global annual pure polymer (resin) production stems from the Plastics Europe Market Research Group and global annual fiber production data from by The Fiber Year and Tecnon OrbiChem [57].

While in a perfect circular economy an increase in plastic production by itself would not constitute a problem, it is estimated that 60 percent of the 8300 million metric tons (Mt) of virgin plastics produced until 2017 were discarded and are accumulating in landfills or in the natural environment [57] (Approximately 12 percent have been incinerated, and around nine percent have been recycled (of which only 10 percent have been recycled more than once), the rest is still in use [57]). Furthermore, recycling rates for plastics were negligible before 1980s, and since then, only non-fiber plastics have been subject to significant recycling efforts. However, even in this sector, the recycling rate accounted for only 18 percent of non-fiber plastic waste generated in 2014, according to estimates [57]. (Unfortunately, no time series data is available regarding recycling rates at a global level, as recycling rates outside of Europe and the US are a major source of uncertainty [57]). Therefore, it is evident that the problem pressure of plastic pollution has increased alongside the production.

Another factor that can contribute to the spread of policies is public pressure [46,58,59], for which we use press coverage and NGO campaigns as proxies. In the case of plastic bags, it was the issue of marine litter, which has first emerged in the newspapers worldwide in the late 1990s and has been receiving increased coverage ever since (see Figure 4). Globally, press coverage of marine litter has thus preceded the broader uptake of plastic bag policies. Moreover, press coverage has increased dramatically since 2010, a development that again preceded an accelerated uptake of plastic bag policies after 2012.

Press coverage on the issue of plastic bag policies has been fluctuating since the turn of the millennium, but overall, it did receive even more attention than marine litter during this period. Compared to marine litter, press coverage of plastic bag policies started slightly later, namely in 2002, when Ireland became the first country to implement a direct consumer tax on the use of plastic bags and Bangladesh the second country (after from the rather small Kingdom of Bhutan) to ban the manufacture and use of plastic bags [37,60].

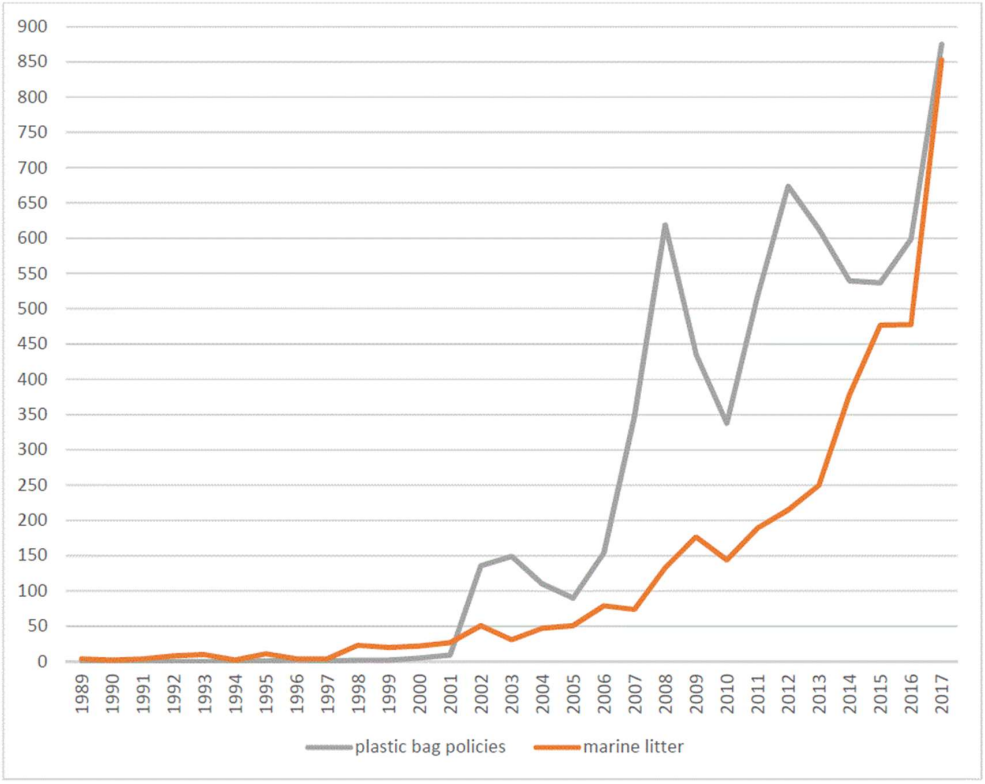

Figure 4. Annual press coverage of plastic bag policies and marine litter worldwide. Based on data of the LexisNexis® Academic Database.

The geographic distribution of press articles shows that both reporting on plastic bag policies and on marine litter was more frequent in the Global North than in the Global South. Furthermore, the diffusion of plastic bag policies in developing countries accelerated before the press coverage on marine litter did, i.e., the number of plastic bag policies increased significantly. However, this is not the case for the diffusion of plastic bag policies in industrialized countries. Here, the press coverage preceded the increase of the plastic bag policies. Thus, our results suggest that public pressure via the press could have been influential for the spread of policies in the Global North but did not have an influence in the Global South. A major reason for this disparity between developed and developing countries is probably the differences in the relative freedom of the press in various countries and thus the possibilities to create public pressure through the press.

Public pressure is increasing both through journalists' reporting and NGO campaigning. Here, Greenpeace is one of the main international environmental NGOs well known for their focus on marine issues. While Greenpeace International had already been campaigning against the dumping of nuclear waste in the oceans in the late 1970s and against the pollution through oil in the early 1980s, marine litter in terms of plastics apparently only became an issue in their international agenda in 2006 [61–63]. Campaigns and activities by NGOs have multiplied since then and are manifold. Moreover, the body of popular scientific as well as other scientific literature on the topic is increasing, and so is the number of reports on and photos of animals dying due to plastic in the environment. Overall, it can be said that while the 1987 Brundtland report did not frame plastic as a threat to sustainable development at the time, 30 years later, marine litter is perceived as one of the key global challenges [64,65].

Moreover, the European Strategy for Plastics in a Circular Economy [66] published in January 2018 mentions "public concern" as a driver for policies. However, it would require further in-depth investigations to prove that public concern or public pressure is (one of) the driver(s) for the diffusion of plastic bag policies.

We therefore conclude with the following hypotheses:

Hypothesis 1. *Global problem pressure contributes to the diffusion of plastic bag policies worldwide.*

Hypothesis 2. *Global public pressure contributes to the diffusion of plastic bag policies to a higher degree in the Global North than in the Global South.*

3.1.2. International Political Agenda

Closely linked to the problem pressure and the public pressure is the international political agenda, with both influencing each other. In 1995, the "Global Programme of Action for Protection of the Marine Environment from Land-Based Activities" (GPA) was adopted by 108 countries in Washington, which is why it is also known as "Washington Declaration" [67]. While it addresses plastic dumping in general, it does not mention plastic bags specifically. It is a voluntary, action-oriented, intergovernmental programme, led by the UN Environment Programme (UNEP).

By contrast, the "Honolulu Strategy," a document resulting from the Fifth International Marine Debris Conference organized by the US National Oceanic and Atmospheric Administration (NOAA) together with UNEP as well as other agencies and organizations in March 2011, explicitly targets plastic bags. Under Goal A it is—among others—recommended to "Adopt policies and regulations that ban, place fees, or other measures to reduce the most common items found as marine debris (e.g., plastic bags, bottle caps, cigarette butts)" [68] (p. 35).

Furthermore, the "Global Partnership on Marine Litter" (GPML) was launched at the Rio 20+ Conference in June 2012, which to date has more than one hundred partners, including international agencies, governments, NGOs, academia, the private sector, and civil society. While we could not find any recommendation regarding plastic bag policies that could be attributed to the GPML, the CleanSeas Campaign that has started in February 2017 and is aiming to support GMPL's goals explicitly supports a ban on plastic bags [69].

During the German G7 Presidency, the "G7 Action Plan to Combat Marine Litter" was signed in June 2015 [70]. The Action plan notably mentions the GPA as well as the GPML and addresses plastic bags indirectly by listing the promotion of "relevant instruments and incentives to reduce the use of disposable single-use and other items, which impact the marine environment;" under the priority areas to address land-based sources [70] (p. 10). In 2017, the G20 adopted a similar "Action Plan on Marine Litter" [71], proposing, amongst other things, to "significantly reduce the use of micro-beads and single-use plastic bags and where appropriate phase them out" [71] (p. 3). The latest achievement is a draft resolution on marine litter and microplastics that was adopted at the UN Environment Assembly in December 2017 [72]. However, it does not address plastic bag policies but remains at a meta level, for instance by urging "all actors to step up actions to 'by 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution'" [72] (p. 2).

With the GPA in 1995, the Honolulu Strategy in 2011, the GPML in 2012, as well as the G7 Action Plan in 2015, the G20 Action Plan in 2017, and the UN draft resolution on marine litter and microplastics in 2017, there is no temporal correlation between the development on the international agenda and the diffusion curve since it kicked off in 2002, starting to rise steeply from 2004 onward. The international political agenda is thus not an explaining factor for the diffusion pattern. However, it might be that it was the driving factor for specific cases. To come to a clear assessment would require further and deeper investigation looking at single transfer cases.

Regarding plastic pollution, there is currently no–and there also has been no former–attempt to regulate at a global or international level. There is no UN convention to combat marine litter or plastic dumping. However, Canada is currently advocating for a "Zero plastics waste charter" under their G7 presidency [73]. Some scholars argue that the international community concerned

with plastic pollution has now arrived at where the climate change community was back in 1992, when climate change was recognized as a problem by the UN Framework Convention on Climate Change (UNFCCC), and voluntary support was encouraged [74].

Moreover, institutions can act as "transfer institutions" [75], "diffusion agent" [55], "transfer agents" [76], or a "change agent" [14]. The latter is defined as "[. . .] an individual who influences clients' innovation-decisions in a direction deemed desirable by a change agency" [14] (p. 365). Although Clapp and Swanston [5] do not use either of these terms, they argue that UNEP promoted an anti-plastic bag norm in Africa and did thereby reach—and probably influence—not only African actors but also communities worldwide. This was due to a UNEP report released in 2005, discussing the plastic bag problem in Kenya and recommending both a ban on thin bags as well as a levy on thicker ones [77]. The report probably followed the intention of introducing plastic policies in Kenya and other developing countries, as it is stated that "lessons learned from implementation of the pilot project could be used to design and implement similar environmental policy packages for other priority solid waste problems in Kenya and other developing countries" [77] (p. xiii). While Kenya introduced the policies in 2007 (see Table A1), it was Rwanda introducing a ban in 2005, Tanzania in 2006, and Uganda like Kenya in 2007.

In general, institutions can function as transfer institutions, thereby converting direct transfer into institutionalized transfer and thus contributing to the acceleration of diffusion. We therefore conclude with the following hypothesis:

Hypothesis 3. *The international political agenda did not contribute to the diffusion of plastic bag policies worldwide.*

Hypothesis 4. *UNEP did function as transfer institution for the diffusion of plastic bag policies in the Global South.*

3.2. Characteristics of Potential Adopter Countries

Apart from characteristics of the international system, internal factors of adopter countries, such as political, social, economic or cultural factors can play a pivotal role in the decision-making process to adopt a new policy [45]. One seemingly obvious explanatory factor is the form of government (e.g., democracy, autocracy, etc.). However, with regard to the list of adopter countries, it seems unlikely that a democracy index correlates with the general adoption of plastic bag policies. The weakest democracies are often found in the Global South. However, they are usually not known for introducing environmental policies. The form of government could however correlate with the type of policy adopted, while the question of causality would remain. In the following section, we look at (national) industry lobby groups and national problem pressure as potential explanatory factors within adopter countries.

3.2.1. National Industry Lobby Groups

Clapp and Swanston argue that industry actors play a prominent role when it comes to the adoption of plastic bag policies in different jurisdictions. More specifically, "the relative weight of the various types of power held by these actors, including their structural presence in the economy, their instrumental power to lobby or litigate, and the traction of their discursive strategies in specific contexts, has enormous relevance for their ability to influence policy outcomes on this issue at both national and subnational levels" [5] (p. 316).

The plastics industry is especially strong in Asia, Europe, and North America (see Figure 5). In 2015, 25 percent of all plastic end products were manufactured in China, 21 percent in Europe (with Germany being the largest single producer with 5.2%), 20 percent in the NAFTA countries (including the US with 14.6%), and 16 percent in Asian countries other than China.

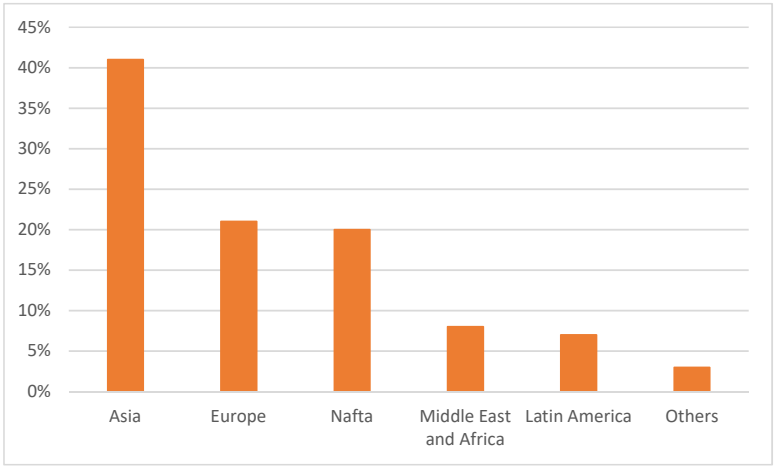

Figure 5. Regional distribution of world total plastics end products manufacturing (2015). Based on data provided by the Turkish Plastics Industry Foundation (PAGEV) [78].

Numbers for exports of plastic items again show China, the US, and Germany in the lead, followed by Japan, Saudi Arabia, France, Italy, and French Guyana, while countries in the Global South, and especially in Africa, export very few plastic items [79]. This finding suggests that these countries do not have a strong plastic lobby, which makes it easier for them to adopt stringent plastic bag legislation. Hence, mostly countries or states in the Global South adopt plastic bag bans, while countries and states in the Global North usually introduce plastic bag taxes. Taxes are often passed on to the consumers in the form of levies, i.e., they do not directly affect the producing industry, while a ban would directly harm the sales figures of plastic bag producers.

This corresponds to the finding based on the LexisNexis® search that only newspapers from the Global North have repeatedly published stories about the lobbying success of the plastics industry in terms of plastic bag policies [80–83]. One example for such a successful lobbying, where legislation has been weakened is the European directive, which was initially planned as a ban but now allows member states to decide on measures for themselves. Moreover, the directive does not impinge on plastic bags with thickness of above half a millimeter. In practice, this means that mainly plastic bags produced in Asia are affected by the EU legislation [82].

It can thus be suggested that:

Hypothesis 5. *A strong plastic industry in potential adopter countries decreases the likelihood that stringent legislation in terms of plastic bags is adopted.*

3.2.2. National Problem Pressure (Recycling Rates, Waste Collection Rates)

We already discussed global problem pressure above. However, in an interconnected world, products produced in one part of the world are often consumed or used elsewhere. Furthermore, we already stated that the production of plastic alone does not constitute a problem but can do so if combined with a lack of waste collection and recycling. In general, the resale value of plastic waste is considerably lower than for paper or metals, with plastic film being one of the least valuable materials that can be recycled [5]. China's so-called National Sword Policy, a number of trade policies implemented in 2017 and 2018 that block the flow of scrap to China, has led to a decrease in recycling commodity prices and thus aggravated the problem further [84,85].

Figure 6 shows municipal solid waste (MSW) collection rates by region. Low income regions in the Global South, have lower collection rates than OECD countries. South Asia and Africa have the lowest MSW collection efficiency with 65 and 46 percent, respectively.

Figure 7 illustrates the difference in MSW disposal in OECD countries and Africa. While dumps and landfills dominate in Africa, the disposal in OECD countries is characterized by a mix of landfill, recycling, incineration and composting.

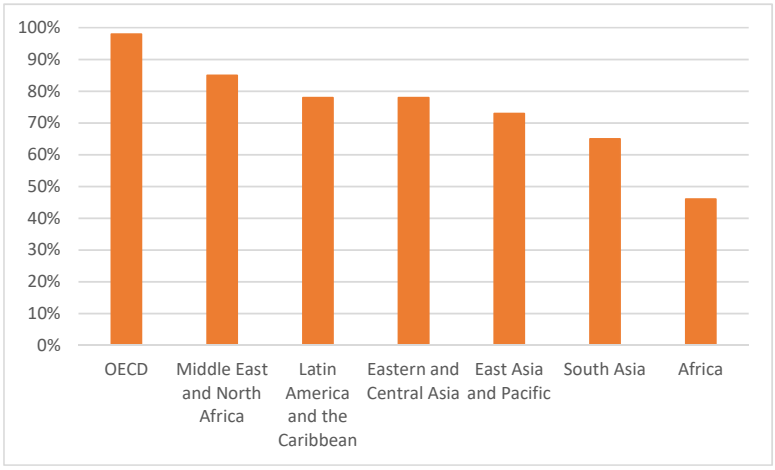

Figure 6. Municipal solid waste collection rates by region. Based on World Bank data [86].

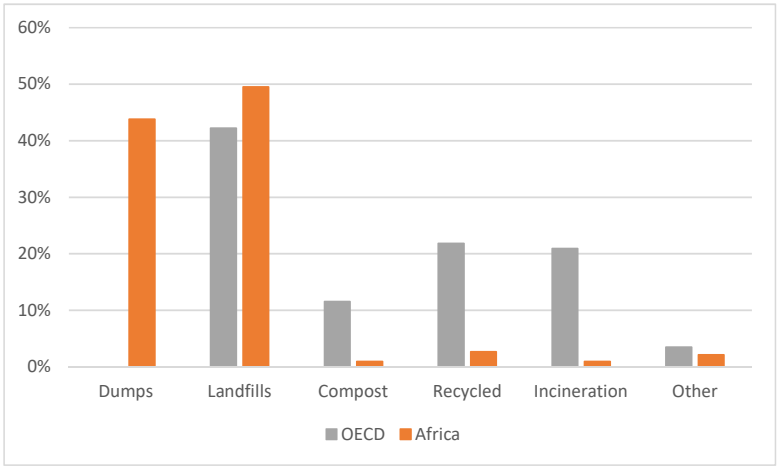

Figure 7. Municipal solid waste disposal in Africa and OECD countries. Based on World Bank data [86].

Overall, municipal waste collection and recycling are much less established in countries in the Global South. This implies that plastic bags are a much more visible and thus a more pressing problem for the general public in the Global South than in the Global North: apart from being an eyesore, plastic bags are a common cause of clogged drainage systems or sewers. As clogged drains are major breeding grounds for malaria-carrying mosquitoes—especially in developing countries due to climatic conditions—plastic bag pollution is directly linked to the spread of this disease. Moreover, it is reported that in many parts of Africa, where livestock often graze in areas with significant plastic bag waste, there is significant economic loss due to cattle and sheep dying from eating plastic bags. For instance, in Mauritania, more than 70 percent of cattle and sheep that die in the capital city die from eating plastic bags [5,87].

Together with Figures 6 and 7, these examples indicate that the problem pressure varies significantly between regions and thus potential adopter countries. (While the general message remains the same, it should be noted here that the graphs show municipal solid waste collection and disposal instead of plastic waste only, due to a lack of available data.) In any case, the severe

consequences caused by plastic bag waste in the Global South seem to result in more stringent plastic bag legislation, namely plastic bag bans.

To sum up, the findings regarding national problem pressure suggest that:

Hypothesis 6. *Limited waste collection and recycling rates increase the likelihood that potential adopter countries adopt stringent plastic bag legislation.*

3.3. Characteristics of the Innovation Itself

The importance of the inherent properties of an issue when assessing the diffusion of an innovation has been recognized already in the late 1990s [88]. The same holds for the diffusion of policies. Whether a policy is implemented or not is affected by the structure of a problem and the policy's political and technical feasibility. Compatibility with other (national) legislation is also relevant. However, delving into the national legislation of over 55 countries was beyond the scope of this research, which is why we will not discuss this aspect here.

Political feasibility relates to the potential for conflict that comes with a certain policy, while technical feasibility refers to the question whether a new policy is closely related to existing regulative and administrative structures, styles, and logics or similar to existing policies [45]. Moreover, it has already been argued that it is more difficult to set policies addressing persistent problems on the international agenda–and that this is one of the reasons why they spread less intensely than other policies. The same holds true for policies addressing problems for which no technical solutions have been found yet [16]. In the case of plastic bags, the underlying problem of plastic in the environment and especially the oceans is actually complex and difficult to solve. This is why existing policies do not address plastic bags that have already been dumped in the environment. However, the implementation of plastic bag policies addressing the accumulation of more bags in the environment is both politically and technically feasible. The policies described above are similar to existing environmental policy measures, e.g., it is quite common that governments impose taxes or bans on non-desired consumer goods. Moreover, the existing examples of plastic bag policies all over the world demonstrate that these policies are easy to communicate, rather easy to implement for a functioning government and do not risk causing major protests among voters as the financial impacts for each single citizen are limited. Negative impacts are mainly felt by companies producing plastic bags; however, these companies do not constitute relevant lobby groups in most countries.

Based on the explanations above, it therefore seems that:

Hypothesis 7. *The given political and technical feasibility accelerate the diffusion of plastic bag policies.*

4. Discussion

This study set out with an aim of analyzing whether the spread of plastic bag policies since 1989 followed a diffusion curve and why plastic bag policies spread, in order to contribute to current discussions in the diffusion literature.

The starting point for our investigation was a finding by Clapp and Swanston [5] that countries in the Global South were among the first countries to introduce plastic bag policies, which is the opposite of the patterns typically seen. To verify this finding, we systematically gathered information on all existing plastic bag policies worldwide. We could thus show that

- the spread of plastic bag policies did in fact follow a diffusion curve;
- different to other diffusion processes, developing countries did not follow the example of typical Western pioneer countries;
- this applies not only to the time of adoption but also to the type of policy adopted.

The results of this study indicate that global and national problem pressure, global public pressure, national lobby groups as well as political and technical feasibility explain to varying degrees the diffusion of plastic bag policies, while we did not find strong evidence regarding the influence of the international political agenda and the structure of the political problem. However, as a key finding, we identified that the degree of influence varies between countries in the Global North and Global South when it comes to (a) global public pressure, (b) national problem pressure and the (c) international political agenda. In the following, the results regarding these three explanatory variables will be discussed, followed by the discussion of research limitations. Subsequently, we highlight future research needs.

Our interpretation of the data suggests that global public pressure has had an influence mainly in the Global North, while a large number of countries in the Global South acted without this pressure. This result may be explained by the fact that international NGOs such as Greenpeace usually target Western governments with their campaigns. This is most likely related to the existence of a stronger organized civil society in the Global North that participates in such campaigns, as well as the fact that most of their individual financial supporters live in the Global North.

Moreover, critical press coverage and freedom of the press are more prevalent in the Global North and media might thus have more influence on policy makers. Nevertheless, the findings need to be interpreted with caution as the findings on press coverage might be distorted by the fact that, though the LexisNexis® Academic search covers newspapers internationally, it still has more Western newspapers in its database. In addition, the search was limited to English, French, German, Portuguese and Spanish search terms which excludes newspapers from certain regions more than others (e.g., Arab and Asian countries).

Instead of global public pressure, it seems that it was the national problem pressure, i.e., the fact that plastic bag litter is much more visible and harmful due to limited waste collection and recycling rates that led policy makers in the Global South to adopt plastic bag legislation. This finding was also reported by Clapp and Swanston [5], although they did not emphasize this issue as an explanatory variable for differences in plastic policy adoption. Furthermore, in 2014, Massey et al. analyzed the adoption and diffusion of adaptation policies across Europe [46]. Though this is a different policy field and different geographical focus, they too found that problem pressure (in their case "extreme weather events") was the most important driver for adopting adaptation policies. Gerigk et al. (2015) who use an economic model to investigate the link between policy diffusion and lobbying conclude that "if the impact of pollution is sufficiently harmful, a country can assume a leadership role (with respect to regulating pollution) among freely trading countries and motivate similar policies abroad" [89] (p. 30). (For their economic explanatory model, Gerigk et al. assume (1) perfect competition, (2) given local pollution and (3) linear environmental damage.)

With regard to the international political agenda, we hypothesize in contrast, that it was not very influential to date. This finding, however, contradicts other analyses within the diffusion literature, according to which the international agenda was very influential. Busch and Jörgens [90], for instance, argue that governments that did not introduce environment ministries felt international pressure to do so in the late 1980s, early 1990s, which is why a large number of countries introduced an environment ministry before the UN Conference on Environment and Development in Rio in 1992. This is one of the reasons why we recommend further investigation to test this hypothesis. It might as well be that the international agenda will be an explanatory variable for future developments.

We furthermore find that UNEP did act as a transfer institution, at least for the African continent. The role of transfer institutions has to date not been analyzed extensively in the diffusion literature, probably due to the structural focus of most diffusion research. However, if we reexamine the findings by Massey et al., they conclude that the efforts by the European Union as well as the ones by the UNFCCC and the OECD are important drivers for the diffusion [46], keeping our findings in line with theirs.

However, generally, there are some limitations to our findings: The collection of own empirical data was beyond the scope of this research and thus we did rely on existing data. Hence, one of the major challenges for this article has been data availability–on at least three levels. First, apart from rough estimates, there is a lack of valid global data regarding the amount of plastic waste, plastic waste collection rates, and reliable data on recycling rates for plastics as well as the production of plastic bags or more generally single-use plastics. Second, if data on certain topics is available, it is nevertheless difficult to find time series that can be used to substantiate claims regarding explanatory factors of the diffusion of plastic bag policies. Finally, even in cases where data is available in time series, it is not necessarily very reliable. For instance, regarding the plastic production worldwide, we decided to use the data provided by Geyer et al. [57], while most publications rely on data published by PlasticsEurope. However, the data reported for some years is varying across publications. For instance, the 2010 publication states that 230 Mt of plastics were produced in 2009, while in the following publications, it is stated that 250 Mt were produced [91–93].

To conclude, investments are needed to standardize datasets at different levels (national and international) and to make them publicly available in order to ensure not only better monitoring but also better understanding and analysis of the progress on plastic bag policies.

Moreover, the diffusion research comes with its own weaknesses that we want to address clearly: diffusion research is based primarily on observations and can thus draw attention to potential explanatory factors. However, it is often unable to provide firm evidence for causal relationships. Furthermore, the idea of pattern-finding also favors structural explanations. Thus, to test the causal relationships observed, additional research would have to be conducted to reveal the relative impact of different explanatory factors. This is to say, the pattern-finding research can produce more robust explanations, if combined with process-tracing, an approach used in policy transfer research [17]. This would allow the identification of specific national explanatory factors and would also help gain more insights into which transfer mechanisms had an effect (e.g., policy learning or mimicry). Moreover, a future discourse analysis or qualitative content analysis could help to uncover the actual underlying motivations for adopting plastic bag policies. This would encompass a more content-focused analysis of the public discourse (instead of the focus on single search terms) as well as the detailed analysis of drafts or background documents produced during a legislative process of plastic bag policies, protocols of plenary debates, the full wording of the policy itself, etc.

In addition, diffusion research has difficulties to address the issue of effectiveness of the policies. This is because the pattern-finding research usually focuses on the question whether a policy has been adopted somewhere but does not pay attention to successful (or unsuccessful) implementation. There is an ongoing debate over the question of whether plastic bag policies are indeed effective [94], or whether they are not [74].

To develop a full picture of explanatory factors for the spread of plastic bag policies, additional studies that–as a first step–test the hypotheses put forward in this article, are required. However, there is also need for further research including several other potential explanatory variables, (e.g., environmental awareness, geographic proximity, recognizing the benefits of a policy, expected impact, motivation by progress in other countries, financial resources, time and human resources, and communication or language barriers to name but a few), which this article could not include. In this context, it would also be interesting to see whether China's National Sword policy, which restricts the importation of plastic waste, will have an influence on plastic policies in the future.

Additionally, more research is required on both the difference and the interplay between decisions taken at the national level and those taken at subnational level.

Against the background of increasing plastic pollution, both in aquatic and terrestrial ecosystems, the adoption of plastic bag policies is only a first step in the struggle against plastics in the environment. Yet, a better understanding of the factors that explain the diffusion of plastic bag policies in the Global South and Global North, respectively, as well as the reasons for why they differ, could also help to implement other types of plastic policies that decrease plastic pollution and associated health risks for

both fauna and humans. Nevertheless, policymakers need more specific and reliable evidence on risks related to plastics but also the effectiveness of certain policy measures in order to balance the costs and benefits of strategies to tackle the problem and identify ones that are neither excessive nor insufficient. The growing awareness of plastic pollution can be harnessed to bring momentum to national and cross-national efforts for developing effective and efficient policy interventions.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

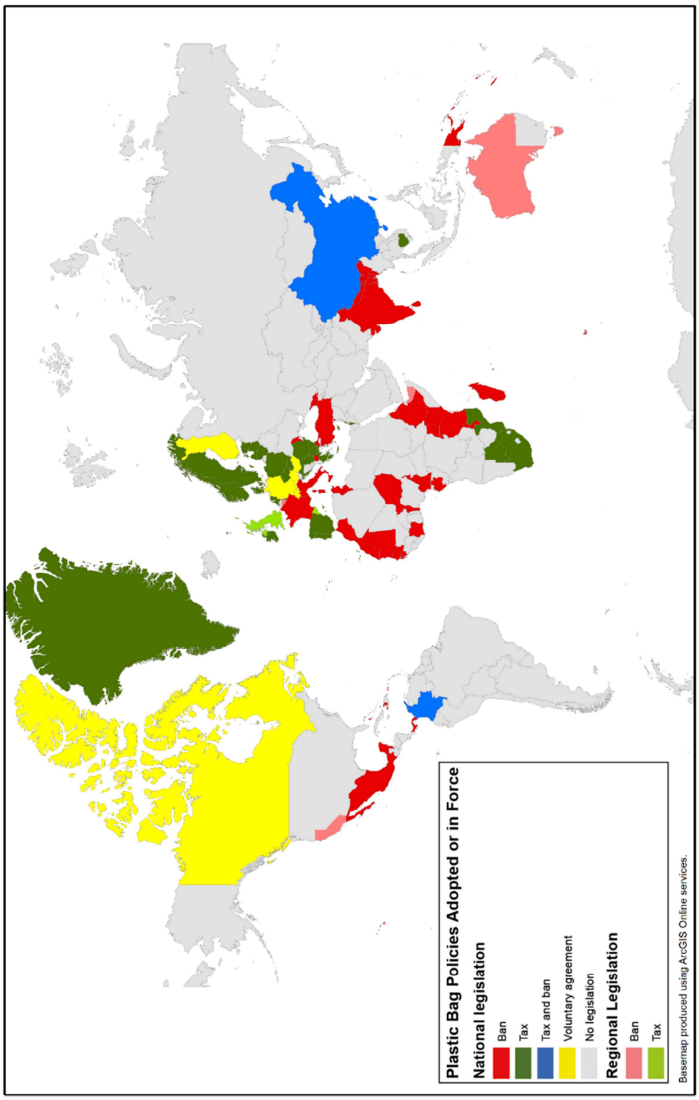

Figure A1. Map of plastic bag policies (policies in force and recently adopted policies as of April 2018).

Table A1. Countries with plastic bag policies.

Year	Country	Type of Policy	Global North (N)/Global South (S)
1991	Germany	tax	N
1994	Denmark	tax	N
1999	Bhutan	ban	S
2002	Bangladesh	ban	S
2002	Ireland	tax	N
2002	India	ban	S
2003	South Africa	tax	S
2003	Taiwan	ban	N
2004	Rwanda	ban (plastic bags banned from shops)	S
2004	Luxemburg	voluntary agreement	N
2005	Eritrea	ban	S
2005	India	ban (including thicker bags)	S
2005	Somaliland	ban	S
2005	Bhutan	ban (reinforced due to ineffectiveness)	S
2006	Tanzania	ban	S
2006	Romania	tax	N
2007	Kenya	ban (manufacture and import)	S
2007	Kenya	tax (on other bags)	S
2007	Uganda	ban (plastic bags < 30 µm)	S
2007	Uganda	tax (for bags > 39 µm)	S
2007	Botswana	tax	S
2008	Rwanda	ban (plastic bans banned completely)	S
2008	China	tax	S
2008	China	ban	S
2009	Macedonia	tax	S
2009	Hong Kong	tax (for supermarkets and retail outlets)	N
2009	South Australia	ban	N
2009	Malta	tax	N
2010	Gabon	ban	S
2010	Mexico	ban	S
2011	Australia Capitol Territory, Norther Territory	ban	N
2011	Republic of Congo	ban	S
2011	Kenya	ban (renewed ban on manufacture and import for thicker bags, due to former ineffectiveness)	S
2011	Kenya	tax (on other bags)	S
2011	Malaysia, state of Penang	tax	S
2011	Wales	tax	N
2011	Ethiopia	Ban (import and manufacture of single use plastic bags)	S
2012	Bulgaria	tax	N
2012	Serbia	tax	S
2013	Tasmania	ban	N
2013	Uganda	ban (extended to manufacturing and use of most plastic bags)	S
2013	Italy	ban	N
2013	Mauritania	ban	S
2013	Macedonia	ban	S
2013	Niger	ban	S
2013	Northern Ireland	tax	N
2013	Haiti	ban	S
2014	Scotland	tax	N
2014	Cameroon	ban	S
2014	Ivory Coast	ban	S
2015	England	tax	N
2015	Hawaii	ban	N

Table A1. *Cont.*

Year	Country	Type of Policy	Global North (N)/Global South (S)
2015	Hong Kong	tax (levy widened to all retailers)	N
2015	Gambia	ban	S
2015	Madagascar	ban	S
2015	Senegal	ban	S
2015	Malawi	ban	S
2015	Portugal	tax	N
2016	Canada	voluntary agreement	N
2016	California	ban	N
2016	Netherlands	tax	N
2016	Puerto Rico	ban	N
2016	Morocco	ban	S
2016	Papua New Guinea	ban	S
2016	Mozambique	tax	S
2016	India	Ban (including thicker bags)	S
2016	Guinea-Bissau	ban	S
2016	France	ban	N
2016	Nepal	ban	S
2016	Germany	voluntary agreement (due to EU legislation)	N
2016	Finland	voluntary agreement	N
2016	Antigua and Barbuda	ban	S
2017	Israel	tax	N
2017	Kenya	ban (regarding use, manufacture and importation of plastic bags)	S
2017	Benin	ban	S
2017	Sri Lanka	ban	S
2017	Tunisia	ban	S
2017	Estonia	tax	N
2017	Georgia	ban	S
2017	Austria	voluntary agreement	N
2017	Catalonia	tax	N
2017	Norway	tax	N
2017	Switzerland	voluntary agreement	N
2017	Colombia	tax	S
2017	Colombia	ban	S
2017	Moldova	ban	S
2018	Wallonia, Brussels	ban	N
2018	Cyprus	tax	N
2018	Czech Republic	tax	N
2018	Poland	tax	N
2018	Greece	tax	N
2018	Lithuania	tax	N
2018	Luxemburg	tax	N
2018	Slovakia	tax	N
2018	Panama	ban	S
2018	Australia	ban	N
2018	Vanuatu	ban	S
2018	Spain	tax	N
2019	Turkey	ban	S
2019	Croatia	tax	N
2019	Latvia	tax	N
2019	Belize	ban	S
2020	Ethiopia	ban (on plastic bags use)	S
2020	Cambodia	tax	S
2020	Bahamas	ban	N
n.d.	Sweden	tax	N
n.d.	Hungary	voluntary agreement	N

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