Ecole Doctorale des Sciences Economiques, Juridiques, Politiques et de Gestion

Centre d'Etudes et de Recherches sur le Développement International (CERDI)

Université Clermont Auvergne, CNRS, IRD, CERDI, F-63000 Clermont-Ferrand, France

ESSAYS ON FOREIGN AID, POLITICAL CYCLES AND ENVIRONMENTAL DEGRADATION

Thèse Nouveau Régime

Présentée et soutenue publiquement le **4 Décembre 2020**

Pour l'obtention du titre de Docteur *ès* Sciences Économiques de l'Université Clermont Auvergne

Par

Mohamed BOLY

sous la direction de:

Pr. Pascale Combes Motel et Pr. Théophile Azomahou

Composition du jury:

Phu Van NGUYEN	DR, CNRS, INRAE, Université de Strasbourg	Rapporteur
Mathilde MAUREL	DR, CES, Université Paris 1 Panthéon-Sorbonne	Rapporteure
Jean-Louis COMBES	Professeur, CERDI, UCA	Suffragant
Mariana VIJIL	Sr Economist, World Bank	Suffragante
Pascale COMBES-MOTEL	Professeur, CERDI, UCA	Directrice
Théophile AZOMAHOU	Professeur, CERDI, UCA	Directeur

L'Université Clermont Auvergne n'entend donner aucune approbation ni improbation aux opinions émises dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur.

A mes parents...

Nous y sommes enfin! Je vous la dédie.

Remerciements

L'accomplissement de ce travail n'aurait pas été possible sans le concours d'un certain nombre de personnes. Mes remerciements vont tout d'abord à mes directeurs de thèse, Pr. Pascale Combes Motel et Pr. Théophile Azomahou pour leurs conseils, leurs encouragements et surtout leur confiance tout au long de cette thèse. Je retiens également de ces années, une très belle expérience humaine.

Ils s'adressent aussi aux membres de mon jury pour le temps consacré à évaluer ce travail, les professeurs Phu Van Nguyen, Mathilde Maurel, Jean-Louis Combes et Mariana Vijil. Je me réjouis à l'avance de bénéficier de votre expertise et de pouvoir échanger avec vous lors de ma soutenance.

Un grand merci à l'ensemble du corps enseignant et au personnel administratif. J'ai une pensée particulière pour Mariannick, Agnès, Martine, Chantal, Johan, Hassen, Claudine, et tous les autres de l'adminisration, sans qui ce parcours n'aurait pas été le même. Merci pour votre sympathie et votre dynamisme afin de toujours nous faciliter les choses.

Dès le début de cette aventure Clermontoise, il y avait Aliou, Hyppolite, Djibril, et Axelle à qui je témoigne toute ma reconnaissance pour leur accueil et leurs précieux conseils. Et comment ne pas citer Ibrahima Diallo (aka "the Stata Machine")? Merci pour tes conseils et encouragements toutes ces années, et surtout pour ta patience dans les échanges avec les plus jeunes et ta passion à partager le savoir.

J'exprime également ma profonde gratitude à tous les membres de l'Association des Burkinabé de Clermont-Ferrand (ABUC), spécialement à Alassane Drabo, Serge Koblavi, Ali Compaoré, pour leurs constants efforts pour l'intégration des nouveaux.

Un grand merci à mes devanciers Aissata, Éric, Constantin, Maimouna, Jean Galbert, Chirstelle Tchoupe, Pierre, Clément Mathonnat, pour leurs encouragements et leurs conseils, ainsi qu'à mes collègues (Tanou, Carine, Ibrahim Nana, Camille Laville, Jean Marc, Régina, Moulaye, Yoro, Humaira Pasha, Elsa, Pauline, Claire Ricard, Fayçal, Hakim, Hamid, Mohamed, Bernard, Harouna, Neimatou, Awa, Ismael, Ouli et plein d'autres) pour la bonne ambiance de travail.

Mahamady, Maimouna, Nassem et Isaac, merci pour votre accueil toujours aussi chaleureux. Camara, Yashmina et Fatou, nos débats entre deux régressions me manquent déjà. Une pensée pour ceux hors de Clermont (Cheik Diallo, Kady Keita, Elisée Konan, Cédric Deguenonvo, Christelle Nikiema, Yann Tapsoba, Racky Balde, Ange Darga, Hadiatou Diallo, Théoneste Toé, Safiatou, Mariam)

Ruth, Richard, et Frans, merci pour vos encouragements et surtout votre compréhension ces derniers mois. Quant à la team Searchball (Seb, Sam, Mika, Florent, Damien, Jocelyn, Nestor, Narcisse, Gildas, Camille), je vous dis à très bientôt pour le prochain match.

Mention spéciale à mes collègues pour leur flexibilité et leur compréhension pendant les derniers mois de la thèse; un grand merci à Anouk pour cela.

Et il y aura toujours Aïcha, Cynthia, Aimé, Issaka et Macoura que je remercie du fond du coeur pour leur présence depuis toutes ces années et ce, jusqu'à la toute dernière minute.

Enfin et surtout, je ne serais pas là sans ma famille. Nous avons toujours été là les uns pour les autres. Vous m'avez toujours poussé à aller plus loin et avez tout fait pour me mettre dans de bonnes conditions afin de réussir. Cette thèse est aussi la votre; merci à vous.

Je vous souhaite une excellente lecture.

Résumé

Les effets observés du changement climatique sur les dernières décennies mettent en exergue le besoin et l'urgence de mobiliser suffisamment de resources pour le ralentir et en atténuer les effets. Dans le cas des pays en développement, d'aucuns suggèrent que l'aide au développement aurait un rôle non des moindres à jouer dans cette lutte. Cependant, encore faudrait-il que les ambitions politiques des décideurs ne soient pas en compétition avec celles environnementales. Cette thèse examine les liens existants entre l'aide au développement, les cycles politiques et la dégradation de l'environnement, à travers trois chapitres empiriques. Le chapitre 2 étudie le lien entre l'aide et l'atténuation des émissions de CO_2 dans 112 pays en développement. Il montre que l'effet de l'aide dépend du type de donneur, l'aide multilatérale étant plus susceptible de réduire la pollution que l'aide bilatérale pour laquelle il n'y a pas d'effet. Cependant, une aide bilatérale spécifiquement ciblée sur la protection de l'environnement contribue à réduire le niveau de pollution. Cet impact est toutefois non linéaire, un effet de réduction de la pollution n'étant observé que pour des montants importants d'aide bilatérale environnementale. Le chapitre 3 étudie les facteurs associés à l'allocation de l'aide bilatérale environnementale entre les pays bénéficiaires, sur la période 1990-2013. L'objectif est d'évaluer si l'aide bilatérale environnementale est motivée par des facteurs non environnementaux tels que les intérêts économiques et politiques des donneurs. Trois types de variables susceptibles d'influencer l'allocation de l'aide environnementale sont examinés : les besoins et les mérites environnementaux et non environnementaux des pays bénéficiaires, ainsi que les intérêts économiques et politiques des donneurs. Les variables relatives aux besoins et aux mérites environnementaux comprennent la vulnérabilité aux événements climatiques extrêmes et la rigueur de la politique environnementale. Les résultats des régressions montrent que si la vulnérabilité au changement climatique semble être un déterminant clé de l'aide environnementale, son allocation est peu ou pas liée aux efforts d'atténuation du changement climatique des bénéficiaires. Il trouve également peu d'évidence empirique sur une quelconque association entre les variables d'intérêt des donneurs et l'aide environnementale, en moyenne. Cependant, une analyse désagrégée révèle d'importantes hétérogénéités dans ces relations, et révèle ainsi que certains donneurs sont plus sensibles aux variables environnementales, tandis que d'autres semblent plutôt se concentrer sur leurs intérêts économiques et politiques. Le chapitre 4 explore l'impact des élections sur la politique environnementale et la dégradation de l'environnement, en utilisant un échantillon de 76 pays démocratiques de 1990 à 2014. Les estimations indiquent que les années électorales sont caractérisées par une augmentation des émissions de CO_2, même si cet effet semble s'atténuer sur les années plus récentes. Il révèle également que cet effet n'est présent que dans les démocraties plus anciennes, où les électeurs sont plus avisés et où les dirigeants se livrent à des manipulations budgétaires via la composition des dépenses publiques plutôt que par leur niveau. Une plus grande liberté de la presse et des préférences environnementales élevées de la part des électeurs permettent de réduire l'ampleur de ce cycle.

Mots-clés : Emissions de CO_2 · Aide Publique au Développement · Aide environnementale · Allocation de l'aide · Cycles électoraux · Politique environnementale · Atténuation du changement climatique

Codes JEL : D72 · E6 · E62 · F35 · O11 · O13 · Q53 · Q54

Abstract

The observed effects of climate change over the last decades highlight the urgency of mobilizing sufficient resources to slow it down and mitigate its effects. In the case of developing countries, some suggest that development aid has an important role to play. However, the political ambitions of decision-makers should not be in competition with environmental ones. This thesis examines the existing links between foreign aid, political cycles and environmental degradation, through three empirical chapters. Chapter 2 studies the link between foreign aid and CO_2 mitigation in 112 developing countries. It shows that the effect of aid depends on the donor, with multilateral aid more likely to reduce pollution than bilateral aid for which there is no effect. Nevertheless, a bilateral aid specifically targeted toward environment contributes to decrease the level of pollution. This later impact is non-linear, a pollution-reducing effect is only observed for important amounts of environmental bilateral aid. Chapter 3 studies the factors associated with environmental bilateral aid to recipient countries over the 1990-2013 period. The objective is to assess whether the environmental bilateral aid is motivated by non-environmental factors such as donors' economic and political interests. Three kind of variables that might influence environmental aid allocation are examined: the environmental and non-environmental needs and merits of recipient countries, and the economic and political interests of donors. Environmental needs and merits variables include vulnerability to extreme climate events and the stringency of climate policy. The results show that while vulnerability to climate change seems to be a key determinant of environmental aid, its allocation is poorly linked to recipients' climate mitigation policies. It finds weak evidence of association between donors' interest variables and environmental aid on average. However, an heterogeneity analysis allows to go deeper into all the relations above, and unveils that some donors are more sensitive to environmental variables, while others rather seem focused on their economic and political interests. Chapter 4 explores how elections impact climate change policy and environmental degradation, using a sample of 76 democratic countries from 1990 to 2014. The findings indicate election years are characterized by an increase in CO_2 emissions, even though the effect weakens over the recent years. It also reveals that this effect is present only in established democracies, where incumbents engage in fiscal manipulation through the composition of public spending rather than its level. Higher freedom of the press and high environmental preferences from citizens reduce the size of this "political pollution cycle".

Keywords : CO_2 emissions · Official Development Assistance · Environmental aid · Aid Allocation · Electoral cycles · Environmental policy · Climate mitigation

JEL Codes : D72 · E6 · E62 · F35 · O11 · O13 · Q53 · Q54

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Context

Except for a few climate-skeptics, the question of the reality or even the existence of climate change is no longer debated, both within the scientific community and within States. It is indeed a reality! However, for those who are still doubtful, in blind denial, or in the most complete ignorance of the phenomenon, it should be noted that climate change can be defined as "*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*" United Nations Framework Convention on Climate Change (UNFCCC, 1992).

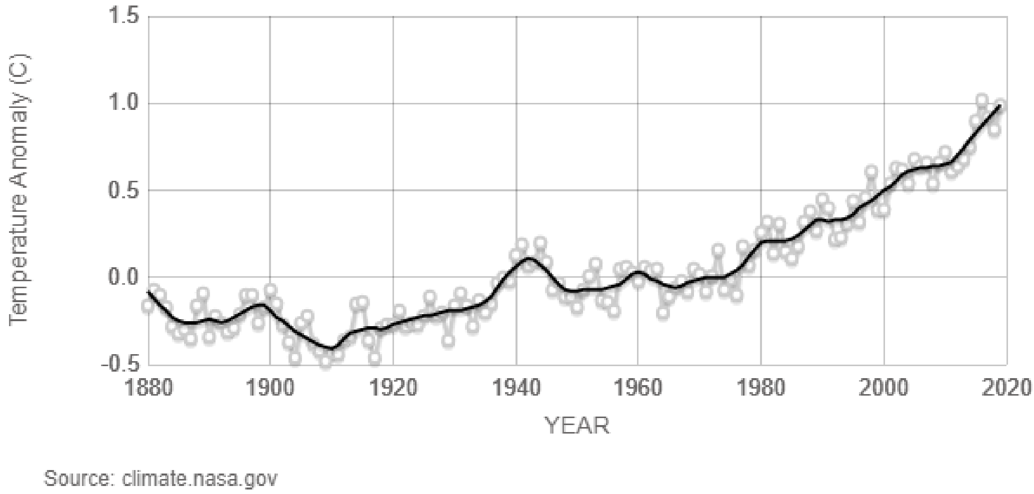


Figure 1.1: Global Land-Ocean Temperature Index

Indeed, the global average surface temperature significantly raised since 1906 (Figure 1.1). The heat lead among others to melting glaciers, changing precipitation patterns and setting animals in motion. It encompasses, in addition to the rise in average temperatures, extreme weather events, the displacement of wildlife habitats and populations, rising sea levels and a series of other impacts. All of these changes appear as humans continue to add greenhouse gases such as carbon dioxide, trapping heat in the atmosphere. According to the NASA database, over the last 170 years, atmospheric CO_2 concentrations have risen 47% above pre-industrial levels found in 1850 as a result of human activities. This is higher than what had happened naturally over a period of 20,000 years (since the Last Glacial Maximum to 1850, from 185 ppm to 280 ppm).

From this climate change ensue many consequences around the world; in Africa, some regions are at risk of water shortages. Coupled with growing demand, this will likely lead to a sharp increase in the number of people at risk of water scarcity. It is likely to affect livelihoods, according to the report of the International Panel on Climate Change. Projected reductions in the area suitable for growing crops, and in the length of the growing season, are likely to produce an increased risk of hunger.

In Asia, Glacier melting in the Himalayas is virtually certain to disrupt water supplies within the next 20 to 30 years. Floods and rock avalanches are almost certain to increase. Highly populated coastal regions, including deltas of rivers such as the Ganges and Mekong rivers, are likely to be at increased risk of flooding. Economic development is likely to be affected by the combination of climate change, urbanization, and rapid economic and population growth. Projected changes in temperature and rainfall will likely reduce crop yields overall, increasing the risk of hunger. Likewise, persistent water shortages, especially in southern and eastern Australia, are likely to worsen. Ecologically important regions such as the Great Barrier Reef and Kakadu National Park are likely to lose a significant portion of their wildlife. Some coastal communities are very likely to see an increased risk of coastal storms and flooding. Countries in central and eastern Europe could face less summer rainfall, leading to higher water stress. The health risks from heat waves are expected to increase. Forest productivity is expected to decline and the frequency of peat-land fires to increase. Countries in southern Europe are very likely to experience reduced water supplies, lower agricultural production, more forest fires and the health effects of increased heat waves. Rising temperatures and decreasing soil water in the eastern Amazon region would lead to the replacement of rain-forest by Savannah. Drier areas are likely to see salinization and desertification of agricultural land, declining crop yields and livestock productivity reducing food security. Warming in the mountains of western North America will most likely reduce the snow-pack, causing more flooding in the winter and reduced water supplies in the summer. An increase in pest, disease and forest fire problems is likely.

In view of all that has been mentioned above, the necessity and the urgency of a global, effective and coordinated action to tackle the damage no longer needs to be demonstrated. Few questions then arise: those of the responsibilities, of the sacrifices to be made, but above all, of the capacities to do so.

Concerning the responsibilities, the polluters should be responsible and pay to mitigate their emissions. If historical emissions are considered, developing countries are not primarily responsible for climate change, given their relatively small historical emissions (Figure 1.2). Even in recent periods, these countries' contribution to global emissions remains modest (Figure 1.3). In addition, the fight against climate change requires additional resources and requires changing the growth and development path. For developing countries, any additional resources in the short-run that would be allocated to fight climate change represent less resources for the fight against poverty. This makes fighting poverty and climate change mitigation look opposite goals for these countries as they are confronted with a dilemma between tackling today's issues and future risk. However, in the long run, both are not opposed: in the absence of mitigation, extreme climate events could reverse the development gains and bring these countries back into poverty (Halverson and McNeill). When it comes to capacities, these countries have very limited capacities to make significant efforts to fight climate change, given their level of development.

It is in this perspective that Official Development Assistance (hereafter ODA) could be used as a tool to help these countries in their transition to clean and climate-resilient economies.

The Development Assistance Committee (DAC) defines ODA as "those flows to countries and territories on the DAC List of ODA recipients and to multilateral institutions which are :

(i) provided by official agencies, including state and local governments, or by their executive agencies; and

(ii) each transaction of which

(a) is administered with the promotion of the economic development and welfare of developing countries as its main objective; and

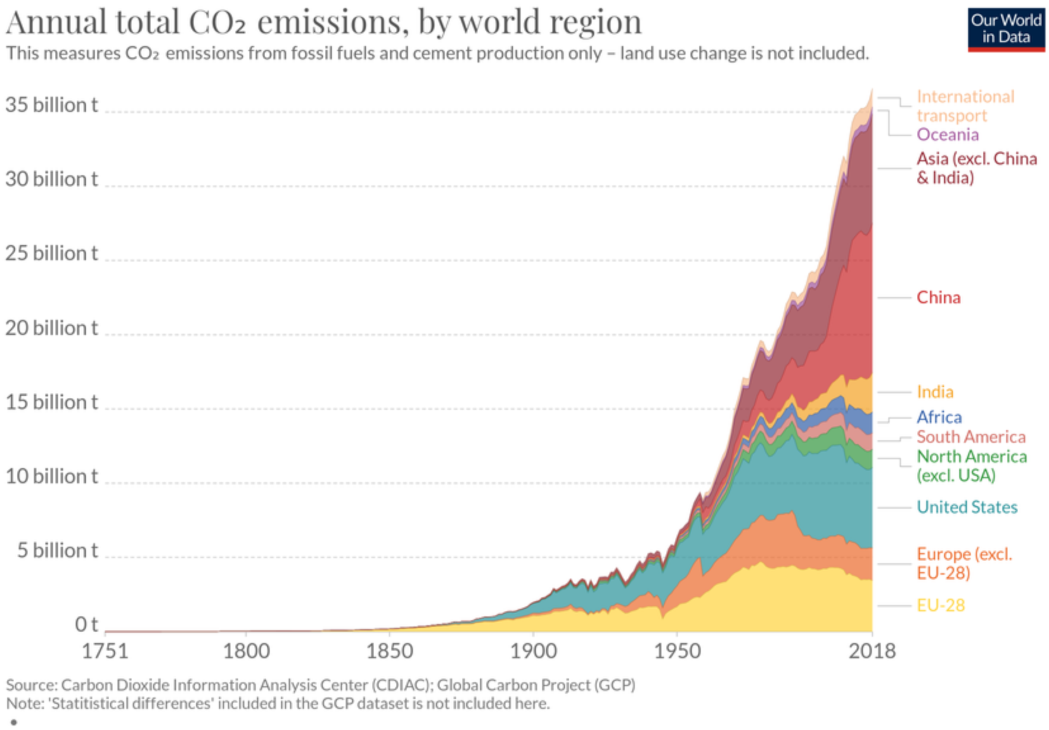
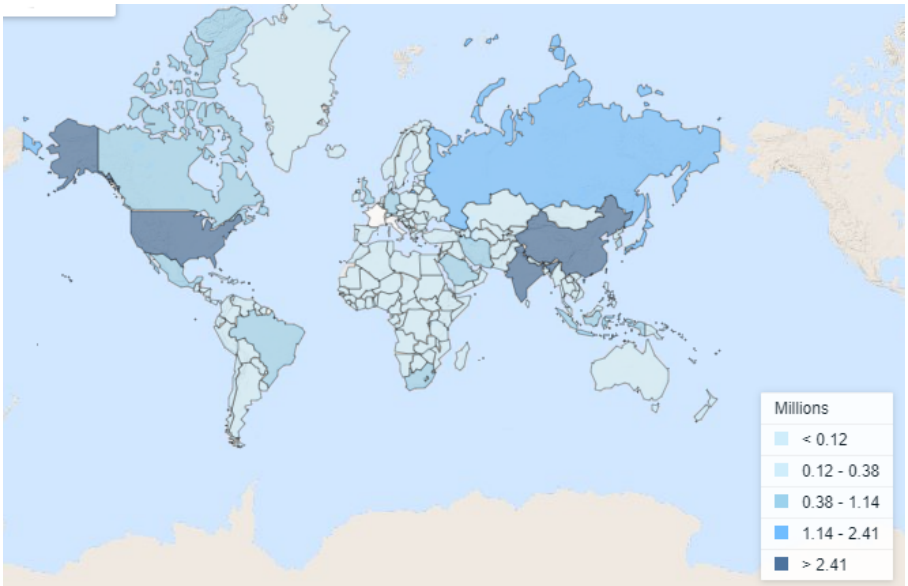


Figure 1.2: Annual CO_2 emissions per region

(b) is concessional in character and conveys a grant element of at least 25 per cent (calculated at a rate of discount of 10 per cent)".

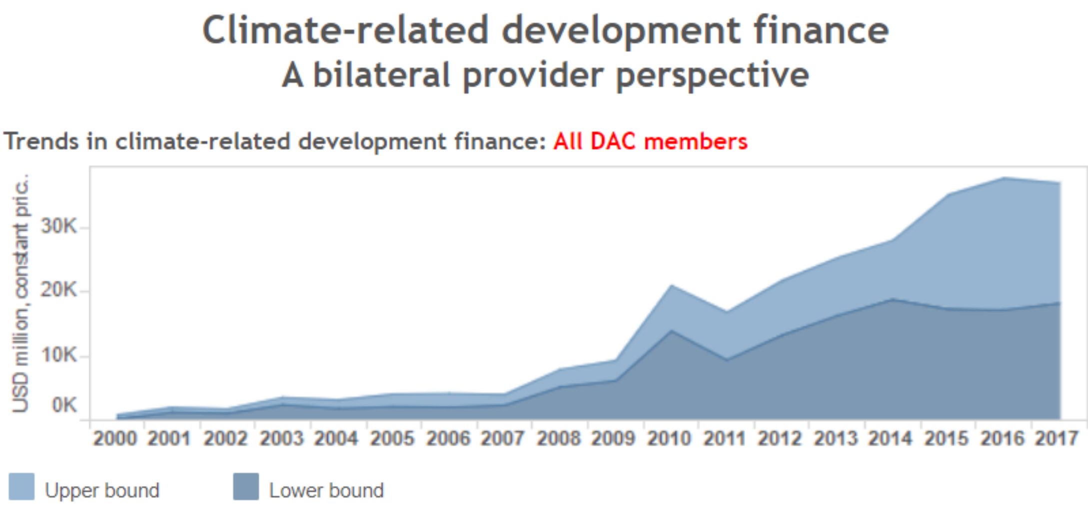
In 2009 in Copenhagen, developed countries committed to mobilize $100billion per year by 2020 from a wide variety of sources (public and private, bilateral and multilateral, including alternative sources) for developing countries for climate change mitigation and adaptation. In 2010, the UNFCCC Conference of Parties recognized this commitment from developed countries; since then, the level of financial support mobilized and provided have significantly increased, while improvements in the transparency of climate finance were made for a better comprehension. The Paris Agreement is historic in the sense that all countries agreed to ambitious goals for strengthening the global response to climate change. The aggregate volume of climate finance (public and private) mobilized reached US$62 billion in 2014[1], and developed countries were urged to scale-up their level of support to achieve the US$100 billion goal by 2020, even if climate-related development finance from bilateral providers significantly increased over recent years (Figure 1.4).

[1] OCDE (2015)



Source: The World Bank.

Figure 1.3: CO_2 emissions (kt) in 2016



Source: OECD Statistics

Figure 1.4: Evolution of climate-related development finance from bilateral providers

ODA is increasingly oriented in the form of climate finance (Bierbaum et al., 2010; OECD, 2011) and supports projects that aim to create an enabling environment[2] for countries to later host Clean Development Mechanism (CDM) projects (Dutschke

[2]Through measures such as strengthening environmental policy.

and Michaelowa, 2006).

Even if the funding is supposed to be new and additional (UNFCCC, 2011) to the existing target of 0.7% ODA from Gross National Income (GNI), the amount of ODA allocated to climate mitigation is increasing way faster than ODA allocated to poverty and could compete with the latter according to certain authors (Tol, 2007). However, in the long-run climate mitigation will help maintaining a stable, though slower, poverty alleviation path (Stern, 2008).

With this underlying assumption, ODA is therefore perceived as a useful tool for shaping environment friendly policies, especially in developing countries (Halimanjaya and Papyrakis, 2012; Lebovic and Voeten, 2009).

But beyond mobilizing enough resources to help developing countries fight climate change, there are much more complex issues. One of them is in particular that of knowing whether ODA really has this beneficial effect for the environment that is lent to it. In other words, is aid really effective in helping to mitigate climate change?

Also, concerning ODA aimed at poverty reduction, it is often stated that donors' motivations go beyond the altruistic goal of improving the economy and the well-being of people in developing countries (McKinlay and Little, 1977; Maizels and Nissanke, 1984; Trumbull and Wall, 1994; Alesina and Dollar, 2000; Berthélemy, 2006; Hoeffler and Outram, 2011). Why would it be any different for environmental aid? Even if the resources are mobilized, how can one make sure they will be sent where they are the most needed, rather than according to donors' political and economic interest as pointed out by some scholars (Lewis, 2003)?

Last but not least, are there real incentives for not only developing countries, but also developed countries, to effectively fight climate change? Is environmental protection not influenced by politics, particularly for electoral purposes, as it has been proven to be the case for fiscal policy (Brender and Drazen, 2005; Shi and Svensson, 2006; Brender and Drazen, 2008, 2013)?

1.2 A lack of consensus

On the environmental impact of foreign aid

Some studies have paid attention to the effects of foreign aid on environmental protection in aid-recipient countries, but the literature is still inconclusive with mixed results.

For those finding a positive impact of ODA, aid creates good incentives for recipient countries to engage in environmental protection, given that they compete for more aid; thus, they have to align with donor countries' preferences (Tsakiris et al., 2005; Hadjiyiannis et al., 2013). This competition for environmental aid results in higher environmental protection. However, this is not always the case Chambers et al. (2018). Another channel highlighted in this literature is also the improvement of environment quality due to higher citizens' demand: indeed, by promoting economic development and increasing citizens' income, aid leads to a higher demand for a clean environment (Grossman and Krueger, 1995; Arvin and Lew, 2009). It is also supposed to be an additional revenue that allows recipient countries to partially relax the trade-off between economic growth and environmental protection, which is particularly important in developing countries because of their small tax base (Hamilton and Clemens, 1999; Haber and Menaldo, 2011).

Others rather consider that aid creates bad incentives given that it mitigates the development of democratic insitutions (Djankov et al., 2008) and frees governments from fiscal revenues; it is thus making them less accountable to the citizens, as in a "resource curse" (Knack, 2001). These governments therefore delay important reforms (Ostrom et al., 2005) such as environmental reforms and under-supply public goods. Also, receiving funds for environmental protection could lead recipients' to decrease their environmental spending (Feyzioglu et al., 1998; Farag et al., 2009; Waddington, 2004).

Bilateral aid is also more criticized and is said to be more driven by political alliances rather than recipient country's performance (Alesina and Dollar, 2000; Dreher et al., 2008; Faye and Niehaus, 2012), in opposition to multilateral aid which has a more beneficial effect (Rodrik, 1995; Lebovic and Voeten, 2009).

Most of the studies have just focused on a specific project, a particular recipient or donor. For some using a group of countries (Arvin and Lew, 2009), the results depend on the indicator of environmental degradation used. More recent studies (Lim et al., 2015) suggest that these mixed results are due to the fact that previous studies were focusing on the unconditional effect of ODA and find that the effect is conditional on other types of flows such as trade or FDI. But above all, it seems that incomplete data (Tierney et al., 2011) and miscoding (Michaelowa and Michaelowa, 2011) are the key drivers of such mixed results.

On the allocation of environmental aid

The question of the allocation of foreign aid is not new and has been widely documented in the literature in order to understand the motivations of donors, which go far beyond the needs of recipient countries and their poverty reduction objectives. The main determining factors that are highlighted by this literature are the needs and merits of recipients, and the interests of donors. Concerning merits, even after the conclusions of Burnside and Dollar (2000) about the role of recipients' countries good policies on aid effectiveness have been challenged (Roodman, 2007), recipients' countries governance remained one of the key determinant factors in the aid allocation (Berthélemy and Tichit, 2004; Easterly, 2007; Clist, 2011; Acht et al., 2015). However, it has been proven that donors might overlook those merits depending on their interests. Beyond recipients' needs and merit, there is indeed large evidence that donors pursue many economic and political interests while providing aid (Alesina and Dollar, 2000; Berthélemy, 2006; Dreher et al., 2008, 2011; Faye and Niehaus, 2012), and new donors, particularly, are not exception to this (Dreher et al., 2011). Such interference of political and economic interests with recipients' needs and merits, in aid allocation processes, may reduce aid's effectiveness (Dreher et al., 2013). Some studies focused on the factors associated with the allocation of environmental aid in particular. Lewis (2003) for instance, finds that donor interests outweigh recipient needs because environmental aid is not targeted to the recipients that are most in need of abating local pollution. Her findings suggest that donors favor democratic recipients with unexploited natural resources, with whom they have had prior relations (economic and security). These findings are opposed to those of Figaj (2010) that finds number of environmental treaties, environmental vulnerability, environmental sustainability, CO_2 emissions, and biodiversity as major determinants of environmental aid, while political variables seem to play no role. More recent studies separately look at mitigation and adaptation aid. While poverty and exposure to climate change risks seem to be positively associated with adaptation aid (Betzold and Weiler, 2017; Weiler et al., 2018), the latter is also linked to donors' economic interests (Weiler et al., 2018). For mitigation aid, recipient countries with higher CO_2 emissions, lower GDP per capita and good governance receive more funds (Halimanjaya, 2015, 2016); but then again, donors' geopolitical interests play a role in the allocation especially for bilateral donors such as France or Japan (Halimanjaya, 2016). Also, Clean Development Mechanism (CDM) host countries tend to receive more funds (Halimanjaya, 2016). Most of these studies consider either aid for mitigation or adaptation separately, which they identify using the Rio-markers that have been proven to be barely reliable (Michaelowa and Michaelowa, 2011; Weikmans et al., 2017); many do not disentangle environmental degradation, and recipient countries climate policies (e.g Halimanjaya (2015, 2016)), which might lead to confusion in interpretations. Moreover, the econometric techniques used are not appropriated to the structure of the bilateral data used, as explained by Silva and Tenreyro (2006, 2011).

On the political motivations behind countries' environmental protection

A growing literature suggests that elections have distortionary effects on economic policy. A small body of it consists of 'partisan' models, which focus on the behavior of ideologically motivated politicians. Another more substantive part of this literature focuses on the incentives of office-motivated politicians to manipulate economic variables for re-election purposes. This latter theoretical argument has firstly been formulated by Nordhaus (1975). Assuming that voters are backward looking, governments have incentives to use expansionary fiscal policies to stimulate the economy in the late years of their term in office. Other studies have addressed this argument both in adverse selection models (Rogoff, 1990) as well as in moral hazard models (Shi and Svensson, 2006; Persson and Tabellini, 2012).

Several authors wonder whether elections affect environmental policies and outcomes. During election periods, politicians manipulate public spending in order to boost their popularity and secure votes. They do this by either increasing overall expenditure or changing their composition (Brender and Drazen, 2013). They can shift expenses from one category to another, or even among sectors, by shifting outlays from sectors in which benefits are not immediately visible to other sectors where it is the case. It is therefore likely that environment could be affected because environmental protection is a public good for which benefits are not readily visible. In the USA, List and Sturm (2006) theoretically and econometrically found evidence that environmental policy choices differ between governors' election and non-election years. However, while elections seem to have a visible influence on the public positions taken by politicians, they eventually have little influence on environmental outcomes (Bergquist and Warshaw, 2020). Few other studies investigate deforestation or land use political cycles. Rodrigues-Filho et al. (2015) and Pailler (2018) found evidence of deforestation political cycles in Brazil. Election years are characterized by high deforestation rates, owing mainly to the weakening of institutional constraints. Another example is Cisneros Tersitsch et al. (2020) who econometrically evidence mutually reinforcing economic and political drivers of forest loss and land conversion for oil palm cultivation in Indonesia. D'Amato et al. (2019) also enlighten land use political cycles in Italy taking the issuance of building permits as the environmental indicator. Klomp and de Haan (2016) find that natural resources rents (including forest rents) are higher during election years because incumbents use them to expand public spending and reduce taxes. Relatedly, Laing (2015) finds that the government of Guyana issues less mining rights after election years, while the number of canceled rights rises.

1.3 Contributions of the thesis

This thesis contributes to these branches of the aforementioned literature by studying the effects of aid on environmental degradation, the factors associated with the allocation of environmental aid, and the effect of electoral cycles on environmental degradation.

The first chapter empirically investigates the link between foreign aid and environmental degradation measured as CO_2 emissions in 112 aid-recipient countries over 1980-2013 using GMM-system estimator of Blundell and Bond (1998).

Our approach differs from earlier studies in different ways: First, we consider a much larger set of countries over the 1980-2013 period because we use a more recent and more complete source of aid data that help refine our understanding of aid. Second, we apply a rigorous coding scheme to disaggregate our aid flows according to their environmental impact. This allows us to better assess its effect on pollution and not to make the trial of bilateral aid, since we show evidence of composition effects in its environmental impact. Finally, our econometric approach allows tackling endogeneity bias concerns relative to the possible reverse causation link between pollution and environmental assistance. In addition to the internal instruments, for the estimates using bilateral aid, we also build an external instrument. It is computed, for each recipient, as the weighted average of the donors' CO_2 emissions. For each recipient-year, the weight of a donor is given by its share of ODA, in the total ODA received.

The second chapter studies the factors associated with the allocation of environmental aid, to see if it suffers from the same weaknesses as aid for poverty reduction, which could hamper its effectiveness. We use a novel "project-level" aid data set and rely on a comprehensive coding scheme to classify projects according to their environmental impact and obtain the number of projects and the amounts of environmental ODA for 9 donors and 128 recipients over 1990-2013. The role of different types of factors that might influence the allocation of environmental aid is investigated: the environmental and non-environmental needs and merits of recipient countries, as well as the donors' political and economic interests. To measure the recipients' environmental merits, we use a new measure of "revealed" climate mitigation efforts, introduced by Combes et al. (2016), rather than relying on observed CO_2 emissions as previous studies on environmental aid allocation. To the best of our knowledge, our study is the first using this indicator to analyze the allocation of environmental aid. We separately analyze the number of environmental projects and the amount of environmental ODA received, using Poisson Pseudo-Maximum Likelihood that are better appropriated than OLS, two-part, and Tobit models in the presence of many zero(0) observations and heteroscedasticity (Silva and Tenreyro, 2006, 2011). Beyond the absolute values, the recipients' shares in donors' total projects and amounts are also analyzed using a fractional logit which is also adapted for proportions as dependent variables (Papke and Wooldridge, 1996, 2008). We also perform donor-by-donor analysis to reveal important heterogeneities across donors' allocation behavior, some of them being more sensitive to environmental variables, while others are rather responsive to their own interests.

In the third chapter, we explore how governments may use the trade-off between pork-barrel projects and the provision of public goods such as environmental protection, or become lax in terms of environmental policy, for re-election purposes. Instead of focusing on one country, we rather rely on a cross-country econometric study. To estimate the impact elections have on environmental degradation measured with CO_2 emissions, we rely on a dataset made of 76 democracies over the period 1990-2014. We find evidence of a pollution-increasing effect in elections years, which tends to be weaker over the recent years. We highlight some factors that shape this relationship. Some of them are conditioning factors of PBCs (Brender and Drazen, 2005; Shi and Svensson, 2006) while other factors are linked to environmental preferences in countries under consideration. We test whether the size of our effect is conditioned by traditional conditioning factors of PBCs (such as democracy age and access to free media) as well as environmental preferences of citizens. We find that this effect is present in established democracies, where incumbents are punished by voters in case of deficit-spending. In such countries, leaders change the expenditure composition rather than its level: they increase the budget share of pork-barrel spending and under-provide public goods in election periods, which results in higher environmental degradation. We finally find evidence that better access to free media and stringent environmental policies are associated with a lower size of the pollution-cycle given that they reduce the level of economic voting from citizens. As a consequence, incumbents will then have weak incentives to manipulate fiscal policy and will choose the appropriate set of policies that match voters' concerns.

Chapter 2

CO_2 mitigation in developing countries: the role of foreign aid

This paper empirically investigates the link between foreign aid and pollution, specifically CO_2 emissions in developing countries. We use a more complete and recent dataset to re-assess the environmental impact of foreign aid. Focusing on 112 aid recipient countries over the period 1980- 2013, we find that the effect of aid depends on the donor, with multilateral aid more likely to reduce pollution than bilateral aid for which we find no effect. However, when we more precisely look at the composition of bilateral aid, we find it has an effect when specifically targeted toward environment. This effect is non-linear, since we observe a pollution-reducing effect only for important amounts of bilateral environmental aid.

Keywords : CO_2 emissions · Foreign aid · Environmental aid · Treshold effect

2.1 Introduction

Aid is increasingly viewed as useful tool for shaping environment friendly policies, especially in developing countries. In 2009 in Copenhagen, developed countries pledged $100billion per year as aid to developing countries for climate change mitigation and adaptation. In 2010, the climate conference held in Cancun set up the Green Climate Fund which role is to deal with the allocation of this amount. This highlights that aid is considered as an important instrument for shaping public policy, particularly environmentally friendly policies in this specific case.

Some empirical studies have paid attention to the effects of foreign aid on environmental protection in aid-recipient countries, but the literature is still inconclusive with mixed results (Arvin and Lew, 2009). Most recent studies (Lim et al., 2015) argue that the effect of aid is conditioned by other external flows such as trade or

Foreign Direct Investments (FDI), and find a positive effect of aid on environmental protection which tends to be reversed for high values of these external flows. However, this finding relies on the "california effect" assumption (Prakash and Potoski, 2006) for which there is no real consensus in the literature. Moreover, the contrasted findings on aid seem to be associated to quality of aid data, as pointed out by Tierney et al. (2011), for who all aid studies have been driven by too little information because of incomplete data on foreign aid.

This chapter empirically investigates the link between foreign aid and environmental degradation measured as CO_2 emissions in aid-recipient countries, using a more recent and sufficient source of aid data. Compared to previous studies, we consider a much larger set of 112 countries over the 1980- 2013 period.

We find no statistically significant effect for total aid as previous studies (Lim et al., 2015); however, by disaggregating it, we find that the environmental impact of aid depends on the type of donor. In particular, multilateral aid turns out to be effective in reducing CO_2 emissions but not bilateral aid. Nevertheless, bilateral aid turns out to be effective if specifically targeted toward environment even though we find evidence of an inverted U-shape relationship between environmental bilateral aid and emissions, which implies that bilateral aid is only effective above the endogenously defined threshold of $10.57 per capita. This result highlights the need to increase environmental bilateral aid, because it is still insufficient for many countries in our study.

The rest of the chapter is organized as follows: in section 2.2 we review the literature on the potential environmental impacts of foreign aid. Section 2.3 presents our data and empirical model, and section 2.4 presents and discusses our results before conclusion in section 2.5.

2.2 Aid for environment: good or bad ultimately?

The results of the literature concerning the environmental impact of foreign aid remain very mixed (Castro and Hammond, 2009). Some scholars suggest that aid can help to improve environmental quality. Tsakiris et al. (2005) mention that developed countries are increasingly involved in environmental protection during the recent years. Therefore, they could use foreign aid as an incentive for recipient countries to provide public goods, in this case environmental protection, since developing countries take donors' preferences into account to attract more aid (Hadjiyiannis et al., 2013); this competition for aid leads to efforts in terms of abatement in these countries[1]. For others, by promoting development and increasing citizens' incomes in developing countries, aid might indirectly lead to a higher environmental protection as well. This because the citizens' demand for a higher environment quality will also become more important (Arvin and Lew, 2009).

This last point is close to the Environmental Kuznets Curve theory (Grossman and Krueger, 1995) which suggests that there is an inverted U-shape relation between growth and environmental degradation. In fact, the underlying idea is that at the first stage of their development process, countries experience a high level of pollution due to a conflictual relation between growth and environmental protection; but in a second stage, when citizens' incomes increase and their demand for a clean environment rises, we observe the dropping of pollution.

Likewise, according to Lim et al. (2015), this trade-off between growth and environmental protection is expected to be more pronounced in developing countries which are most in the first stage of the development process, and especially for governments which have no access to external resources and which are obliged to rely on domestic resources. Such governments, given their low level of development coupled with a small tax base, participate in intensive resource plundering (Haber and Menaldo, 2011; Hamilton and Clemens, 1999), leading to environmental degradation. So, for such countries, aid could be considered as an additional "environmentally neutral"[2] revenue (Hicks et al., 2008) which allows them to partially relax this trade-off between economic growth and environmental protection. It could then be expected to be associated with an improvement of environmental quality.

However, it appears that considering aid as environmentally neutral could be in some sense risky to the extend that aid, even though it would have no direct effect on environment, could indirectly affect it through other channels. For instance, given the conflictual relation between economic growth and environmental protection (Grossman and Krueger, 1995), one could think that aid, which is first intended to promote development, is unlikely to enhance environmental protection while

[1]Recent studies however show that this is not always the case; see for instance Chambers et al. (2018)

[2]Hicks et al. (2008) suggest that aid has a neutral effect on environment since it is granted to recipient countries for different reasons (i.e natural disaster, democratization, economic development, etc.)

promoting economic growth. It could rather reinforce this negative pressure growth has on environment: by stimulating economic growth, it may stimulate resource plunder or polluting industries.

There are some studies which suggest that foreign aid creates bad incentives as it leads governments to delay important reforms (Ostrom et al., 2005), including environmental reforms. Also, it appears that aid mitigates the development of democratic institutions (Djankov et al., 2008) and works as a "resource curse" (Knack, 2001) because it frees governments from fiscal revenues and political support from their populations, leading them to under supply public goods, in this case environmental protection. Moreover, there is no guarantee that the aid granted for a specific sector will be totally dedicated to this sector because of fungibility. Several studies (Feyzioglu et al., 1998; Farag et al., 2009; Waddington, 2004) show that governments can reduce their spending in this sector and reallocate resources to others that seem to be of higher priority. Thus, all or part of the received aid is found to finance activities for which it was not intended for the basic contract. Through this mechanism, aid can be granted for environmental protection but used by the recipient donor to finance other activities, including polluting ones. According to this, it might not be surprising to find a null or even a harmful effect of foreign aid on environment in some studies.

There are very few empirical studies that have been led on the link between foreign aid and environmental degradation. Most studies have just focused on specific environmental projects (Ross, 1996), a specific recipient country (Gutner, 2002) or a specific donor (Dauvergne et al., 1998). Indeed, the results remain inconclusive on the few existing ones that led analysis on a large set of countries. For instance, using a sample of developing countries, Arvin and Lew (2009) study the impact of foreign aid on three ecological indicators (CO_2 emissions, water pollution and deforestation) and find that while foreign aid helps reducing CO_2 emissions, it has an increasing effect on water pollution and deforestation. They conclude while suggesting that "the economic and social conditions of individual recipient countries should be examined to understand such findings".

Following this, Lim et al. (2015) think such contradictory and inconclusive results are explained by the fact that the literature focuses on the average, unconditional, impact of aid. They suggest that other types of resources flows from developed countries, such as trade and FDI inflows, might condition the effect of foreign aid. Using a sample of 88 countries over the 1980-2005 period, they find that aid is associated with superior environmental protection in the recipient country, at low levels of exports receipts and FDI inflows from developed countries; moreover, this positive effect tends to diminish or to be even reversed as these flows increase. This happens because aid frees these countries of their dependence on these flows and thus, of incentives for high environmental protection; this lies on the somewhat heroic "California effect" hypothesis (Prakash and Potoski, 2006) and is totally challenged in the context of "pollution haven" hypothesis[3] (Eskeland and Harrison, 2003).

When it comes to the method of allocation, bilateral aid is much more criticized among scholars. Alesina and Dollar (2000) find that bilateral aid is more driven by political alliances or colonial past rather than the recipient country's performance. Following them, Dreher et al. (2008) use voting patterns at the United Nations to measure alignment between governments and show evidence that US aid is used to buy UN votes. Also using the voting patterns at the United Nations, Faye and Niehaus (2012) find that bilateral donors use aid to influence elections' results in recipient countries. Beyond these reasons, the exploitation of the recipient's market can also be a motivation for bilateral aid (Wagner, 2003). Thus, bilateral aid seems to be motivated by the personal interests of the donor country rather than by altruism; these results suggest that aid, including the one which is devoted to environmental protection, might have a weaker expected effect on the targeted goal if provided by a bilateral donor. Moreover, Michaelowa and Michaelowa (2011) find evidence that states often systematically miscode their aid, claiming it to contribute to climate change mitigation or adaptation while in fact it does nothing related to that purpose. Their results help to understand why environmental effectiveness tests for aid sometimes produce either poor results or wrong ones which could be of interest.

Multilateral aid, on the other hand, appears to be less subject to criticism, this maybe because of two reasons according to Rodrik (1995): the first is due to information about recipients. Since the latter is a collective good, it might be underprovided by individual donors, while multilateral organizations are more likely to provide it, especially if it is necessary to monitor the recipient. The second argument is that the interaction between multilateral agencies and recipient

[3]The pollution haven hypothesis suggests that trade openness leads to an increase in pollution in developing countries through relocation of dirty industries from the developed countries while the "California effect" suggests that trading with partners that have stringent environmental standards can lead to the transmission of these environmental preferences to the home country.

countries is less politicized than those with bilateral donors. Multilateral assistance is also said to be more sensitive to recipients' interests and long-run development: it should then be expected to perform more than bilateral assistance (Lebovic and Voeten, 2009).

A final point, which seems to be not negligible in our view was raised by Tierney et al. (2011) : it is "possible that aid debates have been driven by too little information" and that many results rely on very poor evidence because of very incomplete data on aid. It is therefore clear that environmental aid is no exception to this rule. They introduced a new dataset of foreign assistance, AidData, which they claim to cover more bilateral and multilateral donors and more types of aid than existing datasets[4]. They also claim it to improve project-level information about the activities funded by aid.

We contribute to this literature, using this dataset to assess the environmental effect of foreign aid according to the donor type. While the environmental effect of multilateral aid is not very surprising given its good reputation among scholars, we find that the relation between bilateral aid and CO_2 emissions is more complex.

[4]To provide an order of magnitude, they say in their article that "William Easterly, a contributor to this special issue, in his best-selling book *The White Man's Burden*(2006), pegged the sum of total aid since 1945 at $2.3 trillion, which is less than half of the total reported here".

2.3 Empirical framework

Our approach differs from earlier studies in different ways: first, we consider a much larger set of countries over the 1980- 2013 period because we use a more recent and more complete source of aid data, that helps to refine our understanding of aid. Second, we apply a rigorous coding scheme to disaggregate our aid flows according to their environmental impact. This allows us to better assess its effect on pollution and not to make the trial of bilateral aid, since we show evidence of composition effects in its environmental impact. Finally, our econometric approach allows tackling endogeneity bias concerns, relative to the possible reverse causation link between pollution and environmental assistance.

2.3.1 Empirical model

Following Brock and Taylor (2010), we use the green Solow model, which predicts a convergence in per capita carbon dioxyde emissions. Their standard green Solow model is augmented here to take into account the role of Official Development Assistance (hereafter ODA) on environmental degradation which is measured by carbone dioxyde emissions per capita. The per capita CO_2 emissions process is modeled as:

$$Y_{it} = \phi_1 Y_{i,t-1} + \beta_1 ODA_{it} + X_{it}\beta_2 + \alpha_i + \tau_t + \epsilon_{it} \tag{2.1}$$

Where Y_{it} represents CO_2 emissions per capita in country i during period t. ϕ_1 is the coefficient of lagged per capita carbon dioxide emissions. We are primarily interested in β_1 which is the coefficient of ODA and its subcomponents. X is the vector of control variables; these include domestic investment, population growth and democratic institutions. α_i and τ_t are the country and time fixed effects. The time coverage extends from 1980 to 2013 and we compile the data in five-years averages to hinder short-term fluctuations so that we obtain 7 periods. Our sample includes 112 countries that ever received ODA, based on data from the AidData web portal. Because of the lagged dependent variable included in our regressors, estimating this equation by a fixed effects model would lead our results to suffer from Nickell bias (Nickell, 1981) which may be severe given the short time-dimension of our data[5]. We use a GMM-type estimator because it

[5] Nickell (1981) shows that this bias is of order 1/T, where T represents the number of periods. Since we have 7 periods available, this bias would account for about 14%.

is asymptotically efficient compared to OLS (Arellano and Bond, 1991; Arellano and Bover, 1995). Specifically, we rely on the GMM-system estimator of Blundell and Bond (1998) which is deemed to be more consistent than its predecessors. It estimates a system of two equations: one equation in level and the other in first difference[6]. It uses lagged variables in level as instruments for the equation in first difference and inversely, it uses lagged first difference variables as instruments for the equation in level. We also add another external instrument in addition to lags: CO_2 emissions of donor countries. To do so, we matched the CO_2 emissions data to bilateral aid data, using donor countries as key. We were then able to compute, for each recipient country and each period, the mean of its donors' emissions. Donor emissions reflect the environmental preferences of donors, and thus may affect the level of environmental aid they provide. On the other hand, they cannot directly affect emissions from recipient countries.

In comparison to its predecessors which become less robust when ϕ_1 tends to 1, the GMM-system estimator adds an average stationarity condition on the dependent variable which makes it more robust. It is also appropriated for "small T, large N" panel datasets as ours (Roodman, 2009a). Given our relatively small number of periods, we confidently expect not to be confronted with the problem of instruments proliferation (Roodman, 2009b).

In order to test the validity of our results, we use Hansen's over-identification test, which null hypothesis states that the instrumental variables are not correlated to the error term and also the second order serial correlation test AR(2) which null hypothesis states that the errors do not present a second order serial correlation. We use the two-step version, which is more efficient, even if its standards errors can be biased[7] on small sample. However, we present the one-step version in robustness checks.

2.3.2 Data sources and description of variables

CO_2 emissions

Carbon dioxide emissions are a widely employed pollution measure in the literature (Arvin and Lew, 2009; Brock and Taylor, 2010) and are at the center of all the debates relative to climate change. Moreover, beyond its global issue, data on

[6]This approach allows to expunge the country fixed effects.

[7]The Windmeijer correction (Windmeijer, 2005) is used to correct them.

CO_2 emissions are available for many countries and over relatively long periods in comparison to other pollution measures. We measure this variable, in terms of logged grams per capita. Consistent with the literature, we take the natural logarithm that exhibits close to a Gaussian distribution. The data are from the World Bank Development Indicators (WBDI). In Figure 2.1, we use these data to compare CO_2 emissions from high income countries and low and middle income countries.

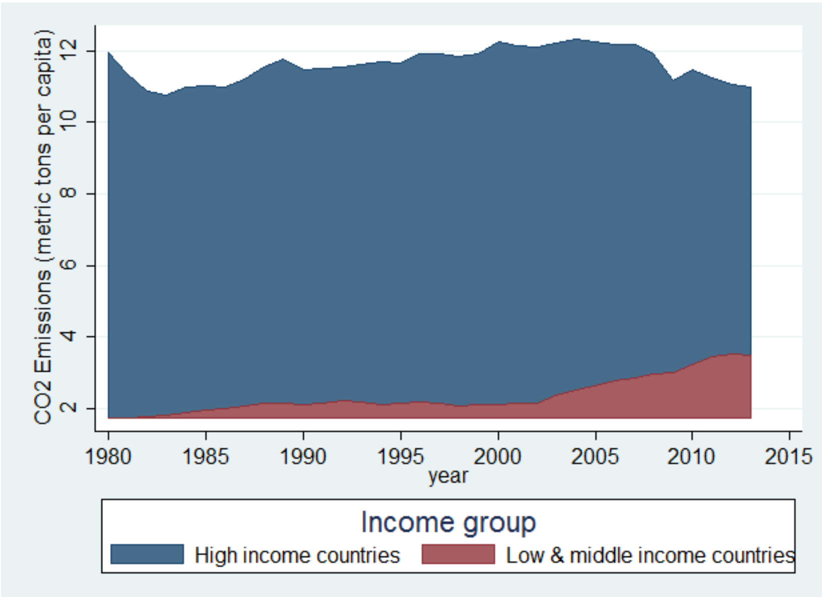


Figure 2.1: CO_2 Emissions per income group

We observe that pollution remains very small in developing countries, compared to developed countries' emissions. Even though their emissions have been quiet stable during a long period, we can however observe a small upward trend starting from the 2000s that could be explained by an acceleration of industrialization and growth in emerging economies. It is clear that these countries are not primarily responsible for climate change, given their relatively small emissions, and may not find an incentive to participate in climate change mitigation. Thinking this way would be wrong because they are still the most vulnerable to climate change (Adger et al., 2003; Mirza, 2003). Then, in order to significantly and globally reduce emissions, it is necessary to break this upward trend in developing countries while simultaneously reducing those in high-income countries, rather than just focusing on the latter. In this context, aid could be used as an instrument for mitigation.

Aid data

We rely on "project" level aid data[8] to more precisely assess the environmental impact of aid. This new dataset is available on the AidData web portal and includes more donors and more types of aid than existing datasets. Each aid flow is assigned a unique purpose code referring to a particular sector (health, education, etc.), using the OECD's Credidor Reporting System (CRS). Hicks et al. (2008), used the 1.9 version of this data based on these codes and assigned an environmental impact code (neutral, dirty, etc.) to each aid flow in the database, for the purpose of their study. Unfortunately, these environmental impact codes are not available on recent versions of the dataset: they are just available for the 1.9 version which stops in 2008. Since we are using the 3.0 version of the data that is more complete and filled in until 2013, we had to apply their coding scheme[9] to this version of the data, so that we obtain environmental impact codes for our data.

We applied the same methodology as Hicks et al. (2008) to provide these environmental impact codes (neutral, dirty, friendly) to each aid flow in our database, relying on its purpose. The repartition of ODA over our period of study and following its expected environmental impact is represented in Figure 2.2.

As we see, environmental aid still represents a very small share of total aid, compared to dirty or neutral aid flows. This provides a first answer to why several studies have failed to find evidence of environmental benefits of ODA, since its environmental friendly component represents a very small share, compared to dirty or neutral aid: the less is the share of environmentally friendly aid, the less likely for its effect to be detected. However, we observe that it is slightly increasing perhaps because of an awakening of consciousness on the part of certain donors. Relying on the foreign aid literature (Alesina and Dollar, 2000), we use ODA per capita (in constant 2011 dollars) in natural logarithm.

[8]As mentioned by Michaelowa and Michaelowa (2011), the aid activities that are listed in this database also include non-project aid, but since the vast majority of these activities are traditional aid projects, and since these distinctions do not really matter in our context, we can use the term "projects" when referring to these flows.

[9]We are particularly indebted to the AidData research team who provided us the codebook which was used for coding the 1.9 version of the data. It was very useful for us to expand these codes on the 3.0 version.

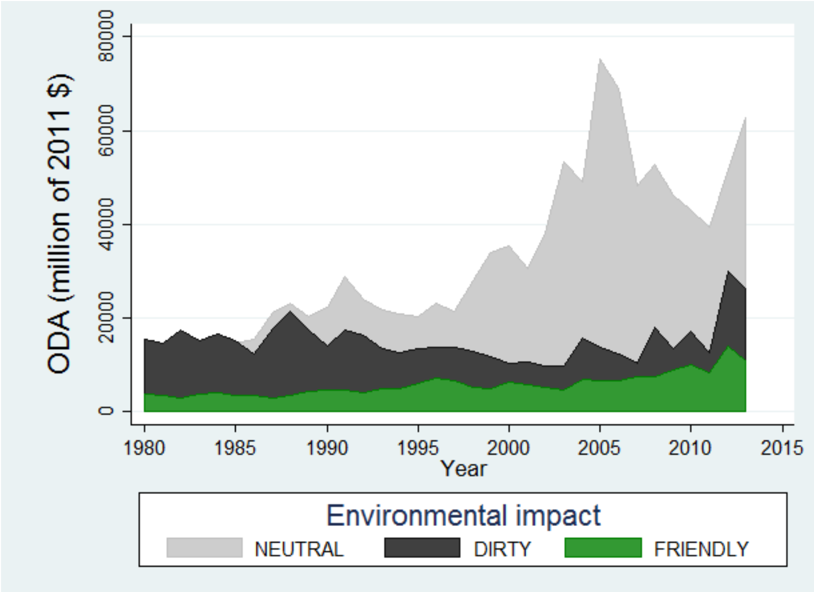


Figure 2.2: Repartition of ODA by environmental impact

Control variables

We measure domestic investment as the ratio of gross capital formation to GDP. According to Brock and Taylor (2010), high investment rates increase carbon dioxide emissions per capita during transitional dynamics, since investment is the engine of economic growth. The data are from the WBDI.

We also control for population growth; for a given country i at period t, it is measured as the growth rate, in percent, of population over period t. There are studies which have analyzed the impact population growth could have on environment (Birdsall and Sinding, 2001; Cropper and Griffiths, 1994). A larger population could lead to an increased demand for fuel, food, energy, industry and transportation. An accelerated population growth could also lead to widen deforestation, changes in land use and combustion of fossil fuels.

We use the *Polity 2 Score*, which is a measure for democratic institutions in a country, to capture the effect of regime type on environmental degradation. Indeed, there are studies that have focused on the impact democratic institutions could have on environment. While most recent studies find opposite direct and indirect effects (Kinda et al., 2011), previous researches find evidence of pollution reducing effects for democratic institutions (Bernauer and Koubi, 2009; Li and Reuveny, 2006). Moreover, democratic institutions influence the amount of foreign aid a country receives[10]. The data for this indicator are from Polity IV (2015) and its values lie between -10 (autocraty) and +10 (democraty).

We also control for additional variables that could possibly confound the effect of aid on CO_2 emissions, including trade openness and urbanization rate. We measure trade openness as the share of trade flows in GDP, and urbanization rate is measured as the share of urban population in total population.

There are two competing arguments on how the former could affect pollution in exporting countries: the "pollution haven" hypothesis (Eskeland and Harrison, 2003) which suggests that trade openness leads to an increase in pollution in developing countries through a relocation of dirty industries from the developed countries; and the "California effect" hypothesis (Prakash and Potoski, 2006) which suggests the opposite effect (Frankel and Rose, 2005). Exporting toward markets with stringent environmental standards could lead developing countries to adopt these standards at home for instance (Perkins and Neumayer, 2012). Thus, the adoption of these stringent standards will result in lower emissions and then lead to an improvement of their own environmental quality. Trade openness can also affect the amount of received aid, since less opened countries can receive more aid as an incentive to liberalize their economies (Wagner, 2003).

Urbanization is considered as a consequence of development (Moomaw and Shatter, 1996) and may then influence the amount of aid received, since the latter is a function of the recipient's level of development[11]. ODA can also play a role in a country's urbanization process, since it is supposed to promote development. Lastly, urbanization can affect the level of pollution, according to some studies which argue that countries with higher urbanization rates experience more environmental degradation (Shahbaz et al., 2014; Dewan et al., 2012).

Data on both, urbanization rate and trade openness, are obtained from the WBDI database. The descriptive statistics of our main variables are provided in Table 2.1.

As we can see, our sample is characterized by a very high degree of heterogeneity, both for CO_2 emissions and other variables. This heterogeneity is more important for the aid variables compared to other variables, exception made for the *Policy 2*

[10] For instance, institutions are included in the Country Performance Rating of the Performance Based Allocation formula used by the World Bank International Development Association (IDA).

[11] The Performance Based Allocation formula which is used by the main Multilateral Development Banks includes the GNI.

Table 2.1: Summary statistics of used variables

Variable	Obs	Mean	S.D	C.V	Min	Max
CO_2 per capita (metric tons)	865	1.82	2.36	1.30	0.002	16.41
ODA per capita ($ 2011)	882	84.91	218.76	2.58	0	4508.55
Bilateral ODA per capita ($ 2011)	882	69.57	204.29	2.94	0	4508.55
Multilateral ODA per capita ($ 2011)	882	14.04	40.44	2.88	0	834.72
Dirty Bilateral ODA per capita ($ 2011)	882	17.62	48.52	2.75	0	775.39
Environmental Bilateral ODA per capita ($ 2011)	882	5.12	11.65	2.28	0	161.42
Investment (% GDP)	755	22.70	8.61	0.38	0	60.78
Population growth (%)	881	7.56	5.36	0.71	-17.41	31.96
Polity 2 Score	752	0.61	6.36	10.50	-10	10
Urban population (% of total)	882	43.36	21.03	0.49	4.68	100
Trade (%GDP)	798	76.45	38.13	0.50	0.22	310.58

Notes Descriptive statistics are based on the whole sample

Score.

On the other hand, we notice that the bilateral channel is still very privileged by the donors, since bilateral ODA is on average 5 times higher than multilateral ODA. We also observe that the environmentally friendly component of bilateral ODA remains very small compared to its dirty component, since it is on average 3 times smaller than the latter. Both are also characterized by an important heterogeneity as total bilateral aid.

2.4 Results

2.4.1 Baseline results

Our results from the two-step system GMM estimation are shown in Table 2.2. In column 1 and 2, we estimate the effect of ODA on CO_2 emissions and we find no statistically significant effect. This result is not very surprising since we are measuring the average overall effect of aid as previous studies (Lim et al., 2015) suggest. In fact, ODA taken as an aggregated flow may contain components that could have opposite environmental impacts. For instance, aid may have different impacts on environment depending on the type of donor. Some authors (Wagner, 2003; Faye and Niehaus, 2012) think that bilateral ODA is more likely to be driven by common interests like political survival of the recipient's government or the exploitation of the recipient's market by the donor. Then, this could lead the recipient government to pursue economic growth by completely ignoring environmental issues.

Multilateral ODA, at the opposite, seems to have good reputation in terms of environmental protection among scholars (Buys et al., 2004; Lebovic and Voeten, 2009). For instance, Lebovic and Voeten (2009) argue that it is more sensitive to the long-run sustainability of the recipient's development strategy and then, might encourage recipient governments to commit in environmental protection as a condition for future aid. If so, by disaggregating ODA into bilateral and multilateral, we should find a strong pollution-reducing effect for multilateral ODA that should be weaker, null, or even of opposite sign for bilateral ODA.

To address this issue, we proceed to a first level of disaggregation: we split ODA into bilateral and multilateral, and we estimate their effects from column 3 to column 6. Our results are in line with the previous intuitions, since we find a negative and significant effect of multilateral ODA on CO_2 emissions in columns 5 and 6, a 1% increase in multilateral ODA per capita leading to a 0.3% decrease in per capita CO_2 emissions.

Bilateral ODA, at the opposite, seems to have no effect, as total aid; its results are presented in columns 3 and 4. Does this mean it has absolutely no effect on pollution? Probably no: we suspect this result to be driven by composition effects in its environmental impact. In fact, beyond the type of donor, the purpose for which this aid is provided to the recipient country should be taken into account. Following Hicks et al. (2008), we provided an environmental label to each aid

Table 2.2: Environmental effects of Aid

Dependent Variable	Log of CO2 (per capita)					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged D.V	0.609**	0.813***	0.627**	0.840***	0.716***	0.777*
	(0.263)	(0.183)	(0.294)	(0.251)	(0.243)	(0.430)
ODA per capita (Log)	-0.005	0.049				
	(0.066)	(0.102)				
Bilateral ODA per capita (Log)			-0.021	0.065		
			(0.072)	(0.111)		
Multilateral ODA per capita (Log)					-0.302***	-0.324*
					(0.111)	(0.195)
Investment (% GDP)	0.021***	0.018***	0.021***	0.017***	0.017**	0.013**
	(0.007)	(0.003)	(0.007)	(0.004)	(0.007)	(0.006)
Population growth (%)	-0.026	-0.008	-0.024	-0.007	-0.013	-0.003
	(0.028)	(0.017)	(0.030)	(0.021)	(0.020)	(0.034)
Democratic Institutions (Polity 2 Score)	0.012**	0.009	0.012**	0.008	0.012**	0.009
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.008)
Urban Population (% of total)		-0.002		-0.002		0.002
		(0.004)		(0.004)		(0.007)
Trade (% GDP)		0.001		0.000		0.003
		(0.002)		(0.002)		(0.004)
Constant	5.078	2.117	4.875	1.802	3.850	3.198
	(3.662)	(2.594)	(4.110)	(3.435)	(3.308)	(5.808)
Time dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Observations	585	580	585	580	585	580
Countries	112	112	112	112	112	112
Instruments	19	29	19	21	14	17
AR1	0.000	0.005	0.001	0.022	0.001	0.001
AR2	0.397	0.190	0.320	0.422	0.604	0.781
Hansen test	0.224	0.123	0.152	0.167	0.420	0.930

Standard errors in parentheses

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

flow in our database according to its purpose[12] and then, we proceeded to a

[12] For instance, if the flow purpose is "Coal-fired power plan", the "Dirty" label is provided while the "Environmental" label is provided for flows like "Solar power plant".

second level of disaggregation: we splitted bilateral ODA into an environmental friendly component (hereafter "Environmental Aid") and an environmental harmful component (hereafter "Dirty Aid")[13]. The estimation results are reported in Table 2.3. In column 1 we have the baseline specification with the total bilateral aid. In columns 2 and 3 we estimate the effect of bilateral "Dirty Aid" and not surprisingly we find it has a positive and significant effect on per capita CO_2 emissions, a 1% increase in bilateral dirty aid leading to a 0.14% increase in emissions.

However, surprisingly, we also find an unexpected positive effect for "Environmental Aid" on CO_2 emissions in columns 4 and 5. This counter intuitive result might be driven by the presence of a possible non-linear relationship between environmental aid and pollution (Kennedy, 2005). In fact, it is possible that the pollution-reducing effect arises beyond a certain threshold value of environmental ODA. We could imagine for instance that for small amounts, donors' pressure is just as low, and thus the effect of environmental aid less present. But for large amounts, donors are more involved and this results in a more pronounced pollution-reducing effect of environmental aid. Since the latter is still not very important for many countries in our sample, one could find a positive relation between it and CO_2 emissions when assuming a linear function in the Data Generating Process.

We address this issue by adding a quadratic term of environmental aid in the Data Generating Process. If our previous intuition is right, then we should obtain a negative coefficient associated to this square-term while the term in level should have a positive coefficient. We estimate this relation in columns 6 and 7 and we obtain a negative coefficient associated to our square-term, confirming the presence of an inverted-U relationship between environmental bilateral ODA and pollution: environmental bilateral aid is associated with low pollution only beyond a certain threshold.

2.4.2 Non-renewable energy as potential transmission channel

Non- renewable energy is known as a major driver of a country GHG emissions, principally CO_2 emissions (Shafiei and Salim, 2014). Non-renewables' consumption could thus be a potential mediator for the effect of both dirty and environmental aid on pollution. Dirty aid projects could increase CO_2 emissions by increasing

[13] We do not use the neutral component which is by definition environmentally neutral.

Table 2.3: Compositions Effects of Bilateral ODA

Dependent Variable	Log of CO2 (per capita)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged D.V	0.840***	0.766***	0.794***	0.890***	0.929***	0.896***	0.871***
	(0.251)	(0.121)	(0.010)	(0.149)	(0.193)	(0.138)	(0.134)
Bilateral ODA per capita (Log)	0.065						
	(0.111)						
Dirty Bilateral Aid (Log)		0.131*	0.144**				
		(0.067)	(0.063)				
Environmental Bilateral Aid (Log)				0.212***	0.201***	0.344***	0.359***
				(0.067)	(0.062)	(0.116)	(0.115)
Environmental Bilateral Aid^2						-0.048**	-0.053*
						(0.023)	(0.029)
Investment (% GDP)	0.017***	0.014***	0.015***	0.010***	0.012***	0.012***	0.011***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Population growth (%)	-0.007	-0.010	-0.008	-0.003	-0.000	-0.003	-0.010
	(0.021)	(0.012)	(0.011)	(0.014)	(0.020)	(0.014)	(0.012)
Democratic Institutions (Polity 2 Score)	0.008	0.008*	0.008	0.003	0.005	0.003	0.006
	(0.006)	(0.004)	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)
Urban Population (% of total)	-0.002		-0.001		-0.003		-0.004
	(0.004)		(0.005)		(0.004)		(0.004)
Trade (% GDP)	0.000		0.000		-0.000		0.000
	(0.002)		(0.001)		(0.001)		(0.001)
Constant	1.802	2.652	2.375*	1.057	0.728	0.884	1.479
	(3.435)	(1.725)	(1.342)	(2.112)	(2.595)	(1.979)	(1.803)
Time dummies included	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	580	585	580	585	580	585	580
Countries	112	112	112	112	112	112	112
Instruments	21	18	22	18	25	24	28
AR1	0.022	0.001	0.000	0.001	0.001	0.001	0.000
AR2	0.422	0.410	0.479	0.370	0.340	0.517	0.676
Hansen test	0.167	0.569	0.162	0.461	0.364	0.585	0.332

Standard errors in parentheses

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

non-renewables consumption, while environmental aid would rather decrease CO_2 by increasing renewables (and thus, reducing the share of non-renewable energy). A traditional way of testing this channel would be to add it as an additional regressor in our model,

$$Y_{it} = \phi_1 Y_{i,t-1} + \beta_1 ODA_{it} + \beta_2 NR_{it} + X_{it}\beta_3 + \alpha_i + \tau_t + \epsilon_{it} \quad (2.2)$$

where NR represents the share of non renewables in total energy consumption, and to interpret β_1 as a direct effect. But this interpretation is only true if and only if we make the assumption of no intermediate confounders, which is an unrealistic assumption according to Imai et al. (2010). These intermediate confounders are represented by Z in Figure 2.3 , while pretreatment confounders are represented by P, both set of covariates included in vector X above.

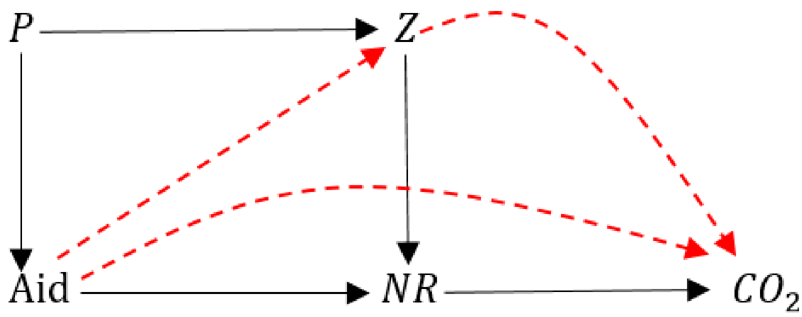


Figure 2.3: Directed acyclic graph of the causal relationships

Including them in the equation would lead β_1 not to be equal to the direct effect of aid, since conditioning on a post-treatment variable can induce spurious relationships between the treatment and the outcome (Rosenbaum, 1984). However, assuming that there are no intermediate confounders and including our mediator NR without adding them results in selection bias unless we include all of them as well[14] (Acharya et al., 2016).

To deal with this dilemma, we rely on sequential g-estimation[15] (Vansteelandt, 2009; Joffe and Greene, 2009) which is appropriated to estimate direct effects in the case of parametric models with continuous treatment and continuous mediator such ours. We proceed in two steps:

First stage: estimation of a demediation function

We start estimating Equation 2.2 (with vector X including P and Z) from which

[14] This bias is often called M bias.

[15] also called reverse sequential twostage (RS2S).

we calculate the sample version of the demediation function:

$$\widehat{\gamma}(NR_{it}) = \widehat{\beta}_2 NR_{it} \tag{2.3}$$

Second stage: demediating output and estimating direct effect

With this estimate of the demediation function, we demediate our outcome:

$$\widetilde{Y}_{it} = Y_{it} - \widehat{\gamma}(NR_{it}) \tag{2.4}$$

which is equivalent to

$$\widetilde{Y}_{it} = Y_{it} - \widehat{\beta}_2 NR_{it} \tag{2.5}$$

We then obtain the direct effect of aid by estimating the following equation:

$$\widetilde{Y}_{it} = \phi_1 \widetilde{Y}_{i,t-1} + \beta_1 ODA_{it} + X_{it}\beta_2 + \alpha_i + \tau_t + \epsilon_{it} \tag{2.6}$$

Where β_1 is the direct effect of ODA. Obtaining $\beta_1 = 0$ would imply that the effect of ODA is completely mediated by NR. We applied this methodology for dirty aid and environmental aid; the results are presented in Table 2.4. In column 1 we run a specification with dirty bilateral ODA and NR, while in column 2 we have environmental bilateral ODA and NR. From these estimates we computed two demediation functions $\widehat{\gamma}_{dirty}(NR_{it})$ and $\widehat{\gamma}_{env}(NR_{it})$ that we use to determine the demediated outcomes $\widetilde{Y}_{dirty}$ and $\widetilde{Y}_{env}$ which are explained in column 3 and 4 respectively [16]. Our results suggest that the effect of dirty bilateral ODA is completely mediated by non-renewable energy; in other words, dirty aid increase CO_2 emissions by increasing the share of non-renewable energy in total energy consumption.

[16] Bootstrapped standard errors.

Table 2.4: Non-renewables as potential transmission channel

Dependent Variable	Log of CO_2 (per capita)		$\widetilde{Y}_{dirty}$	$\widetilde{Y}_{env}$
	(1)	(2)	(3)	(4)
Lagged D.V	0.601***	0.650***	0.978***	0.968***
	(0.166)	(0.152)	(0.088)	(0.077)
Non renewables (% of total energy consumption)	0.018***	0.018***		
	(0.006)	(0.006)		
Dirty Bilateral Aid (Log)	0.040		0.083	
	(0.058)		(0.055)	
Environmental Bilateral Aid (Log)		0.259***		0.342***
		(0.097)		(0.108)
Environmental Bilateral Aid^2		-0.048***		-0.073***
		(0.019)		(0.027)
Investment (% GDP)	0.014**	0.012**	0.011*	0.010**
	(0.006)	(0.005)	(0.006)	(0.005)
Democratic Institutions (Polity 2 Score)	0.006	0.006	-0.017*	-0.025***
	(0.010)	(0.009)	(0.009)	(0.009)
Population growth (%)	0.025	0.021**	0.010	0.017*
	(0.017)	(0.009)	(0.015)	(0.010)
Urban Population (% of total)	0.007	0.004	-0.003	-0.001
	(0.007)	(0.005)	(0.004)	(0.004)
Trade (% GDP)	0.000	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	3.660**	3.096**	0.149	0.080
	(1.600)	(1.579)	(1.056)	(0.879)
Time dummies included	Yes	Yes	Yes	Yes
Observations	497	497	409	409
Countries	112	112	110	110
Instruments	44	49	24	44
AR1	0.008	0.007	0.002	0.000
AR2	0.186	0.426	0.176	0.197
Hansen test	0.131	0.315	0.560	0.544

Standard errors in parentheses

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

For environmental aid, its effect still remains even after ruling out the non-renewables mechanism; this suggests that its effect is only partially mediated by non-renewable energy. Its remaining nonzero effect can be interpreted either as direct effect or as an effect which is mediated by other alternative mechanisms. For instance, an other transmission channel could be new pollution-abatement technologies' transfer through Clean Developement Mechanism projects. Unfortunately, the latter started to be implemented in the post Kyoto-protocol period; testing it in this configuration would not be possible due to small number of observations.

To confirm the presence of an inverted U-shape relationship between environmental aid and CO_2 emissions, we perfomed a U-test (Lind and Mehlum, 2010) using the regression in column 4 of Table 2.4 and the results are presented in Appendix. These results help to understand why we find an average positive effect of environmental bilateral ODA when assuming a linear function in the Data Generating Process: in fact, 86.73% of our observations are below the threshold value of $10.57 per capita that the U-test indicates. This result has important policy implications since it means that environmental bilateral aid remains very insufficient and should be increased to produce environmental benefits.

2.4.3 Robustness Checks

In Table 2.2 and Table 2.3, we estimated our equations with the two-step GMM-system estimator which is more efficient than the one-step GMM-system estimator. However, its standard errors can be severely downward biased in a small sample. This bias can be solved using the Windmeijer correction (Windmeijer, 2005). To make sure our results are not sensitive to the estimation technic, we re-estimate our equations using the one-step GMM-system estimator. The results we obtain are similar to those with the two-step GMM-system estimator and are reported in Table 2.7 and Table 2.6 in Appendices.

We also change the measure of aid; in Table 2.7, for total ODA, we take its natural logarithm without taking it per capita. We also take bilateral ODA and multilateral ODA as a share of total aid, instead of measuring them per capita as in previous tables. In Table 2.8, bilateral aid is still measured in % of total aid while bilateral dirty and bilateral environmental aid are measured in % of total bilateral aid. Our results remain the same.

2.5 Conclusion

Even if aid could be used as a tool for shaping environmental-friendly policies in developing countries, small number of empirical studies have focused on the environmental impact on foreign aid, finding inconclusive results (Arvin and Lew, 2009) or conditional effects of ODA which rely on assumptions that are not unanimous (Lim et al., 2015). These results may also be driven by incomplete or wrong information on different aid flows (Tierney et al., 2011).

In this chapter we use a more complete and new source of aid data to re-explore the link between ODA and CO_2 emissions in 112 aid recipient countries over the period 1980- 2013, using GMM-system estimator. While we find aggregated ODA has no effect on pollution as previous studies (Lim et al., 2015), our results show evidence of a pollution-reducing effect for multilateral ODA and no effect for bilateral ODA. This could explain the choice by the Cancun conference stakeholders to delegate the management of pledged funds to a multilateral agency (the Green Climate Fund).

However, our results do not suggest that bilateral aid has no role to play in the fight against climate change. Following the methodology of Hicks et al. (2008), we provided an environmental impact code to each bilateral flow in our data set, and we disaggregated bilateral ODA according to this scheme. We find evidence of a pollution-increasing effect for the dirty component of bilateral aid, working mainly through the increase of non-renewable energy.

Our findings suggest that the composition of bilateral aid should change if one expects it to provide environmental benefits: bilateral donors should finance less polluting activities and reallocate their funding to more environmental friendly activities. This will help increasing environmental bilateral aid, which we found more effective for important amounts only, and which remains insufficient for a large majority of countries in our sample. These results are robust to an other estimation technique and to the use of alternative measures of aid flows.

We remain aware that beyond the donor characteristics and the flows' purpose, donors' motivations during the allocation of ODA, as well as recipient countries' incentives to engage in climate change mitigation, also matter. These incentives can vary because of many factors, leading environmental aid, even when increased, to be less effective. Further empirical research should explore donors' motivations and recipient countries' political and social characteristics, to improve environmental aid effectiveness.

2.6 Appendices of Chapter 2

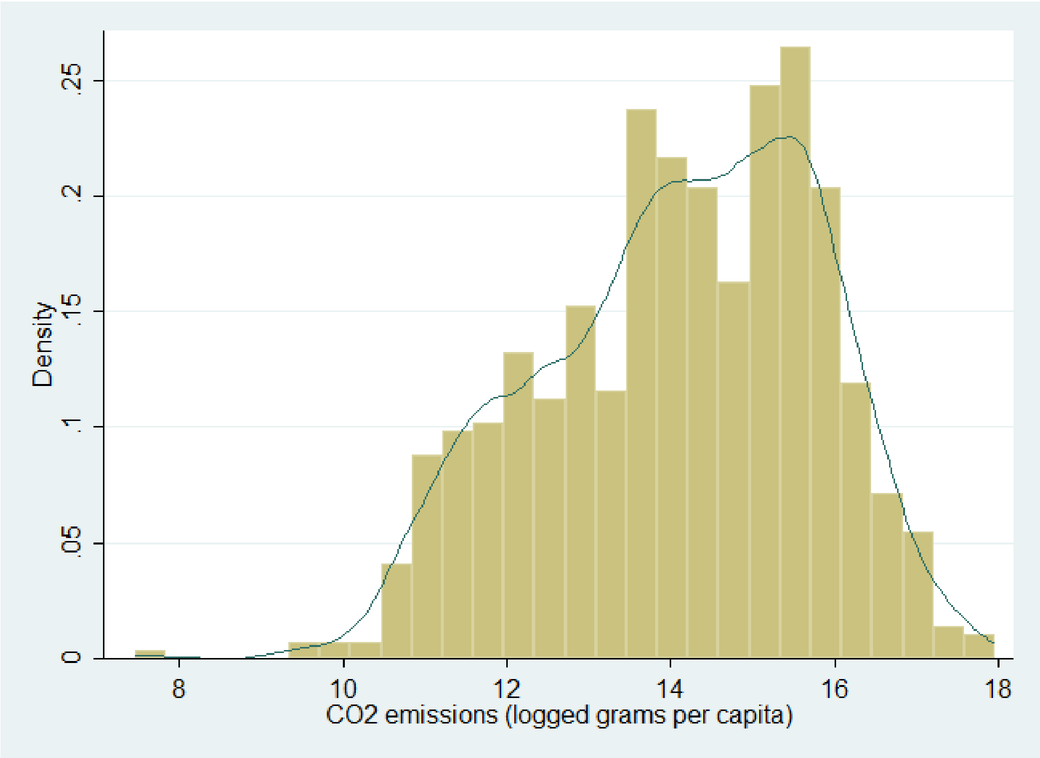


Figure 2.4: Distribution of CO_2 Emissions

```
Specification: f(x)=x^2
Extreme point:  2.357978

Test:
     H1: Inverse U shape
 vs. H0: Monotone or U shape
```

	Lower bound	Upper bound
Interval	0	5.090206
Slope	.3424568	-.3968104
t-value	3.180717	-2.219822
P>|t|	.0007905	.0134893

```
Overall test of presence of a Inverse U shape:
     t-value =      2.22
     P>|t|   =      .0135

95% Fieller interval for extreme point: [1.7345906; 4.0973387]
```

Figure 2.5: Test of presence of an inverted U-shape

Table 2.5: Environmental effects of Aid (One Step GMM)

Dependent Variable	Log of CO2 (per capita)					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged D.V	0.768***	0.813***	0.810***	0.840***	0.898***	0.777*
	(0.222)	(0.183)	(0.256)	(0.251)	(0.315)	(0.430)
ODA per capita (Log)	0.046	0.049				
	(0.097)	(0.102)				
Bilateral ODA per capita (Log)			0.027	0.065		
			(0.081)	(0.111)		
Multilateral ODA per capita (Log)					-0.243**	-0.324*
					(0.115)	(0.195)
Investment (% GDP)	0.019***	0.018***	0.018***	0.017***	0.014*	0.013**
	(0.006)	(0.003)	(0.007)	(0.004)	(0.008)	(0.006)
Population growth (%)	-0.011	-0.008	-0.007	-0.007	0.004	-0.003
	(0.021)	(0.017)	(0.024)	(0.021)	(0.029)	(0.034)
Democratic Institutions (Polity 2 Score)	0.009	0.009	0.008	0.008	0.008	0.009
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.008)
Urban Population(% of total)		-0.002		-0.002		0.002
		(0.004)		(0.004)		(0.007)
Trade (% GDP)		0.001		0.000		0.003
		(0.002)		(0.002)		(0.004)
Constant	2.661	2.117	2.162	1.802	1.287	3.198
	(3.217)	(2.594)	(3.631)	(3.435)	(4.369)	(5.808)
Time dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Observations	585	580	585	580	585	580
Countries	112	112	112	112	112	112
Instruments	19	29	19	21	14	17
AR1	0.004	0.005	0.013	0.022	0.001	0.001
AR2	0.199	0.190	0.191	0.422	0.859	0.781
Hansen test	0.224	0.123	0.152	0.167	0.420	0.930

Standard errors in parentheses

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

Table 2.6: Compositions Effects of Bilateral ODA (One Step GMM)

Dependent Variable	Log of CO2 (per capita)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged D.V	0.840***	0.819***	0.794***	0.923***	0.929***	0.956***	0.871***
	(0.251)	(0.159)	(0.100)	(0.218)	(0.193)	(0.122)	(0.134)
Bilateral ODA per capita (Log)	0.065						
	(0.111)						
Dirty Bilateral Aid (Log)		0.155**	0.144**				
		(0.074)	(0.063)				
Environmental Bilateral Aid (Log)				0.200***	0.201***	0.408***	0.359***
				(0.059)	(0.062)	(0.130)	(0.115)
Environmental Bilateral Aid^2						-0.061*	-0.053*
						(0.034)	(0.029)
Investment (% GDP)	0.017***	0.014***	0.015***	0.011**	0.012***	0.010***	0.011***
	(0.004)	(0.005)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)
Population growth (%)	-0.007	-0.006	-0.008	0.002	-0.000	0.002	-0.010
	(0.021)	(0.017)	(0.011)	(0.021)	(0.020)	(0.011)	(0.012)
Democratic Institutions (Polity 2 Score)	0.008	0.007	0.008	0.003	0.005	-0.000	0.006
	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)
Urban Population (% of total)	-0.002		-0.001		-0.003		-0.004
	(0.004)		(0.005)		(0.004)		(0.004)
Trade (% GDP)	0.000		0.000		-0.000		0.000
	(0.002)		(0.001)		(0.001)		(0.001)
Constant	1.802	1.823	2.375*	0.569	0.728	0.008	1.479
	(3.435)	(2.258)	(1.342)	(3.000)	(2.595)	(1.733)	(1.803)
Time dummies included	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	580	585	580	585	580	585	580
Countries	112	112	112	112	112	112	112
Instruments	21	18	22	18	25	22	28
AR1	0.022	0.002	0.000	0.004	0.001	0.001	0.000
AR2	0.422	0.424	0.479	0.307	0.340	0.548	0.676
Hansen test	0.167	0.569	0.162	0.461	0.364	0.808	0.332

Standard errors in parentheses

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

Table 2.7: Environmental effects of Aid (changing measure of aid)

Dependent Variable	Log of CO2 (per capita)					
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged D.V	0.572**	0.658***	0.983***	0.984***	0.971***	0.972***
	(0.280)	(0.207)	(0.047)	(0.033)	(0.084)	(0.108)
Log of ODA	0.034	0.056				
	(0.092)	(0.096)				
Bilateral ODA (% of total)			0.003	0.002		
			(0.003)	(0.002)		
Multilateral ODA (% of total)					-0.010**	-0.008**
					(0.005)	(0.004)
Investment (% GDP)	0.022***	0.018***	0.011***	0.013***	0.008**	0.009***
	(0.007)	(0.005)	(0.003)	(0.002)	(0.003)	(0.003)
Population growth (%)	-0.031	-0.020	0.006	0.005	0.005	0.002
	(0.027)	(0.015)	(0.005)	(0.003)	(0.008)	(0.010)
Democratic Institutions (Polity 2 Score)	0.013***	0.011*	0.004	0.006***	0.004	0.007*
	(0.005)	(0.006)	(0.003)	(0.002)	(0.003)	(0.004)
Urban Population(% of total)		0.001		-0.003		-0.002
		(0.007)		(0.002)		(0.003)
Trade (% GDP)		0.003*		0.000		0.000
		(0.001)		(0.000)		(0.001)
Constant	4.913	3.037	-0.185	-0.045	0.270	0.643
	(5.350)	(3.979)	(0.732)	(0.406)	(1.165)	(1.413)
Times dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Observations	585	580	584	579	584	579
Countries	112	112	112	112	112	112
Instruments	22	29	22	37	21	24
AR1	0.002	0.006	0.000	0.000	0.001	0.001
AR2	0.624	0.364	0.253	0.222	0.879	0.959
Hansen test	0.204	0.128	0.222	0.452	0.143	0.141

Standard errors in parentheses

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

Table 2.8: Compositions Effects of Bilateral ODA (changing measure of aid)

Dependent Variable	Log of CO2 (per capita)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged D.V	0.984***	0.891***	0.886***	0.900***	0.954***	0.922***	0.930***
	(0.0329)	(0.0896)	(0.0732)	(0.0533)	(0.0687)	(0.0904)	(0.0854)
Bilateral ODA (% of total aid)	0.0022						
	(0.0022)						
Dirty Aid (% Bilateral aid)		0.0065**	0.0070**				
		(0.0033)	(0.0035)				
Environmental Aid (% Bilateral aid)				0.0176***	0.0151***	0.0379**	0.0268**
				(0.0053)	(0.0053)	(0.0148)	(0.0116)
Environmental Aid^2						-0.0005*	-0.0004*
						(0.0003)	(0.0002)
Investment (% GDP)	0.0130***	0.0108***	0.0096***	0.0107***	0.0098***	0.0116***	0.0097**
	(0.0024)	(0.0030)	(0.0025)	(0.0019)	(0.0020)	(0.0027)	(0.0041)
Democratic Institutions (Polity 2 Score)	0.0061***	0.0078	0.0076	0.0056**	0.0087***	0.0035	0.0094**
	(0.0020)	(0.0048)	(0.0065)	(0.0023)	(0.0032)	(0.0031)	(0.0044)
Population growth (%)	0.0049	0.0027	0.0005	0.0025	0.0014	0.0041	-0.0036
	(0.0034)	(0.0075)	(0.0047)	(0.0056)	(0.0059)	(0.0084)	(0.0084)
Urban Population(% of total)	-0.0027		-0.0002		-0.0055**		-0.0055
	(0.0020)		(0.0039)		(0.0024)		(0.0036)
Trade (% GDP)	0.0001		0.0009		0.0004		-0.0005
	(0.0003)		(0.0006)		(0.0006)		(0.0018)
Constant	-0.0447	1.187	1.222	0.964	0.495	0.528	0.857
	(0.406)	(1.181)	(0.848)	(0.722)	(0.904)	(1.223)	(1.266)
Time dummies included	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	579	584	579	584	579	584	579
Countries	112	112	112	112	112	112	112
Instruments	37	30	37	23	27	18	29
AR1	0.000	0.001	0.001	0.000	0.000	0.000	0.000
AR2	0.222	0.198	0.265	0.106	0.114	0.139	0.182
Hansen test	0.452	0.274	0.194	0.814	0.412	0.957	0.389

Standard errors in parentheses

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

Table 2.9: Definition and description of variables

Variables	**Definition and description**	**Source**
Carbon dioxide emissions	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring	WBDI
Population growth	Annual population growth rate. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship	WBDI
Urbanization rate	The share of urban population in total population	WBDI
Trade openness	The share of trade flows in GDP	WBDI
Domestic investment	The ratio of gross capital formation to GDP	WBDI
Policy score 2	Index for Democratic Institutions	Polity IV (2015)
Official Development Assistance (ODA)	per capita in constant 2011 US	AidData web portal

Table 2.10: List of Countries

Afghanistan	Cote d'Ivoire	Kyrgyz Republic	Philippines
Albania	Cuba	Lao PDR	Rwanda
Algeria	Djibouti	Lebanon	Senegal
Angola	Dominican Republic	Liberia	Sierra Leone
Argentina	Ecuador	Libya	Solomon Islands
Armenia	Egypt, Arab Rep.	Lithuania	Somalia
Azerbaijan	El Salvador	Macedonia, FYR	South Africa
Bangladesh	Eritrea	Madagascar	Sri Lanka
Belarus	Ethiopia	Malawi	Sudan
Benin	Fiji	Malaysia	Suriname
Bhutan	Gabon	Mali	Swaziland
Bolivia	Gambia, The	Mauritania	Syrian Arab Republic
Botswana	Georgia	Mauritius	Tajikistan
Brazil	Ghana	Mexico	Tanzania
Bulgaria	Guatemala	Moldova	Thailand
Burkina Faso	Guinea	Mongolia	Togo
Burundi	Guinea-Bissau	Morocco	Tunisia
Cambodia	Guyana	Mozambique	Turkey
Cameroon	Haiti	Namibia	Turkmenistan
Cape Verde	Honduras	Nepal	Uganda
Central African Republic	India	Nicaragua	Ukraine
Chad	Indonesia	Niger	Uruguay
Chile	Iran, Islamic Rep.	Nigeria	Uzbekistan
China	Iraq	Pakistan	Venezuela, RB
Colombia	Jamaica	Panama	Vietnam
Comoros	Jordan	Papua New Guinea	Yemen, Rep.
Congo, Rep.	Kazakhstan	Paraguay	Zambia
Costa Rica	Kenya	Peru	Zimbabwe

Chapter 3

On the allocation of environmental aid: strategy beyond environmental considerations?

This chapter studies the factors associated with environmental bilateral aid to recipient countries over the 1990-2013 period. The objective is to assess whether environmental bilateral aid is motivated by non-environmental factors such as donors' self-interests. Environmental ODA is measured using the AidData's Core Research Release, Version 3.1. Three kind of variables that might influence environmental aid allocation are examined: the environmental and non-environmental needs and merits of recipient countries, and the economic and political interests of donors. Environmental needs and merits variables include vulnerability to extreme climate events and the stringency of climate policy. The Poisson and Fractional regressions results show that while vulnerability to climate change seems to be a key determinant of environmental aid, its allocation is poorly linked to recipients' climate mitigation policies. We also find weak evidence of association between donors' interest variables and environmental aid on average, exception made for trade. But a donor-by-donor analysis allows to go deeper into all the relations above, and unveils that some donors are more sensitive to environmental variables, while others rather seem focused on their economic and political interests.

Keywords : Official Development Assistance · Bilateral Environmental aid · Aid Allocation Climate mitigation

3.1 Introduction

Is increasing the global volume of environmental aid enough to achieve effective mitigation and adaptation in the developing world? What would happen if those resources, which are already scarce and which need to be increased, were misallocated and diverted from where they are the most needed? One can easily imagine the negative impacts on climate.

The question of the allocation of foreign aid is not new and has been widely documented in the literature, in order to understand the motivations of donors, which go far beyond the needs of recipient countries and their poverty reduction objectives. The main determining factors that are highlighted by this literature are the needs and merits of recipients, and the interests of donors. Concerning merits, even after the conclusions of Burnside and Dollar (2000) about the role of recipients' countries good policies on aid effectiveness have been challenged (Roodman, 2007), recipients' countries governance remained one of the key determinant factors in the aid allocation (Berthélemy and Tichit, 2004; Easterly, 2007; Clist, 2011; Acht et al., 2015). However, it has been evidenced that donors might overlook those merits depending on their own political and economic interests. Beyond recipients' needs and merit, there is indeed large evidence that donors pursue many economic and political objectives while providing aid (Alesina and Dollar, 2000; Berthélemy, 2006; Dreher et al., 2008, 2011; Faye and Niehaus, 2012); and new donors, particularly, are not exception to this (Dreher et al., 2011). Such interference of political and economic interests with recipients' needs and merits, in aid allocation processes, may reduce aid's effectiveness (Dreher et al., 2013).

The objective of this chapter is to study the factors associated with the allocation of environmental aid, to see if it suffers from the same drawbacks as poverty aid, which could hamper its effectiveness. Few studies have already attempted to examine the factors affecting the allocation of environmental aid; one of the seminal major contributions is the work of Lewis (2003), based on secondary data from the United Sates Agency for International Development (USAID) and the Global Environment Facility (GEF). She finds that donor interests outweigh recipient needs, environmental aid not being targeted to the recipients that are most in need of abating local pollution. Her findings suggest that donors favor democratic recipients with unexploited natural resources, with whom they have had prior relations (economic and national security interests). These results are opposed to those of Figaj (2010) that finds the number of environmental treaties, environmental vulnerability and sustainability, CO_2 emissions and biodiversity are major determinants of environmental aid, while political variables seem to play no role. More recent studies separately look at mitigation and adaptation aid; while poverty and exposure to climate change risks seem to be positively associated with adaptation aid (Betzold and Weiler, 2017; Weiler et al., 2018), the latter is also linked to donors economic interests (Weiler et al., 2018). For mitigation aid, recipient countries with higher CO_2 emissions, lower GDP per capita and good governance receive more funds (Halimanjaya, 2015, 2016) but again, donors' geopolitical interests play a role in the allocation, especially for bilateral donors such as France or Japan (Halimanjaya, 2016). Also, Clean Development Mechanism (CDM) host countries tend to receive more funds (Halimanjaya, 2016).

Most of the studies consider either aid for mitigation or adaptation separately, which they identify using the Rio-markers[1], rather than focusing on global environmental aid. While this approach is perfectly understandable, it is somewhat risky to try distinguishing these two types of aid because, beyond the fact that they are not covering a relatively large period, the Rio-markers have been dubbed to be barely reliable (Michaelowa and Michaelowa, 2011; Weikmans et al., 2017), due to insufficient coding diligence or misinterpretation of the Rio-marker.

Another fact is the risk of misinterpretation, concerning the relation between mitigation finance and recipients' environmental policies, especially for the studies looking at mitigation finance. This, because of how these environmental policies stringency is measured. In the absence of relevant environmental policy variables which are available for many recipient countries, some studies consider for instance environmental degradation as a measure of environmental policy. Several authors find for instance that recipients with higher CO_2 intensities tend to receive more aid (Halimanjaya, 2015, 2016). This suggests that donors provide more mitigation aid to countries with lax environmental policies, if one considers emissions as a proxy of mitigation policies.[2]. If the goal is to cut emissions, it is reasonable to help countries with high intensities to reduce their emissions; but at the same time, it is important to create the right incentives, otherwise they might keep polluting to continue receiving more aid. In this regard, the interpretation of the CO_2 variable is ambigous: are donors providing environmental aid to countries with bad climate

[1] Visit this OECD page for a complete information about the Rio-Markers.

[2] Emerging economies such as China and India for instance contribute to CO_2 emissions, but are also some of the largest producers of renewable energy (Kamat et al., 2020). It might therefore be misleading to use CO_2 emissions as a measure of mitigation efforts.

policies that are facing high pollution, or are they rewarding countries that have high emissions but are making efforts to significantly reduce them?

A third challenge is the use of econometric methods that are not most of the times well suited to analyze these bilateral financial flows, having many zero (0) observations because not all countries receive environmental aid each year from each donor.

The objective of this chapter is therefore to contribute to this growing non-consensual literature. We use a novel "project-level"[3] aid data set and rely on a comprehensive coding scheme to classify projects according to their environmental impact and obtain the number of projects and the amounts of environmental ODA for 9 donors and 128 recipients over 1990-2013.

The role of different types of factors that might influence the allocation of environmental aid is investigated: the environmental and non-environmental needs and merits of recipient countries, as well as the donors' political and economic self-interests. For the reasons, mentioned above, for the recipients' environmental merits, we use a new measure of climate mitigation efforts introduced by Combes et al. (2016), rather than relying on observed CO_2 emissions as previous studies. To the best of our knowledge, our study is the first using this indicator to analyze the allocation of environmental aid. We separately analyze the number of environmental projects and the amount of environmental ODA received, using Poisson Pseudo-Maximum Likelihood that is better appropriated than OLS, two-part, and Tobit models in the presence of many zero(0) observations and heteroscedasticity (Silva and Tenreyro, 2006, 2011). Beyond the absolute values, the recipients' shares in donors' total projects and amounts are also analyzed using a fractional logit which is also adapted for proportions as dependent variables (Papke and Wooldridge, 1996, 2008).

Our results show that recipients' climate mitigation efforts are positively associated with the number of projects received, while there seems to be no effect on the amount received. This suggests that donors are just splitting their total funding into more projects for recipients with more stringent policies, but don't increase the total amount they devote to environmental projects in these countries. This finding is also confirmed by the analysis performed on shares of environmental ODA. Regarding vulnerability, the results show that recipients that are more

[3]The majority of the activities are traditional aid projects, so we interchangeably use the term "projects" for an easier exposition; the aid-activities also comprise non-project aid.

vulnerable to climate change tend to receive more environmental aid. But this is made at the expense of aid received by other less vulnerable recipients, given that this result is found only while analyzing shares of donors' total funding. Donors are thus reallocating environmental projects funds from less vulnerable recipients to more vulnerable ones, they do not simply increase environmental aid of these recipients. Governance and GDP per capita also appear to be strong determinants. Concerning donors' interests, only imports from donor seem to play a key role. Finally, donor-by-donor analysis reveals important heterogeneities across donors' allocation behavior, some of them being more sensitive to environmental variables, while others are rather responsive to their strategic interests.

The rest of the chapter is organized as follows: section 3.2 presents data and some stylized facts and section 3.3 explains the econometric methods; the findings and robustness checks are explained in section 3.4 and section 3.5 concludes.

3.2 Data and stylized facts

3.2.1 Environmental aid

Environmental aid is measured using project-level data from the 3.1 version of the AidData database, constructed by the William and Mary University. It provides a very comprehensive tracking of international development finance. Concerning the amounts, we consider commitment amounts rather than disbursements, due to the high number of missing values for disbursements over our period of study. This could have been an issue if the goal of our study was to assess the impact of environmental aid; then it would make more sense to use disbursed amounts. However, in our context it makes no great difference to look at the determinants of committed amounts or disbursed amounts.

We use the purpose codes provided in the AidData Research release 3.1, to provide environmental impact codes to the projects, following the methodology of Hicks et al. (2008) and the codebook provided by the AidData research team. For the 1990-2013 period, there are 17,723 projects (out of 970,749) for which we were not able to assign an environmental impact code, representing (1,83%) of the total projects.[4] The 98.17% remaining (953,026 projects) have been assigned an environmental impact code. Among these projects, 6.93% only are considered as environmental aid. Representing 9.5% of the amount of ODA for which we have

[4] Before doing so, we also dropped 464 projects with negative commitment amounts.

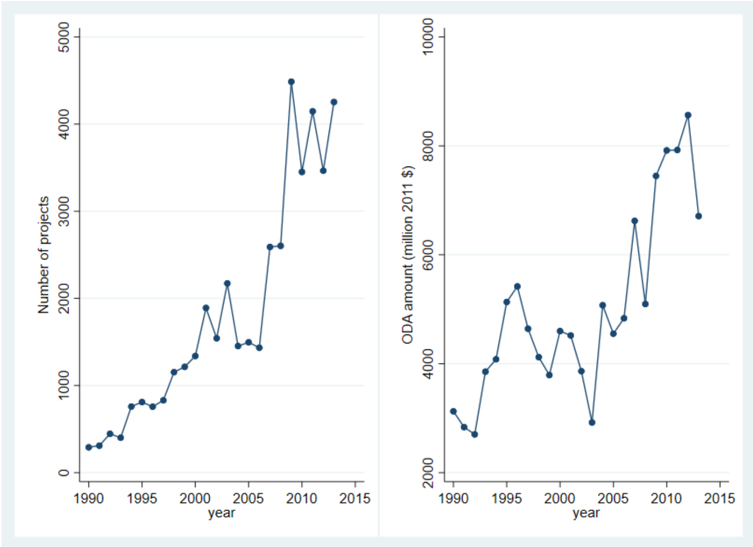


Figure 3.1: Evolution of environmental ODA projects and amount over 1990-2013

environmental impact codes.

We focus on the nine major traditional bilateral donors providing most of the environmental ODA. These are Canada, France, Germany, Japan, Netherlands, Norway, Sweden, United Kingdom and the USA. These countries account for around 61% of all ODA projects over the period, which represents 83% of total amount. When it comes to environmental ODA, these donors represent 65.5% of the number of total projects, constituting 84.3% of the amount of environmental aid over the period.

In total, these donors financed 43,294 environmental ODA projects over the period 1990-2013, representing a total amount of US$2011 120.36 billion. Figure 3.1 shows the evolution of the number of environmental projects on the left and the amount allocated on the right, over the period. We see that both the annual number of projects and the annual total amount allocated increased over the period. However, the number of projects increased way faster than the total amount which had a very unstable growth made of successive increases and decreases, leading to the decrease in the average amount per project shown in figure 3.2.

Figure 3.3 and 3.4 show the geographical distribution of Environmental aid in recipient countries all around the world over 1990-2013. Figure 3.3 displays the share of total projects received while figure 3.4 represents share of the total amount. These figures indicate that most of the environmental ODA has been mostly

Figure 3.2: Evolution of the average amount per environmental aid project

Table 3.1: Top 5 recipients of Environmental ODA over 1990-2013

Projects			**Amount**		
Recipient	**Number**	**Share (%)**	**Recipient**	**Amount (M 2011 $)**	**Share (%)**
China	2086	4.8	India	12978.6	10.8
India	1920	4.4	China	11752.5	9.8
Indonesia	1304	3.0	Indonesia	6579	5.5
Mexico	1186	2.7	Egypt	5765.7	4.8
Vietnam	1135	2.6	Vietnam	4658.6	3.9

concentrated in Asia, both in terms of projects and amount. China and India, together concentrate 13.2% of the projects and 20.6% of total amount over the period.

Table 3.1 shows the ranking by number of projects and amount; it indicates that the top five recipients concentrate around 17.5% of the total number of projects, with China being the biggest with 4.8%. In terms of amount received, these recipients represent together up to 34.8% of total amount over the period[5] with India alone,

[5]In our sensitivity analysis, we exclude dyads including the top 5 recipients. In regressions explaining the number of projects, we exclude dyads containing China, India, Indonesia, Mexico, and Vietnam as recipients. For amounts, we have approximately the same list exception made of Egypt which replace Mexico.

the biggest recipient, concentrating around 10.8% of the total amount.

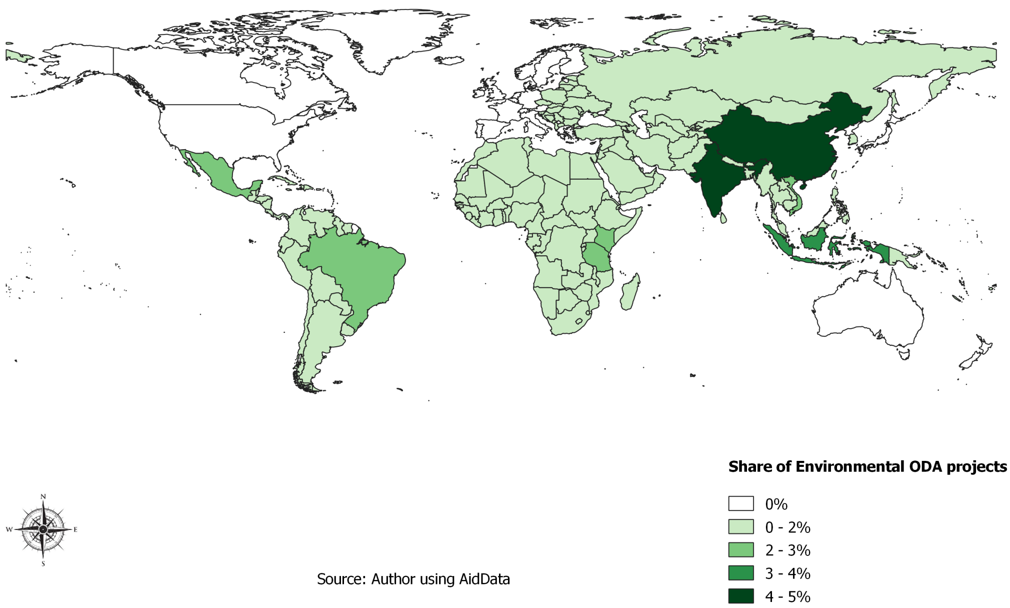


Figure 3.3: Geographical distribution of Environmental projects

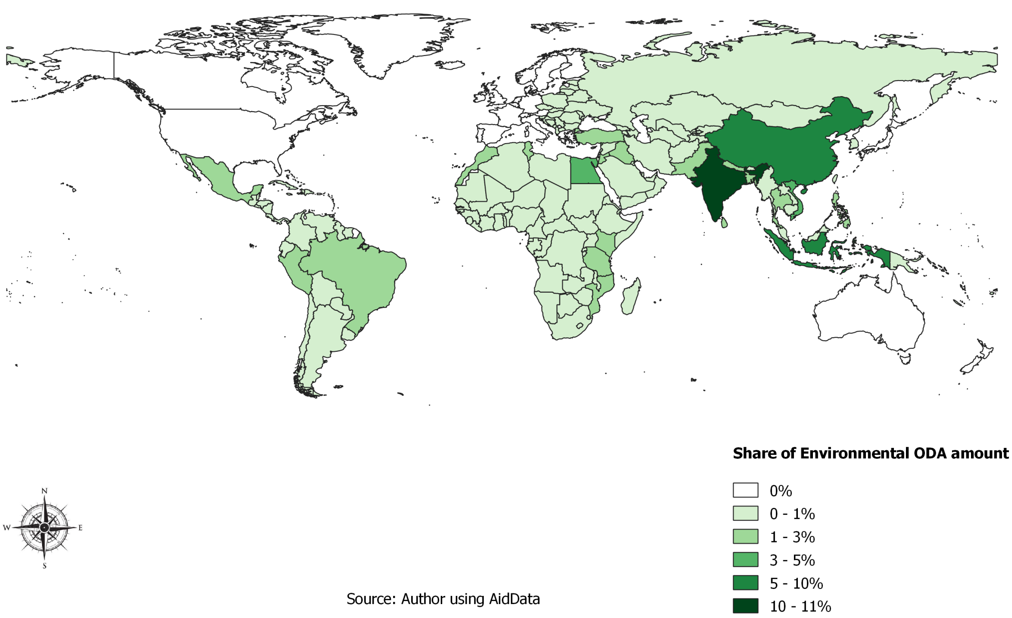


Figure 3.4: Geographical distribution of Environmental ODA

3.2.2 Explanatory variables

Environmental need and merit variables: climate change mitigation efforts and vulnerability

Data on public research and development expenditure, investment expenditure for abatement, ratification of multilateral environmental agreements (MEAs) or taxes are scarce, especially for developing countries. Beyond their delayed effects and their enforcement weakness, the impact of such instruments is difficult to assess, given that their implementation may be anticipated (Combes et al., 2016). Finally, since countries are using different sets of instruments, the use of a synthetic index can be challenging.

It then seems better opting for an output-oriented approach to measure climate change mitigation efforts. However, using output-oriented indicators based on emission intensities is challenging because the latter embody both countries' structural features (which are not under governments' control), and climate policies[6].

We adopt the approach proposed by Combes et al. (2016) to measure domestic efforts for climate change mitigation ($DECM$). They suggest that these efforts can be quantified by comparing measured emissions to structural emissions. The intuition behind this approach is that structural emissions are due to structural factors that change slowly over time, and cannot therefore be influenced by environmental policies in the short term.

Domestic efforts are extracted using the Green Solow model of Brock and Taylor (2010):

$$Log(CO_{2i,t}) = \phi Log(CO_{2i,t-1}) + X_{it}\beta + \mu_i + \lambda_t + \epsilon_{it} \tag{3.1}$$

Where CO_{2it} stands for per capita emissions of country i over period t; ϕ gauges the speed of convergence of emissions toward a steady state which is conditional on other variables; it should be strictly lower than 1 and significant according to the theoretical predictions. X_{it} is a vector of structural determinants of CO_2; these include the logarithm of domestic investment, as well as the logarithm of population growth. As in a Solow growth model, investment drive capital accumulation and is expected to have a positive effect on CO_2 emissions. In the Green Solow model

[6]For comprehensive reviews focusing on methodological challenges of measuring environmental policy, see Brunel and Levinson (2013) or Sauter (2014).

framework, population growth is expected to have a negative impact on CO_2[7] since it reduces the steady state level of per capita emissions. We also include the logarithm of GDP per capita and trade openness, measured as the share of trade to GDP; all variables are retrieved from the World Bank WDI database. μ_i represents country fixed effects which control for structural determinants of CO_2 that are time invariant, and ϵ_{it} is the error term.

Given the dynamic specification linked to the emissions convergence assumption, we rely on the GMM-System estimator of Blundell and Bond (1998) to estimate equation 3.1. Beyond dealing with the potential endogeneity of regressors in the absence of true internal instruments, it provides consistent estimates when the lagged dependent variable is among the regressors and when there is unobserved heterogeneity. Moreover, it is recommended for panel datasets with a larger individual dimension (Roodman, 2009a). The results are presented in Table 3.5.

From equation 3.1, we predict $DECM_{it} = \hat{\epsilon_{it}}$ which is for each country-period the CO_2 emissions that are not due to structural factors, i.e the emissions that are due to domestic climate change mitigation efforts. A positive $DECM$ corresponds to lax climates policies while negative values of $DECM$ denote stringent policies. For ease of interpretation, We normalize it on a scale ranging from [-5, 5] interval[8] using the following transformation :

$$DECM = 10 * \frac{max(\epsilon) - \epsilon}{max(\epsilon) - min(\epsilon)} - 5.$$

After such a transformation, countries-periods with lax climate policies will now get a score ranging between -5 and 0, while stringent climate policies will correspond to a value of the indicator ranging from 0 to 5.

As mentioned by Combes et al. (2016), the $DECM$ measure presents several advantages; it first allows comparison across countries and periods, given that it is a relative measure obtained from an error term for which the average value is zero. Second, progress in abatement technologies is already captured by period fixed effects λ_t and determinants of abatement technology (which depends on investment and economic growth) are already accounted for in X_{it}; thus, one can reasonably assume that $DECM$ only captures abatement costs induced by

[7] In opposition to previous studies (Ehrlich and Holdren, 1971; Holdren, 1991; Shi, 2003)

[8] The choice of the bounds is arbitrary; one could range the values in any interval [a,b], using : $DECM = (b-a) * \frac{max(\epsilon) - \epsilon}{max(\epsilon) - min(\epsilon)} + a$

climate policies. Third, it is a macro-economically based measure contrary to other micro-economically focused indicators used by other studies (Brunel and Levinson, 2013; Sauter, 2014). It then takes economic policies with proximate influences on CO_2 emissions into account. Lastly, it avoids criticism faced by synthetic indicators regarding subjectivity in the choice and weighting when combining climate policy instruments[9].

The allocation decisions might not solely depend on the recipients' efforts, but also on the donors' own mitigation efforts, therefore justifying to consider these latter as well. Given that the DECM variable is obtained from a regression on a sample of world countries, we are also able to compute the DECM for donors. We can then define the gap between the donor and recipient mitigation efforts[10] as:

$$DECMgap_{drt} \equiv DECM_{dt} - DECM_{rt}.$$

Since higher and positive values of DECM correspond to stringent climate policies, the higher the value of this new variable for a dyad, the lower the recipient's effort compared to the donor. A positive effect of this variable would imply that the donors are providing more environmental ODA to countries with very lax climate policies relatively to their own; while a negative effect implies the opposite, meaning that environmental ODA rewards recipients with higher mitigation efforts.

Vulnerability to climate change is proxied through natural disaster variables. We use the number of droughts and floods from the Emergency Events Database (EM-DAT) provided by the Centre for Research on the Epidemiology of Disasters (CRED) of the Catholic University of Louvain. Given that these two types of disasters are not likely to occur for the same region at the same time, it is better not considering separately these variables. We rather add them up to build a "number of natural disasters" variable. Countries more frequently affected by such extreme climate events are likely to receive more adaptation aid; we expect a positive correlation between this variable and environmental ODA if the allocation of this latter takes vulnerability to climate change as criterion.

---

[9]For a detailed discussion on the building and the advantages of $DECM$, see Combes et al. (2016).

[10]Estimates using the recipient countries DECMs rather than the DECMs gap are also performed. The results are similar, with the sign on DECM_{rt} being the opposite of the one on DECMgap_{drt}

Non-environmental need and merit variables

The non-environmental needs are captured by GDP per capita and the ratio of the total debt service to Growth National Income (GNI), both taken from the World Development indicators (WDI). Also, to measure the non-environmental merits, we use the Kraay et al. (2010) control of corruption index which has been proven to be a strong determinant of aid especially for DAC donor countries (Dreher et al., 2011). It is ranging from -2.5 to 2.5 with higher values corresponding to better governance. We thus expect this variable to show a positive correlation with environmental ODA.

Donors' economic and political interest

Donors' political interests are captured by the United Nations General Assembly (UNGA) voting alignment of recipient countries with donors (Strezhnev and Voeten, 2013). According to previous studies (Alesina and Dollar, 2000; Neumayer, 2003; Faye and Niehaus, 2012), UNGA voting seems to be a key determinant in the aid allocation decisions of donors. We expect a positive correlation between voting alignment and environmental ODA if donor countries use it as part of their diplomatic policy with recipients.

The donors' economic interests are measured by recipients' oil rents [11], as a share of GDP as well as total imports from the donor, as a share of recipient's GDP. The oil rents are retrieved from the WDI and the bilateral imports come from the UN Comtrade database. If donors allocate their environmental aid according to these economic interests, to support domestic markets opening or access to natural resources, we should observe a positive correlation between the imports from donors, the oil rents and Environmental ODA. However, it is important to mention that we cannot strictly consider oil rents as a proxy of economic interests as it could be the case for trade, since we are analyzing environmental aid.[12]

Other explanatory variables

As other control variables, we also use the recipient countries' population in millions, in order to control for their size. This variable is obtained from the WDI. To study the substituability or complementarity between environmental ODA and ODA

[11] We also run regressions using total natural resources rents as a share of GDP, in robustness. The results for this variable are the same as those of Oil rents.

[12] Donors might provide aid to resource rich countries to help them protect the environment and reduce resource plundering.

in other sectors, we include the number and amount of non-environmental ODA projects respectively in the regressions explaining the number of projects and the amount of environmental ODA. Table 4.12 in appendix provides details on the definitions and sources of all the variables.

3.3 Methods

Let d index donors, r index recipients and t index the time period considered. Environmental ODA from donor d to recipient r at period t is given by:

$$Env\_ODA_{drt} = X_{1drt}\beta_1 + X_{2rt}\beta_2 + \mu_{dr} + \delta_t + \epsilon_{drt} \tag{3.2}$$

where Env_ODA_{drt} denotes environmental aid. For the regressions studying the absolute values, it represents either the number of projects, or the amount. For the regression analyses of shares, it represents the recipient r's share in donor d's total number of projects or total amount. X_{1drt} is a vector of time-varying donor-recipient variables; those include DECM gap, UNGA voting alignment, bilateral exports from donors to recipients and non-environmental ODA projects or amounts, depending on the regression. X_{2rt} is a vector of time-varying recipient-specific variables such as the number of natural disasters, GDP per capita, population, oil rents, Debt, and control of corruption index. μ_{dr} represents a vector of dyads fixed effects, δ_t the time dummies and ϵ_{drt} the error term.

Data are compiled in 4-year averages to smooth short-run fluctuations, except for ODA projects, amounts and the number of natural disasters for which we take the total for each period. This also help reducing the number of dyads with zero(0) values for aid, compared to taking the data year-by-year.

Many recipient countries in our sample did not benefit from environmental ODA projects each period, therefore leading to the presence of many zero(0) observations. In that case, simple regression techniques like OLS are not well suited to estimate factors associated with the allocation of environmental ODA: the effects of the independent variables will be underestimated, as OLS estimates will be biased toward 0.

To deal with this issue, some alternative models could be used. First, one could rely on a Two-Part model in which the factors associated with being a recipient country (i.e receiving a positive value of ODA) and those associated with the amount would be estimated independently. There is however the risk of introducing a selection bias in the second-step if the amount of ODA received by a donor is not independent of the selection as recipient by this donor.

The Heckman selection model can help dealing with this selection bias, by adding an exclusion restriction on at least one independent variable which must explain the selection process but not the amount of ODA received. In our study, this restriction is difficult to meet because independent variables affecting the selection as recipient will very likely also affect the amount received, and the task is much more complicated by the fact that we have more than one donor.[13]

Another solution would be to estimate in one step the factors associated with the volume of environmental ODA while correcting for the downward bias due to the many 0 observations, thanks to a Tobit model. The independent variables are thus assumed to have the same impact on both the selection as recipient and the volume. One major constraint with the Tobit model is however the homoscedasticity condition that it imposes on residuals; it provides biased estimates in the presence of heteroscedasticity.

In the presence of heteroscedasticity and many zero observations, the Poisson pseudo-maximum likelihood (PPML) regression model have been evidenced by Silva and Tenreyro (2006, 2011) to outperform the Tobit model. Last but not least, compared to other count data models such as zero-inflated Poisson (ZIP) and negative binomial, the PPML estimator also remains consistent when there is over-dispersion due to the high number of zero(0), with the advantage of being invariant to the scale of the dependent variable[14]. We therefore rely on the PPML to study the factors associated with environmental ODA. Given that the DECM measure is generated from a first-stage regression, we rely on the bootstrap technique for all the regressions to correct the standard errors.

We also run regressions using the share of environmental projects and the share of environmental ODA as dependent variables, using fractional logit method (Papke and Wooldridge, 1996, 2008).

---

[13]While studying the factors linked to Chinese aid allocation in particular, Guillon and Mathonnat (2020) for instance were able to use the recognition of Taiwan as an exclusion variable.

[14]One drawback of ZIP and negative binomial is that they are not invariant to the scale of the dependent variable. In our case, measuring ODA in millions of dollars or thousands dollars for instance would lead to different estimates with these estimators.

3.4 Findings

3.4.1 Number of projects and amounts

Table 3.2 shows the results of regression analyses for the number of projects and amount of environmental ODA. To quantify the effects of the explanatory variables, coefficients are reported as incidence rate ratios (IRRs). Columns 1-3 show regression analyses explaining the number of projects. Compared to other variables, control of corruption index and Debt have a relatively higher share of missing values. Therefore, to avoid losing many observations, they are not systematically included in all columns.

Environmental needs and merits

We observe a non-significant correlation between the number of natural disasters and the number of environmental ODA projects. There is a small correlation with the amount in column 4, one additional natural disaster in the recipient country being associated with 2.2% increase in the received amount. However, this correlation disappears, in columns 5 and 6, when control of corruption and Debt are included. Therefore, there seems to be no association between climate vulnerability and the absolute values of projects and amounts, which is contrasting with previous findings (Figaj, 2010; Betzold and Weiler, 2017; Weiler et al., 2018).

Concerning DECM gap, regression analyses show a negative correlation with the number of environmental aid projects, meaning that the recipient countries with the most lax policies relative to the donor, tend to benefit from a lower number of projects. From column 3, a 1 unit increase in the DECM gap is associated with a 23.4% decrease[15] in the number of projects. It is however, not correlated with the amount received. This suggests that stringent climate policies lead donors to increase the number of projects in these countries, but not the total amount, which means a smaller average amount per project as illustrated previously in Figure 3.2. As robustness check, we replace the donor-recipient DECM gap by the DECM of recipients (results are shown in Table 3.6). The results go in the same direction: we find a positive correlation between recipients' DECM and the number of project, suggesting that recipients' with lax environmental policies benefit from a lower number of projects. Again, we find no significant correlation with the amount of environmental ODA received. The results for the number of

[15] A 1 unit increase in DECM gap is associated with an IRR of 0.766; multiplying the number of projects by a factor of 0.766 corresponds to a 23.4% decrease.

natural disasters also remain the same. These findings contrast with previous studies that use environmental degradation as proxy of environmental policies (Figaj, 2010; Halimanjaya, 2015, 2016): we find that donors increase the number of environmental projects in recipient countries with stringent climate policies, but not the amount.

Donors' economic and political interest

For the donors' economic interests, we find a positive correlation between recipients' oil rents and the number of projects, a 1% increase in oil rents being associated with 3.2% more projects. However, it shows no significant correlation with the amount received. It is however important to recall again, that we cannot strictly consider oil rents as a proxy of economic interests in the case of environmental aid, as it could be the case for aid in other sectors. In robustness, we replaced oil rents by natural resources rents as a share of GDP, the results, presented in Table 3.8 in appendix, remain similar for both the number of projects and amounts.

Regarding imports from donor, we find no significant correlation with the number of projects, while it shows a positive and significant correlation with the total amount received. A 1% increase in imports from donor is associated with a 13% increase in the amount of environmental ODA received.

For political interests, we find no correlation between UNGA voting alignment and the amount of environmental ODA; for the number of projects, we even find a negative correlation between voting alignment and the number of projects, a 1% increase in voting alignment being associated with a 1.4% decrease in the number of projects benefited. These findings are in line with those of Figaj (2010), but they might be the result of important heterogeneities regarding donors' behavior.

Non-environmental needs and merits

We find a negative correlation between GDP per capita and the number of projects; a thousand dollar increase in GDP per capita is associated with a 16% decrease in received projects. However, the correlation between this variable and the amount is not statistically significant.

Institutional quality seems to play an important role for donors, with least corrupt countries receiving more projects and higher amounts. Indeed, control of corruption is positively correlated with both the number of projects and the amount. A 1 unit increase in the value of the control of corruption index is associated with 34%

more projects and 61.7% more funds.

We find a negative link between population and the number of projects. A million more people leading to 0.2% less projects. Concerning the amount, we however find a non-significant correlation. The coefficient on Debt is also non-significant for both the number of projects and the amount. Finally, we also find evidence of complementarity between environmental ODA and ODA in other sectors, for both the number of projects and the amounts.

Table 3.2: Determinants of number of projects and amount of environmental ODA

Method	PPML					
Dependent variable	Total Number of projects			Total Env. ODA Amount		
	(1)	(2)	(3)	(4)	(5)	(6)
DECM gap	0.718***	0.730***	0.766**	0.929	1.240	1.245
	(0.0654)	(0.0729)	(0.0833)	(0.180)	(0.292)	(0.280)
Natural disasters	1.008	1.006	1.007	1.022*	1.021	1.020
	(0.00685)	(0.00781)	(0.00693)	(0.0130)	(0.0154)	(0.0141)
GDP per capita (1000 $)	0.859***	0.825***	0.840***	0.970	1.026	1.065
	(0.0267)	(0.0263)	(0.0445)	(0.0715)	(0.0792)	(0.103)
Population (million)	0.995***	0.996***	0.996**	0.998	0.998	0.998
	(0.00118)	(0.00165)	(0.00165)	(0.00181)	(0.00267)	(0.00223)
UNGA Voting alignment	0.985***	0.984***	0.986***	1.002	1.011	1.011
	(0.00384)	(0.00439)	(0.00441)	(0.00934)	(0.00989)	(0.0102)
Imports from donor(% recipient GDP)	0.986	0.967	0.985	1.094**	1.136*	1.130*
	(0.0179)	(0.0216)	(0.0253)	(0.0476)	(0.0747)	(0.0773)
Oil rents (% GDP)	1.032**	1.029**	1.032**	1.023	1.050	1.057
	(0.0132)	(0.0134)	(0.0143)	(0.0316)	(0.0395)	(0.0376)
Non-env. ODA projects	1.002***	1.002***	1.002***			
	(0.000231)	(0.000214)	(0.000242)			
Non-env. ODA amount (million $)				1.000***	1.000**	1.000**
				(0.0000704)	(0.0000835)	(0.0000813)
Control of Corruption		1.323**	1.340**		1.698*	1.617*
		(0.149)	(0.158)		(0.486)	(0.472)
Debt (% GNI)			1.001			0.973
			(0.00780)			(0.0216)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5259	4414	3605	5259	4414	3605
Number of dyads	894	890	732	894	890	732
Log pseudolikelihood	-12148.4	-10611.9	-9249.6	-45110.5	-34492.4	-32080.1

Exponentiated coefficients (IRRs); Bootstrapped standard errors in parentheses. Replications based on clustering on Dyads

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

3.4.2 Results using recipients' shares in donors' allocations

After the regressions on the absolute values, in a second step, we also perform regressions on the shares[16] to see if the factors associated with the allocation of level variables also play a role in the trade-off by donors, concerning the allocation among several recipients. The results are presented in Table 3.3 below.

Regarding the environmental merits, results are very similar to those obtained using the absolute values: DECM-gap is negatively correlated with the share of environmental projects. It also shows a negative correlation with the share of total amount but which tends to vanish once Control for corruption index is included. Donors allocate more environmental aid projects to recipients that tend to have more stringent climate mitigation policies. This result is still observed in Table 3.7 in appendix where DECM gap is replaced by recipient's DECM, and also in Table 3.10 where top five recipients are removed. The number of natural disasters now shows a positive correlation with both the share of projects and total amount, suggesting that donors tend to allocate more projects and funds to most vulnerable recipients. These conclusions still hold in Table 3.7. However, when top five recipients are removed from the analysis (see Table 3.10), the correlation vanishes.

When it comes to donors' interests, UNGA voting alignment and Oil rents show a non-significant correlation with both the share of projects and amount. These results remain the same, after removing the top five recipients in Table 3.10. This suggests that donors are not allocating more projects or funds to countries that are more politically aligned with them or with high oil rents. Commercial ties seem to matter more: the imports from donor show a positive and significant correlation with the share of environmental ODA amount. The correlation with the share of projects is however non-significant, in line with the previous results in Table 3.2. This result strongly holds in the robustness checks made in Tables 3.7, 3.9 and 3.10.

We also find a positive correlation between control of corruption and the share of environmental aid projects; for the amount share, we again get a positive correlation which becomes insignificant, once debt is controlled for. GDP per capita and population show strong negative correlations with the share of projects and amount, and there is still evidence of complementarity between ODA in other

[16]The share of environmental ODA projects (or amount) for a dyad in a given period is computed as the number (or amount) of environmental ODA projects of this dyad this period, divided by the total number (or amount) of projects of the corresponding donor.

sectors and environmental ODA. These results are also found in tables 3.7 and 3.9. However, once we remove the top recipients in Table 3.10, only the coefficients of GDP per capita and ODA in other sectors remain statistically significant.

Table 3.3: Determinants of the Share of projects and amount

Method	Fractional logit					
Dependent variable	Share of env. ODA projects			Share of env. ODA amount		
	(1)	(2)	(3)	(4)	(5)	(6)
DECM gap	-0.367***	-0.400***	-0.330***	-0.411**	-0.228	-0.182
	(0.0881)	(0.0982)	(0.101)	(0.180)	(0.209)	(0.205)
Natural disasters	0.00871*	0.00461	0.00627	0.0237**	0.0183*	0.0177*
	(0.00493)	(0.00496)	(0.00490)	(0.00949)	(0.00978)	(0.0100)
GDP per capita (1000 $)	-0.100***	-0.146***	-0.122***	-0.210***	-0.215***	-0.162*
	(0.0263)	(0.0282)	(0.0402)	(0.0636)	(0.0655)	(0.0826)
Population (million)	-0.00180*	-0.00181*	-0.00170*	-0.00394***	-0.00376***	-0.00371***
	(0.00101)	(0.000987)	(0.000992)	(0.00109)	(0.00138)	(0.00140)
UNGA Voting alignment	-0.000542	0.00225	0.00337	0.000900	0.0103	0.0124
	(0.00325)	(0.00349)	(0.00358)	(0.00707)	(0.00795)	(0.00842)
Imports from donor(% recipient GDP)	0.0203	0.00515	0.0162	0.0754**	0.111***	0.112**
	(0.0155)	(0.0239)	(0.0239)	(0.0343)	(0.0373)	(0.0447)
Oil rents (% GDP)	0.0139	0.0178	0.0184	0.0288	0.0474	0.0480
	(0.0142)	(0.0174)	(0.0182)	(0.0280)	(0.0324)	(0.0328)
Share of non-environmental ODA projects (%)	0.405***	0.431***	0.408***			
	(0.0377)	(0.0420)	(0.0417)			
Share of non-envionmental ODA amount (%)				0.0952***	0.0860***	0.0850***
				(0.0159)	(0.0227)	(0.0229)
Control of Corruption		0.261**	0.254**		0.401*	0.373
		(0.122)	(0.128)		(0.236)	(0.243)
Debt (% GNI)			0.0147			-0.00170
			(0.00960)			(0.0218)
Constant	-6.131***	-5.561***	-5.945***	-6.195***	-6.757***	-7.278***
	(0.414)	(0.444)	(0.480)	(0.987)	(1.087)	(1.174)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5259	4414	3605	5259	4414	3605
Number of dyads	894	890	732	894	890	732
Log pseudolikelihood	-189.7	-158.9	-145.0	-167.6	-139.1	-132.9

Robust standard errors in parentheses

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

3.4.3 Donor-by-donor results

The results presented above hide an important heterogeneity. Indeed, donors might differ on many aspects particularly on their interests; some might value certain particular criteria, while others do not, all these opposite effects potentially offsetting in some of the coefficients above. This might be the reason behind some of the non-significant correlations above. We thus rely on donor-by-donor analysis to get an in-depth overview of the effects. We plot donor-by-donor coefficient estimates of some of the key variables, using the specifications explaining the shares, in tables 3.13 and 3.14 presented in appendix[17].

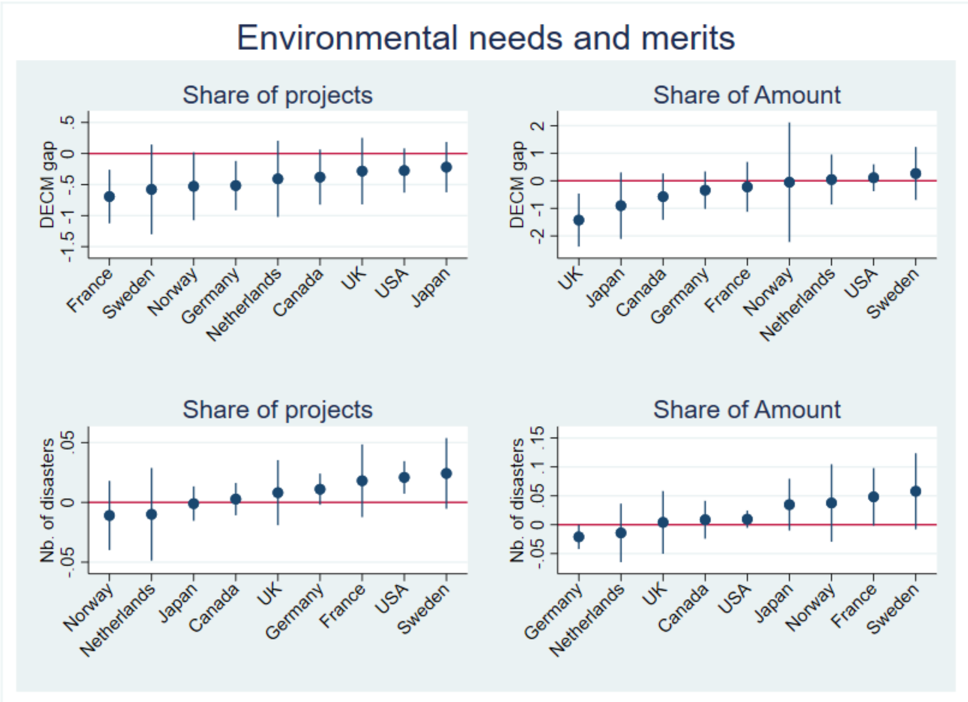


Figure 3.5: Environmental needs and merits

Figure 3.5 presents the coefficient estimates for the DECM gap and number of natural disasters. Regarding DECM gap, the largest negative and significant correlations with the share of projects are observed for France, Norway, Germany and Canada, while the variable is not significant for other donors. But concerning the amount, we find a negative and significant correlation only for United Kingdom.

Concerning recipients' vulnerability, we find that more vulnerable recipients benefit from more projects from Germany and the US. However, these donors do no

[17] We also performed regressions on the absolute values, which are presented in Tables 3.11 and 3.12 in appendix.

allocate more funds to vulnerable recipients; the correlation is even negative for Germany. Rather, only France and Sweden seem to relatively allocate more funds to vulnerable recipients.

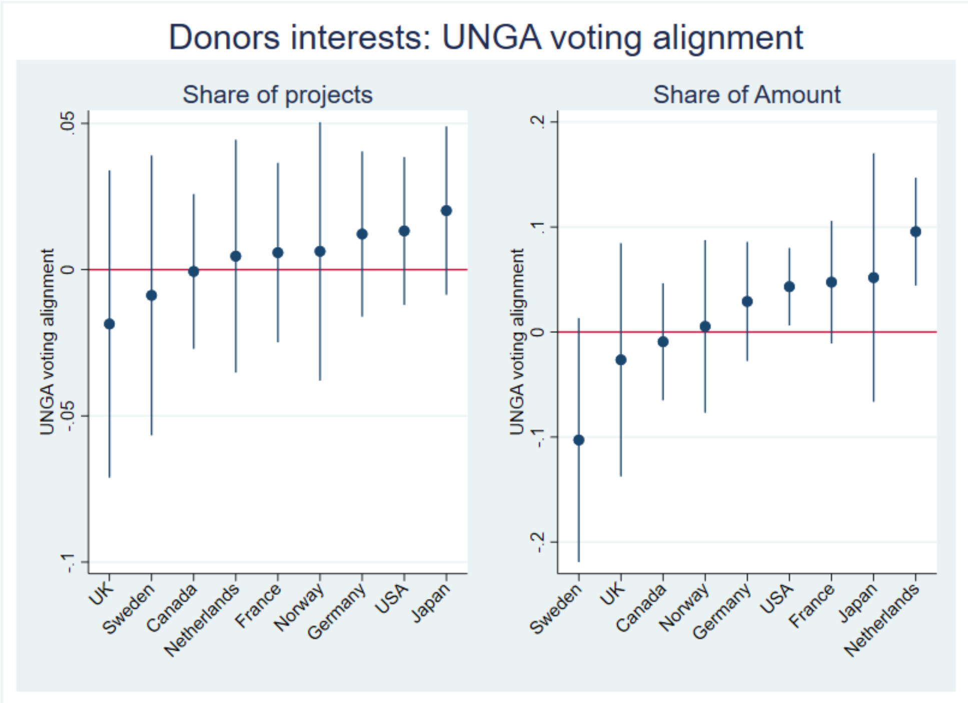


Figure 3.6: Donors interests: UNGA voting alignment

For the share of projects, the UNGA voting alignment variable remains insignificant for all donors; however, even if they don't receive more projects, recipients' that are more aligned with Netherlands and USA tend to receive a higher share of these donors' environmental aid (Figure 3.6).

Imports also play a role, for donors like Canada and Germany given that both of them increase the share of funding for recipients having strong commercial ties with them. For Germany, we find a significant effect for both the projects and amount of environmental ODA (Figure 3.7). We also find evidence that Norway and USA allocate more funds to recipients having higher oil rents. Japan also consider oils rents, but these seem to play a role only on the number of projects. (Figure 3.8).

Control of corruption turns out to be a key determinant in the allocation of funds for France, Japan, Sweden and USA. Sweden and USA increase both the number of projects and amount for recipients with a better governance. (Figure 3.9)

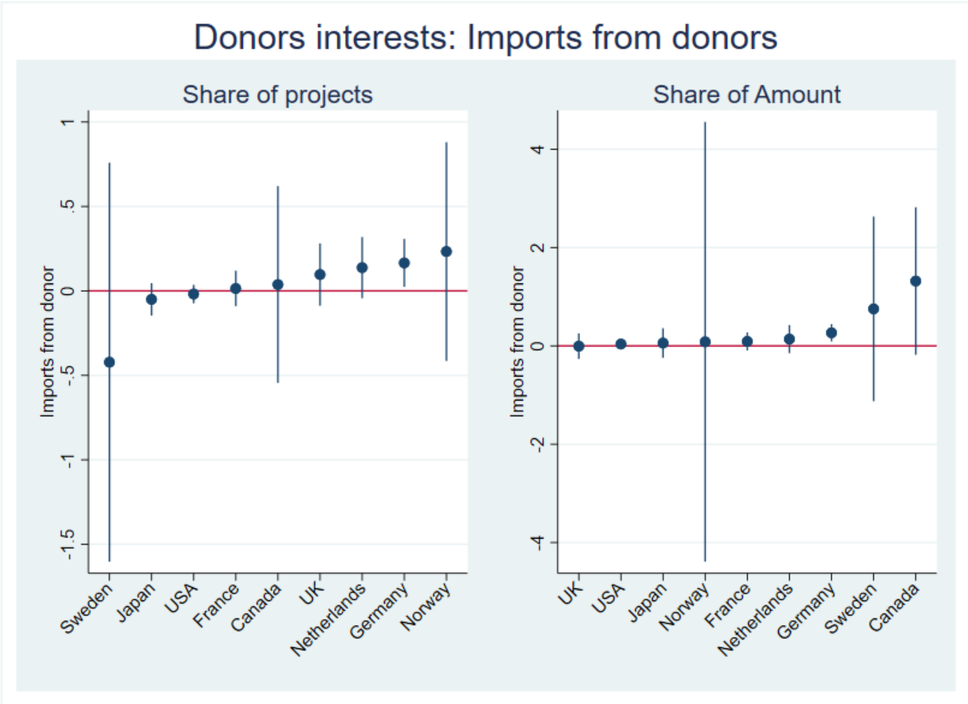


Figure 3.7: Donors interests: Imports from donors

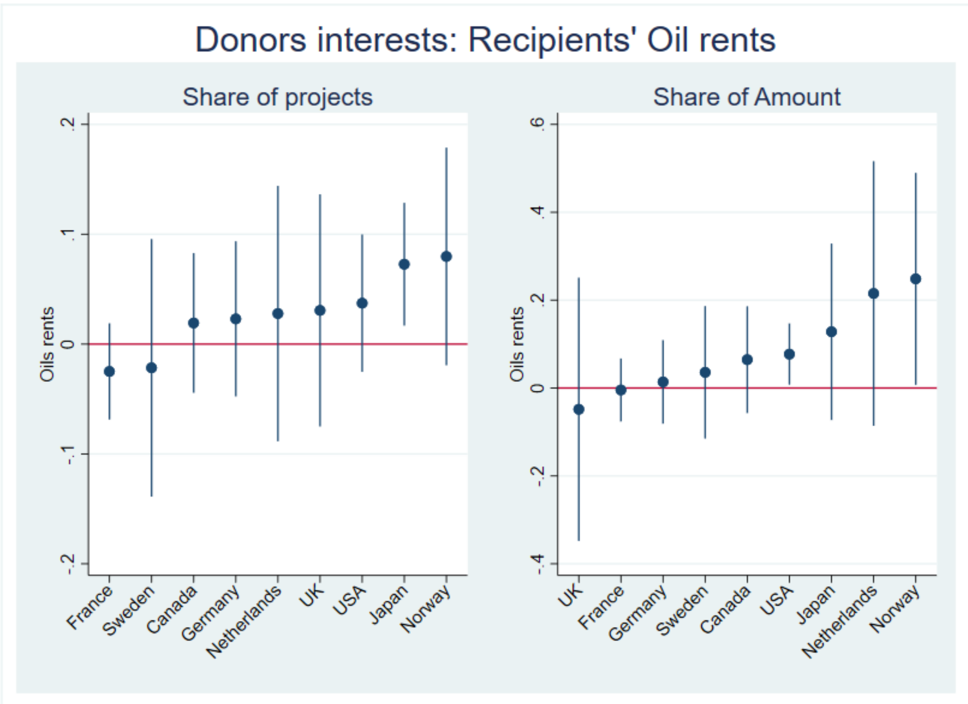


Figure 3.8: Donors interests: Recipients' Oil rents

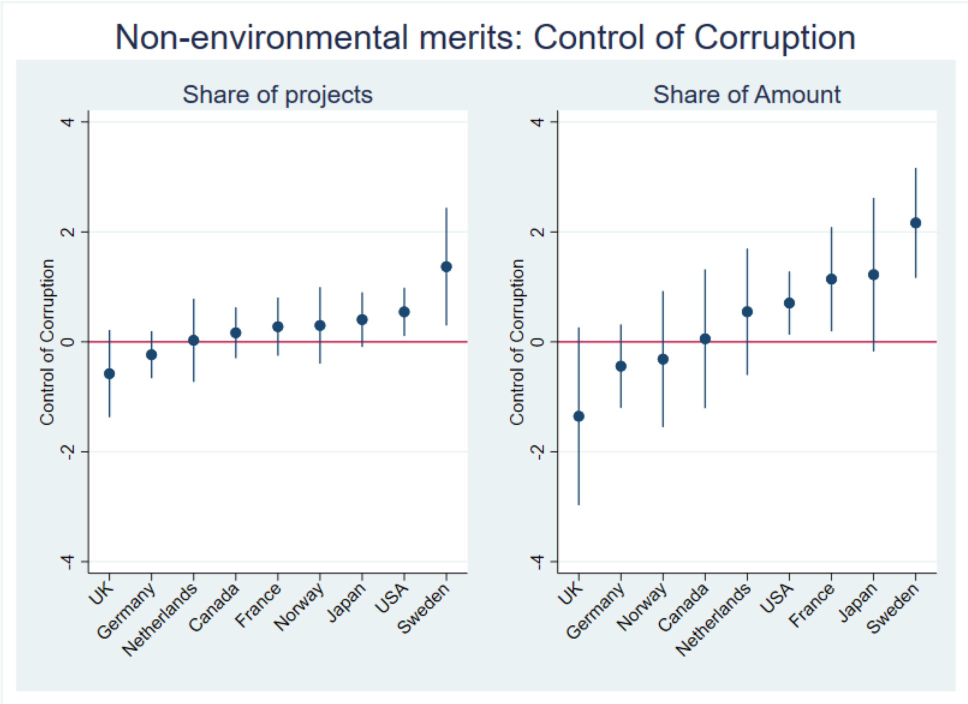


Figure 3.9: Non-environmental merits: Control of Corruption

3.5 Conclusion and discussion

This chapter analyzes the factors associated with the allocation of environmental aid over the period 1990-2013, using project-level data for the 9 major donors that provided 84.3% of the total environmental aid over the period, and 128 recipient countries. The fact of systematically analyzing both the number of projects and the amounts has proved particularly useful in this analysis, as it has made it possible to highlight two types of strategic behavior from donors. Indeed, some of the criteria lead donors to increase (reduce) the amount (with or without an increase in projects), while other criteria only make them increase the number of projects, but not the amount. For instance, concerning recipients' climate policies, donors such as France tend to increase the number of projects in countries with stringent policies, but without significantly increasing their funding to these countries. At the opposite, recipients' that are more aligned with USA do no systematically benefit from more projects, but receive a significantly higher amount from the USA.

A very likely explanation to such different behaviors is the fact that donors behave differently depending on how much they value a criterion. Therefore, a donor that does not give much importance to recipients' climate policy compared to their political cooperation, will will be more reluctant to increase funding for recipients with stringent climate policy. Thus, increasing the number of projects, but not the amount, might be a good option to "reward" those recipients, without increasing total costs. However, this donor will be more inclined to increase the amount for politically aligned recipients.

The key takeaways of the present chapter are the following:

Concerning environmental variables, recipients' vulnerability is a strong determinant in donors' allocation, since they provide more environmental ODA to vulnerable countries that have a higher frequency of extreme weather events. However, recipients' climate mitigation efforts seem not to be important for the donors, given that it globally doesn't affect the amount they provide.

Donors' political and economic interests seem to play a more important role in the allocation of environmental ODA, as suggested by previous studies (Lewis, 2003). We can say that globally, even if these variables show weak correlations with the amount received, the donor-by-donor analysis puts the spot on some particular donors that are giving much more importance to them.

Environmental ODA is also complementary to ODA received in sectors and for other purposes, and is responsive to traditional determinants of development aid such as governance and recipients' level of development. Basically, allocation of environmental ODA suffers from the same drawbacks as poverty aid.

One major limit of the links exposed here is that, although very strong, they remain correlations, because it would have been challenging to try isolating a causal impact for each of these determinants. Next studies could take a deep dive into each of the correlations exposed in this study and isolate a proper causal impact. But most importantly, given the emergency of climate change, beyond simply highlighting the weaknesses in the allocation of environmental ODA, it is important to start thinking about ways to improve its allocation process and make it more efficient. In that vein, possibilities offered by new technologies such as blockchain (with its smart contracts) should not be neglected (Reinsberg, 2019).

3.6 Appendices of Chapter 3

Table 3.4: Evolution of environmental ODA

Year	Projects	Amount (2011 M$)	Amount/project (2011 M$)
1990	291	3126.39	10.74
1991	310	2836.53	9.15
1992	446	2702.71	6.06
1993	401	3854.23	9.61
1994	759	4081.51	5.38
1995	810	5134.29	6.34
1996	757	5419.75	7.16
1997	830	4642.82	5.59
1998	1153	4121.58	3.57
1999	1214	3791.41	3.12
2000	1339	4599.63	3.44
2001	1890	4519.24	2.39
2002	1542	3863.33	2.51
2003	2172	2921.21	1.34
2004	1453	5074.11	3.49
2005	1496	4552.09	3.04
2006	1434	4834.57	3.37
2007	2590	6623.29	2.56
2008	2603	5096.43	1.96
2009	4487	7449.00	1.66
2010	3451	7917.22	2.29
2011	4147	7924.45	1.91
2012	3465	8565.36	2.47
2013	4254	6710.83	1.58

Table 3.5: Regression to compute DECM

Method	GMM-system
Dependent variable	log CO_2 per capita
Lagged D.V	0.831***
	(0.124)
Investment (log)	0.467***
	(0.169)
Population growth (log)	-0.0917
	(0.553)
GDP per capita (log)	0.876**
	(0.371)
Openness (log)	0.207
	(0.243)
Constant	-6.946
	(4.839)
Year dummies	Yes
Observations	3328
Countries	151
Instruments	32
AR1 pvalue	0.001
AR2 pvalue	0.978
Hansen pvalue	0.731

Standard errors in parentheses

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

Table 3.6: Regression analysis for number of projects and amount, replacing DECM gap by recipient DECM

Method	PPML					
Dependent variable	Total Number of projects			Total Env. ODA Amount		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient's DECM	1.388***	1.355***	1.313***	1.339	1.057	1.090
	(0.135)	(0.139)	(0.129)	(0.269)	(0.240)	(0.285)
Natural disasters	1.008	1.006	1.007	1.022*	1.021	1.019
	(0.00664)	(0.00714)	(0.00746)	(0.0121)	(0.0142)	(0.0137)
GDP per capita (1000 $)	0.859***	0.826***	0.840***	0.933	0.978	1.006
	(0.0299)	(0.0279)	(0.0452)	(0.0677)	(0.0828)	(0.105)
Population (million)	0.995***	0.996***	0.996**	0.997	0.997	0.997
	(0.00119)	(0.00152)	(0.00157)	(0.00194)	(0.00225)	(0.00255)
UNGA Voting alignment	0.986***	0.986***	0.987***	1.002	1.009	1.009
	(0.00401)	(0.00444)	(0.00445)	(0.00976)	(0.0110)	(0.0107)
Imports from donor(% recipient GDP)	0.985	0.968	0.985	1.083*	1.119*	1.111*
	(0.0196)	(0.0245)	(0.0268)	(0.0478)	(0.0653)	(0.0680)
Oil rents (% GDP)	1.032**	1.029**	1.033**	1.019	1.047	1.055
	(0.0130)	(0.0140)	(0.0154)	(0.0312)	(0.0395)	(0.0377)
Non-environmental ODA projects	1.002***	1.002***	1.002***			
	(0.000236)	(0.000240)	(0.000254)			
Non-environmental ODA amount (million $)				1.000***	1.000**	1.000**
				(0.0000621)	(0.0000871)	(0.0000859)
Control of Corruption		1.326**	1.337**		1.704*	1.622
		(0.154)	(0.154)		(0.471)	(0.488)
Debt (% GNI)			1.000			0.970
			(0.00745)			(0.0245)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5259	4414	3605	5259	4414	3605
Number of dyads	894	890	732	894	890	732
Log pseudolikelihood	-12154.3	-10617.9	-9250.3	-44983.6	-34549.5	-32132.6

Exponentiated coefficients (IRRs); Bootstrapped standard errors in parentheses. Replications based on clustering on Dyads

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

Table 3.7: Regression analysis for Shares, replacing DECM gap by recipient DECM

Method	Fractional logit					
Dependent variable	Share of env. ODA projects			Share of env. ODA amount		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient's DECM	0.411***	0.474***	0.420***	0.451**	0.241	0.219
	(0.0921)	(0.100)	(0.104)	(0.190)	(0.221)	(0.212)
Natural disasters	0.00880*	0.00465	0.00623	0.0237**	0.0182*	0.0176*
	(0.00494)	(0.00487)	(0.00482)	(0.00965)	(0.00978)	(0.0100)
GDP per capita (1000 $)	-0.110***	-0.161***	-0.140***	-0.214***	-0.217***	-0.168**
	(0.0278)	(0.0302)	(0.0418)	(0.0671)	(0.0685)	(0.0840)
Population (million)	-0.00197*	-0.00212**	-0.00207**	-0.00398***	-0.00375***	-0.00380***
	(0.00101)	(0.000975)	(0.000986)	(0.00115)	(0.00134)	(0.00136)
UNGA	0.00125	0.00398	0.00488	0.00302	0.0114	0.0133
	(0.00327)	(0.00348)	(0.00357)	(0.00690)	(0.00767)	(0.00810)
Imports from donor(% recipient GDP)	0.0195	0.00236	0.0140	0.0746**	0.110***	0.111**
	(0.0158)	(0.0244)	(0.0240)	(0.0345)	(0.0373)	(0.0444)
Oil rents (% GDP)	0.0137	0.0177	0.0182	0.0283	0.0475	0.0479
	(0.0144)	(0.0179)	(0.0187)	(0.0284)	(0.0327)	(0.0332)
Share of non-environmental ODA projects (%)	0.405***	0.432***	0.409***			
	(0.0373)	(0.0408)	(0.0406)			
Share of non-environmental ODA amount (%)				0.0958***	0.0859***	0.0851***
				(0.0161)	(0.0230)	(0.0232)
Control of Corruption		0.242**	0.229*		0.394*	0.361
		(0.121)	(0.126)		(0.235)	(0.242)
Debt (% GNI)			0.0133			-0.00271
			(0.00952)			(0.0217)
Constant	-7.482***	-6.994***	-7.130***	-7.722***	-7.593***	-7.944***
	(0.292)	(0.339)	(0.367)	(0.625)	(0.701)	(0.766)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5259	4414	3605	5259	4414	3605
Number of dyads	894	890	732	894	890	732
Log pseudolikelihood	-189.7	-158.9	-144.9	-167.6	-139.1	-132.9

Standard errors in parentheses

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

Table 3.8: Regression analysis replacing recipient's Oil rents by natural resources rents

Method	PPML					
Dependent variable	Total Number of projects			Total Env. ODA Amount		
	(1)	(2)	(3)	(4)	(5)	(6)
DECM gap	0.726***	0.747***	0.779**	0.922	1.233	1.236
	(0.0644)	(0.0781)	(0.0818)	(0.168)	(0.316)	(0.331)
Natural disasters	1.007	1.005	1.006	1.022*	1.020	1.018
	(0.00708)	(0.00851)	(0.00738)	(0.0116)	(0.0144)	(0.0134)
GDP per capita (1000 $)	0.856***	0.823***	0.838***	0.968	1.019	1.057
	(0.0229)	(0.0264)	(0.0378)	(0.0692)	(0.0831)	(0.104)
Population (million)	0.995***	0.996**	0.996**	0.998	0.998	0.998
	(0.00129)	(0.00166)	(0.00151)	(0.00189)	(0.00256)	(0.00263)
UNGA	0.986***	0.985***	0.986***	1.002	1.011	1.010
	(0.00398)	(0.00437)	(0.00462)	(0.00934)	(0.0105)	(0.0112)
Imports from donor(% recipient GDP)	0.985	0.968	0.986	1.093**	1.132**	1.129*
	(0.0194)	(0.0241)	(0.0269)	(0.0483)	(0.0713)	(0.0724)
Natural resources (% of GDP)	1.024***	1.025***	1.020***	1.008	1.021	1.021
	(0.00642)	(0.00709)	(0.00689)	(0.0146)	(0.0171)	(0.0162)
Non-environmental ODA projects	1.002***	1.002***	1.002***			
	(0.000227)	(0.000222)	(0.000228)			
Non-environmental ODA amount (million $)				1.000***	1.000**	1.000**
				(0.0000638)	(0.0000936)	(0.0000908)
Control of Corruption		1.398***	1.396***		1.748*	1.665*
		(0.168)	(0.161)		(0.548)	(0.479)
Debt (% GNI)			0.999			0.973
			(0.00795)			(0.0214)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5259	4414	3605	5259	4414	3605
Number of dyads	894	890	732	894	890	732
Log pseudolikelihood	-12125.1	-10583.2	-9242.7	-45132.9	-34539.1	-32160.7

Exponentiated coefficients; Bootstrapped standard errors in parentheses

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

Table 3.9: Regression analysis replacing recipient's Oil rents by natural resources rents

Method	Fractional logit					
Dependent variable	Share of env. ODA projects			Share of env. ODA amount		
	(1)	(2)	(3)	(4)	(5)	(6)
DECM gap	-0.368***	-0.391***	-0.331***	-0.406**	-0.231	-0.208
	(0.0883)	(0.0979)	(0.100)	(0.179)	(0.201)	(0.191)
Natural disasters	0.00837*	0.00405	0.00561	0.0227**	0.0166*	0.0158
	(0.00491)	(0.00493)	(0.00487)	(0.00913)	(0.00952)	(0.00968)
GDP per capita (1000 $)	-0.103***	-0.151***	-0.130***	-0.221***	-0.242***	-0.195**
	(0.0263)	(0.0281)	(0.0406)	(0.0634)	(0.0633)	(0.0798)
Population (million)	-0.00183*	-0.00179*	-0.00172*	-0.00401***	-0.00393***	-0.00392***
	(0.00101)	(0.000987)	(0.000992)	(0.00109)	(0.00136)	(0.00137)
UNGA Voting alignment	-0.000300	0.00283	0.00372	0.00269	0.0129*	0.0148*
	(0.00323)	(0.00345)	(0.00355)	(0.00672)	(0.00756)	(0.00807)
Imports from donor(% recipient GDP)	0.0189	0.00498	0.0170	0.0695**	0.107***	0.113**
	(0.0156)	(0.0243)	(0.0239)	(0.0347)	(0.0378)	(0.0461)
Natural resources (% of GDP)	0.0133**	0.0201***	0.0168**	0.0440**	0.0607***	0.0586***
	(0.00662)	(0.00702)	(0.00739)	(0.0173)	(0.0191)	(0.0212)
Control of Corruption		0.297**	0.281**		0.468**	0.430*
		(0.120)	(0.126)		(0.232)	(0.240)
Debt (% GNI)			0.0130			-0.00869
			(0.00951)			(0.0232)
Share of non-environmental ODA projects (%)	0.404***	0.430***	0.408***			
	(0.0378)	(0.0417)	(0.0415)			
Share of non-envionmental ODA amount (%)				0.0950***	0.0902***	0.0888***
				(0.0160)	(0.0226)	(0.0226)
Constant	-6.154***	-5.621***	-5.942***	-6.429***	-6.930***	-7.336***
	(0.414)	(0.442)	(0.482)	(0.970)	(1.060)	(1.127)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5259	4414	3605	5259	4414	3605
Number of dyads	894	890	732	894	890	732
Log pseudolikelihood	-189.7	-158.9	-144.9	-167.4	-138.8	-132.7

Standard errors in parentheses

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

Table 3.10: Regression analysis excluding top 5 recipients

Method	PPML				Fractional logit			
Dependent variable	Total Number of projects		Total Env. ODA Amount		Share of env. ODA projects		Share of env. ODA amount	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DECM gap	-0.296***	-0.246**	-0.0743	0.0701	-0.291***	-0.356***	-0.257	-0.187
	(0.0947)	(0.103)	(0.191)	(0.215)	(0.0885)	(0.0973)	(0.218)	(0.234)
Natural disasters	-0.00466	-0.00564	-0.00720	-0.0185	-0.00230	-0.00587	0.00490	0.000339
	(0.00945)	(0.00859)	(0.0179)	(0.0192)	(0.00707)	(0.00723)	(0.0180)	(0.0166)
GDP per capita (1000 $)	-0.154***	-0.198***	0.0175	0.0757	-0.0924***	-0.103**	-0.196***	-0.149
	(0.0346)	(0.0471)	(0.0719)	(0.108)	(0.0262)	(0.0417)	(0.0679)	(0.0957)
Population (million)	-0.00914**	-0.00664	-0.00198	0.00220	-0.00351	-0.00345	-0.00651	0.00204
	(0.00401)	(0.00460)	(0.00853)	(0.0124)	(0.00428)	(0.00536)	(0.00763)	(0.00868)
UNGA	-0.0142***	-0.0137***	0.00484	0.00612	-0.00199	0.00128	-0.00411	0.00606
	(0.00358)	(0.00398)	(0.0103)	(0.0102)	(0.00345)	(0.00367)	(0.00768)	(0.00941)
Imports from donor(% recipient GDP)	-0.0113	0.000510	0.0922***	0.0966**	0.0196	0.0212	0.0619*	0.0967**
	(0.0185)	(0.0251)	(0.0337)	(0.0491)	(0.0172)	(0.0267)	(0.0327)	(0.0433)
Oil rents (% GDP)	0.0305**	0.0323**	0.0536	0.0696*	0.0120	0.0147	0.0346	0.0518
	(0.0119)	(0.0132)	(0.0350)	(0.0413)	(0.0136)	(0.0180)	(0.0297)	(0.0367)
Non-environmental ODA projects	0.00235***	0.00217***						
	(0.000265)	(0.000237)						
Non-environmental ODA amount (million $)			0.000425***	0.000300**				
			(0.000164)	(0.000152)				
Share of non-environmental ODA projects (%)					0.430***	0.450***		
					(0.0446)	(0.0444)		
Share of non-envionmental ODA amount (%)							0.118***	0.0427
							(0.0294)	(0.0339)
Control of Corruption		0.258**		0.271		0.127		0.283
		(0.131)		(0.266)		(0.124)		(0.263)
Debt (% GNI)		0.00241		-0.0117		0.0178*		0.00810
		(0.00812)		(0.0222)		(0.0101)		(0.0241)
Constant					-6.254***	-5.854***	-6.252***	-6.816***
					(0.429)	(0.500)	(1.132)	(1.243)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5001	3390	4989	3380	5001	3390	4989	3380
Number of dyads	851	689	849	687	851	689	849	687
Log pseudolikelihood	-10438.9	-7818.7	-35172.6	-24419.6	-159.9	-120.0	-130.2	-102.3

Standard errors in parentheses

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

Table 3.11: Regression analysis by donor (Numbers of projects)

Method	PPML								
Dependent variable	Number of projects								
Donor	Canada	France	Germany	Japan	Netherlands	Norway	Sweden	UK	USA
DECM gap	-0.362	-0.526**	-0.344*	-0.217	-0.260	-0.586***	-0.496	-0.185	-0.322*
	(0.223)	(0.256)	(0.179)	(0.151)	(0.237)	(0.205)	(0.369)	(0.398)	(0.192)
Natural disasters	-0.00119	0.00867	-0.000243	-0.0108	0.00278	0.00220	0.0216	0.0178	0.0181**
	(0.0212)	(0.0171)	(0.00682)	(0.0170)	(0.0169)	(0.0127)	(0.0222)	(0.0214)	(0.00854)
GDP per capita (1000 $)	-0.347***	-0.293	-0.108	-0.0369	-0.454***	-0.163	-0.0737	0.0780	-0.351**
	(0.129)	(0.180)	(0.0917)	(0.132)	(0.175)	(0.140)	(0.171)	(0.208)	(0.151)
Population (million)	-0.00616*	-0.00489	-0.00500*	-0.00172	-0.00479	-0.00520	0.000286	-0.00208	0.0000889
	(0.00329)	(0.00361)	(0.00259)	(0.00256)	(0.00335)	(0.00416)	(0.00281)	(0.00422)	(0.00618)
UNGA	0.00965	-0.0167	0.0122	-0.0153	0.00456	0.0229	-0.0136	-0.00580	0.0145
	(0.0133)	(0.0168)	(0.0101)	(0.0165)	(0.0258)	(0.0345)	(0.0289)	(0.0352)	(0.0226)
Imports from donor(% recipient GDP)	0.152	0.0814	0.117	0.0406	0.189	0.242	-0.374	0.116	-0.0137
	(0.381)	(0.0926)	(0.0791)	(0.0634)	(0.146)	(2.136)	(0.766)	(0.196)	(0.0412)
Oil rents (% GDP)	0.0314	-0.0348*	0.0102	0.0358	0.0150	0.108*	-0.0221	0.0273	0.0490*
	(0.0291)	(0.0203)	(0.0311)	(0.0319)	(0.0591)	(0.0589)	(0.110)	(0.0531)	(0.0274)
Non-environmental ODA projects	0.00436***	0.00257***	0.00160***	-0.0000507	0.00883***	0.00312**	0.00625	0.00327*	0.000524*
	(0.000887)	(0.000789)	(0.000429)	(0.000525)	(0.00321)	(0.00131)	(0.00419)	(0.00170)	(0.000278)
Control of Corruption	0.235	0.411	-0.0522	0.634**	0.188	0.305	1.502***	-0.349	0.320
	(0.381)	(0.312)	(0.232)	(0.255)	(0.445)	(0.557)	(0.427)	(0.488)	(0.279)
Debt (% GNI)	0.00802	-0.0453***	0.0363**	0.00643	0.0422	0.00974	0.0656**	-0.0245	-0.00959
	(0.0207)	(0.0105)	(0.0177)	(0.0181)	(0.0314)	(0.0166)	(0.0299)	(0.0219)	(0.0129)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	419	438	439	443	358	364	312	384	448
Number of dyads	85	89	89	90	73	74	63	78	91
Log pseudolikelihood	-658.0	-892.9	-902.3	-712.6	-683.8	-627.3	-425.1	-672.8	-1423.6

Standard errors in parentheses

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

Table 3.12: Regression analysis by donor (Amount)

Method	PPML								
Dependent variable	Amount								
Donor	Canada	France	Germany	Japan	Netherlands	Norway	Sweden	UK	USA
DECM gap	-0.553	0.0656	-0.236	-0.989	-0.0425	0.222	0.272	-1.334**	-0.0188
	(0.532)	(0.556)	(0.150)	(0.827)	(0.473)	(1.157)	(0.416)	(0.526)	(0.502)
Natural disasters	0.00524	0.0364	-0.0187	0.0237	-0.0176	0.0316	0.0568*	-0.00274	0.0190**
	(0.0212)	(0.0571)	(0.0187)	(0.0314)	(0.0398)	(0.0259)	(0.0323)	(0.0539)	(0.00935)
GDP per capita (1000 $)	-0.127	0.198	0.134	-0.230	-0.994***	0.158	-0.436*	-0.713***	-0.0630
	(0.219)	(0.169)	(0.105)	(0.307)	(0.222)	(0.367)	(0.242)	(0.268)	(0.129)
Population (million)	-0.00142	0.00171	0.000682	-0.00439	-0.00670	-0.00557	0.00165	-0.0108	0.000128
	(0.00782)	(0.0144)	(0.00621)	(0.00759)	(0.0117)	(0.00632)	(0.00787)	(0.00908)	(0.00348)
UNGA	-0.00635	0.0105	0.0313	0.0608	0.0858**	0.0169	-0.0990**	-0.0468	0.0405*
	(0.0446)	(0.0716)	(0.0254)	(0.0637)	(0.0417)	(0.0523)	(0.0441)	(0.0438)	(0.0220)
Imports from donor(% recipient GDP)	1.262*	0.113	0.274**	0.0179	0.129	-0.244	0.907	-0.0457	0.0885
	(0.705)	(0.139)	(0.110)	(0.166)	(0.177)	(3.145)	(1.687)	(0.249)	(0.0689)
Oil rents (% GDP)	0.0762	-0.0203	0.0105	0.137	0.175	0.312	0.0644	-0.0106	0.0966
	(0.0832)	(0.0834)	(0.0281)	(0.181)	(0.128)	(0.259)	(0.394)	(0.202)	(0.0606)
Non-environmental ODA amount (million $)	0.00539***	-0.000646	0.0000212	0.000217**	0.00143	-0.00142	-0.00154	0.000130	0.000503***
	(0.000858)	(0.000729)	(0.000336)	(0.0000880)	(0.00186)	(0.00329)	(0.00287)	(0.000525)	(0.000130)
Control of Corruption	0.0402	0.312	-0.343	1.208*	0.535	-0.229	2.239**	-1.568	0.448
	(0.913)	(0.830)	(0.339)	(0.687)	(0.401)	(0.689)	(0.871)	(1.333)	(0.279)
Debt (% GNI)	-0.0142	-0.0321	0.00466	-0.154**	-0.105	-0.122	0.190***	0.0202	0.0167
	(0.0415)	(0.0387)	(0.0349)	(0.0609)	(0.0788)	(0.110)	(0.0525)	(0.0511)	(0.0412)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	419	438	439	443	358	364	312	384	448
Number of dyads	85	89	89	90	73	74	63	78	91
Log pseudolikelihood	-679.2	-4728.5	-3406.1	-9775.6	-1540.6	-942.5	-774.5	-1330.0	-2011.7

Standard errors in parentheses

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

Table 3.13: Regression analysis by donor (Share of projects)

Method	Fractional logit								
Dependent variable	Share of projects								
Donor	Canada	France	Germany	Japan	Netherlands	Norway	Sweden	UK	USA
DECM gap	-0.380*	-0.693***	-0.516**	-0.219	-0.408	-0.528*	-0.578	-0.283	-0.275
	(0.227)	(0.220)	(0.202)	(0.207)	(0.314)	(0.279)	(0.369)	(0.274)	(0.182)
Natural disasters	0.00276	0.0181	0.0110*	-0.00103	-0.00998	-0.0109	0.0242	0.00810	0.0209***
	(0.00690)	(0.0155)	(0.00665)	(0.00735)	(0.0198)	(0.0148)	(0.0151)	(0.0139)	(0.00695)
GDP per capita (1000 $)	-0.305***	-0.173*	-0.120	-0.00651	-0.478***	-0.191**	-0.111	0.0614	-0.154*
	(0.0890)	(0.102)	(0.101)	(0.109)	(0.146)	(0.0909)	(0.143)	(0.0941)	(0.0855)
Population (million)	-0.00334***	-0.00869***	-0.00339***	-0.000508	-0.00284	-0.00369	0.000501	0.000567	0.000267
	(0.00121)	(0.00282)	(0.00121)	(0.00128)	(0.00309)	(0.00251)	(0.00184)	(0.00159)	(0.00134)
UNGA	-0.000611	0.00582	0.0122	0.0202	0.00461	0.00627	-0.00879	-0.0186	0.0132
	(0.0135)	(0.0157)	(0.0144)	(0.0147)	(0.0203)	(0.0225)	(0.0244)	(0.0268)	(0.0129)
Imports from donor(% recipient GDP)	0.0376	0.0144	0.166**	-0.0502	0.138	0.233	-0.422	0.0968	-0.0186
	(0.297)	(0.0537)	(0.0723)	(0.0489)	(0.0925)	(0.330)	(0.602)	(0.0941)	(0.0278)
Oil rents (% GDP)	0.0192	-0.0249	0.0229	0.0727**	0.0278	0.0798	-0.0216	0.0307	0.0373
	(0.0324)	(0.0224)	(0.0360)	(0.0285)	(0.0593)	(0.0505)	(0.0598)	(0.0539)	(0.0319)
Share of non-environmental ODA projects (%)	0.488***	0.685***	0.540***	0.435***	0.655***	0.466***	0.316***	0.287***	0.434***
	(0.0663)	(0.135)	(0.128)	(0.102)	(0.116)	(0.118)	(0.0962)	(0.0722)	(0.0853)
Control of Corruption	0.164	0.276	-0.234	0.404	0.0278	0.298	1.367**	-0.579	0.545**
	(0.236)	(0.270)	(0.219)	(0.254)	(0.387)	(0.355)	(0.546)	(0.405)	(0.225)
Debt (% GNI)	0.00808	-0.0391***	0.0288*	0.0187	0.0315	0.0260	0.0750**	-0.000694	0.00667
	(0.0185)	(0.0125)	(0.0158)	(0.0151)	(0.0307)	(0.0256)	(0.0327)	(0.0210)	(0.00975)
Constant	-4.971***	-1.972	-5.128***	-5.173***	-3.122	-2.173	-0.321	-2.985	-3.852***
	(1.255)	(1.667)	(1.325)	(1.478)	(1.948)	(2.039)	(2.190)	(2.211)	(0.942)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	419	438	439	443	358	364	312	384	448
Numberofdyads	85	89	89	90	73	74	63	78	91
Log pseudolikelihood	-16.54	-16.79	-17.25	-16.50	-15.76	-14.26	-14.11	-15.55	-17.47

Standard errors in parentheses

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

Table 3.14: Regression analysis by donor (Shares of amount)

Method	Fractional logit								
Dependent variable	Share of Amount								
Donor	Canada	France	Germany	Japan	Netherlands	Norway	Sweden	UK	USA
DECM gap	-0.575	-0.220	-0.341	-0.903	0.0457	-0.0523	0.267	-1.426***	0.110
	(0.430)	(0.461)	(0.347)	(0.616)	(0.463)	(1.106)	(0.491)	(0.492)	(0.249)
Natural disasters	0.00855	0.0481*	-0.0210*	0.0347	-0.0142	0.0376	0.0578*	0.00395	0.00955
	(0.0167)	(0.0254)	(0.0108)	(0.0229)	(0.0259)	(0.0342)	(0.0336)	(0.0277)	(0.00765)
GDP per capita (1000 $)	-0.125	0.165	0.122	-0.218	-1.009***	0.157	-0.420	-0.786***	-0.0844
	(0.166)	(0.139)	(0.136)	(0.294)	(0.232)	(0.274)	(0.284)	(0.235)	(0.118)
Population (million)	-0.00265	-0.00298	0.000194	-0.00361	-0.00638	-0.00835	0.00132	-0.0105***	-0.000100
	(0.00228)	(0.00359)	(0.00179)	(0.00304)	(0.00395)	(0.00691)	(0.00321)	(0.00307)	(0.00147)
UNGA	-0.00926	0.0475	0.0291	0.0519	0.0956***	0.00532	-0.103*	-0.0265	0.0432**
	(0.0284)	(0.0298)	(0.0290)	(0.0604)	(0.0262)	(0.0420)	(0.0593)	(0.0567)	(0.0188)
Imports from donor(% recipient GDP)	1.319*	0.0904	0.267***	0.0577	0.137	0.0822	0.753	-0.00597	0.0370
	(0.766)	(0.0931)	(0.0899)	(0.153)	(0.145)	(2.281)	(0.958)	(0.133)	(0.0365)
Oil rents (% GDP)	0.0646	-0.00442	0.0140	0.128	0.215	0.248**	0.0358	-0.0484	0.0772**
	(0.0620)	(0.0365)	(0.0485)	(0.102)	(0.154)	(0.123)	(0.0770)	(0.153)	(0.0356)
Share of non-envionmental ODA amount (%)	0.404***	-0.0931	0.0251	0.119***	0.138*	-0.0258	-0.0648	0.0244	0.151***
	(0.0670)	(0.0707)	(0.0574)	(0.0277)	(0.0713)	(0.0983)	(0.0927)	(0.0443)	(0.0160)
Control of Corruption	0.0561	1.141**	-0.442	1.222*	0.547	-0.314	2.164***	-1.354	0.706**
	(0.645)	(0.484)	(0.388)	(0.713)	(0.588)	(0.632)	(0.511)	(0.825)	(0.294)
Debt (% GNI)	-0.00258	-0.00650	0.00220	-0.167***	-0.123**	-0.109***	0.190***	0.0479	0.00989
	(0.0479)	(0.0266)	(0.0272)	(0.0582)	(0.0484)	(0.0396)	(0.0517)	(0.0711)	(0.0265)
Constant	-4.980*	-8.224***	-8.680***	-4.777	-9.841***	-4.364	3.507	4.467	-6.585***
	(2.986)	(3.169)	(2.563)	(4.714)	(2.672)	(7.659)	(4.781)	(4.765)	(1.219)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dyad FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	419	438	439	443	358	364	312	384	448
Number of dyads	85	89	89	90	73	74	63	78	91
Log pseudolikelihood	-15.18	-16.91	-15.92	-13.69	-14.51	-12.53	-14.27	-13.41	-14.08

Standard errors in parentheses

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

Table 3.15: Definition and description of variables

Variables	**Definition and description**	**Source**
Carbon dioxide emissions	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring	WDI(World Development Indicators)
GDP per capita	GDP per capita in thousand (2011 US)	WDI(World Development Indicators)
Debt to GNI ratio	Total debt service (sum of principal repayments and interest actually paid in currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments to the IMF) in % of GNI	WDI(World Development Indicators)
Control of corruption index	Index representing the control of corruption ranging from -2.5 to 2.5 with higher values corresponding to better governance	WGI (World Governance Indicators)
Imports from donor	Recipient's Total imports from donor	UN Comtrade Datbase
Natural resources rent	The total natural resources rent, is the sum of oil, natural gas, coal (hard and soft), mineral and forest rents, expressed in % of GDP	WDI(World Development Indicators)
UNGA voting alignment	Voting alignment in the United Nations General Assembly	Strezhnev and Voeten (2013).
Drought	Number of droughts	The International Disaster Database
Flood	Number of floods	The International Disaster Database
Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.	WDI(World Development Indicators)
Openness rate	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI(World Development Indicators)
Investment	Net investment in government nonfinancial assets includes fixed assets, inventories, valuables, and non-produced assets. Nonfinancial assets are stores of value and provide benefits either through their use in the production of goods and services or in the form of property income and holding gains. Net investment in nonfinancial assets also includes consumption of fixed capital	WDI(World Development Indicators)
Population growth	Annual population growth rate. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.	WDI(World Development Indicators)

Chapter 4

How much does environment pay for politicians?

This chapter is joint work with Jean-Louis COMBES (CERDI-UCA) and Pascale COMBES MOTEL (CERDI-UCA)

We empirically explore how elections impact climate change policy and environmental degradation, using a sample of 76 democratic countries over the period 1990-2014. Three key results emerge from our system-GMM estimations. First, election years are characterized by an increase in CO_2 emissions, even though the effect weakens over the recent years. Second, this effect is present only in established democracies, where incumbents engage in fiscal manipulation through the composition of public spending rather than its level. Third, higher freedom of the press and high environmental preferences from citizens reduce the size of this trade-off between pork-barrel spending and the public good, namely environment quality.

Keywords : CO_2 emissions · Electoral cycles · Environmental policy · Panel data

4.1 Introduction

«Nobody can beat me on economy (and jobs).»

— Donald J. Trump (30 April 2016)

Voters generally value better economic performance and material wellbeing (Franzese, 2002). Incumbents have, therefore, a vested interest in fostering expectations on economic performance when they run for election or re-election. This can be achieved by manipulating fiscal policy before elections, which is the motivation of the Political budget cycles (PBC) literature (Nordhaus, 1975; Rogoff, 1990).

There is a bulk of econometric studies that have predicted opportunistic behavior from politicians in election years. Over time, results have covered a broader set of countries and evidenced that the magnitude of the cycles is greater in developing countries (Shi and Svensson, 2006). Several studies have focused on the heterogeneity of PBCs and provided support for conditional PBCs (De Haan and Klomp, 2013). Other studies have shown that incumbents can either play on the level of fiscal outcomes, or their composition (Brender and Drazen, 2013). The literature on compositional budget cycles also attracted attention on how fiscal manipulation is operated. For instance, a trade-off may appear between election-motivated expenditure or the provision of public goods (Lizzeri and Persico, 2001) or between the social and military expenditures (Bove et al., 2017).

Another and more recent strand of the literature underlines that policy-makers increasingly target subjective well-being indicators as a major policy goal (Ward, 2019). Besides, some scholars suggest that subjective well-being indicators such as happiness data may contribute to the evaluation of environmental policies (Welsch, 2009). Public opinions seem to support stronger environmental policies while politicians have exhibited an interest in alternative metrics of economic performance incorporating the quality of the environment (Durand, 2018). Building on the idea that voter's subjective well-being strongly correlates to environmental performance, this paper intends to explore environmental political cycles.

There is much literature on the relationship between the characteristics of democracies and environmental performance (see e.g. the recent survey of Escher and Walter-Rogg (2020)). Several authors wonder whether elections affect environmental policies and outcomes. In the USA, List and Sturm (2006) theoretically and econometrically found evidence that environmental policy choices differ between governors' election and non-election years. However, while elections seem to have a visible influence on the public positions taken by politicians, they eventually have little influence on environmental outcomes (Bergquist and Warshaw, 2020). Few other studies investigate deforestation or land use political cycles. Rodrigues-Filho et al. (2015) and Pailler (2018) found evidence of deforestation political cycles in Brazil. Election years are characterized by high deforestation rates, owing mainly to the weakening of institutional constraints.[1] Another example is Cisneros Tersitsch et al. (2020) who econometrically evidence mutually reinforcing economic and political drivers of forest loss and land conversion for oil palm cultivation in Indonesia. D'Amato et al. (2019) also enlighten land use political cycles in Italy taking the issuance of building permits as the environmental indicator.

In this paper, we explore how governments may use the trade-off between pork-barrel projects and the provision of public goods such as environmental protection, or become lax in terms of environmental policy for re-election purposes. Instead of focusing on one country, we rather rely on a cross-country econometric study. To estimate the impact elections have on environmental degradation measured with CO_2 emissions, we rely on a dataset made of 76 democracies over the period 1990-2014. We find evidence of a pollution-increasing effect in elections years, which

[1] Several unpublished papers also address deforestation political cycles. Ruggiero (2018) Chapter 3 is dedicated to the Brazilian Atlantic forest while Sanford (2018) studies deforestation cycles using satellite data.

tends to be weaker over the recent years. We highlight some factors that shape this relationship. Some of them are conditioning factors of PBCs (Brender and Drazen, 2005; Shi and Svensson, 2006) while other factors are linked to environmental preferences in countries under consideration.

The remainder of the paper is structured as follows. Section 2 reviews previous research and discusses how our paper contributes to the literature on PBCs and research on environmental degradation. Section 3 describes the data and methodology used, section 4 presents our main results and some robustness checks. The final section offers the conclusions.

4.2 Background

4.2.1 About political budget cycles

A growing literature suggests that elections have distortionary effects on economic policy. A small body of it consists of 'partisan' models, which focus on the behavior of ideologically motivated politicians. Another more substantive part of this literature focuses on the incentives of office-motivated politicians to manipulate economic variables for re-election purposes. This latter theoretical argument has firstly been formulated by Nordhaus (1975). Assuming that voters are backward looking, governments have incentives to use expansionary fiscal policies to stimulate the economy in the late years of their term in office. Other studies have addressed this argument both in adverse selection models (Rogoff, 1990) as well as in moral hazard models (Shi and Svensson, 2006; Persson and Tabellini, 2012).

Despite clear-cut theoretical insights, empirical studies on political budget cycles deliver contrasted results. It appears that the magnitude or even the existence of such cycles depends on different factors. De Haan and Klomp (2013) provide an in-depth review of these potential conditioning variables. Some of them include variables such as democracy characteristics, quality of institutions or the level of development.

Regarding democracy characteristics, Brender and Drazen (2005) for instance show that such cycles are more a phenomenon of new democracies, in which voters lack experience with an electoral system. They further argue that over time, as countries gain experience in competitive electoral processes, PBCs are less likely. Such conclusions do not, however, imply that there is no fiscal manipulation in established democracies since they solely focus on the dynamics of the overall budget. In established democracies, voters are better informed and, therefore, aware of fiscal policy manipulation for re-election purposes. Voters also tend to punish governments running public deficits (Brender and Drazen, 2008); thus, opportunistic politicians can change the composition of public spending while avoiding an increase in the overall budget deficit (Brender and Drazen, 2005; Vergne, 2009). To this end, they can shift away from capital expenditures towards current ones that are more visible (Rogoff, 1990; Katsimi and Sarantides, 2012), or even target particular groups of voters. Recent studies lend support to this prediction; Bove et al. (2017) show for instance that governments bias outlays towards social expenditure and away from military expenditure at election times. They can also reduce taxes or increase subsidies for particulars goods such as fossil fuels.

In a similar vein, it appears that media access also affects the magnitude of PBCs. Indeed, politicians behave opportunistically when information is scant. Studies find empirical evidence that electoral fiscal manipulation is more prevalent in countries where voters have limited access to free media (Shi and Svensson, 2006; Boix et al., 2009; Vergne, 2009; De Haan and Klomp, 2013). Therefore, good access to free media dampens the cycle, as external flows like remittances do for developing countries (Combes et al., 2015). Another factor that deserves to be mentioned is the level of non-economic voting: the magnitude of electoral fiscal cycles is negatively correlated with it, as shown by Efthyvoulou (2012). The higher the level of non-economic voting, the weaker the incentives for fiscal manipulation; then, politicians rather choose policies to signal they have the same concerns[2] as voters.

However, one should be careful with the magnitude of these cycles, since recent research points out a research bias regarding them. Indeed, a meta-analysis led by Mandon and Cazals (2018) suggests that leaders manipulate fiscal tools for re-election, but to an extent that is exaggerated by researchers.

4.2.2 Implications for environment

As explained in the previous section, during election periods, politicians manipulate public spending in order to boost their popularity and secure votes. They do this by either increasing overall expenditure or changing their composition (Brender and Drazen, 2013). They can shift expenses from one category to another, or even among sectors by shifting outlays from sectors in which benefits are not immediately visible to other sectors where it is the case. It is therefore likely that environment could be affected; environmental protection is a public good, for which benefits are not readily visible. Moreover, environmental benefits cannot be targeted to voters as easily as pork-barrel spending (Lizzeri and Persico, 2001), leading to a trade-off: the higher the spending for pork-barrel projects, the lower the available funding for the provision of public goods such as the environment, resulting in an under-provision. Apart from a modification in the structure of public spending, manipulating the tax structure can also foster re-election chances and lead to a higher environmental degradation. A tax cut or an increase of subsidies on fossil fuels can lead to higher consumption of these and thus result in

[2] One example is the case of environmental policies. In countries with strict environmental policies, where voters more value environmental protection, the incumbent has no incentive to reduce the budget share devoted to environment, in order to re-allocate it to other sectors.

higher CO_2 emissions.

Most of the studies that have predicted opportunistic behavior from politicians in election years only focused on fiscal outcomes, probably because of lack of data on expenses for environmental protection or environmental taxes. Then, one way to test the effect elections have on the environment is to analyze the impact on environmental degradation, rather than looking at either the composition of public expenditure or the tax structure. The idea behind this approach is that environmental outcomes could reflect more or less the stringency of environmental policies. Empirical studies are however scarce and the few ones have been led on deforestation in Brazil (Rodrigues-Filho et al., 2015; Pailler, 2018). They find high that deforestation rates observed in the Brazilian amazon during elections are correlated with administrative shifts that lead to weak institutional constraints; the result is either a manipulation of forest resources or an inability to fight illegal deforestation.

Election years are also characterized by intensive pressure on the environment through resource plundering. Klomp and de Haan (2016) find that natural resources rents (including forest rents) are higher during election years because incumbents use them to expand public spending and reduce taxes. Relatedly, Laing (2015) finds that the government of Guyana issues less mining rights after election years, while the number of canceled rights rises.

Faced also with the lack of data on environmental expenditure, we assess the impact of elections on environment, using CO_2 emissions. To some extend, CO_2 can be interpreted as a proxy of environmental policy, particularly climate change policy, if its structural determinants are controlled for. Moreover, since CO_2 emissions mainly result from the use of fossil fuels, changes in CO_2 emissions therefore reflect changes in fossil fuels consumption, which is known to be affected by energy taxes and subsidies. For instance, an increase in subsidies to fossil fuels during election years will result in lower prices and higher consumption of these products, leading to higher CO_2 emissions in these years.

The innovation of our work lies in the fact that it performs a retrospective empirical analysis, based on a set of countries and not on a single country as previous works (Rodrigues-Filho et al., 2015; Pailler, 2018). In addition, since the magnitude of PBCs may differ depending on the age of democracy (Brender and Drazen, 2005) and thus on the level of democratic capital (Fredriksson and Neumayer, 2013), access to information (Shi and Svensson, 2006), and the level of non-economic voting (Efthyvoulou, 2012), we also test whether such factors condition the environmental impact of elections.

4.3 Econometric setup

Elections could affect environmental quality in different ways. For instance, electoral discipline might be higher in such periods, particularly if voters are sensitive to environmental issues; this resulting in a more stringent behavior in the management of each sector, including the environment. Alternatively, short-time horizons or election campaigns financing needs could also incentivize a reallocation of funds and efforts away from environmental purposes to the benefit of other expenditure items that secure rapid and visible outcomes. To evaluate our theoretical intuitions, we formulate and test the following hypotheses:

H1: Considering that benefits generated by environmental-friendly decisions cannot accrue to incumbents before the end of their office, politicians fall prey to the temptation of completely ignoring environmental issues. They instead prioritize boosting the economy by any means, thus enhancing environmental degradation in electoral years. However, due to growing awareness of climate change issues over the recent years, this phenomenon could be more present in the past compared to recent periods.

H2: The previous effect can vary in magnitude or even in sign. It depends on factors, such as democracy age, citizens' access to free media or strong environmental preferences, which limit the incumbent's leeway or oblige him to align with voters' preferences.

This section explores these two hypotheses while relying on a dynamic panel estimator on a sample of 76 democratic countries over the period 1990-2014. We depart from the Green Solow model (Brock and Taylor, 2010) and take the emissions of CO_2 per capita as our dependent variable. We enrich the model while including elections variables. In the following, we provide stylized facts on how countries support carbon-intensive activities.

4.3.1 Data and stylized facts

Pass-through elasticities of fossil fuels and CO_2 emissions

Energy is a critical productive input whose contribution to economic growth has been underestimated (Kümmel et al., 2010). Politicians often give to energy issues a prominent place in their statements (see e.g. Littlefield (2013)). We argue that the support for fossil fuels is a key factor in environmental outcomes such as CO_2 emissions. To measure countries' support for fossil fuels, we consider the pass-through of crude oil price shocks to retail fuel prices in each country. We compute the pass-through elasticity as the percentage retail price change relative to the percentage change in crude oil price. For country i and year t this proxy is defined as:

$$PT_{i,t}^{f} = 100 * \frac{\Delta P_{i,t}^{f}}{\Delta P_{t}^{*}} * \frac{P_{t-1}^{*}}{P_{i,t-1}^{f}} \tag{4.1}$$

Where PT is the pass-through elasticity in percentages

f is an index for the fuel product considered

$\Delta P^{f}_{i,t}$ is the absolute change in retail fuel prices, between years $t-1$ and t.

ΔP^{*}_{t} is the absolute change in crude oil price, between years $t-1$ and t.

Prices are expressed in US dollars.

We use a new dataset on retail fuel prices introduced and discussed in **?** which provides monthly data on retail fuel prices for a large set of countries and covers four different fuel products: gasoline, diesel, kerosene and LPG. Data is available for most countries starting from the early 2000s and the majority of observations are constituted by diesel and gasoline prices. We use this dataset to calculate annual pass-through elasticities of diesel and gasoline, for the countries in our sample.

The intuition behind interpreting pass-through elasticities as proxies of support for fossil fuels, and thus of climate change policy, is the following: if we assume that other elements of the price structure (i.e transportation costs and margins) are fairly stable, any change in crude oil prices that is not reflected in retail fuel prices is likely to be driven by changes in fuel taxes and subsidies.[3] Therefore, for a positive change in international oil prices, a pass-through elasticity lower than 100 percent suggests that the net fuel tax has been reduced or a subsidy has increased. Inversely, a pass-through elasticity higher than 100 percent implies a constant or higher net fuel tax. In the event of a drop in international prices, the interpretation of the pass-through elasticity differs: an elasticity higher than 100 is interpreted as a stronger support for fossil fuels (i.e lower fuel taxes) while a coefficient lower than 100 indicates higher taxes. Care should therefore be taken to distinguish

[3] In the absence of an automatic pricing mechanism, or when prices are not liberalized, fuel taxes and subsidies are the main tools allowing governments to keep control on retail prices.

positive and negative shocks in international prices while analyzing pass-through elasticities. We decide to compare pass-through elasticities in election years to those in non-election years, to get an intuition on how support to oil products, and so climate policy, changes according to the electoral cycle. When the price shock is negative, pass-through elasticities should be similar[4] or stronger in election years to confirm the presence of lax environmental policies during such periods. For positive shocks in international prices, the elasticities should be smaller in elections years to confirm support for fossil fuels in such periods.

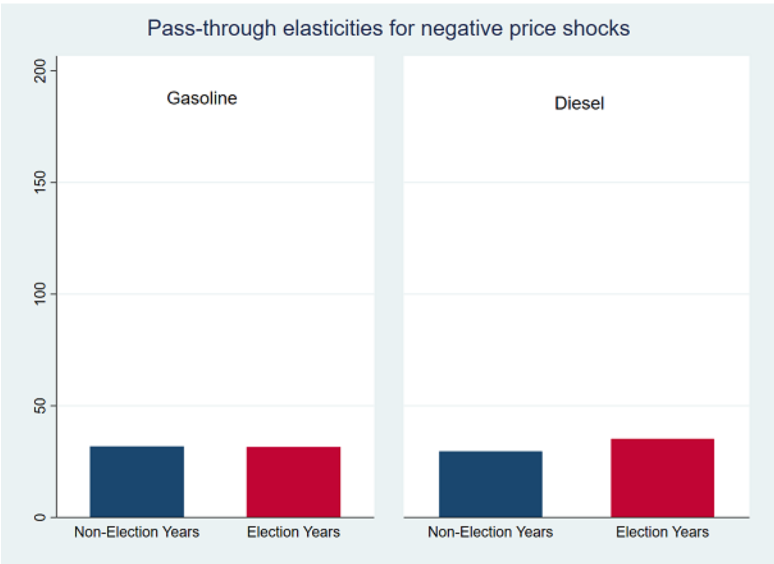


Figure 4.1: Pass-through elasticities for negative price shocks of crude oil

Figures 4.1 and 4.2 respectively show pass-through elasticities for negative and positive price shocks of crude oil. Figure 4.1 suggests that negative shocks in international prices are always partially passed-through to domestic consumers, independently from whether we are in elections periods or not, given that they always remain below 100.

[4]It is possible for pass-through elasticities to be similar or just slightly different for both elections years and non-election years, especially in the case of negative oil price shocks, given that negative shocks in international prices are always partially passed-through to domestic consumers by governments. Indeed, retailers are reluctant to immediately decrease retail prices after a decrease in their input costs, in pursuit of more benefits (Sun et al., 2019).

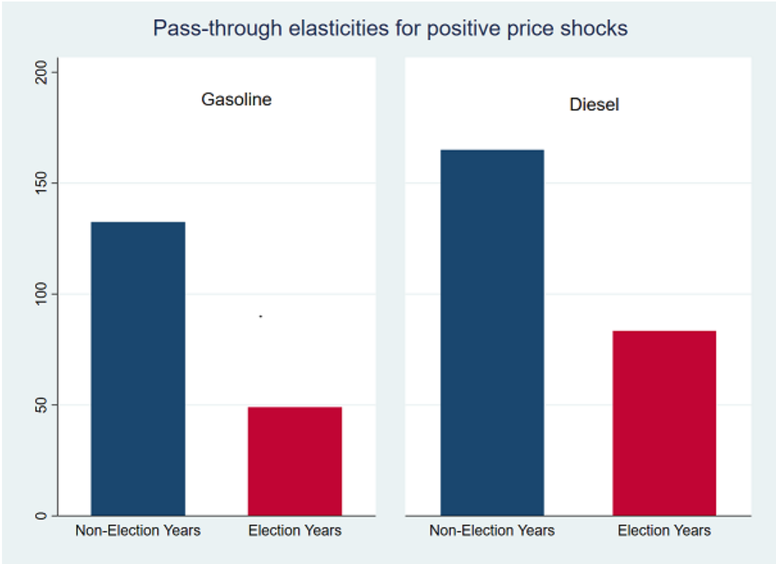


Figure 4.2: Pass-through elasticities for positive price shocks of crude oil

Regarding support for fossil fuels, we observe a very small increase in the pass-through for diesel in election years but not for gasoline. Regarding positive shocks, we see in figure 4.2 that the elasticities are indeed smaller for both products during election years, suggesting a lax climate change policy. This difference is noteworthy because the elasticities are not just smaller in election times: in average, they drop below 100 in election years, while they are above 100 during other years. This means there are significant changes in fuel taxation in election times: positive shocks in international prices are partially passed-through to domestic consumers in election years, while they are fully or more than proportionally passed-through during non-election years. It is important again to highlight that the data points used to compute the pass-through elasticities are available from the 2000s, thus making it difficult to use the elasticities in a regression framework[5] as this would result in losing approximately more than half of our sample, especially since one has to consider positive and negative shocks separately. Given that CO_2 emissions

[5]Even if they are not included in a regression, using them for descriptive purposes is not completely useless to the extend that this justifies the choice of CO_2 as dependent variable in what follows.

are mostly stemming from the burning of fossil fuels and that CO_2 data are much more available, we therefore decide to use them as dependent variable instead of the pass-through elasticities.

Elections

Figure 4.3 presents average CO_2 emissions in election years versus non-election years; as expected, it shows that in election years where there is higher support to fossil fuels consumption, CO_2 emissions are in average higher.

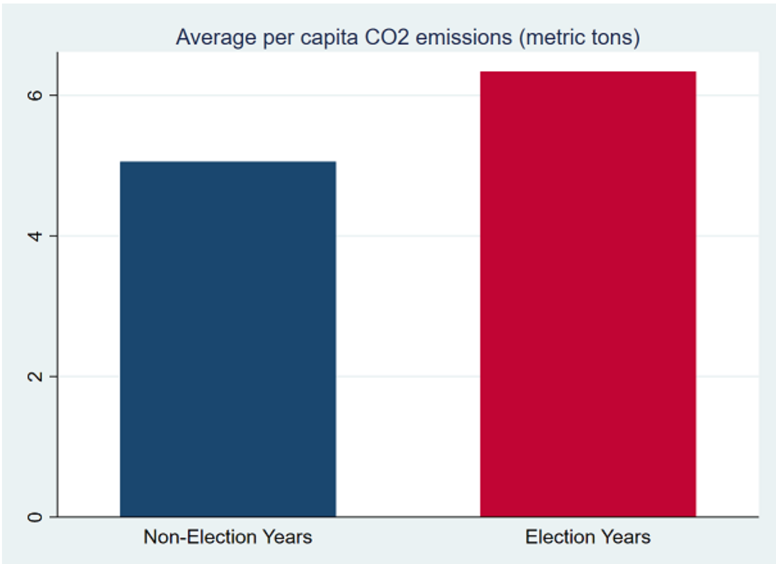


Figure 4.3: Average CO_2 emissions and intensities in election versus non-election years

We use data on emissions per capita from the World Bank Development Indicators (WBDI). CO_2 is measured in terms of metric tons per capita. We take it in our regressions in terms of logged grams per capita, since this measure exhibits close to a gaussian distribution.

Data on elections come from the National Elections across Democracy and Autocracy (NELDA) dataset compiled and discussed in Hyde and Marinov (2015). The database includes detailed information on all election events from 1960 to 2010, both for democracies and non-democracies. According to Brender and Drazen (2005), fiscal manipulation is used to improve an incumbent's re-election chances and thus makes sense in countries in which elections are competitive. We therefore decide to consider countries and elections for which there are incentives for fiscal manipulation. We first apply a filter for the level of democracy, the polity2 filter[6], leading us to restrict our sample to 76 democratic countries. Second, we only keep elections for which the incumbent or ruling party declared their intention to run for re-election. Following Shi and Svensson (2006), we take executive elections for countries with presidential systems and legislative elections for countries with parliamentary systems. Also, to mitigate the endogeneity bias from reverse causation[7] or from omitted variables[8], we only consider elections whose timing is pre-determined as discussed in Brender and Drazen (2005) and Shi and Svensson (2006). For this, we look at the constitutionally scheduled election interval; the elections we considered as pre-determined were those which were held at this fixed interval or within the expected year of the constitutionally fixed term. Following the definition used in the database, we check whether elections were held early or late relative to the date they were supposed to be held according to the scheduled interval. We then keep "exogenous" elections, which are those that occur at the constitutionally set date.

It is common in this type of research to use a dummy that takes the value of one in election years and zero otherwise, which could be subject to measurement error. We rather use an election variable suggested by Franzese (2000) that takes the timing of an election into account. It is calculated as $\frac{M}{12}$ in an election year and $\frac{12-M}{12}$ in a pre-election year, where M is the month of the election. In all other

[6]This filter is taken from the POLITY IV project, conducted at the University of Maryland. Each country is assigned a value that ranges from -10 (autocracy) to 10 (the highest level of democracy). We keep countries for which the average polity2 score remains strictly positive over the period.

[7]Some incumbent politicians might strategically choose the timing of elections conditional to economic (and thus environmental) outcomes.

[8]Such as shocks affecting both the election date and environmental degradation.

years its value is set to zero.

Control Variables

We control for the structural determinants of CO_2 emissions, used by Brock and Taylor (2010). These include domestic investment, as a share of GDP, and the population growth rate. Also, to make sure that changes in emissions during election years are not a by-product of increased economic activity in such periods rather than a change in environmental policies, we control for GDP per capita. Data on GDP per capita, and population growth come from the WBDI and data on domestic investment come from the IMF World Economic Outlook database. We consider that once the main structural determinants of CO_2 are controlled for, the remaining variation in emissions can be considered as changes in environmental policies[9]. For regressions based on the whole sample, we expect a positive effect on per capita CO_2 emissions for investment as well as for GDP per capita, and a negative effect for population growth.

4.3.2 Dynamic panel specification

The data generating process is borrowed from the green Solow model (Brock and Taylor, 2010), which we augment to take elections into account.

CO_2 emissions are modeled as:

$$Log(CO_2)_{it} = \phi Log(CO_2)_{it-1} + \beta_1 Elections_{it} + X_{it}\beta_2 + \mu_i + \tau_t + \epsilon_{it} \tag{4.2}$$

Where $Log(CO_2)_{it}$ represents the logarithm of per capita CO_2 emissions for country i during year t. ϕ is the coefficient of lagged per capita carbon dioxide. CO_2 emissions are attributed to fossil fuel combustion that is critical to a wide array

[9] See Combes et al. (2016) on the measurement of performances.

of economic activities. The CO_2 emissions variable is, therefore, the proxy of environmental degradation that is widely employed in the literature (Arvin and Lew, 2009). It is worth to notice that, compared to other pollution measures, data on CO_2 emissions are widely available for many countries and over relatively long periods. $Elections_{it}$ is the election variable; X_{it} represents the vector of control variables. These include the logarithm of domestic investment, as well as the logarithm of population growth and the logarithm of GDP per capita. As in a Solow growth model, investment drive capital accumulation and is expected to have a positive effect on CO_2 emissions. In the Green Solow model framework, population growth is expected to have a negative impact on CO_2; μ_i and τ_t are the country and time fixed effects. ϵ_{it} is the error term.

To test our hypothesis, we focus on the coefficient associated to $Elections_{it}$. A positive coefficient on $Elections_{it}$ would provide support for our assumption, meaning that electoral periods are associated with a lower stringency in climate change policy and a higher environmental degradation (measured by CO_2 emissions).

Because of lagged CO_2 among the regressors, to avoid our results suffering from the Nickell bias (Nickell, 1981) in fixed effects regressions, we rely on the GMM-system estimator (Blundell and Bond, 1998) to estimate Equation 4.2. We use it in its two-step version, which is more efficient. We also limit the lags length, to avoid instruments proliferation (Roodman, 2009b) given our relatively large time period [10].

[10] Given this relatively long period, unit-root tests were performed on CO_2 emissions and reject the presence of a unit-root. Results available upon request.

4.4 Findings

4.4.1 Baseline

Table 4.1 provides the baseline results. The use of the system-GMM estimator is comforted by the Hansen test and the presence (absence) of first-order (second-order) autocorrelation in the residuals. Column 1 presents results obtained on the whole period for CO_2 per capita. The control variables exhibit the expected signs, even though the effects for some of them are non-significant. The results show that election years are characterized by higher environmental degradation compared to non-election years. Regressions on the whole sample suggests that per capita emissions increase by 8.6% over the 12 months preceding an election.

However, we think this pollution-increasing effect of electoral cycles should be less important over recent periods. This could be explained in two ways: first, as voters gain experience in competitive electoral processes, fiscal manipulation tends to diminish as mentioned by Brender and Drazen (2005); second, there is an awake of consciousness regarding environmental issues, which increasingly attracted attention over the recent years. Thus, the pollution-increasing effect should be weaker in recent periods. To test this latter intuition, we split our sample into two sub-periods: we use the year 1998 as cutoff period, as it is the year just after the Kyoto agreement [11]. Column 2 shows the results over the pre-Kyoto period. As expected, we find a positive and statistically significant effect of elections for pre-Kyoto years, with emissions increasing by about 14.6% in election years. We find no significant effect in column 3, which corresponds to the post-Kyoto period. These findings confirm our first hypothesis: politicians ignore environmental issues and focus on economic growth, resulting in higher

[11] The agreement was in December 1997, so we consider the year 1997 as part of the Pre-Kyoto period.

Table 4.1: Determinants of CO_2 emissions

Dependent Variable	Log of CO_2 (per capita)		
	Whole Period	Pre-Kyoto	Post-Kyoto
Lagged D.V	0.789***	0.829***	0.961***
	(0.123)	(0.154)	(0.0432)
Elections	0.0858***	0.146**	0.0396
	(0.0256)	(0.0675)	(0.0478)
Investment (Log)	0.123**	0.0430	0.0908**
	(0.0560)	(0.0716)	(0.0401)
Population growth (Log)	-0.0741	-0.100	-0.0775
	(0.132)	(0.289)	(0.0590)
GDP per capita (Log)	0.224	0.251	0.0247
	(0.143)	(0.177)	(0.0413)
Constant	-2.196*	-2.076*	-0.361
	(1.228)	(1.177)	(0.369)
Time dummies	Yes	Yes	Yes
Observations	1724	509	1215
Countries	76	76	76
Instruments	48	33	33
AR1 pvalue	0.000	0.004	0.000
AR2 pvalue	0.344	0.739	0.532
Hansen pvalue	0.107	0.754	0.223

Standard errors in parentheses

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

environmental degradation in such periods. But it seems that this effect, which was more important in the past, tends to vanish over the recent years. This is why we find a higher pollution-increasing effect of elections over the pre-Kyoto period, compared to the one we obtain on the whole period.

4.4.2 Conditioning factors

Experience in democracy

The effect we found in Table 4.1 might depend on some factors; one of them is the age of democracy. According to Brender and Drazen (2013), new democracies increase their overall level of expenditure in elections years; this, in opposition with established democracies in which voters have greater experience in electoral processes. For the latter, they find important changes in expenditure composition. Therefore, as the overall level of spending increases in such periods for new democracies, we expect environmental spending like abatement expenditure will increase as well as other kind of expenditure (such as subsidies for oil products). The effect of elections on CO_2 should then be weaker or even absent in new democracies, while we should observe a pollution increasing effect for established democracies.

We test this issue in Table 4.2, by estimating the equation on sub-samples of established and new democracies[12]. Column 1 corresponds to established democracies and suggest that emissions per capita are 8.1% higher in elections years. We find no statistically significant effect for the sub-sample of new democracies, confirming our previous intuitions which are in line with the work of Brender and Drazen (2005) and Brender and Drazen (2013).

In established democracies, since incumbents avoid increasing public deficits, the trade-off between pork-barrel spending and environmental protection is higher. In an electoral period, politicians' spending are targeted. They precisely rise the budget share of sectors where economic benefits are visible in the short-term, to the detriment of sectors such as the environment, for which benefits are observed

[12] We follow Brender and Drazen (2005), using the POLITY filter to separate established and new democracies. In our approach, we consider the polity2 score since the 1960s and count the number of years for which each country received a positive score for this indicator. We then compared this number of democratic years to the sample average (around 41 years) and countries with a number of years lower than the average are considered as "young" (or instable) democraties.

in the long-term.

In new democracies, we obtain no effect because politicians increase the overall spending, for all sectors, including environmental protection. As a result, pollution induced by the increase of some expenses is offset by the increase in the budget allocated to environment.

Access to information

Information is essential to political, social and democratic issues. Previous research find that fiscal manipulation is more prevalent when information is scant, and that a better access to good information for voters allows to dampen PBCs (Shi and Svensson, 2006; De Haan and Klomp, 2013; Klomp and de Haan, 2016). Moreover, information plays an important role in democratization processes; and democracy has a good effect on environmental quality according to recent studies (Policardo, 2016). We therefore assess the pollution-increasing effect of elections, conditional on access to free media, using sub-samples.

We use the Freedom House's annual press freedom index[13]. It lies between 61 and 100 for countries where the press is considered as "not free", and between 31 and 60 when this freedom is partial. Countries where the press is totally free get a score that ranges between 0 and 30.

The results are displayed in Table 4.3 and are in line with previous findings: in election years, CO_2 emissions are 21.5% higher for country-years where the press is considered as "partially free" or "not free". We get a weaker effect of about 5.8% for country-years that have a high freedom of the press. Thus, a better access to free-media allows to dampen fiscal manipulation and, at the same time, its resulting environmental damages.

[13]We also run estimates on sub-samples, using the percentage of population having access to internet, from the WBDI. The results are similar and available upon request.

The role of environmental preferences

As previously mentionned by Efthyvoulou (2012), the size of electoral fiscal cycles is negatively correlated with the level of non-economic voting. So the higher the level of non-economic voting, the weaker the incentives for fiscal manipulation. When the voters are less sensitive to electoral booms in welfare expenditures, there are greater incentives for the politicians to adopt non-economic policies which are close to voters' concerns. For instance, the spending bias away from military expenditure and toward social expenditure, as predicted by Bove et al. (2017), is dampened in countries involved in a conflict. This, because voters value more security than material well-being in such periods.

Similarly, it is likely than in countries with stricter environmental policies, the pollution-increasing effect of elections tends to be weaker, since citizens give greater importance[14] to environmental quality. In order to assess these issues, we use the GDP per capita as a proxy of the environmental preferences; we use this measure in line with Grossman and Krueger (1995) : as countries experience greater prosperity there is a higher demand from citizens for attention to be paid to non-economic aspects of their lives such as the environment.

We therefore rely on the average income per capita to split our sample in two sub-groups. The first sub-sample is constituted by countries for which the average income [15] is below the median income. Such countries are thus considered as having lower environmental preferences compared to those above the cutoff point.

The results presented in Table 4.4 confirm our intuition[16]. For countries below the

[14]The adoption of such strict policies at home most often reflects citizens' preferences.

[15]The average better captures income dynamics and allows our classification to rely on income trends over the whole period rather than transitory income shocks

[16]We also consider inequalities, measured through the gini index from the SWIID dataset, as proxy of environmental preferences since it has been shown that high inequalities are associated with lower environmental preferences (Magnani, 2000). The results are presented in [tab:elec$_{e}nv_{p}ref_{i}neq]appendix$

median GDP in column 1 (i.e lax environmental policy), emissions per capita rise by up to 21%, during election periods. We find no significant effect for countries with high environmental preferences. This latter result suggests that stringent environmental policies (higher demand for environmental goods) allow to dampen the cycle, as they limit the incumbents' leeway and oblige them to align with citizens' preferences.

4.4.3 Robustness Checks

Excluding high emitters

To assess whether the previous results are not influenced by the major polluters, we alter our sample by removing the top emitters. As for GDP per capita, we consider the average per capita emissions over the period and we remove successively the top 5%, 10% and 25% emitters, using the 95th, 90th, and 75th percentiles respectively as cutoff values. The results, similar to those obtained previously, are presented in table 4.6, table 4.7 and table 4.8 respectively.

Additional Controls

We include additional controls in table 4.9. Since aid is not environmentally neutral (Lim et al., 2015) and is also affected by electoral cycles (Faye and Niehaus, 2012), we include environmental aid per capita[17] in column 1 and as a share of GDP in column 2; it is computed thanks to data from the AidData web portal on which we applied a coding methodology based on the Creditor Reporting System (CRS) purpose codes (Hicks et al., 2008; Boly, 2018). We still find a pollution-increasing effect of elections. We also control for government expense, as a share of GDP, in columns 3 and 4. The data are from the WBDI. In column 3, we omit GDP per capita since the effect of elections that is working through fiscal policy might be

[17]These regressions concern developing countries.

already captured by it. We however include both GDP per capita and government expense in column 4; the result remains the same, regarding the impact of elections.

4.5 Conclusion and discussion

The manipulation of fiscal and monetary policy instruments often results in political cycles. In this paper, we argue that that politicians might also reap benefits from the manipulation of environmental policies. Using electoral data for 76 democratic countries (34 established and 42 new democracies), we find evidence that CO_2 emissions are higher over the year preceding an election. This effect is becoming weaker over the recent years, as voters gain experience with competitive electoral processes and as awareness about climate change issues is increasing.

Further, we test whether the size of our effect is conditioned by traditional conditioning factors of PBCs (such as democracy age and access to free media), as well as environmental preferences of citizens. We find that this effect is present in established democracies, where incumbents are punished by voters in case of deficit-spending. In such countries, leaders change the expenditure composition rather than its level: they increase the budget share of pork-barrel spending and under-provide public goods in election periods, which results in higher environmental degradation.

We finally find evidence that better access to free media, and stringent environmental policies are associated with a lower size of the pollution-cycle, as they reduce the level of economic voting from citizens. As a consequence, incumbents will then have weak incentives to manipulate fiscal policy and will choose the appropriate set of policies that match voters' concerns.

The findings still hold when we sequentially remove the 5%, 10%, 25% top CO_2 emitters, as well as when we control for government spending and environmental aid.

Further research could investigate in more details how incumbents incentives are shaped by external actors, through external financial flows like foreign aid.

Since previous research show that bilateral donors use aid volume to influence elections outcomes in recipient countries (Faye and Niehaus, 2012), it would also be interesting to look at how aid composition (e.g. environmental aid vs others types) changes in election times.

Appendices of Chapter 4

Table 4.2: The role of democracy age

Dependent variable	Log of CO_2 (per capita)	
	Established	Young
Lagged D.V	0.837***	0.864***
	(0.137)	(0.129)
Elections	0.0805**	-0.0008
	(0.0314)	(0.115)
Investment (Log)	0.172**	0.144*
	(0.0731)	(0.0773)
Population growth (Log)	-0.199	-0.110
	(0.151)	(0.174)
GDP per capita (Log)	0.198	0.109
	(0.153)	(0.169)
Constant	-1.985*	-1.202
	(1.104)	(1.625)
Time dummies	Yes	Yes
Observations	781	943
Countries	34	42
Instruments	32	34
AR1 pvalue	0.000	0.000
AR2 pvalue	0.828	0.674
Hansen pvalue	0.343	0.253

Standard errors in parentheses

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

Table 4.3: Freedom of the press

Dependent Variable	Log of CO_2 (per capita)	
	Partially or Not Free	Totally Free
Lagged D.V	0.662***	0.968***
	(0.149)	(0.0671)
Elections	0.215**	0.0578**
	(0.109)	(0.0278)
Investment (Log)	0.0795	0.0165
	(0.0756)	(0.0668)
Population growth (Log)	-0.0606	-0.0350
	(0.154)	(0.0677)
GDP per capita (Log)	0.395**	-0.0341
	(0.167)	(0.0312)
Constant	-3.535**	0.391
	(1.452)	(0.363)
Time dummies	Yes	Yes
Observations	886	838
Countries	72	55
Instruments	56	47
AR1 pvalue	0.001	0.000
AR2 pvalue	0.105	0.844
Hansen pvalue	0.342	0.370

Standard errors in parentheses

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

Table 4.4: Environmental Preferences

Dependent Variable	Log of CO_2 (per capita)	
	Low pref.	High pref.
Lagged D.V	0.503*	0.908***
	(0.287)	(0.0769)
Elections	0.209*	0.0523
	(0.116)	(0.0319)
Investment (Log)	0.0331	0.174**
	(0.0783)	(0.0700)
Population growth (Log)	-0.119	-0.115
	(0.345)	(0.0712)
GDP per capita (Log)	0.541**	0.103
	(0.275)	(0.110)
Constant	-4.597*	-1.284
	(2.632)	(1.071)
Time dummies	Yes	Yes
Observations	892	832
Countries	39	37
Instruments	35	32
AR1 pvalue	0.018	0.000
AR2 pvalue	0.340	0.162
Hansen pvalue	0.448	0.584

Standard errors in parentheses

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

Table 4.5: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	C.V	Min	Max
CO_2 per capita (metric tons)	1724	4.8846	4.7956	0..9818	0.0487	27.4314
Election Variable	1724	0.0653	0.2008	3.0767	0	1
Domestic investment (% of GDP)	1724	23.4462	7.1087	0.3032	0.552	66.322
Population growth (%)	1724	1.1747	1.013	0.8624	-2.2585	6.017
GDP per capita (constant 2011 $)	1724	17457.02	15977.26	0.9152	916.6775	96711.05
Environmental aid (2011 $ per capita)	1276	4.9321	14.7266	2.9858	0	296.4061
Environmental aid (% of GDP)	1276	0.1047	0.2857	2.7281	0	4.8479
Government expense (% of GDP)	1283	26.706	12.7366	0.4769	1.8777	134.7713

Note: Descriptive statistics are based on the sample used in first column of table 4.1

Table 4.6: Removing top 5% Emitters

Dependent Variable	Log of CO_2 (per capita)						
	Baseline	Democracy age		Freedom of press		Env. Preferences	
		Old	Young	Low	High	Low	High
Lagged D.V	0.754***	0.882***	0.701***	0.337**	0.968***	0.503*	0.736***
	(0.138)	(0.0739)	(0.167)	(0.159)	(0.0660)	(0.287)	(0.180)
Elections	0.0861***	0.0906***	0.0199	0.174**	0.0686***	0.209*	0.0507
	(0.0269)	(0.0298)	(0.126)	(0.0844)	(0.0265)	(0.116)	(0.0325)
Investment (Log)	0.136**	0.174**	0.136*	0.00948	0.0102	0.0331	-0.0480
	(0.0583)	(0.0710)	(0.0773)	(0.0785)	(0.0710)	(0.0783)	(0.287)
Population growth (Log)	-0.107	-0.199	-0.138	-0.238	-0.0254	-0.119	-0.167
	(0.139)	(0.144)	(0.303)	(0.235)	(0.0778)	(0.345)	(0.159)
GDP per capita (Log)	0.270*	0.148*	0.373*	0.713***	-0.0338	0.541**	0.115
	(0.163)	(0.0792)	(0.215)	(0.170)	(0.0424)	(0.275)	(0.304)
Constant	-2.587*	-1.562**	-3.456*	-5.738***	0.397	-4.597*	-0.313
	(1.407)	(0.612)	(2.017)	(1.553)	(0.465)	(2.632)	(3.243)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1678	735	943	882	796	892	786
Countries	74	32	42	70	53	39	35
Instruments	48	31	31	39	39	35	29
AR1 pvalue	0.000	0.000	0.000	0.024	0.000	0.018	0.001
AR2 pvalue	0.333	0.827	0.489	0.104	0.812	0.340	0.104
Hansen pvalue	0.101	0.824	0.148	0.846	0.482	0.448	0.243

Standard errors in parentheses

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

Table 4.7: Removing top 10% Emitters

Dependent Variable	Log of CO_2 (per capita)						
	Baseline	Democracy age		Freedom of press		Env. Preferences	
		Old	Young	Low	High	Low	High
Lagged D.V	0.764***	0.874***	0.854***	0.664***	0.961***	0.503*	0.886***
	(0.196)	(0.0716)	(0.171)	(0.157)	(0.0814)	(0.287)	(0.107)
Elections	0.100***	0.112***	-0.00845	0.202**	0.0739**	0.209*	0.0447
	(0.0360)	(0.0419)	(0.112)	(0.101)	(0.0352)	(0.116)	(0.0373)
Investment (Log)	0.140**	0.157**	0.157*	0.0874	0.000285	0.0331	0.148
	(0.0597)	(0.0763)	(0.0898)	(0.0778)	(0.106)	(0.0783)	(0.0978)
Population growth (Log)	-0.124	-0.162	-0.105	-0.0134	-0.0185	-0.119	-0.157*
	(0.121)	(0.138)	(0.162)	(0.146)	(0.0664)	(0.345)	(0.0868)
GDP per capita (Log)	0.242	0.154**	0.121	0.410**	-0.0327	0.541**	0.133
	(0.211)	(0.0679)	(0.239)	(0.189)	(0.0384)	(0.275)	(0.102)
Constant	-2.322	-1.614***	-1.351	-3.797**	0.412	-4.597*	-1.409
	(1.853)	(0.581)	(2.276)	(1.678)	(0.511)	(2.632)	(1.141)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1592	689	903	857	735	892	700
Countries	70	30	40	67	50	39	31
Instruments	44	24	36	49	39	35	26
AR1 pvalue	0.000	0.000	0.000	0.001	0.0007	0.018	0.000
AR2 pvalue	0.383	0.736	0.767	0.104	0.965	0.340	0.738
Hansen pvalue	0.107	0.821	0.417	0.545	0.451	0.448	0.474

Standard errors in parentheses

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

Table 4.8: Removing top 25% Emitters

Dependent Variable	Log of CO_2 (per capita)						
	Baseline	Democracy age		Freedom of press		Env. Preferences	
		Old	Young	Low	High	Low	High
Lagged D.V	0.727***	0.807***	0.905***	0.581**	0.901***	0.664**	0.914***
	(0.233)	(0.0898)	(0.0923)	(0.271)	(0.178)	(0.293)	(0.0818)
Elections	0.127**	0.184***	-0.0250	0.173**	0.0817**	0.203*	0.0298
	(0.0588)	(0.0620)	(0.106)	(0.0853)	(0.0320)	(0.112)	(0.0196)
Investment (Log)	0.133*	0.0897	0.139**	0.00206	-0.193	0.0744	0.222*
	(0.0776)	(0.0714)	(0.0563)	(0.0563)	(0.223)	(0.0795)	(0.133)
Population growth (Log)	-0.0334	-0.146	-0.0114	-0.0304	-0.0295	-0.336	-0.0539
	(0.149)	(0.166)	(0.112)	(0.280)	(0.269)	(0.443)	(0.0734)
GDP per capita (Log)	0.294	0.190**	0.0631	0.428*	-0.0937	0.308	-0.0159
	(0.276)	(0.0900)	(0.181)	(0.237)	(0.158)	(0.262)	(0.0974)
Constant	-2.905	-1.687**	-0.949	-3.618**	1.684	-2.359	-0.325
	(2.639)	(0.742)	(1.668)	(1.634)	(1.937)	(2.339)	(1.183)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1316	459	857	819	497	869	447
Countries	58	20	38	55	38	38	20
Instruments	44	18	32	48	29	36	18
AR1 pvalue	0.002	0.001	0.000	0.033	0.001	0.010	0.005
AR2 pvalue	0.355	0.898	0.780	0.113	0.839	0.473	0.405
Hansen pvalue	0.247	0.412	0.220	0.454	0.621	0.424	0.147

Standard errors in parentheses

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

Table 4.9: Controlling for environmental aid and government expenditure

Dependent Variable	Log of CO_2 (per capita)			
	Control for Env. Aid		Control for Gov. Exp.	
	(1)	(2)	(3)	(4)
Lagged D.V	0.675***	0.822***	0.890***	0.642***
	(0.169)	(0.128)	(0.0978)	(0.176)
Elections	0.139**	0.144**	0.0863**	0.0574**
	(0.0602)	(0.0639)	(0.0397)	(0.0271)
Investment (Log)	0.0392	0.0169	-0.165	-0.0716
	(0.0658)	(0.0524)	(0.231)	(0.138)
Population growth (Log)	-0.293	-0.162	-0.151	-0.281
	(0.379)	(0.203)	(0.181)	(0.172)
GDP per capita (Log)	0.378**	0.189		0.332*
	(0.190)	(0.142)		(0.174)
Government expenditures (% of GDP)			-0.001	-0.0017
			(0.0017)	(0.0024)
Environmental Aid per capita (Log)	0.005			
	(0.006)			
Environmental aid as share of GDP (%)		0.0212		
		(0.0338)		
Constant	-2.911*	-1.415	0.908	-2.085*
	(1.605)	(1.107)	(1.029)	(1.201)
Time dummies	Yes	Yes	Yes	Yes
Observations	1302	1276	1283	1283
Countries	74	73	71	71
Instruments	38	49	42	62
AR1 pvalue	0.000	0.000	0.000	0.001
AR2 pvalue	0.350	0.355	0.432	0.521
Hansen pvalue	0.530	0.762	0.201	0.410

Standard errors in parentheses

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

Table 4.10: Environmental preferences (measured through inequalities)

Dependent Variable	Log of CO_2 (per capita)	
	Low pref.	High pref.
Lagged D.V	0.463*	0.873***
	(0.245)	(0.0630)
Elections	0.232***	0.0470**
	(0.0810)	(0.0206)
Investment (Log)	0.0533	0.206***
	(0.0617)	(0.0764)
Population growth (Log)	-0.0704	-0.125*
	(0.576)	(0.0712)
GDP per capita (Log)	0.629*	0.178
	(0.368)	(0.113)
Constant	-5.512	-2.065*
	(4.007)	(1.097)
Time dummies	Yes	Yes
Observations	895	827
Countries	39	37
Instruments	36	36
AR1 pvalue	0.002	0.000
AR2 pvalue	0.105	0.429
Hansen pvalue	0.306	0.409

Standard errors in parentheses

Low preferences correspond to high inequalities.

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

Table 4.11: List of countries

Argentina	Estonia	**Malaysia***	Russia
Australia*	Fiji	Mali	Sierra Leone
Austria*	**Finland***	**Mauritius***	Slovenia
Bangladesh	**France***	Moldova	**South Africa***
Belgium*	Ghana	Mongolia	Spain
Benin	**Greece***	Namibia	**Sri Lanka***
Bolivia	Guatemala	Nepal	Suriname
Botswana*	Guyana	**Netherlands***	**Sweden***
Brazil	Honduras	**New Zealand***	**Switzerland***
Bulgaria	**India***	Nicaragua	Thailand
Canada*	**Ireland***	Nigeria	**Turkey***
Cape Verde	**Israel***	**Norway***	**United Kingdom***
Chile	**Italy***	Pakistan	**United States***
Colombia*	**Jamaica***	Panama	**Uruguay***
Costa Rica*	Korea South	Paraguay	**Venezuela***
Cyprus*	Latvia	**Peru***	Zambia
Denmark*	Lesotho	**Philippines***	
Dominican Republic	Lithuania	Poland	
Ecuador	**Luxembourg***	Portugal	
El Salvador	Madagascar	Romania	

* Countries with a number of democratic years above the sample average of 41 years

Table 4.12: Definition and description of variables

Variables	**Definition and description**	**Source**
Carbon dioxide emissions	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring	WDI(World Development Indicator)
Population growth	Annual population growth rate. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship	WDI(World Development Indicator)
GDP per capita	GDP per capita in thousand (2011 US)	WDI(World Development Indicator)
Government expense	% of GDP	WDI(World Development Indicator)
Environmental aid	(2011 dollar per capita)	AidData web portal
Environmental aid	% of GDP	AidData web portal
Elections	dummy variable	National Elections across Democracy and Autocracy
Domestic investment	% of GDP	IMF World Economic Outlook

Chapter 5

Conclusion

This thesis contributes to the growing literature on the political economy of foreign aid and environmental policy. Through its three empirical papers, it mainly assesses the link between foreign aid and pollution, the motivation behind the allocation of environmental aid, and the effect of electoral cycles on environmental degradation.

5.1 Summary

The first empirical chapter analyzes the link between foreign aid and CO_2 emissions, in 112 aid-recipient countries over 1980-2013. It uses a new and more complete "project-level" aid data to re-explore the link between ODA and emissions. It uses the GMM-system estimator of Blundell and Bond (1998) with an additional external instrument when using bilateral aid, to tackle endogeneity issues. The instrument is computed for each recipient country as the weighted average of its donors' CO_2 emissions, which may affect the amount of aid received but is less likely to impact the emissions of the recipient country. It uses a much larger set of countries compared to previous studies but also finds that aggregated ODA has no impact, as most of them.

Looking at the channel, it finds that multilateral aid turns out to be effective in reducing emissions, while no impact is found for bilateral ODA. Each bilateral aid flow is provided a environmental impact code (neutral, dirty, environmental) through a rigorous coding scheme and the impact of each of the sub-components of bilateral aid is estimated. As expected, the dirty component has a pollution-increasing effect, mainly working through non-renewable energy. Bilateral aid turns out to be effective if specifically targeted toward environment but for important amounts, since we find evidence of an inverted U-shape relationship between environmental bilateral aid and emissions. Even if the potential mitigation impact of ODA exists, donors incentives might result in a less effective allocation of these resources.

The second empirical chapter thus studies the factors associated with the allocation of environmental aid, to see if its suffers from the same weaknesses as aid for poverty reduction, which could hamper its effectiveness. We use a novel "project-level" aid data set and rely on a comprehensive coding scheme to classify projects according to their environmental impact and obtain the number of projects and the amounts of environmental ODA for 9 donors and 128 recipients over 1990-2013. The role of different types of factors that might influence the allocation of environmental aid is investigated: the environmental and non-environmental needs and merits of recipient countries, as well as the donors' political and economic interests. To measure the recipients' environmental merits, we use a new measure of "revealed" climate mitigation efforts introduced by Combes et al. (2016), rather than relying on observed CO_2 emissions as previous studies on environmental aid allocation. To the best of our knowledge, our study is the first using this indicator to analyze the allocation of environmental aid. We separately analyze the number of environmental projects and the amount of environmental ODA received, using Poisson Pseudo-Maximum Likelihood that is better appropriated than OLS, two-part, and Tobit models in the presence of many zero(0) observations and heteroscedasticity (Silva and Tenreyro, 2006, 2011). Beyond the absolute values, the recipients' shares in donors' total projects and amounts are also analyzed using a fractional logit which is also adapted for proportions as dependent variables (Papke and Wooldridge, 1996, 2008).

The Poisson and Fractional regressions find that while vulnerability to climate change seems to be a key determinant of environmental aid, its allocation is poorly linked to recipients' climate mitigation policies. We also find weak evidence of association between donors' interest variables and environmental aid on average, exception made for trade. But a donor-by-donor analysis allows to go deeper into all the relations above, and reveals that some donors are more sensitive to environmental variables, while others rather seem focused on their economic and political interests. Even if there might be weaknesses linked to the mobilization of resources to fight climate change, countries' incentives to engage in climate change mitigation also matter. Among other factors, these incentives can vary because of political interests.

In the last empirical study, we explore how governments may use the trade-off between pork-barrel projects and the provision of public goods such as environmental protection, or become lax in terms of environmental policy for re-election purposes. Instead of focusing on one country, we rather rely on a cross-country econometric study. To estimate the impact elections have on environmental degradation measured with CO_2 emissions, we rely on a dataset made of 76 democracies over the period 1990-2014. We also rely on GMM-system estimator and focus on pre-determined elections to mitigate endogeneity issues. We find evidence of a pollution-increasing effect in elections years, which tends to be weaker over the recent years. We highlight some factors that shape this relationship. Some of them are conditioning factors already highlighted in the PBCs literature (Brender and Drazen, 2005; Shi and Svensson, 2006), while other factors are linked to environmental preferences in countries under consideration. We test whether the size of our effect is conditioned by traditional conditioning factors of PBCs (such as democracy age and access to free media), as well as environmental preferences of citizens. We find that this effect is present in established democracies, where incumbents are punished by voters in case of deficit-spending. In such countries, leaders change the expenditure composition rather than its level: they increase the budget share of pork-barrel spending and under-provide public goods in election periods, which results in higher environmental degradation. We finally find evidence that better access to free media, and stringent environmental policies are associated with a lower size of the pollution-cycle, as they reduce the level of economic voting from citizens. As a consequence, incumbents will then have weak incentives to manipulate fiscal policy and will choose the appropriate set of policies that match voters' concerns.

5.2 Key Takeaways

From these three studies, we learned that environmental aid effect depends on the type of donors. Multilateral aid contributes to reduce environmental degradation through the reduction of CO_2 emissions, while the composition of bilateral aid should change if one expects it to provide environmental benefits. Bilateral donors should reallocate their funding to more environmental friendly activities. This will help increasing environmental bilateral aid, which we found more effective for important amounts only, and which remains insufficient for a large majority of countries. There is therefore an urge for donors to scale-up their environmental aid.

The second study revealed that even in the case of sufficient resources, the effectiveness of environmental aid could be seriously threatened. While vulnerability to climate change is one of the key determinants of environmental aid allocation by donors, recipients' mitigation efforts seem to matter less. In addition, even if there seem to be weak evidence of association between donors' interests and environmental aid on average, heterogeneity analysis reveals that fewer donors are sensitive to recipients' climate policies, compared to a significant number whose aid is motivated by their own-interests. This sheds light on the necessity to explore new solutions in order to improve environmental aid allocation, if one wants it to be more effective.

The third study showed that political interests override environmental considerations, CO_2 emissions being higher in election periods. This effect is much more present in established democracies, where incumbents are punished by voters in case of deficit-spending, and therefore find incentives to temporarily overlook environmental protection. Nevertheless, since a better access to free media for more awareness and democracy, as well as stringent environmental policies are associated with a lower size of this "pollution-cycle", these have to be encouraged.

5.3 Direction for future research

These empirical studies face some limits mostly due to data availability. Therefore, we might consider doing further research when information will be more available or new methodology which would allow tackling some of the issues encountered. Nevertheless, methodologies adapted to the data of each case were used to minimize the potential biases inherent in the impact assessment. However, especially for the second empirical study, it was challenging to obtain causal impacts for each of the variables. Next studies could take a deep dive into some of these correlations and isolate a proper causal impact. Or look at how aid governance and allocation could be improved thanks to new technologies. This will be the subject of future work.

Regarding the role of electoral cycles in countries climate policy, it would be interesting especially for developing countries to investigate in more details how incumbents incentives are shaped by external actors. It could be interesting to look at how aid composition (e.g. environmental aid vs others types) changes in election times. This will also be the subject of future work.

Last but not least, in this fight against climate change, one additional thing to keep in mind and which is not the least is the fact that ODA, public finance, alone cannot fill all the financing gap. Private sector solutions should also be sought as a priority, as far as possible, in order to allocate already scarce public resources to other uses. This is increasingly the guideline[1] adopted by multilateral development institutions such as the World Bank Group.

[1] Also known as Maximizing Finance for Development (MFD).

Chapter 6

RÉSUMÉ EXTENSIF EN FRANÇAIS

6.1 Contexte

Hormis pour quelques climato-sceptiques, la question de la réalité ou même de l'existence du changement climatique n'est plus à débattre, tant au sein de la communauté scientifique qu'au sein des Etats. Il s'agit bien d'une réalité! Cependant, pour ceux qui sont encore dubitatifs, dans un déni aveugle ou dans l'ignorance la plus complète du phénomène, il faudrait noter que le changement climatique peut être défini comme "*un changement de climat attribué directement ou indirectement à l'activité humaine qui modifie la composition de l'atmosphère globale, et qui s'ajoute à la variabilité naturelle du climat observée sur des périodes comparables*". Convention-cadre des Nations unies sur le changement climatique (UNFCCC, 1992).

En effet, la température moyenne à la surface du globe a considérablement augmenté depuis 1906. Cette chaleur a notamment entraîné la fonte des glaciers, modifié les régimes de précipitations et mis les animaux en mouvement. Outre l'augmentation des températures moyennes, elle entraîne des phénomènes météorologiques extrêmes, le déplacement d'habitats et de populations d'animaux sauvages, l'élévation du niveau des mers et une série d'autres impacts. Tous ces changements apparaissent au fur et à mesure que l'homme continue d'ajouter des gaz à effet de serre tels que le dioxyde de carbone, piégeant la chaleur dans l'atmosphère. Selon la base de données de la NASA, au cours des 170 dernières années, les concentrations atmosphériques de CO_2 ont augmenté de 47% par rapport aux niveaux préindustriels constatés en 1850, en raison des activités humaines. C'est plus que ce qui s'était produit naturellement sur une période de 20 000 ans (depuis le dernier maximum glaciaire jusqu'en 1850, de 185 ppm à 280 ppm).

De ce changement climatique découlent de nombreuses conséquences dans le monde entier ; en Afrique, certaines régions sont menacées de pénurie d'eau. Conjugué à une demande croissante, ce phénomène entraînera probablement une forte augmentation du nombre de personnes menacées de pénurie d'eau. Selon le rapport du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC), cela risque d'affecter les moyens de subsistance. Le risque de famine sera probablement plus élevé, étant donné les réductions prévues de la durée de la saison de croissance et des zones propices à la culture.

En Asie, il est très probable que l'approvisionnement en eau soit perturbé au cours des 20 à 30 prochaines années en raison de la fonte des glaciers. Il est presque certain que les inondations et les avalanches vont augmenter. Les régions côtières très peuplées, y compris les deltas des fleuves tels que le Gange et le Mékong, seront probablement plus exposées aux inondations. Le développement économique sera probablement affecté par la combinaison du changement climatique, de l'urbanisation et de la croissance économique et démographique rapide. Les changements prévus en matière de température et de précipitations réduiront probablement les rendements des cultures en général, augmentant ainsi le risque de famine. De même, les pénuries d'eau persistantes, en particulier dans le sud et l'est de l'Australie, devraient s'aggraver. Les tempêtes côtières et les inondations vont très probablement augmenter pour certaines communautés côtières. Les pays d'Europe centrale et orientale pourraient être confrontés à une diminution des précipitations estivales, ce qui entraînerait un stress hydrique plus important. Les risques sanitaires liés aux vagues de chaleur devraient augmenter. La productivité des forêts devrait diminuer et la fréquence des incendies de tourbières devrait augmenter. Les pays du sud de l'Europe risquent fort de connaître une diminution des réserves d'eau, une baisse de la production agricole, une augmentation des incendies de forêt et les effets sur la santé d'une augmentation des vagues de chaleur. L'augmentation des températures et la diminution de l'eau du sol dans la région de l'Amazonie orientale entraîneraient le remplacement de la forêt tropicale humide par la savane. Les zones plus sèches risquent de voir la salinisation et la désertification des terres agricoles, la baisse des rendements des cultures et de la productivité du bétail réduire la sécurité alimentaire. Le réchauffement des montagnes de l'ouest de l'Amérique du Nord réduira très probablement l'accumulation de neige, ce qui entraînera davantage d'inondations en hiver et une réduction des réserves d'eau en été. Une augmentation des problèmes de parasites, de maladies et d'incendies de forêt est probable.

Compte tenu de tout ce qui a été mentionné ci-dessus, la nécessité et l'urgence d'une action globale, efficace et coordonnée pour faire face aux dégâts ne sont plus à démontrer. Certaines questions jaillissent dès lors presque naturellement: celles des responsabilités des uns et des autres, des sacrifices à consentir pour la lutte, mais surtout des capacités à la mener.

En ce qui concerne les responsabilités, les pollueurs devraient être responsables et payer pour atténuer leurs émissions. Si l'on considère les émissions historiques, les pays en développement ne sont pas les premiers responsables du changement climatique, étant donné leurs émissions historiques relativement faibles. Même dans les périodes récentes, la contribution de ces pays aux émissions mondiales reste modeste. En outre, la lutte contre le changement climatique nécessite des ressources supplémentaires et exige de modifier la trajectoire de croissance et de développement. Pour les pays en développement, toute ressource supplémentaire à court terme qui serait allouée à la lutte contre le changement climatique représente toutefois moins de ressources pour la lutte contre la pauvreté. La lutte contre la pauvreté et l'atténuation du changement climatique semblent donc être des objectifs opposés pour ces pays, qui sont confrontés à un dilemme entre les problèmes actuels et les risques futurs. Nonobstant cela, à long terme, les deux ne sont pas opposés : en l'absence d'atténuation, les événements climatiques extrêmes pourraient annuler les gains de développement et ramener ces pays dans la pauvreté (Halverson and McNeill). Quant aux capacités, force est de reconnaître que ces pays ont des capacités très limitées pour faire des efforts significatifs dans la lutte contre le changement climatique, étant donné leur niveau de développement.

C'est dans cette perspective que l'aide publique au développement (ci-après APD) pourrait être utilisée comme un outil pour aider ces pays dans leur transition vers des économies propres et plus résilientes face au changement climatique.

Le Comité d'aide au développement (CAD) définit l'APD comme "les flux destinés aux pays et territoires figurant sur la liste du CAD des bénéficiaires de l'APD et aux institutions multilatérales qui sont :

(i) fournis par des organismes officiels, y compris les gouvernements des États et les collectivités locales, ou par leurs agences exécutives ; et

(ii) dont chaque transaction

(a) est administrée avec pour objectif principal la promotion du développement économique et du bien-être des pays en développement ; et

(b) est de nature concessionnelle et comporte un élément don d'au moins 25 pour cent (calculé à un taux d'actualisation de 10 pour cent)".

En 2009 à Copenhague, les pays développés se sont engagés à mobiliser 100 milliards de dollars par an d'ici 2020 auprès d'un large éventail de sources (publiques et privées, bilatérales et multilatérales, y compris des sources alternatives) pour les pays en développement afin d'atténuer le changement climatique et de s'y adapter. En 2010, la conférence des parties à la CCNUCC a reconnu cet engagement des pays développés ; depuis lors, le niveau de soutien financier mobilisé et fourni a considérablement augmenté, tandis que des améliorations ont été apportées à la transparence du financement pour le climat dans une optique de meilleure compréhension. L'accord de Paris est historique en ce sens que tous les pays se sont mis d'accord sur des objectifs ambitieux pour renforcer la réponse mondiale au changement climatique. Le volume global du financement mobilisé pour le climat (public et privé) a atteint 62 milliards de dollars US en 2014[1], et les pays développés ont été invités à augmenter leur niveau de soutien pour atteindre l'objectif de 100 milliards de dollars US d'ici 2020, même si le financement du développement lié au climat provenant de fournisseurs bilatéraux a considérablement augmenté ces dernières années.

L'APD est de plus en plus orientée sous la forme d'aide environnementale (Bierbaum et al., 2010) et soutient des projets qui visent à créer un environnement favorable [2] pour que les pays bénéficiaires soient en mesure d'accueillir ultérieurement des projets de type mécanisme de développement propre (MDP) (Dutschke and Michaelowa, 2006).

Même si le financement est censé être nouveau et s'ajouter à l'objectif actuel de 0,7% d'APD provenant du revenu national brut (RNB), le montant de l'APD alloué à l'atténuation du climat augmente bien plus vite que celui de l'APD allouée à la lutte contre la pauvreté et pourrait concurrencer cette dernière selon certains auteurs. Toutefois, à long terme, l'atténuation du climat contribuera à maintenir une trajectoire stable, quoique plus lente, de réduction de la pauvreté (Stern, 2008).

Avec cette hypothèse sous-jacente, l'APD est donc perçue comme un outil utile pour élaborer des politiques respectueuses de l'environnement, en particulier dans les pays en développement (Halimanjaya and Papyrakis, 2012; Lebovic and Voeten,

[1] OCDE (2015)

[2] Au moyen de mesures telles que le renforcement de la politique environnementale.

2009).

Mais au-delà de la mobilisation de ressources suffisantes pour aider les pays en développement à lutter contre le changement climatique, il existe des questions beaucoup plus complexes. L'une d'entre elles est notamment de savoir si l'APD a réellement cet effet bénéfique pour l'environnement qui lui est prêté. En d'autres termes, l'aide est-elle vraiment efficace pour contribuer à atténuer le changement climatique?

Par ailleurs, en ce qui concerne l'APD visant à réduire la pauvreté, il est souvent dit que les motivations des donateurs vont au-delà de l'objectif altruiste d'améliorer l'économie et le bien-être des populations des pays en développement (McKinlay and Little, 1977; Maizels and Nissanke, 1984; Trumbull and Wall, 1994; Alesina and Dollar, 2000; Berthélemy, 2006; Hoeffler and Outram, 2011). Pourquoi en serait-il autrement pour son homologue environnementale? Même si les ressources sont mobilisées, comment s'assurer qu'elles seront envoyées là où elles sont le plus utiles, plutôt que selon l'intérêt des donneurs, comme l'ont souligné certains universitaires (Lewis, 2003)?

Enfin et surtout, existe-t-il de véritables incitations, non seulement pour les pays en développement, mais aussi pour les pays développés, à lutter efficacement contre le changement climatique? La protection de l'environnement n'est-elle pas influencée par la politique, notamment à des fins électorales, comme cela s'est avéré être le cas pour la politique budgétaire (Brender and Drazen, 2005; Shi and Svensson, 2006; Brender and Drazen, 2008, 2013) ?

6.2 Un manque de consensus

Sur l'impact environnemental de l'aide

Certaines études ont porté sur les effets potentiels de l'aide sur la protection de l'environnement dans les pays bénéficiaires, mais la littérature n'est pas encore concluante et les résultats sont assez mitigés.

Pour ceux qui constatent un impact positif de l'APD, l'aide crée de bonnes incitations pour les pays bénéficiaires à s'engager dans la protection de l'environnement, étant donné qu'ils sont en concurrence pour obtenir davantage d'aide et qu'ils doivent donc s'aligner sur les préférences des bailleurs de fonds (Tsakiris et al., 2005; Hadjiyiannis et al., 2013). Cette concurrence pour l'aide environnementale se traduit par une meilleure protection de l'environnement. Toutefois, cela n'est pas toujours le cas Chambers et al. (2018). Un autre canal mis en évidence dans cette littérature est également l'amélioration de la qualité de l'environnement en raison d'une demande accrue des citoyens : en effet, en favorisant le développement économique et en augmentant les revenus des citoyens, l'aide entraîne une demande accrue d'un environnement de meilleure qualité (Grossman and Krueger, 1995; Arvin and Lew, 2009). Elle est également censée constituer un revenu supplémentaire qui permet aux pays bénéficiaires d'assouplir partiellement la contrainte qu'ils ont de devoir choisir entre croissance économique et protection de l'environnement, laquelle contrainte est particulièrement importante du fait de leur faible assiette fiscale (Hamilton and Clemens, 1999; Haber and Menaldo, 2011).

D'autres considèrent plutôt que l'aide crée de mauvaises incitations, étant donné qu'elle atténue le développement des institutions démocratiques (Djankov et al., 2008) et libère les gouvernements de leur dépendance aux recettes fiscales, les rendant ainsi moins redevables envers les citoyens, comme dans le cas une "malédiction des ressources naturelles" (Knack, 2001). Ces gouvernements retardent donc d'importantes réformes (Ostrom et al., 2005) telles que les réformes environnementales et optent pour un sous-approvisionnement des biens publics. Aussi, le fait de recevoir des fonds pour la protection de l'environnement pourrait amener les pays bénéficiaires à réduire leurs dépenses environnementales et à les réallouer vers d'autres secteurs (Feyzioglu et al., 1998; Farag et al., 2009; Waddington, 2004).

S'agissant du type de donneur, l'aide bilatérale est également plus critiquée et serait davantage motivée par des alliances politiques que par les performances du pays bénéficiaire (Alesina and Dollar, 2000; Dreher et al., 2008; Faye and Niehaus, 2012), en opposition à l'aide multilatérale qui aurait un effet plus bénéfique (Rodrik, 1995; Lebovic and Voeten, 2009).

La plupart des études se sont simplement concentrées sur un projet spécifique, un bénéficiaire ou un donneur particulier. Pour certaines, qui utilisent un groupe de pays (Arvin and Lew, 2009), les résultats dépendent de l'indicateur de dégradation environnementale utilisé. Des études plus récentes (Lim et al., 2015) suggèrent que ces résultats mitigés sont dus au fait que les études précédentes se concentraient sur l'effet inconditionnel de l'APD et soutiennent que cet effet est conditionné par d'autres types de flux tels que le commerce ou les IDE. Mais surtout, il semble que les données incomplètes (Tierney et al., 2011) et la mauvaise catégorisation des projets (Michaelowa and Michaelowa, 2011) soient les principaux facteurs de ces résultats mitigés.

Allocation de l'aide environnementale

La question de l'allocation de l'aide étrangère n'est pas nouvelle et a été largement documentée dans la littérature, afin de comprendre les motivations des donneurs, qui vont bien au-delà des besoins des pays bénéficiaires et des objectifs de réduction de la pauvreté. Les principaux facteurs déterminants qui sont mis en évidence par cette littérature sont les besoins et les mérites des bénéficiaires, et les intérêts des donneurs. En ce qui concerne les mérites, même après que les conclusions de Burnside and Dollar (2000) quant au rôle des bonnes politiques des pays bénéficiaires sur l'efficacité de l'aide aient été remises en question (Roodman, 2007), la gouvernance des pays bénéficiaires est restée l'un des principaux facteurs déterminants dans l'allocation de l'aide (Berthélemy and Tichit, 2004; Easterly, 2007; Clist, 2011; Acht et al., 2015). Toutefois, il a été prouvé que les donneurs pouvaient négliger ces mérites en fonction de leur propre intérêt. Au-delà des besoins et des mérites des bénéficiaires, il est en effet largement prouvé que les donneurs poursuivent de nombreux intérêts économiques et politiques tout en fournissant une aide : (Alesina and Dollar, 2000; Berthélemy, 2006; Dreher et al., 2008, 2011; Faye and Niehaus, 2012) ; et les nouveaux pays donneurs, en particulier, ne font pas exception à cette règle. Une telle interférence des intérêts politiques et économiques avec les besoins et les mérites des bénéficiaires, dans les processus d'attribution de l'aide, peut réduire son efficacité (Dreher et al., 2013). Certaines études ont porté sur les facteurs liés à l'allocation de l'aide environnementale en particulier. Lewis (2003) par exemple, constate que les intérêts des donneurs l'emportent sur les besoins des bénéficiaires, l'aide environnementale n'étant pas ciblée sur les pays qui en ont le plus besoin. Ses conclusions suggèrent que les donneurs favorisent les bénéficiaires démocratiques disposant de ressources naturelles non exploitées, avec lesquels ils ont eu des relations antérieures (économiques et coopération dans le domaine de la sécurité). Ces constatations s'opposent à celles de Figaj (2010) qui constate que le nombre de traités environnementaux, la vulnérabilité environnementale, la durabilité environnementale, les émissions de CO_2 et la biodiversité sont les principaux déterminants de l'aide environnementale, alors que les variables politiques semblent ne jouer aucun rôle. Des études plus récentes examinent séparément l'aide ayant pour objectif l'atténuation du changement climatique et celle visant plutôt l'adaptation ; tandis que la pauvreté et l'exposition au climat, les risques de changement semblent être positivement associés à l'aide à l'adaptation (Betzold and Weiler, 2017; Weiler et al., 2018), cette dernière est également liée aux intérêts économiques des donneurs (Weiler et al., 2018). Pour l'aide visant l'atténuation, les pays bénéficiaires ayant des émissions de CO_2 plus élevées, un PIB par habitant plus faible et une bonne gouvernance reçoivent plus de fonds (Halimanjaya, 2015, 2016) mais là encore, les intérêts géopolitiques des bailleurs de fonds jouent un rôle dans l'allocation, en particulier pour les bailleurs bilatéraux comme la France ou le Japon (Halimanjaya, 2016). Les pays hôtes de projets MDP ont également tendance à recevoir plus de fonds (Halimanjaya, 2016). La plupart de ces études considèrent séparément l'aide visant l'atténuation et celle visant l'adaptation, qu'elles identifient en utilisant les marqueurs de Rio qui se sont avérés à peine fiables (Michaelowa and Michaelowa, 2011; Weikmans et al., 2017). Ces études assimilent également la dégradation environnementale et les politiques climatiques des pays bénéficiaires (par exemple Halimanjaya (2015, 2016)), ce qui pourrait entraîner une confusion dans les interprétations. En outre, les techniques économétriques utilisées ne sont pas adaptées à la structure des données bilatérales utilisées, comme l'explique Silva and Tenreyro (2006, 2011).

Les motivations politiques qui sous-tendent la protection de l'environnement dans les pays

Une littérature croissante suggère que les élections ont des effets de distorsion sur la politique économique. Une petite partie de cette littérature est constituée de modèles "partisans", qui se concentrent sur le comportement des politiciens à motivation idéologique. Une autre partie plus substantielle de cette littérature se concentre sur les motivations des politiciens à manipuler les variables économiques à des fins de réélection. Ce dernier argument théorique a d'abord été formulé par Nordhaus (1975). Les gouvernements sont incités à utiliser des politiques budgétaires expansionnistes pour stimuler l'économie dans les dernières années de leur mandat. D'autres études ont abordé cet argument tant dans les modèles de sélection adverse (Rogoff, 1990) que dans les modèles d'aléa moral (Shi and Svensson, 2006; Persson and Tabellini, 2012).

Plusieurs auteurs se demandent si les élections ont une incidence sur les politiques environnementales et leurs résultats. En période électorale, les hommes politiques manipulent les dépenses publiques afin de renforcer leur popularité et de s'assurer des voix. Pour ce faire, ils augmentent les dépenses globales ou modifient leur composition (Brender and Drazen, 2013). Ils peuvent faire passer les dépenses d'une catégorie à une autre, voire d'un secteur à un autre en déplaçant les dépenses de secteurs dont les bénéfices ne sont pas immédiatement visibles à d'autres secteurs où c'est le cas. Il est donc probable que l'environnement puisse être affecté ; la protection de l'environnement est un bien public, dont les bénéfices ne sont pas immédiatemment visibles car étant situés plus à long terme. Aux États-Unis, List and Sturm (2006) ont trouvé théoriquement et économétriquement la preuve que les choix de politique environnementale diffèrent entre les années d'élection et de non-élection des gouverneurs. Cependant, si les élections semblent avoir une influence visible sur les positions publiques prises par les hommes politiques, elles n'ont finalement que peu d'influence sur les choix environnementaux (Bergquist and Warshaw, 2020). Quelques études s'intéressent également à la déforestation et à l'utilisation des terres en période électorale. Rodrigues-Filho et al. (2015) et Pailler (2018) ont trouvé des preuves des cycles politiques de déforestation au Brésil. Les années électorales sont caractérisées par des taux de déforestation élevés, principalement en raison de l'affaiblissement des contraintes institutionnelles. Un autre exemple est celui de Cisneros Tersitsch et al. (2020) qui démontre économétriquement que les facteurs économiques et politiques de la perte de forêts et de la conversion des terres pour la culture du palmier à huile en Indonésie se renforcent mutuellement. D'Amato et al. (2019) éclairent également les cycles politiques d'utilisation des terres en Italie en prenant la délivrance des permis de construire comme indicateur environnemental. Klomp and de Haan (2016) constatent que les rentes des ressources naturelles (y compris les rentes forestières) sont plus élevées pendant les années d'élection parce que les titulaires les utilisent pour augmenter les dépenses publiques et réduire les impôts. De même, Laing (2015) constate que le gouvernement en Guyane émet moins de droits miniers après les années d'élection, tandis que le nombre de droits annulés augmente.

6.3 Contributions de la thèse et résultats

Cette thèse contribue à la littérature croissante sur l'économie politique de l'aide étrangère et la politique environnementale. À travers ses trois papiers empiriques, elle évalue principalement le lien entre l'aide étrangère et la pollution, la motivation derrière l'allocation de l'aide environnementale, et l'effet des cycles electoraux sur la dégradation de l'environnement.

Le premier chapitre empirique analyse le lien entre l'aide étrangère et les émissions de CO_2, dans 112 pays bénéficiaires d'aide sur la période 1980-2013. Il utilise une nouvelle base de données plus complète sur l'aide pour réexaminer le lien entre l'APD et les émissions. Il utilise l'estimateur du système GMM de Blundell and Bond (1998) avec un instrument externe supplémentaire lors de l'utilisation de l'aide bilatérale, pour traiter les problèmes d'endogénéité. L'instrument est calculé pour chaque pays bénéficiaire comme la moyenne pondérée des émissions de CO_2 de ses donneurs, qui est supposée affecter le montant de l'aide reçue mais est moins susceptible d'avoir un impact sur les émissions du pays bénéficiaire. Il utilise un ensemble de pays beaucoup plus important que les études précédentes, mais constate également que l'APD agrégée n'a pas d'impact, comme la plupart d'entre eux.

En examinant le type de bailleur de fonds, on constate que l'aide multilatérale s'avère efficace pour réduire les émissions, alors qu'aucun impact n'est constaté pour l'APD bilatérale. Chaque flux d'aide bilatérale se voit attribuer un code d'impact environnemental (neutre, nefaste, environnemental) grâce à un système de classification rigoureux et l'impact de chacune des sous-composantes de l'aide bilatérale est estimé. Comme prévu, la composante "nefaste" a un effet d'augmentation de la pollution, principalement par le biais des énergies non-renouvelables. L'aide bilatérale s'avère efficace si elle est spécifiquement ciblée sur la protection de l'environnement, mais pour des montants importants, étant donné que nous trouvons une relation en forme de U inversé entre l'aide bilatérale environnementale et les émissions. Même si l'impact potentiel de l'APD sur l'atténuation existe, les incitations des donneurs pourraient entraîner une allocation moins efficace de ces ressources.

Le deuxième chapitre empirique étudie donc les facteurs associés à l'allocation de l'aide environnementale, afin de déterminer si celle-ci souffre des mêmes défauts que l'aide non-environnementale, ce qui pourrait nuire à son efficacité. Nous utilisons une nouvelle base de données sur l'aide et nous nous appuyons sur un système de codification complet pour classer les projets en fonction de leur impact environnemental et obtenir le nombre de projets et les montants de l'APD environnementale pour 9 donneurs et 128 bénéficiaires sur la période 1990-2013. Le rôle des différents types de facteurs susceptibles d'influencer l'allocation de l'aide environnmentale est étudié : les besoins et mérites environnementaux et non environnementaux des pays bénéficiaires, ainsi que les intérêts politiques et économiques des donneurs. Pour mesurer les mérites environnementaux des bénéficiaires, nous utilisons une nouvelle mesure des efforts "révélés" d'atténuation du changement climatique introduite par Combes et al. (2016), plutôt que de nous baser sur les émissions de CO_2 observées qui, comme les études précédentes sur l'allocation de l'aide environnementale, sachant que cela pourrait mener à des confusions dans les interprétations. À notre connaissance, notre étude est la première à utiliser cet indicateur pour analyser l'allocation de l'aide environnementale. Nous analysons séparément le nombre de projets environnementaux et la quantité d'APD environnementale reçue, en utilisant des modèles de Poisson pseudo-maximum de vraisemblance (PPML) qui sont mieux appropriés que les MCO, les modèles en deux parties, et les modèles Tobit en présence de nombreuses observations nulles(0) et d'hétéroscédasticité (Silva and Tenreyro, 2006, 2011). Au-delà des valeurs absolues, les parts des bénéficiaires dans le total des projets et des montants des donneurs sont également analysées en utilisant un logit fractionnaire qui est également adapté pour les proportions en tant que variables dépendantes (Papke and Wooldridge, 1996, 2008).

Les résulats montrent que si la vulnérabilité au changement climatique semble être un déterminant clé de l'aide environnementale, son allocation est peu liée aux politiques d'atténuation des bénéficiaires. Nous trouvons également de faibles liens entre les variables d'intérêt des donneurs et l'aide environnementale en moyenne, exception faite pour le commerce. Mais une analyse donneur par donneur révèle de grandes hétérogénéités, certains donneurs étant plus sensibles aux variables environnementales lors de l'allocation, tandis que d'autres semblent plutôt se focaliser sur leurs propres intérêts politiques et économiques. Même si les analyses précédentes mettent en évidence l'existence de faiblesses liées à la mobilisation des ressources pour la lutte contre le changement climatique, les incitations des pays à s'engager dans l'atténuation du changement climatique ont également leur importance. Entre autres, ces incitations peuvent varier en raison d'intérêts politiques des dirigeants.

Dans le dernier papier empirique, nous examinons comment les gouvernements peuvent utiliser la sustituabilité entre la relance de l'activité économique et la fourniture de biens publics tels que la protection de l'environnement, ou devenir laxistes en termes de politique environnementale à des fins de réélection. Au lieu de nous concentrer sur un seul pays, nous nous appuyons sur un panel de plusieurs pays. Pour estimer l'impact des élections sur la dégradation de l'environnement (mesurée par les émissions de CO_2), nous nous appuyons sur un ensemble de données portant sur 76 pays démocratiques au cours de la période 1990-2014. Nous nous appuyons également sur l'estimateur du système GMM et nous nous concentrons sur des élections prédéterminées pour atténuer les problèmes d'endogénéité. Nous trouvons un effet d'augmentation de la pollution pendant les années d'élections, qui tend à être plus faible sur les périodes récentes au fur et à mesure que les electeurs deviennent de plus en plus familiers avec les processus électoraux ou que la prise de conscience sur le changement climatique s'accroît. Nous mettons en évidence certains facteurs qui conditionnent cette relation. Certains d'entre eux sont des facteurs conditionnels déjà mis en évidence dans la littérature sur les cycles politico-budgétaires (CPB) (Brender and Drazen, 2005; Shi and Svensson, 2006), tandis que d'autres facteurs sont liés aux préférences environnementales dans les pays considérés. Nous testons si l'ampleur de notre effet est conditionnée par les facteurs traditionnels de conditionnement des CPB (tels que l'âge de la démocratie et la liberté de la presse), ainsi que les préférences environnementales des électeurs. Nous constatons que cet effet est présent dans les vieilles démocraties, où les titulaires sont sanctionnés par les électeurs en cas d'augmentation des dépenses totales et donc du déficit. Dans ces pays, les dirigeants modifient la composition des dépenses plutôt que leur niveau : ils augmentent la part du budget consacrée aux autres secteurs en période électorale au détriment de la protection de l'environnement, ce qui entraîne une dégradation accrue de ce dernier. Enfin, il est prouvé qu'un meilleur accès à des médias libres et des politiques environnementales strictes sont associés à une réduction de l'effet observé, car ils réduisent le niveau de vote économique des citoyens. Par conséquent, les dirigeants seront alors peu incités à manipuler la politique budgétaire et choisiront l'ensemble approprié des politiques qui correspondent aux préoccupations des électeurs.

6.4 Principaux enseignements, limites et recherches futures

Ces trois études nous ont appris en premier que l'effet de l'aide environnementale dépend du type de donneur. L'aide multilatérale contribue à réduire la dégradation de l'environnement par la réduction des émissions de CO_2, tandis que la composition de l'aide bilatérale devrait changer si l'on s'attend à ce qu'elle apporte des avantages environnementaux. Les donneurs bilatéraux devraient réaffecter leur financement à des activités plus respectueuses de l'environnement. Cela permettra d'accroître l'aide environnementale bilatérale, que nous avons trouvée plus efficace pour des montants importants seulement, et qui reste insuffisante pour une grande majorité de pays. Il est donc urgent que les donneurs augmentent leur aide environnementale.

La deuxième étude a révélé que même en cas de ressources suffisantes, l'efficacité de l'aide environnementale pourrait être sérieusement menacée. Alors que la vulnérabilité au changement climatique est l'un des principaux déterminants de l'allocation de l'aide environnementale par les donneurs, les efforts d'atténuation des bénéficiaires semblent moins importants. En outre, même s'il semble y avoir peu de preuves d'une association entre les intérêts des donneurs et l'aide environnementale en moyenne, cela est dû à l'hétérogénéité. Une analyse par donneur révèle que moins de donneurs sont sensibles aux politiques environnementales des bénéficiaires, par rapport à un nombre important d'entre eux dont l'aide est motivée par leurs propres intérêts. Cela met en lumière la nécessité d'explorer de nouvelles solutions technologiques afin d'améliorer l'allocation de l'aide.

La troisième étude a montré que les intérêts politiques l'emportent sur les considérations environnementales, les émissions de CO_2 étant plus élevées en période électorale. Cet effet est beaucoup plus présent dans les vieilles démocraties, où les candidats sont sanctionnés par les électeurs en cas de déficit, et trouvent donc des incitations à négliger temporairement la protection de l'environnement. Néanmoins, étant donné qu'une liberté accrue de la presse pour plus de sensibilisation et de démocratie, ainsi que des politiques environnementales rigoureuses sont associés à une plus petite taille de ce “cycle de pollution”, ceux-ci doivent être encouragés.

Ces études empiriques se heurtent à certaines limites, principalement en raison de la disponibilité des données. Par conséquent, nous pourrions envisager de faire des recherches supplémentaires lorsque les informations seront davantage disponibles ou lorsque de nouvelles méthodologies permettront d'aborder certains des problèmes rencontrés. Néanmoins, les méthodologies les mieux adaptées à chaque cas ont été utilisées afin de minimiser les biais potentiels inhérents aux différentes esitmations des effets. Par ailleurs, en particulier pour la deuxième étude empirique, il a été difficile d'obtenir un effet causal pour chacune des variables. Les prochaines études pourraient approfondir l'analyse de certaines de ces corrélations et tenter d'isoler un impact causal approprié. Ou encore examiner comment la gouvernance et l'allocation de l'aide pourraient être améliorées grâce aux nouvelles technologies. Cela fera l'objet de travaux futurs.

En ce qui concerne le rôle des cycles électoraux dans la politique environnementale des pays, il serait intéressant, en particulier pour les pays en développement, d'étudier plus en détail la manière dont les incitations des dirigeants sont influencées par les acteurs extérieurs. Il pourrait être intéressant d'examiner comment la composition de l'aide (par exemple, l'aide environnementale par rapport à d'autres types d'aide) change en période électorale. Cela sera également le sujet de travaux futurs.

Enfin, dans cette lutte contre le changement climatique, un élément supplémentaire à garder à l'esprit et qui n'est pas des moindres est le fait que l'APD, resource publique, ne peut à elle seule combler le besoin de financement. Il convient également de rechercher en priorité, dans la mesure du possible, des solutions émanant du secteur privé afin d'affecter les recettes publiques déjà insuffisantes à d'autres usages. C'est de plus en plus la ligne directrice[3] adoptée par les institutions multilatérales de développement telles que le groupe de la Banque mondiale.

[3]Également connue sous le nom de Maximizing Finance for Development (MFD).

References

Acharya, A., Blackwell, M., and Sen, M. Explaining causal findings without bias: Detecting and assessing direct effects. *American Political Science Review*, 110 (3):512–529, 2016.

Acht, M., Mahmoud, T. O., and Thiele, R. Corrupt governments do not receive more state-to-state aid: Governance and the delivery of foreign aid through non-state actors. *Journal of Development Economics*, 114:20–33, 2015.

Adger, W. N., Huq, S., Brown, K., Conway, D., and Hulme, M. Adaptation to climate change in the developing world. *Progress in Development Studies*, 3(3): 179–195, 2003.

Alesina, A. and Dollar, D. Who gives foreign aid to whom and why? *Journal of Economic Growth*, 5(1):33–63, 2000.

Arellano, M. and Bond, S. Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2):277–297, 1991.

Arellano, M. and Bover, O. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1):29–51, 1995.

Arvin, B. and Lew, B. Foreign aid and ecological outcomes in poorer countries: an empirical analysis. *Applied Economics Letters*, 16(3):295–299, 2009.

Bergquist, P. and Warshaw, C. Elections and parties in environmental politics. In *Handbook of US Environmental Policy*. Edward Elgar Publishing, 2020.

Bernauer, T. and Koubi, V. Effects of political institutions on air quality. *Ecological Economics*, 68(5):1355–1365, 2009.

Berthélemy, J.-C. Bilateral donors' interest vs. recipients' development motives in aid allocation: do all donors behave the same? *Review of Development Economics*, 10(2):179–194, 2006.

Berthélemy, J.-C. and Tichit, A. Bilateral donors' aid allocation decisions—a three-dimensional panel analysis. *International Review of Economics & Finance*, 13(3):253–274, 2004.

Betzold, C. and Weiler, F. Allocation of aid for adaptation to climate change: Do vulnerable countries receive more support? *International Environmental Agreements: Politics, Law and Economics*, 17(1):17–36, 2017.

Bierbaum, R. M., Fay, M., and Ross-Larson, B. World development report 2010: Development and climate change. Technical report, The World Bank, 2010.

Birdsall, N. and Sinding, S. W. How and why population matters: new findings new issues. 2001.

Blundell, R. and Bond, S. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1):115–143, 1998.

Boix, C., Stokes, S. C., Alt, J. E., and Rose, S. S. Context-conditional political budget cycles, 2009.

Boly, M. CO_2 mitigation in developing countries: the role of foreign aid. Working Papers 201801, CERDI, 2018. URL https://EconPapers.repec.org/RePEc:cdi:wpaper:1915.

Bove, V., Efthyvoulou, G., and Navas, A. Political cycles in public expenditure: Butter vs guns. *Journal of Comparative Economics*, 45(3):582–604, 2017.

Brender, A. and Drazen, A. Political budget cycles in new versus established democracies. *Journal of Monetary Economics*, 52(7):1271–1295, 2005.

Brender, A. and Drazen, A. How do budget deficits and economic growth affect reelection prospects? evidence from a large panel of countries. *American Economic Review*, 98(5):2203–20, 2008.

Brender, A. and Drazen, A. Elections, leaders, and the composition of government spending. *Journal of Public Economics*, 97:18–31, 2013.

Brock, W. A. and Taylor, M. S. The green solow model. *Journal of Economic Growth*, 15(2):127–153, 2010.

Brunel, C. and Levinson, A. Measuring environmental regulatory stringency. 2013.

Burnside, C. and Dollar, D. Aid, policies, and growth. *American economic review*, 90(4):847–868, 2000.

Buys, P., Dasgupta, S., Acharya, A., Ijjasz Vasquez, E. J., Hamilton, K., Meisner,

C. M., Pandey, K. D., and Wheeler, D. How has environment mattered? An analysis of world bank resource allocation. 2004.

Castro, R. and Hammond, B. *The architecture of aid for the environment: a ten year statistical perspective*. World Bank, 2009.

Chambers, P. E., Dutcher, E. G., and Isaac, R. M. Improving environmental quality through aid: An experimental analysis of aid structures with heterogeneous agents. *Ecological Economics*, 146:435–446, 2018.

Cisneros Tersitsch, M. E., Kis-Katos, K., and Nuryartono, N. Palm oil and the politics of deforestation in indonesia. Technical report, Ruhr Economic Papers, 2020.

Clist, P. 25 years of aid allocation practice: Whither selectivity? *World Development*, 39(10):1724–1734, 2011.

Combes, J. L., Ebeke, C., and Maurel, M. The effect of remittances prior to an election. *Applied Economics*, 47(38):4074–4089, August 2015. ISSN 0003-6846, 1466-4283. doi: 10.1080/00036846.2015.1023945. URL http://www.tandfonline.com/doi/full/10.1080/00036846.2015.1023945.

Combes, J.-L., Combes-Motel, P., and Kinda, S. R. Do climate mitigation efforts hurt trade performance? *Revue d'Economie Politique*, 126(5):947–970, 2016.

Cropper, M. and Griffiths, C. The interaction of population growth and environmental quality. *The American Economic Review*, 84(2):250–254, 1994.

Dauvergne, P. et al. The rise of an environmental superpower? Evaluating japanese environmental aid to southeast asia. 1998.

De Haan, J. and Klomp, J. Conditional political budget cycles: a review of recent evidence. *Public Choice*, 157(3-4):387–410, 2013.

Dewan, A. M., Kabir, M. H., Nahar, K., and Rahman, M. Z. Urbanisation and environmental degradation in dhaka metropolitan area of bangladesh. *International Journal of Environment and Sustainable Development*, 11(2):118–147, 2012.

Djankov, S., Montalvo, J. G., and Reynal-Querol, M. The curse of aid. *Journal of Economic Growth*, 13(3):169–194, 2008.

Dreher, A., Nunnenkamp, P., and Thiele, R. Does US aid buy un general assembly votes? a disaggregated analysis. *Public Choice*, 136(1-2):139–164, 2008.

Dreher, A., Nunnenkamp, P., and Thiele, R. Are 'new' donors different? comparing the allocation of bilateral aid between nondac and dac donor countries. *World Development*, 39(11):1950–1968, 2011.

Dreher, A., Klasen, S., Vreeland, J. R., and Werker, E. The costs of favoritism: is politically driven aid less effective? *Economic Development and Cultural Change*, 62(1):157–191, 2013.

Durand, M. Countries' experiences with well-being and happiness metrics. *Global Happiness*, 2018.

Dutschke, M. and Michaelowa, A. Development assistance and the cdm–how to interpret'financial additionality'. *Environment and development economics*, pages 235–246, 2006.

D'Amato, A., Marin, G., and Rampa, A. Environmental disasters and electoral cycle: An empirical analysis on floods and landslides in italy. *Environmental and Resource Economics*, 74(2):625–651, 2019.

Easterly, W. Are aid agencies improving? *Economic Policy*, 22(52):634–678, 2007.

Efthyvoulou, G. Political budget cycles in the european union and the impact of political pressures. *Public Choice*, 153(3-4):295–327, 2012.

Ehrlich, P. R. and Holdren, J. P. Impact of population growth. *Science*, 171(3977): 1212–1217, 1971.

Escher, R. and Walter-Rogg, M. Democratic qualities and environmental performance in democracies. In *Environmental Performance in Democracies and Autocracies*, pages 61–83. Springer, 2020.

Eskeland, G. S. and Harrison, A. E. Moving to greener pastures? Multinationals and the pollution haven hypothesis. *Journal of Development Economics*, 70(1): 1–23, 2003.

Farag, M., Nandakumar, A., Wallack, S. S., Gaumer, G., and Hodgkin, D. Does funding from donors displace government spending for health in developing countries? *Health Affairs*, 28(4):1045–1055, 2009.

Faye, M. and Niehaus, P. Political aid cycles. *The American Economic Review*, 102(7):3516–3530, 2012.

Feyzioglu, T., Swaroop, V., and Zhu, M. A panel data analysis of the fungibility of foreign aid. *The World Bank Economic Review*, 12(1):29–58, 1998.

Figaj, M. Who gets environmental aid? the characteristics of global environmental aid distribution. *Environmental Economics and Policy Studies*, 12(3):97–114, 2010.

Frankel, J. A. and Rose, A. K. Is trade good or bad for the environment? Sorting out the causality. *Review of Economics and Statistics*, 87(1):85–91, 2005.

Franzese, R. J. Electoral and partisan manipulation of public debt in developed democracies, 1956–90. In *Institutions, politics and fiscal policy*, pages 61–83. Springer, 2000.

Franzese, R. J. Electoral and partisan cycles in economic policies and outcomes. *Annual Review of Political Science*, 5(1):369–421, 2002.

Fredriksson, P. G. and Neumayer, E. Democracy and climate change policies: Is history important? *Ecological Economics*, 95:11–19, 2013.

Grossman, G. and Krueger, A. B. Economic growth and the environment. *Quarterly Journal of Economics*, 110(2):353–375, 1995.

Guillon, M. and Mathonnat, J. What can we learn on chinese aid allocation motivations from available data? a sectorial analysis of chinese aid to african countries. *China Economic Review*, 60:101265, 2020.

Gutner, T. Banking on the environment: Multilateral development banks and their performance in central and eastern europe, 2002.

Haber, S. and Menaldo, V. Do natural resources fuel authoritarianism? A reappraisal of the resource curse. *American Political Science Review*, 105(01):1–26, 2011.

Hadjiyiannis, C., Hatzipanayotou, P., and Michael, M. S. Competition for environmental aid and aid fungibility. *Journal of Environmental Economics and Management*, 65(1):1–11, 2013.

Halimanjaya, A. Climate mitigation finance across developing countries: what are the major determinants? *Climate Policy*, 15(2):223–252, 2015.

Halimanjaya, A. Allocating climate mitigation finance: A comparative analysis of five major green donors. *Journal of Sustainable Finance & Investment*, 6(3): 161–185, 2016.

Halimanjaya, A. and Papyrakis, E. Donor characteristics and the supply of climate change aid. *School of International Development*, 2012.

Halverson, E. and McNeill, C. I. *Advancing a new paradigm: institutional and policy breakthroughs toward poverty reduction and sound environmental management.*, pages 3–29.

Hamilton, K. and Clemens, M. Genuine savings rates in developing countries. *The World Bank Economic Review*, 13(2):333–356, 1999.

Hicks, R. L., Parks, B. C., Roberts, J. T., and Tierney, M. J. *Greening aid?: Understanding the environmental impact of development assistance*. OUP Oxford, 2008.

Hoeffler, A. and Outram, V. Need, merit, or self-interest—what determines the allocation of aid? *Review of Development Economics*, 15(2):237–250, 2011.

Holdren, J. P. Population and the energy problem. *Population and Environment*, 12(3):231–255, 1991.

Hyde, S. and Marinov, N. Nelda 4.0: National elections across democracy and autocracy dataset codebook for version 4, 2015.

Imai, K., Keele, L., Yamamoto, T., et al. Identification, inference and sensitivity analysis for causal mediation effects. *Statistical Science*, 25(1):51–71, 2010.

Joffe, M. M. and Greene, T. Related causal frameworks for surrogate outcomes. *Biometrics*, 65(2):530–538, 2009.

Kamat, A. S., Khosla, R., and Narayanamurti, V. Illuminating homes with leds in india: Rapid market creation towards low-carbon technology transition in a developing country. *Energy Research & Social Science*, 66:101488, 2020.

Katsimi, M. and Sarantides, V. Do elections affect the composition of fiscal policy in developed, established democracies? *Public Choice*, 151(1-2):325–362, 2012.

Kennedy, P. E. Oh no! I got the wrong sign! What should I do? *The Journal of Economic Education*, 36(1):77–92, 2005.

Kinda, R. S. et al. Democratic institutions and environmental quality: effects and transmission channels. In *2011 International congress, August 30–September 2, 2011, Zurich, Switzerland*, number 120396, 2011.

Klomp, J. and de Haan, J. Election cycles in natural resource rents: Empirical evidence. *Journal of Development Economics*, 121:79–93, 2016.

Knack, S. Aid dependence and the quality of governance: cross-country empirical tests. *Southern Economic Journal*, pages 310–329, 2001.

Kraay, A., Kaufmann, D., and Mastruzzi, M. *The worldwide governance indicators: methodology and analytical issues*. The World Bank, 2010.

Kümmel, R., Ayres, R. U., and Lindenberger, D. Thermodynamic laws, economic methods and the productive power of energy. *Journal of Non-Equilibrium Thermodynamics*, 35(2):145–179, 2010.

Laing, T. Rights to the forest, REDD+ and elections: Mining in guyana. *Resources Policy*, 46:250–261, 2015.

Lebovic, J. H. and Voeten, E. The cost of shame:international organizations and foreign aid in the punishing of human rights violators. *Journal of Peace Research*, 46(1):79–97, 2009.

Lewis, T. L. Environmental aid: Driven by recipient need or donor interests? *Social Science Quarterly*, 84(1):144–161, 2003.

Li, Q. and Reuveny, R. Democracy and environmental degradation. *International Studies Quarterly*, 50(4):935–956, 2006.

Lim, S., Menaldo, V., and Prakash, A. Foreign aid, economic globalization, and pollution. *Policy Sciences*, 48(2):181–205, 2015.

Lind, J. T. and Mehlum, H. With or without U? The Appropriate Test for a U-Shaped Relationship. *Oxford Bulletin of Economics and Statistics*, 72(1): 109–118, 2010.

List, J. A. and Sturm, D. M. How elections matter: Theory and evidence from environmental policy. *The Quarterly Journal of Economics*, 121(4):1249–1281, 2006.

Littlefield, S. R. Security, independence, and sustainability: Imprecise language and the manipulation of energy policy in the united states. *Energy Policy*, 52: 779–788, 2013.

Lizzeri, A. and Persico, N. The provision of public goods under alternative electoral incentives. *American Economic Review*, 91(1):225–239, 2001.

Magnani, E. The environmental kuznets curve, environmental protection policy and income distribution. *Ecological Economics*, 32(3):431–443, 2000.

Maizels, A. and Nissanke, M. K. Motivations for aid to developing countries. *World development*, 12(9):879–900, 1984.

Mandon, P. and Cazals, A. Political budget cycles: Manipulaion by leaders versus manipulation by researchers? evidence from a meta-regression analysis. *Journal of Economic Surveys*, 0(0), 2018.

McKinlay, R. D. and Little, R. A foreign policy model of us bilateral aid allocation. *World Politics: A Quarterly Journal of International Relations*, pages 58–86, 1977.

Michaelowa, A. and Michaelowa, K. Coding error or statistical embellishment? the political economy of reporting climate aid. *World Development*, 39(11): 2010–2020, 2011.

Mirza, M. M. Q. Climate change and extreme weather events: can developing countries adapt? *Climate Policy*, 3(3):233–248, 2003.

Moomaw, R. L. and Shatter, A. M. Urbanization and economic development: a bias toward large cities? *Journal of Urban Economics*, 40(1):13–37, 1996.

Neumayer, E. What factors determine the allocation of aid by arab countries and multilateral agencies? *Journal of Development Studies*, 39(4):134–147, 2003.

Nickell, S. Biases in dynamic models with fixed effects. *Econometrica: Journal of the Econometric Society*, pages 1417–1426, 1981.

Nordhaus, W. D. The political business cycle. *The Review of Economic Studies*, 42(2):169–190, 1975.

OCDE. *Climate Finance in 2013-14 and the USD 100 billion Goal*. 2015. doi: https://doi.org/https://doi.org/10.1787/9789264249424-en. URL https://www.oecd-ilibrary.org/content/publication/9789264249424-en.

OECD, D. Handbook on the oecd-dac climate markers. *Paris: Organisation for Economic Co-operation and Development's Development Assistance Committee (DAC). Available at: https://www. oecd. org/dac/stats/48785310. pdf*, 2011.

Ostrom, E., Gibson, C. C., Andersson, K., and Shivakumar, S. The samaritan's dilemma: The political economy of development aid, 2005.

Pailler, S. Re-election incentives and deforestation cycles in the brazilian amazon. *Journal of Environmental Economics and Management*, 88:345–365, 2018.

Papke, L. E. and Wooldridge, J. M. Econometric methods for fractional response variables with an application to 401 (k) plan participation rates. *Journal of Applied Econometrics*, 11(6):619–632, 1996.

Papke, L. E. and Wooldridge, J. M. Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics*, 145 (1-2):121–133, 2008.

Perkins, R. and Neumayer, E. Does the 'california effect' operate across borders? Trading-and investing-up in automobile emission standards. *Journal of European Public Policy*, 19(2):217–237, 2012.

Persson, T. and Tabellini, G. *Macroeconomic policy, credibility and politics*. Routledge, 2012.

Policardo, L. Is democracy good for the environment? quasi-experimental evidence from regime transitions. *Environmental and Resource Economics*, 64(2):275–300, 2016.

Prakash, A. and Potoski, M. Racing to the bottom? Trade, environmental governance, and iso 14001. *American Journal of Political Science*, 50(2):350–364, 2006.

Reinsberg, B. Blockchain technology and the governance of foreign aid. *Journal of Institutional Economics*, 15(3):413–429, 2019.

Rodrigues-Filho, S., Verburg, R., Bursztyn, M., Lindoso, D., Debortoli, N., and Vilhena, A. M. Election-driven weakening of deforestation control in the brazilian amazon. *Land Use Policy*, 43:111–118, 2015.

Rodrik, D. Why is there multilateral lending? Technical report, National bureau of economic research, 1995.

Rogoff, K. Equilibrium political budget cycles. *American Economic Review*, 80: 21–36, 1990.

Roodman, D. How to do xtabond2: An introduction to difference and system gmm in stata. *Stata Journal*, 9(1):86–136, 2009a.

Roodman, D. The anarchy of numbers: aid, development, and cross-country empirics. *The World Bank Economic Review*, 21(2):255–277, 2007.

Roodman, D. A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1):135–158, 2009b.

Rosenbaum, P. R. The consequences of adjustment for a concomitant variable that has been affected by the treatment. *Journal of the Royal Statistical Society. Series A (General)*, pages 656–666, 1984.

Ross, M. Conditionality and logging reform in the tropics. *Institutions for Environmental Aid: Pitfalls and Promise*, pages 167–98, 1996.

Ruggiero, P. G. *Impacts of conservation policies and electoral cycles on protected areas and forest cover in the Brazilian Atlantic Forest*. PhD thesis, Universidade de São Paulo, 2018.

Sanford, L. Democratization, elections, and public goods: The evidence from deforestation. 2018.

Sauter, C. How should we measure environmental policy stringency? a new approach. Technical report, IRENE Working paper, 2014.

Shafiei, S. and Salim, R. A. Non-renewable and renewable energy consumption and co_2 emissions in oecd countries: a comparative analysis. *Energy Policy*, 66: 547–556, 2014.

Shahbaz, M., Sbia, R., Hamdi, H., and Ozturk, I. Economic growth, electricity consumption, urbanization and environmental degradation relationship in united arab emirates. *Ecological Indicators*, 45:622–631, 2014.

Shi, A. The impact of population pressure on global carbon dioxide emissions, 1975–1996: evidence from pooled cross-country data. *Ecological Economics*, 44 (1):29–42, 2003.

Shi, M. and Svensson, J. Political budget cycles: Do they differ across countries and why? *Journal of Public Economics*, 90(8-9):1367–1389, 2006.

Silva, J. S. and Tenreyro, S. The log of gravity. *The Review of Economics and Statistics*, 88(4):641–658, 2006.

Silva, J. S. and Tenreyro, S. Further simulation evidence on the performance of the poisson pseudo-maximum likelihood estimator. *Economics Letters*, 112(2): 220–222, 2011.

Stern, N. The economics of climate change. *American Economic Review*, 98(2): 1–37, 2008.

Strezhnev, A. and Voeten, E. United Nations General Assembly Voting data (codebook). *URL http://hdl. handle. net/1902.1/12379*, 2013.

Sun, Y., Zhang, X., Hong, Y., and Wang, S. Asymmetric pass-through of oil prices to gasoline prices with interval time series modelling. *Energy Economics*, 78: 165–173, 2019.

Tierney, M. J., Nielson, D. L., Hawkins, D. G., Roberts, J. T., Findley, M. G., Powers, R. M., Parks, B., Wilson, S. E., and Hicks, R. L. More dollars than sense: Refining our knowledge of development finance using aiddata. *World Development*, 39(11):1891–1906, 2011.

Tol, R. S. Climate policy versus development aid. Technical report, ESRI Working Paper, 2007.

Trumbull, W. N. and Wall, H. J. Estimating aid-allocation criteria with panel data. *The Economic Journal*, 104(425):876–882, 1994.

Tsakiris, N., Hatzipanayotou, P., and Michael, M. S. Can competition for aid reduce pollution?, 2005.

UNFCCC. United nations framework convention on climate change. *art. 1, 31 I.L.M. 849 (1992)*, 1992.

UNFCCC, S. Compilation of information on nationally appropriate mitigation actions to be implemented by parties not included in annex i to the convention. FCCC/AWGLCA/2011/INF. 1. Geneva, Switzerland: United Nations, Framework Convention on Climate Change, 2011.

Vansteelandt, S. Estimating direct effects in cohort and case–control studies. *Epidemiology*, 20(6):851–860, 2009.

Vergne, C. Democracy, elections and allocation of public expenditures in developing countries. *European Journal of Political Economy*, 25(1):63–77, 2009.

Waddington, C. Does earmarked donor funding make it more or less likely that developing countries will allocate their resources towards programmes that yield the greatest health benefits? *Bulletin of the World Health Organization*, 82(9): 703–706, 2004.

Wagner, D. Aid and trade : an empirical study. *Journal of the Japanese and International Economies*, 17(2):153–173, 2003.

Ward, G. Happiness and voting behaviour. *World Happiness Report 2019*, 2019.

Weikmans, R., Timmons Roberts, J., Baum, J., Bustos, M. C., and Durand, A.

Assessing the credibility of how climate adaptation aid projects are categorised. *Development in Practice*, 27(4):458–471, 2017.

Weiler, F., Klöck, C., and Dornan, M. Vulnerability, good governance, or donor interests? the allocation of aid for climate change adaptation. *World Development*, 104:65–77, 2018.

Welsch, H. Implications of happiness research for environmental economics. *Ecological Economics*, 68(11):2735–2742, 2009.

Windmeijer, F. A finite sample correction for the variance of linear efficient two-step gmm estimators. *Journal of Econometrics*, 126(1):25–51, 2005.