How much does environment pay for politicians?

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Abstract

ln this paper we empirically explore how elections impact environmental degradation using a sample of 77 democratic countries over the period 1990-2014. Three key results emerge. First, election years are characterized by an increase in CO_2 emissions, even though the effect seems to diminish over the recent years. Second, this effect is present only in established democracies, where fiscal manipulation by incumbents is done through the composition of spending rather than the level. Third, better access to information and the adoption of strict environmental policies reduce the size of this trade-off between pork-barrel spending and the public good, namely environment quality.

Keywords

CO_2 emissions, Elections, Environmental policy.

JEL Codes

E62, O13, Q53.

1 Introduction

Voters generally value better economic performance and material wellbeing (Franzese, 2002). Therefore, incumbents have strong incentives to play on voters behavior to get renewed in office. This can be achieved by using fiscal policy before elections (Nordhaus, 1975; Rogoff, 1990; Shi and Svensson, 2006).

Political budget cycles (PBCs) research focuses on how fiscal policy is used for-reelection purposes: depending on the voters' experience, incumbents can either play on the level of fiscal outcomes, or their composition (Brender and Drazen, 2013). Depending on how fiscal manipulation is operated, a trade-off may appear between election-motivated expenditure and the provision of public goods (Lizzeri and Persico, 2001; Bove et al., 2017). Most of the empirical studies that have predicted opportunistic behavior from politicians in election years, only focus on fiscal outcomes, ignoring the effect they could have on environment. A very few number of recent studies try to assess the impact of PBCs on deforestation in Brazil (Rodrigues-Filho et al., 2015; Pailler, 2018) and find evidence that election years are characterized by high deforestation rates, due to weakening institutional constraints.

In this paper we explore how governments may use the trade-off between pork-barrel projects and public goods such as environmental protection for-reelection purposes. To estimate the impact elections have on environmental degradation (measured with CO_2 emissions), we use data on 77 democracies over the period 1990-2014. We find evidence of a pollution-increasing effect of elections, which tends to decrease over time. Compared to previous studies that focus only on one country, we use a large set of countries. Moreover, we highlight some factors that shape the trade-off between pork-barrel spending and environmental protection. Some of them, suggested in previous studies (Brender and Drazen, 2005; Shi and Svensson, 2006) are conditional factors of PBCs, while some are linked to the stringency of environmental policies 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 and section 4 presents our main results. The final section offers the conclusions.

2 Background

2.1 About political budget cycles

A growing literature suggests 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 part of this literature, quite larger, 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).

Even though the theory on political business cycles seems unambiguous, empirical studies are however more contrasted. It appears that the magnitude or even the existence of such cycles depends on different factors; De Haan and Klomp (2013) provide a good 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 tend to decrease. Such conclusions

do not however imply that there is no fiscal manipulation in established democracies: the previous conclusions were focusing solely on the dynamics of the overall budget. In established democracies, voters are better aware that fiscal policy is used for re-election purposes and punish deficit spending (Brender and Drazen, 2008); thus, opportunistic politicians can use fiscal policy while avoiding an increase of the overall budget deficit, by changing the composition of expenditure (Brender and Drazen, 2005; Vergne, 2009). They can do this, shifting for instance public expenditure towards current expenditure which are more visible and away from capital expenditure (Rogoff, 1990; Katsimi and Sarantides, 2012), or targeting 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.

In a similar vein, 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 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 size of electoral fiscal cycles is negatively correlated with it, as showed 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[1] as voters.

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

[1] 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 in other sectors.

election, but to an extent that is exaggerated by researchers.

2.2 Consequences 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), shifting outlays from sectors in which benefits are not immediately visible to others. They can shift expenses from one category to another[2], or even among sectors[3]. It is therefore likely that environment could be affected; environmental protection is a public good, for which benefits are not quickly visible since they are more present in the long-run. Moreover, benefits from it 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 public goods such as environment, resulting in an under-provision.

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. Then, one way to test the effect elections have on environment is to analyze the impact on environmental degradation, rather than looking at the composition of public expenditure. 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 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 inability to fight illegal deforestation.

Election years are also characterized by intensive pressure on environment through

[2]From capital expenditure to current expenditure for instance.

[3]Bove et al. (2017) find that governments increase social expenses and reduce military expenditure in election years.

resource plundering; indeed, governments participate in intensive resource plundering during such periods. Klomp and de Haan (2016) find that natural resources rents[4] are higher during elections because incumbents use them to expand public spending and reduce taxes during such periods. This increased pressure on environment can also result in greater degradation in such periods.

Faced also with the lack of data on environmental expenditure, we assess the impact of elections on environment, using CO_2 emissions. 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 the level of democratic capital (Fredriksson and Neumayer, 2013), access on 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.

3 Empirical tests

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 environment. Alternatively, shortened time horizons or the need to finance campaigns could create bad incentives, resulting in a reallocation of efforts and funds from environmental protection to other sectors in which benefits are immediately visible. To evaluate our theoretical intuitions, we formulate and test the following hypotheses:

H1: Given the fact that environmental benefits are not immediately observed in the very short run, politicians might be tempted to completely ignore environmental

[4]including forest rents.

issues to boost economic activity during election periods; this leading to an increased environmental degradation during such periods. 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 differ in magnitude or even in sign, depending on some factors such as democracy age, citizens access to information or the presence of strict environmental policies which limit the incumbent's leeway or oblige him to align with voters' preferences.

3.1 Model Specification and Methodology

The data generating process is given by Equation 1:

$$Y_{it} = \alpha + \beta_1 Elections_{it} + X_{it}\beta_2 + \mu_i + \epsilon_{it} \tag{1}$$

Where Y_{it} represents environmental degradation for country i during year t. We proxy environmental degradation by CO_2 emissions because it is a widely employed measure in the literature (Arvin and Lew, 2009). Moreover, 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. 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 higher environmental degradation (measured by CO_2 emissions).

Tests led on fixed effect regressions reveal the presence of heteroskedasticity and serial correlation for the error term[5]. We therefore estimate Equation 1 using the

[5]see in appendix.

Feasible Generalized Least Squares (FGLS) estimator (Fomby et al., 2012) to deal with both issues.

3.2 Data

3.2.1 Elections

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 1960-2010, 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 77 democratic countries. Second, we only keep elections for which the incumbent declared his or her 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 avoid 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

[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).

[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.

are those that occur at the constitutionally set date.

It is common in this type of research to use a dummy that is 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 has the advantage of reducing measurement error compared to the dummy. 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 years its value is set to zero.

3.2.2 CO_2 Emissions

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. Figure 1 presents average CO_2 emissions in election years versus non-election years; it suggests a significant difference between the two, with emissions in election years being relatively higher in average.

We also use CO_2 intensity of the GDP as alternative measure; it has the advantage to be the product of two component's of Kaya's equation (Kaya and Yokobori, 1997), namely the energy intensity of GDP and the CO_2 content of energy. It is measured in terms of kg per 2011 PPP $ of GDP. Data on both emissions per capita and CO_2 intensity come from the World Bank Development Indicators (WBDI).

3.2.3 Control Variables

We include a set of covariates which encompass those commonly used in the literature. These include gross domestic savings as a share of GDP and population growth (Brock and Taylor, 2010). We also include urbanization (Shahbaz et al., 2014), measured as the share of urban population in total population, and energy transition that we proxy through the share of renewable energy in the energy mix (Alvarez-Herranz et al., 2017). As additional control, we add government expenses as a share of GDP. Data on savings,

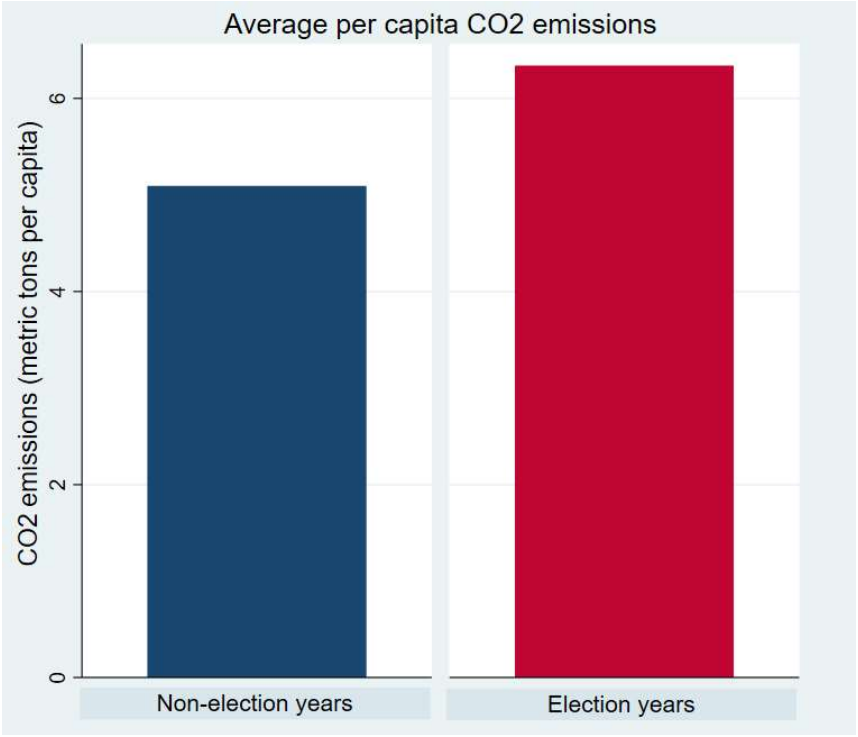

Figure 1: Average CO_2 emissions and intensities in election versus non-election years

population growth, urbanization, renewable energy and government spending are from the WBDI. Finally, since aid is not environmentally neutral (Lim et al., 2015; Boly, 2018) and affected by electoral cycles (Faye and Niehaus, 2012), we include environmental aid; the data are obtained from the AidData web portal. Each aid flow is assigned a unique purpose code, depending on its sector. Starting from these purpose codes, Hicks et al. (2008) assigned environmental impact codes (dirty, friendly, neutral) to each aid flow in this dataset, up to 2008. Boly (2018) applied the same coding scheme as Hicks et al. (2008) and extended these environmental codes to recent years. We follow their coding methodology to isolate environmental aid from other aid flows.

For regressions based on the whole sample, we expect a positive effect on per capita CO_2 emissions for urbanization, savings and government spending, and a negative effect for environmental aid, population growth and renewable energy. However, since some

of these variables may also affect GDP, their resulting effect on CO_2 intensity could be different from the one on CO_2 per capita. This depends on the sign and magnitude of the effect they have on GDP.

Descriptive statistics of all variables are provided in Table 1 and reveal a high heterogeneity in our sample.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	C.V	Min	Max
CO_2 per capita (metric tons)	1821	5.1731	5.3263	1.0296	0.0285	36.8168
CO_2 intensity (kg per 2011 PPP $)	1806	0.2862	0.2033	0.7104	0.005	1.3877
Election Variable	1918	0.0595	0.1923	3.2323	0	1
Environmental aid (2011 $ per capita)	1369	4.7115	14.3297	3.0415	0	296.4061
Gross domestic savings (% of GDP)	1728	20.3744	10.8612	0.5331	-20.1635	67.2772
Population growth (%)	1839	1.1575	1.0317	0.8913	-2.5743	6.0170
Urban Population (% of total)	1841	59.8547	20.9365	0.3498	8.534	97.776
Government expense (% of GDP)	1342	26.7406	12.6801	0.4742	1.8777	134.7713
Renewables (% of energy cons.)	1745	30.2658	26.0529	0.8608	0.3242	100

Notes: Descriptive statistics are based on the whole sample.

4 Findings

4.1 Baseline

Table 2 provides the baseline results. Columns 1 and 4 present results obtained on the whole period for both CO_2 per capita and CO_2 intensity; the results suggest 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 1.13% and that CO_2 intensity is 2 grams higher in 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 have mobilized more and more

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 2005 as cutoff period, as it is the year in which the Kyoto agreement entered into force. Columns 2 and 5 show the results over the pre-Kyoto periods for CO_2 emissions and intensity respectively. As expected, we find a positive and statistically significant effect of elections for pre-Kyoto years, with emissions increasing by about 1.6% in election years and emissions intensity increasing by 5 grams per $. We find no significant effect in columns 3 and 6, which correspond to the post-Kyoto period. These findings confirm our first hypothesis: politicians ignore environmental issues and focus on economic growth, resulting in higher environmental degradation in such periods. But it seems 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 effect we obtain on the whole period.

Table 2: Determinants of CO_2

Dependent Variable	Log of CO_2 (per capita)			CO_2 intensity (kg/ 2011$)		
	Whole Period	Pre-Kyoto	Post-Kyoto	Whole Period	Pre-Kyoto	Post-Kyoto
	(1)	(2)	(3)	(4)	(5)	(6)
Elections	0.0113***	0.0157**	-0.0236	0.0026**	0.0055**	-0.0029
	(0.0043)	(0.0075)	(0.0214)	(0.0013)	(0.0028)	(0.00327)
Environmental Aid per capita (Log)	-0.0023***	-0.0022***	-0.0080***	-0.0003**	-0.0003	-0.0007**
	(0.0005)	(0.0006)	(0.0019)	(0.0002)	(0.0002)	(0.0003)
Gross domestic savings (% of GDP)	0.0063***	0.0111***	0.0123***	-0.0002	-0.0016***	0.0007***
	(0.0007)	(0.0010)	(0.0011)	(0.0001)	(0.0002)	(0.0001)
Population growth (%)	-0.0558***	-0.0411***	-0.1490***	-0.0022	-0.0165***	0.0062***
	(0.0072)	(0.0081)	(0.0140)	(0.0023)	(0.0031)	(0.00180)
Urban Population (% of total)	0.0127***	0.0140***	0.0094***	-0.0012***	-0.0022***	-0.0013***
	(0.0007)	(0.0007)	(0.0010)	(0.0001)	(0.0003)	(0.0001)
Government spending (% of GDP)	0.0033***	0.0030***	0.0092***	0.00003	-0.0003**	-0.0006***
	(0.0005)	(0.0006)	(0.0016)	(0.0001)	(0.0002)	(0.0002)
Renewables (% of energy cons.)	-0.0312***	-0.0350***	-0.0333***	-0.0039***	-0.0063***	-0.0042***
	(0.0005)	(0.0006)	(0.0008)	(0.0002)	(0.0002)	(0.0001)
Constant	0.8880***	0.7920***	0.9750***	0.4330***	0.7310***	0.4460***
	(0.0511)	(0.0539)	(0.0835)	(0.0182)	(0.0250)	(0.0067)
Observations	888	556	325	888	556	325
Countries	63	59	52	63	59	52
Avg_time	14.10	9.424	6.250	14.10	9.424	6.250
Max_time	23	15	8	23	15	8
Wald_pvalue	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

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

4.2 Conditioning factors

4.2.1 The role of democracy age

The effect we found in Table 2 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. 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 will increase as well as that of other sectors. 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 3, by estimating the equation on sub-samples of established and new democracies[9]. Columns 1 and 3 correspond to established democracies and suggest that emissions per capita are 1.8% higher and that each $ of GDP generates 9 additional grams of CO_2 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 environment, for which benefits are observed in the long-term.

[9]We follow Brender and Drazen (2005), using the POLITY filter to separate established and new democracies.

Table 3: The role of democracy age

Dependent variable	Log of CO_2 (per capita)		CO_2 intensity (kg/2011$)	
	Old	Young	Old	Young
	(1)	(2)	(3)	(4)
Elections	0.0185**	0.0045	0.0090**	0.0009
	(0.0089)	(0.0127)	(0.0038)	(0.0013)
Environmental Aid per capita (Log)	-0.0015*	-0.0018*	-0.0002	-0.0005**
	(0.0009)	(0.0010)	(0.0002)	(0.0002)
Gross domestic savings (% of GDP)	0.0063***	0.0038***	0.0002	0.00002
	(0.0012)	(0.0001)	(0.0003)	(0.0002)
Population growth (%)	-0.0153	-0.0916***	0.0059	-0.0060*
	(0.0114)	(0.0157)	(0.0038)	(0.0036)
Urban Population (% of total)	0.0191***	0.0168***	-0.0027***	0.0003
	(0.0011)	(0.0012)	(0.0005)	(0.0004)
Government spending (% of GDP)	0.0013	0.0021***	0.0005	0.0001
	(0.0012)	(0.0007)	(0.0003)	(0.0001)
Renewables (% of energy cons.)	-0.0258***	-0.0320***	-0.0044***	-0.0042***
	(0.0013)	(0.0009)	(0.0003)	(0.0002)
Constant	0.4570***	0.7570***	0.6140***	0.4200***
	(0.0939)	(0.0973)	(0.0378)	(0.0229)
Observations	352	536	352	536
Countries	27	36	27	36
Avg_time	13.04	14.89	13.04	14.89
Max_time	23	23	23	23
Wald_pvalue	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

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

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 stimulation of some sectors is offset by the increase in the budget allocated to environmental protection projects.

4.2.2 Access to information

Information is the base of 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 information, using sub-samples.

We use the Freedom House's annual press freedom index[10]. 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 and are in line with previous findings: in election years, CO_2 emissions are 8% higher and CO_2 intensity increases by about 31 grams for countries where the press is considered as "not free". We get no statistically significant effect on the two other sub-samples, namely countries with medium and high freedom of the press. Thus, a better access to information allows to dampen fiscal manipulation and, at the same time, its resulting environmental damages.

[10]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.

Table 4: Freedom of the Press

Dependent variable	Log of CO_2 (per capita)			CO_2 intensity (kg 2011$)		
	Low	Medium	High	Low	Medium	High
	(1)	(2)	(3)	(4)	(5)	(6)
Elections	0.0823*	0.0046	0.0139	0.0308**	0.0019	0.0024
	(0.0463)	(0.0152)	(0.0127)	(0.0120)	(0.0042)	(0.0024)
Environmental Aid per capita (Log)	-0.0012	-0.0047**	-0.0026***	-0.0021***	-0.0003	-0.0008***
	(0.0021)	(0.0018)	(0.0009)	(0.0004)	(0.0004)	(0.0003)
Gross domestic savings (% of GDP)	0.0157***	0.0064***	0.0119***	0.0004*	0.0003	0.0002
	(0.002)	(0.001)	(0.002)	(0.0002)	(0.0002)	(0.0002)
Population growth (%)	-0.0059	-0.118***	-0.127***	-0.0296***	-0.0015	-0.0006
	(0.0145)	(0.0174)	(0.0124)	(0.0034)	(0.005)	(0.0032)
Urban Population (% of total))	0.0128***	0.0155***	0.0160***	-0.0002	-0.0016***	-0.001***
	(0.0013)	(0.0007)	(0.0013)	(0.0001)	(0.0004)	(0.0003)
Government expenditures (% ofGDP)	0.0091***	0.0013	0.0039***	0.0025***	0.0001	0.0003**
	(0.0021)	(0.001)	(0.001)	(0.0004)	(0.0002)	(0.0001)
Renewables (% of energy cons.)	-0.0356***	-0.0278***	-0.0399***	-0.004***	-0.0046***	-0.0045***
	(0.0012)	(0.0008)	(0.001)	(0.0003)	(0.0003)	(0.0002)
Constant	0.518***	0.621***	0.929***	0.412***	0.499***	0.472***
	(0.130)	(0.081)	(0.101)	(0.0183)	(0.0353)	(0.0247)
Observations	162	340	373	162	340	509
Countries	35	33	42	35	33	43
Avg_time	4.629	10.30	8.881	4.629	10.30	11.84
Max_time	17	20	20	17	20	23
Wald_pvalue	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

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

4.2.3 The role of environmental regulation

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 rather incentives for the politicians to adopt non-economic policies which are close to the 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[11] to environmental quality.

In order to assess these issues we use the share of renewable energy in percentage of total energy consumption as a proxy of the stringency of environmental policies; we use this measure as it is available for an important number of countries over relatively long time periods. This variable, which is positively correlated with energy transition, can be considered as the result of environmental policies taken upstream. Thus, the higher the share of renewable energy, the stricter the environmental policy. As for access to information, we use the 1^{st} and 3^{rd} quartiles to split the sample in three sub-groups.

The results presented in Table 5 confirm our intuitions. For countries with a very low share of renewables (i.e lax environmental policy), emissions per capita rise by up to 13.2%, against only 2% for the sub-sample with a medium stringency of environmental policy, during election years. Similarly, carbon intensity of GDP rise by 15 grams and 10 grams respectively for the sub-samples of low and medium stringency. We find no effect for countries with very strict environmental policy. This latter result suggests that the adoption of stringent environmental policies allows to dampen the cycle, as it limits the incumbents' leeway and oblige them to align with citizens' preferences.

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

Table 5: Stringency of environmental policies

Dependent Variable	Log of CO_2 (per capita)			CO_2 intensity (kg 2011 $)		
	Low	Medium	High	Low	Medium	High
	(1)	(2)	(3)	(4)	(5)	(6)
Elections	0.1320**	0.0207**	-0.0073	0.0156*	0.0100**	0.0005
	(0.0522)	(0.0096)	(0.0828)	(0.0089)	(0.0044)	(0.0017)
Environmental Aid per capita (Log)	-0.0034**	-0.0012	-0.0698***	-0.0001	-0.0017***	-0.0006*
	(0.0015)	(0.0010)	(0.0077)	(0.0005)	(0.0003)	(0.0003)
Gross domestic savings (% of GDP)	0.0110***	0.0086***	0.0146***	0.0013***	0.0011***	-0.0003*
	(0.0008)	(0.0014)	(0.0014)	(0.0003)	(0.0002)	(0.0001)
Population growth (%)	-0.0431***	-0.0880***	-0.2030***	-0.0339***	0.0034	0.0081**
	(0.0063)	(0.0082)	(0.0164)	(0.0055)	(0.0022)	(0.0038)
Urban Population (% of total)	0.0231***	0.0067***	0.0115***	0.0044***	0.0005***	-0.0007***
	(0.0008)	(0.0013)	(0.0007)	(0.0003)	(0.0001)	(0.0002)
Government spending (% of GDP)	0.0020***	0.0057***	0.0007	-0.0014***	-0.0010***	-0.00001
	(0.0008)	(0.0010)	(0.0009)	(0.0003)	(0.0001)	(0.00004)
Renewables (% of energy cons.)	-0.0370***	-0.0290***	-0.0365***	0.0041***	-0.0027***	-0.0028***
	(0.0046)	(0.0014)	(0.0012)	(0.0010)	(0.0001)	(0.0002)
Constant	0.0009	1.1460***	1.4330***	0.1700***	0.2410***	0.3300***
	(0.0670)	(0.1020)	(0.0917)	(0.0261)	(0.0057)	(0.0239)
Observations	216	418	251	219	423	250
Countries	18	36	24	21	41	23
Avg_time	12	11.61	10.46	10.43	10.32	10.87
Max_time	20	23	23	20	23	23
Wald_pvalue	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

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

5 Conclusion and discussion

In this paper we consider the empirical evidence for the existence of environmental damages induced by political cycles, since previous empirical studies are scarce concerning this issue. Using electoral data for 77 democratic countries (31 established and 46 new democracies), we find evidence that CO_2 emissions are higher over the year preceding an election, and that this effect is becoming weaker over time, 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 information), as well as a new conditioning factor linked to the stringency of environmental policy. 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 media access, and the adoption of stringent environmental policies help reducing the 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 choose the appropriate set of policies that match voters' concerns.

Further research could investigate whether incumbents incentives are shaped by external actors, through external financial flows like foreign aid, as previous research show that bilateral donors use Official Development Assistance to influence elections outcomes in recipient countries (Faye and Niehaus, 2012). It could for instance be possible to check if, beyond the total amount, donors shape recipient countries incentives in election periods, through a change in aid composition.

References

Alvarez-Herranz, A., Balsalobre-Lorente, D., Shahbaz, M., and Cantos, J. M. (2017). Energy innovation and renewable energy consumption in the correction of air pollution levels. *Energy Policy*, 105:386–397.

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

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

Boly, M. (2018). CO_2 mitigation in developing countries: the role of foreign aid. Working Papers 201801, CERDI.

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

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

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

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

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

Combes, J. L., Ebeke, C., and Maurel, M. (2015). The effect of remittances prior to an election. *Applied Economics*, 47(38):4074–4089.

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

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

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

Fomby, T. B., Hill, R. C., and Johnson, S. R. (2012). *Advanced econometric methods*. Springer Science & Business Media.

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

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

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

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

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

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

Kaya, Y. and Yokobori, K. (1997). *Environment, energy, and economy: strategies for sustainability*. United Nations University Press Tokyo.

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

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

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

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

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

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

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

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

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

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

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

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

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

6 Appendices

Table 6: Wooldridge test for autocorrelation in panel data

H0: No first order autocorrelation	
F (1, 54)	57.716
P-value	0.0000

Table 7: Modified Wald test for groupwise heteroskedasticity

H0: $(\sigma_i)^2 = \sigma^2$ for all i	
Chi2 (68)	5.4e+28
P-value	0.0000

Table 8: Quartiles of Access to information and Renewable Energy

Variable	Quartile	
	Q1	**Q3**
Internet Access (%)	0.83	39.22
Renewable Energy consumption (%)	8.37	45.13

Table 9: 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	**Trinidad and Tobago***
Cape Verde	**Israel***	**Norway***	**Turkey***
Chile*	**Italy***	Pakistan	**United Kingdom***
Colombia	**Jamaica***	Panama	**United States***
Costa Rica	**Korea South***	Paraguay	**Uruguay***
Cyprus*	**Latvia***	Peru	**Venezuela***
Denmark*	Lesotho	Philippines	Zambia
Dominican Republic	**Lithuania***	**Poland***	
Ecuador	**Luxembourg***	**Portugal***	
El Salvador	Madagascar	Romania	

Established democracies in bold with a (*)