How much does environment pay for politicians?

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Abstract

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 C02 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
CO2emissions, Elections, Environmental policy, Panel data

JEL Codes
D72, E62, O13, Q54

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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 tends to be weaker over the recent years. We highlight some factors that shape this relationship. Some of them are

[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.

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.

2 Background

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.

[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

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.

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 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

share devoted to environment, in order to re-allocate it to other sectors.

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.

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.

3.1 Data and stylized facts

3.1.1 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:

$$PT^{f}_{i,t} = 100 * \frac{\Delta P^{f}_{i,t}}{\Delta P^{*}_{t}} * \frac{P^{*}_{t-1}}{P^{f}_{i,t-1}} \tag{1}$$

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 Kpodar and Abdallah (2017) 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 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.

Figures 1 and 2 respectively show pass-through elasticities for positive and negative price shocks of crude oil. Figure 1 suggests that negative shocks in international prices are always partially passed-through to domestic consumers, independently from whether

[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.

[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).

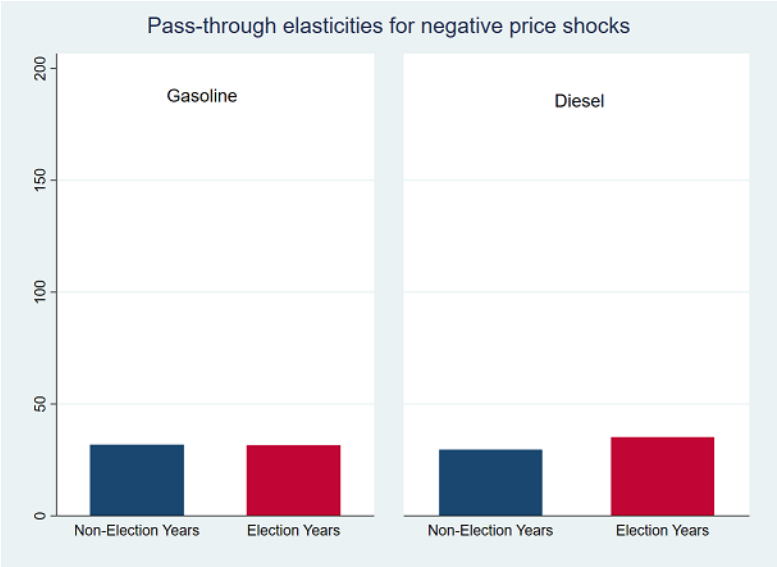

Figure 1: Pass-through elasticities for negative price shocks of crude oil

we are in elections periods or not, given that they always remain below 100.

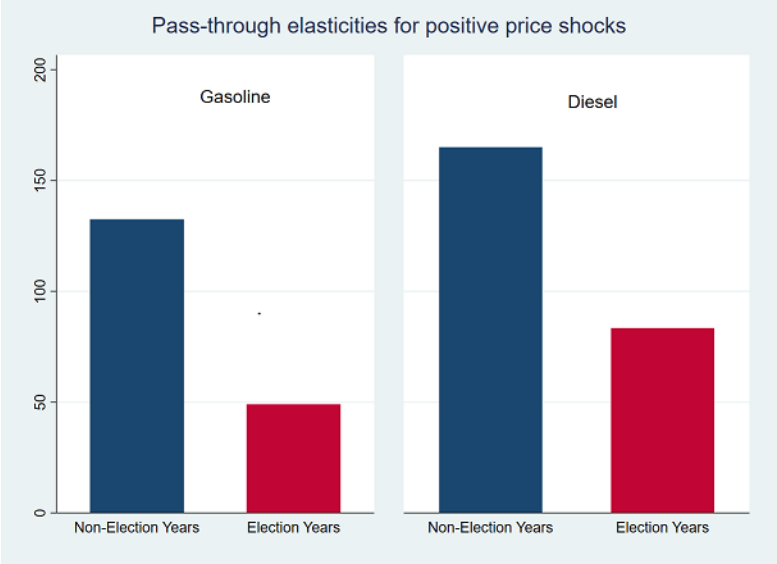

Figure 2: Pass-through elasticities for positive price shocks of crude oil

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 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 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.

3.1.2 Elections

Figure 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.

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

[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.

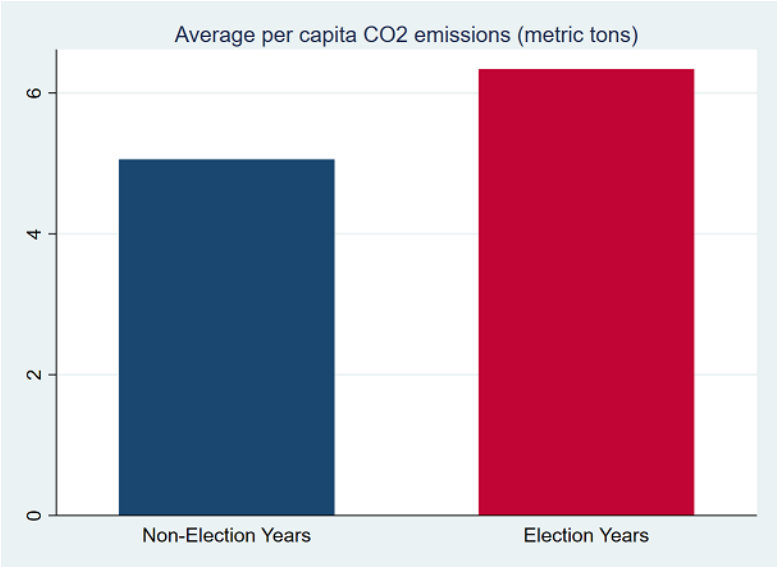

Figure 3: Average CO_2 emissions and intensities in election versus non-election years

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 in-

[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.

terval; 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 years its value is set to zero.

3.1.3 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.

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

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:

$$Log(CO_2)_{it} = \phi Log(CO_2)_{it-1} + \beta_1 Elections_{it} + X_{it}\beta_2 + \mu_i + \tau_t + \epsilon_{it} \quad (2)$$

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 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 2. We use it in its two-step

version, which is more efficient. We also limit the lags length, to avoid instruments proliferation (Roodman, 2009) given our relatively large time period [10].

4 Findings

4.1 Baseline

Table 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

[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.

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

Table 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

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

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 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.

4.2 Conditioning factors

4.2.1 Experience in democracy

The effect we found in Table 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 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 in the long-term.

In new democracies, we obtain no effect because politicians increase the overall

[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) democracies.

Table 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

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

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.

4.2.2 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.

Table 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

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

The results are displayed in Table 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

[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.

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.

4.2.3 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 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

Table 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

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

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.

of environmental preferences since it has been shown that high inequalities are associated with lower environmental preferences (Magnani, 2000). The results are presented in appendix

4.3 Robustness Checks

4.3.1 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 A.2, table A.3 and table A.4 respectively.

4.3.2 Additional Controls

We include additional controls in table A.5. 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 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 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.

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.

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Appendices

Table A.1: 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 1

Table A.2: 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 A.3: 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 A.4: 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 A.5: 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 A.6: 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 A.7: 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