

Spyros Skouras and Nicos Christodoulakis
**Electoral misgovernance cycles: evidence
from wildfires and tax evasion in Greece
and elsewhere**

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Disclaimer: All views expressed in the paper are solely those of the authors and do not necessarily reflect the position of any other person or institution. The second author was Minister of the Economy in Greece during 2001-2004 which provided several insights on the causes and manifestation of electoral misgovernance.

**Electoral Misgovernance Cycles:
Evidence from wildfires and tax evasion
in Greece and elsewhere**

Spyros Skouras[#] and Nicos Christodoulakis^{*}

ABSTRACT

We present detailed empirical evidence that around Greek elections, misgovernance results in significant increases in wildfires and tax evasion and with important economic implications: the cumulative cost of these effects in recent years has been over 8% of GDP and has therefore been a contributing factor to Greece's debt crisis and any effect this has had on the global economy. We interpret this evidence as a type of misgovernance which arises from electoral cycles in two types of incumbent incentives: (i) to allocate effort or attention between governing vs. campaigning; and/or (ii) to adopt even very inefficient redistributive policies if they benefit special interests with a lead over when the costs are observed. While these incentives may manifest differently among countries, our analysis suggests that electoral cycles everywhere may be much more multifaceted and harmful than previous literature suggests.

JEL Classification: D72, H26, E01, H11

Keywords: political cycles; voting behaviour; performance of government; forest fires, tax evasion.

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Electoral Misgovernance Cycles: Evidence from wildfires and tax evasion in Greece and elsewhere

1. Introduction

Since the seminal papers of Nordhaus (1975) and Hibbs (1977), a great deal of effort has been devoted to understanding the distortions elections can impose on an economy. Economists have focused on the theory and empirical evidence for electoral cycles in important macroeconomic policy instruments such as government spending and money supply, and in macroeconomic outcomes such as inflation and unemployment. At the same time a plethora of disparate evidence suggests pervasive effects of all kinds of elections (from district attorneys to presidents) on society at large including the probability that wars are initiated (Gaubatz 1991), the timing of executions (Kubik and Moran 2003), the administration of criminal justice (Dyke, 2007), police appointments (Levitt 1997), environmental policy (Huang 2010), the degree of enforcement of labor regulations (Ronconi 2008) and shirking by elected officials (Kuklinski 1978).

Our work builds on striking evidence that around Greek parliamentary elections wildfires and tax evasion increase dramatically. An immediate feel for the effect can be obtained from figures 1 and 2 though we later present rigorous econometric analysis that shows the effect is both statistically and economically very significant. Areas burnt by wildfires on elections years have been 2.5 times the area burnt on non-election years, and tax evasion increases by approximately 0.2% of annual GDP in the two months that contain the official Greek pre-election period (40 days)¹. We find that the wildfire effects are more pronounced in prefectures with more electoral

¹ We are not the first to suggest that wildfires increase around elections - see among others Kailidis *et al* (2004), though to the best of our knowledge no-one has previously used even elementary statistical analysis to measure this effect. We hope that early versions of this paper have contributed to a broader appreciation of these regularities through the attention they have generated in both Greek and International media (e.g. Walker, 2010).

competition. Separately we find that tax evasion is associated with reduced audits by tax collectors and is pursued by individuals and businesses that can respond to looser monitoring by immediately underreporting actual sales.

The nature of this electoral effect seems to be original in two key respects. First, it is the only electoral effect we know of that involves an increase around elections in something public opinion unambiguously considers ‘bad’. Second, the electoral effect itself is mostly unobservable to voters until *after* the election a fact we will discuss in greater depth in Section 2. By contrast, all the empirical evidence on cycles we are aware of involves increases around elections in something that is widely observed and would be considered ‘good’ by voters, at least if it could be maintained indefinitely (e.g. less unemployment is ‘good’ as long as it can be maintained without large costs later).²

We interpret the electoral cycles in wildfires and tax evasion as part of a broader pattern for an increase in certain types of misgovernance around elections, in particular surreptitious misgovernance via relaxed enforcement of selected laws.³ These cycles cannot be explained by signaling arguments as in Rogoff (1990) since neither the underlying policies nor the precise extent of tax evasion or wildfires are easily observable; hence it seems implausible an incumbent would try to signal competence using a policy that is poorly observed. Additionally, there do not seem to be any partisan effects in our data as assumed by Alesina (1987) and others, so partisan models also do not seem a promising approach to explaining electoral misgovernance cycles.

Instead, we argue that misgovernance via relaxed law enforcement arises for two complementary reasons. First, the open-list nature of Greece’s political system encourages many government officials to neglect their duties around elections and spend most of their time campaigning, often in remote constituencies. The Greek civil service is heavily politicized and dependent on elected officials and their entourage for management of day-to-day tasks so many public services are likely to be performed poorly around elections.

² An example of a ‘good’ policy that cannot be maintained indefinitely, is pre-electoral spending which must eventually be paid for in the future (e.g. in models as in Rogoff, 1990).

³ We use the term “law enforcement” expansively, to include all actions of government institutions aimed at ensuring that state laws are respected, violators are punished and consequences of violations are minimized. Even if laws themselves remain relatively stable over time, the extent to which they are actually enforced depends on the decisions and effort of both elected and career executives and we suggest that this varies with the electoral cycle.

Second, there are a host of laws the relaxation of which results in large immediate redistributive benefits for special interest groups while the large majority of voters who bear the costs can only observe such relaxations with a lag. This is closely related to Galbraith's (1954) suggestion that unobserved embezzlement is pro-cyclical and accentuates cyclicalities in well-being because the embezzlers become better off while the embezzled are unaware of the the embezzlement until the cycle reverses itself; Munger (2003) extends this concept to *febezzlement*, i.e. legal analogs of or 'functional equivalents' to embezzlement. These two effects interact so that in the period immediately preceding an election, governments have an incentive to shift their effort from governing to campaigning and will do so selectively, abandoning effort primarily in areas where this will be *rewarded* by special interest groups in time for the election while it will only be observed *after* elections by the broad voting body.

The difficulty in observing and quantifying policies related to the degree to which each law is enforced is not only a reason why it is difficult to interpret them within signaling models but also the reason that such policies have been difficult to detect, especially by researchers who usually have access to only fairly limited relevant data. Indeed, our research would not have been possible without some *a priori* knowledge (in part based on the experience of one author as Minister of the Economy) of what type of law enforcement manipulations may have occurred systematically over several decades; equally, it would also not have been possible without collecting detailed and unusual data in which such manipulations could be made apparent. While the opportunity for a clear observation of this type of misgovernance may be rare, it is likely that misgovernance itself is not, since governments seeking reelection will have similar manipulation incentives in all countries and all aspects of policy where manipulation is possible.

Using Greece as a case study, we suggest that effort constraints and the interaction of information asymmetries and special interests can be relevant around elections internationally. To the extent that the underlying causes of electoral cycles are similar regardless of the details of the cycle, our research suggests that even thoroughly researched cycles in macroeconomic variables, such as inflation and unemployment, may be affected by government

inattention and special interest group pressures. This is consistent with results reported by Kaufmann (2010) according to which there is a strong relation between corruption and deficits as well as widespread evidence that electoral spending involves very specifically targeted transfers (e.g. Bickers and Stein 1996). It is also consistent with results by Chang (2004) according to which open-list representation can result in increased incentives for political corruption, which of course is intimately associated with misgovernance.

Additionally, we investigate whether similar tax evasion and wildfire election effects are present internationally and document some (weak in comparison to Greece) evidence that such effects may be relevant in certain other countries as well. However, the very nature of the manipulation we demonstrate is likely to be difficult to detect; so we believe we are able to report only the tip of an iceberg of unknown but potentially very significant size. Indeed, it is quite possible that the manipulation of law enforcement may have economic implications that dwarf the effects from monetary and fiscal policy in some countries, especially those with weak institutions. This hypothesis is supported by evidence we present based on international data that there is a relation between the extent of corruption and the magnitude of tax evasion and wildfire effects in that country.

The rest of this paper is structured as follows. In Section 2 we present the institutional and theoretical framework in which our empirical analysis is grounded. We develop a simple but explicit model of government incentives that we believe are relevant given the institutional setting and show that it delivers cycles similar to those observed. In Section 3 we present our empirical analysis of tax evasion and wildfires around elections. In Section 4 we discuss the broader implications of our work and conclude the paper in Section 5.

2. Framework

2.1. Institutional Background

Tax evasion in Greece

It is well-known that Greece has a large unrecorded economy that exists side-by-side with the official activity and indeed in 2006 part of it was added to official estimates, increasing official GDP by 9.6%. Plainly, tax evasion is widespread and occurs in both direct and indirect taxation.

There are several opaque mechanisms through which a government can manipulate incentives for particular interest groups to evade taxes without being noticed by the public-at-large. The most obvious mechanism is the intensity with which it audits particular types of businesses. One type of targeted audits the intensity of which can be changed very easily without being noticed, is the frequency of on-the-spot audits of sales and services reporting which determine monthly VAT revenues.⁴ Similarly, the intensity of retroactive auditing of tax statements, of fines for evasion and the speed of collection are all to some extent under the control of elected party officials. The observed delays in collection can cause substantial fiscal losses even when appropriately discounted (see Christodoulakis 1994).

The number and targeting of audits is controlled under the auspices of the Ministry of Finance and is under the direct day-to-day control of government officials (rather than a permanent non-partisan civil service bureaucracy). In any case, high rank bureaucrats in tax authorities have intimate party affiliations and have even been candidates for various elected government posts in the same constituencies as the ones where they were responsible for collection (see also footnote 2). The fact that there is considerable discretion and variation in the intensity of audits is reflected in the fact that in periods of recession and adverse shocks in local demand, shop-owners and firms have often protested in favor of looser procedures for tax collection which would effectively create the potential for additional evasion.

⁴ The current Minister of Finance has openly acknowledged that “The first thing a government does in an election year is to pull the tax collectors off the streets”. See Michael Lewis, ‘Beware of Greeks Bearing Bonds’, Vanity Fair, October 1 2010.

This institutional environment has two features that are key to the analysis that will follow. First, the incumbent's party machinery can control the ease with which targeted special interest groups can evade taxes. Furthermore, this will be noticed by the special interest groups immediately (word will get around that there will be less audits in number and strictness from party affiliates or discussions among other members of the special interest group). However, the rest of the population will only be able to infer such decisions with a delay (and imperfectly) when tax revenues are published. Special interest group targeting can be on any level of granularity, e.g. hotels in a particular electoral district or the self-employed throughout the country.

Second, even where there is no intentional manipulation by high ranking government officials, they are not actively overseeing the process of tax collection the effectiveness of auditing is likely to diminish and since this will be observed by interested parties it will also lead to a concomitant increase in tax evasion.

Wildfires and building rights in Greece

Greece is particularly prone to destructive wildfires during its simultaneously dry, hot and often very windy summers. As is evident from figure 2, burnt areas have increased steadily in the period 1955-2008, presumably because of changing patterns of land use, climate and population. The extensive 2007 wildfires in the summer of an election year received global news coverage as they involved 84 deaths, 270,000 hectares of forest burnt (of a total 3.5 million of forest area in a country with 13.2 million hectares surface area), several villages burnt with more than 2000 houses destroyed and direct economic damages exceeding 5 billion Euros.⁵ Arson is known to contribute a significant fraction of wildfires each year, though a lack of thorough forensic investigations has meant the causes of wildfires remain poorly understood.⁶ Journalistic explanations for unusual wildfires include arson by property developers and government incompetence at preventing and fighting fires. In some cases government officials have gone so far as to attribute forest fires to

⁵ See http://en.wikipedia.org/wiki/2007_Greek_forest_fires and <http://earthtrends.wri.org/text/forests-grasslands-drylands/country-profile-73.html>. Note that our results are robust to the exclusion of the 2007 wildfires and we report regression results for two separate subsamples.

⁶ According to the UN Economic Commission for Europe Forest Fire Statistics Timber Bulletin, Vol LV (2002), no.4, Table 8, in 2001 just 23% of area burnt in Greece had a known cause. Comparing to some countries with similar risk factors, the respective figure for Spain was 50% and for Turkey 76%.

opposition parties, foreign agents and more broadly forces aiming to destabilize the nation or the incumbent party's authority.

At the same time, Greece is a country that lacks a detailed land registry so there is considerable fuzziness on issues that in most advanced economies are extremely well-defined such as who is the owner of a particular property, what its borders are and what land uses are permitted.⁷ A property that is designated forest area has very little value as it can be used only for extremely limited purposes while forests often surround extremely valuable residential properties. It is very rare for official policy to bring forest areas into other uses unless they have been previously burnt by wildfires. Nevertheless, in a country with a population of 11 million, 400,000 homes have been recently built in areas that were previously forest areas while in certain suburbs of Athens up to 50% of large forest areas have surreptitiously had their designation changed to allow construction.⁸

The fuzziness mentioned above means that many or even most land owners have to present a host of documents, assessments, permits, and go through complex legal procedures and court trials before they can build on their land. One necessary condition of course is that the land itself is not forested at the time the building permit is requested as then the permit will surely not be granted. This means that the incentives for arson increase whenever the probability of a burnt area obtaining a building permit goes up just as the incentives for tax evasion go up when the probability of being caught go down.

As with tax collection, government officials inevitably influence the probability with which a building permit will be granted on burnt land, especially by affecting the strictness of the permit procedure, the speed and effectiveness of any reforestation projects after a forest is burnt as well as the response to any violations of land use laws. If these probabilities are manipulated intentionally, beneficiaries can be targeted quite narrowly and will immediately realize the benefits while those who incur the cost (less forest and more houses) only observe the change in government policy with a lag when relevant statistics are

⁷ There is considerable political pressure from land owners to delay such registries as for many of them it would reveal that their property was locked in a legal status in which it has little value.

⁸ According to the president of the Panhellenic union of researchers and geo-technicians as quoted by *Kathimerini* newspaper, 26 September 2010, p.4.

published. Note that while wildfires have in recent years received significant media attention, aggregate statistics from which ‘unusual’ wildfires and government policy can be inferred are only published with a significant lag of several months. If authorities increase the probability for particular groups of land owners to obtain building permits in burnt forest areas then these groups will be more likely to burn the forests in which their land is situated.

On the other hand, the probability of granting building permits on burnt forests may also increase because governments are doing a poor job of overseeing the integrity of the permission-granting process. Indeed, wildfire prevention and firefighting efficiency may decline for the same reason.

Electoral campaigning versus governing

It is obvious to any casual observer that as elections approach, government officials seeking re-election usually shift at least some of their time and attention from their ordinary duties to their private re-election strategies. In the US this can manifest itself for example in reduced attendance rates of members of Congress around the time they are up for re-election. In Greece it can mean that a minister is less likely to be found in his office overseeing the efficient functioning of tax collection, or of a firefighting effort.

The reason is that in Greece, members of parliament are elected in open-list parliamentary elections which means their status within and outside their party as well as their chances of ministerial posts are influenced by the number of personal votes they receive. In practice this means that all government officials seeking election will be forced to leave some of their duties unattended as they travel to their constituencies and ramp up their campaigning before elections.⁹

2.2. A formalization of relevant incumbent incentives

In this subsection we build on our discussion of the institutional background to present a formalization of incumbent incentives that we believe cause the empirical observations we study in detail in Section 3. Specifically we are interested in why wildfires and tax evasion may peak around elections. We do

⁹ A relevant case in point: when the devastating 2007 wildfires broke out, coordinating the fire-fighting effort was delayed by the absence of a key Minister who was campaigning at his constituency.

not attempt to embed our model of incumbent incentives in a framework of political competition as this raises issues quite separate from the ones we aim to focus on.¹⁰

We assume that each government term lasts for T discrete time periods and that the incumbent acts in order to maximize an intertemporal objective function by allocating available resources during each period $\{1,2,\dots,T\}$ between effort f_t to improve the quality of governance and effort c_t to campaign for re-election. The latter can be interpreted in terms of its opportunity cost if the same effort were spent on providing improved governance instead, so the resource constraint is:

$$c_t + f_t = 1 \quad (1)$$

We define q_t as a scalar measure of some aspect of the quality of the country's governance (for example the effectiveness of tax collection or the degree of forest protection) at time t , and assume it evolves over time according to:

$$q_t = \delta q_{t-1} + \gamma f_t \quad (2)$$

with some initial condition q_0 inherited from the previous incumbent. For $\delta < 1$, this implies that quality of governance 'depreciates' over time at a rate $(1-\delta)$ and can be increased by γ per unit of effort $f_t \leq 1$. If all of the incumbent's effort is devoted to improving the country, i.e. $f_t = 1$, quality eventually reaches a bliss-level $q_\infty = \gamma / (1 - \delta)$.

In each period $0 < t \leq T$ the incumbent is concerned with the period's objective V_t that impacts end-of-term voting:

$$V_t = P_t + S_t \quad (3)$$

The first term P_t represents a function of popularity that is positively affected by both campaigning and the quality of governance enjoyed by voters according to the simple form:

$$P_t = u(c_t) + \alpha \cdot q_{t-1} \quad (4)$$

¹⁰ We merely note in passing that our model might be viewed as the reduced form of incumbent incentives that arise in a fully articulated model of electoral competition. For example, Grossman and Helpman (1996) develop a model of electoral competition in which incumbents maximize a weighed sum of the aggregate welfares of voters and special interests which is very similar to the objective function we develop below.

where $\alpha > 0$. The assumption that votes are influenced by campaigning is motivated by the obvious fact that it is so widespread, by empirical evidence that it is effective (see e.g. Benoit and Marsh, 2008) and by several theoretical justifications discussed e.g. in Meirowitz (2008). The campaign effect is captured by $u(c_t) = c_t - \frac{\psi}{2} c_t^2$, where ψ denotes a saturation factor and $0 < \psi \leq 1$ ensures that the usual conditions $u' > 0$, $u'' < 0$ are satisfied.

Notice also that the quality of governance enters with a lag.¹¹ This is because voters can only observe the quality of government when relevant government statistics are published or its effects are felt which takes time. For example, tax revenues from which evasion can be (very imperfectly) inferred are only published with a few months lag and the strictness with which building permits are granted can only be inferred by the number and location of new buildings after they are built.

The second term in (3) is a function which captures the incumbent's desire to award benefits to a special interest group that thrives on the deterioration of (certain kinds of) governance, i.e.

$$S_t = -\sigma \cdot q_t, \quad \sigma > 0 \tag{5}$$

The idea that benefits to a special interest group enter incumbent's objectives directly has been used extensively, for example in Coate and Morris (1995). Their interpretation is that the more benefits the group receives the greater is their reciprocation to politicians, in terms e.g. of more campaign funds or private (potentially illegal) benefits. An alternative interpretation along the lines of Dixit and Londregan (1996) is that the special interest group constitutes a swing voter constituency the voting of which is much more sensitive to income transfers than the rest of the citizenship and needs to be specifically targeted independently of other electoral considerations. They find that groups which are ideologically moderate and for which consumption matters a lot relative to ideology will be 'swing-voters' that both parties try to win over by making redistributive transfers that benefit them at the expense of other groups.

The aforementioned characteristics of swing-voters match the characteristics of groups we expect would benefit from wildfires and tax evasion: potential

¹¹ The duration of this lag in calendar time is determined by the duration of an incumbency T . By adjusting T , the lag can be made shorter or longer as appropriate for any specific context.

arsonists-cum-property-developers are not likely to be highly ideological while it's plausible they value their consumption highly relative to their preference for electoral outcomes; the same is true for groups that are willing and able to evade taxes.¹² Other models such as that of Robinson and Torvik (2005) and Acemoglu and Robinson (2001) are consistent with the use of socially inefficient policies to benefit special interest groups suggesting it is plausible that under appropriate conditions governments may facilitate a significant and very harmful reduction in government quality if it benefits even small special interest groups.

What is novel in our assumption is that the special interest group advances its interests in *inverse* proportion to the quality of government. This is because the special interest group is able to extract resources from inefficiencies in governance, for example by evading taxes or manipulating the process through which building permits are granted. The quality of government enters (5) at current value as we assume that, in contrast with the voters at large, the special interest group observes the situation immediately because they are directly involved in its mismanagement, e.g. they are themselves evading taxes or exploiting laxity in the enforcement of property development laws.

Over his term in office the incumbent allocates resources $\{c_t, f_t, t = 1 \dots T\}$ in order to maximise an intertemporal objective function of the form:

$$\max W_T = \sum_{t=1}^T \mu^{T-t} \{P_t + S_t\} + L_T \quad (6)$$

¹² We do not tackle the commitment problems that arise between voters and candidates that are engaged in the redistributive interaction. Part of this problem can be resolved by embedding Dixit and Londregan's model in a dynamic game so that candidates can commit by putting their reputation at stake as in Aragonès, Palfrey and Postlewaite (2007). On the other hand, to the extent that voting is secret, voters cannot similarly commit to voting for an incumbent that has offered a benefit. Stokes (2005) addresses this problem by arguing that in fact voting is not as secret as is often presumed because in many countries party machinery is enmeshed in social networks which have ways of (imperfectly) inferring individuals' votes. As Stokes notes, it is 'hard for voters to dissemble before people they've known all their lives.... you know if a neighbor voted against your party if he can't look you in the eye on election day'. In Greece, party machinery is indeed notoriously enmeshed in social networks so this mechanism may well be how commitment issues are resolved to support interactions associated with redistributive politics. As an empirical matter there is also endless anecdotal evidence that (for whatever reason) the commitment issue is not an obstacle to redistributive politics. For example, both main parties routinely charter planes so Greek students studying in the U.K. can fly home for free on election weekends with no guarantee that they will actually vote for the party bearing the cost of their flight.

where μ is the discount factor and L_T is a legacy function which captures its desire to leave the country in a good condition at time T . To keep things simple, we assume:

$$L_T = \theta \cdot q_T \quad , \quad \theta > 0 \quad (7)$$

This enters the government's objective separately to any effects through voting because it affects post-term ego-rents, employment prospects, reputation effects for the governing party and/or individuals, as well as the possibility that gross mismanagement may prompt prosecution of particular officials by subsequent governments. It can also be viewed as a proxy for fact that if re-elected the government will be in a better position in its subsequent term if the state of the country is better (we do not explore our model in an infinite horizon context).

If $\mu < 1$, this reflects diminished responsibility for conditions at the beginning of the term relative to the end and/or potentially imperfect memory. The assumption that voting depends on a retrospective measure of the quality of governance is also plausible as long as this is interpreted as a signal of prospective performance as in many models following Rogoff (1990).¹³

Our formulation can be interpreted as one where there is a trade-off between effort spent in producing and communicating a positive signal to voters.¹⁴ A similar interpretation applies to discounting the special interest group. This leads to incentives for *disguised* redistributive benefits, as in Tullock (1983) and Coase and Morris (1995). In our context, this happens because of the redistributive and asymmetric information characteristics of the effects of misgovernance. As explained above, certain types of misgovernance are observed more quickly by those who *benefit* than by those who incur a *cost*. In the period immediately preceding an election this has a severe effect on government incentives since all benefits are observed before the election while costs are observed afterwards.

¹³ Note that recent evidence suggests that voters care about contemporaneous or past utility in re-electing incumbents even when this is affected by shocks that are clearly uncorrelated with their future utility (see for example Achen and Bartels, 2004).

¹⁴ We interpret the discount factor $\mu < 1$ as a way of modeling the fact that campaigning as well as governance quality signals are more likely to be effective close to an election. As an empirical fact it is obvious that both campaigning and conditions just before an election carry more weight than conditions earlier on. The reasons for this are again tangential to our analysis but can easily be understood as rational consequences of the fact that closer to elections campaigning can be more carefully targeted to the issues and constituencies that happen to be important at that time and that conditions are less dependent on the actions of a predecessor at the end of an incumbency relative to its beginning.

Interpreted in terms of the institutional environment we aim to model, suppose that before elections an incumbent shifts attention away from providing quality governance in particular by reducing audits to certain taxpayers, by providing building rights more easily and/or by being slower to implement reforestation projects. These effects will not be immediately felt by voters at large, until they show up *after the elections* as less larger deficits and more houses; on the other hand, they will be immediately appreciated *before the election* by the groups that act to exploit the temporary drop in audits or increase in building opportunities. In this way an incumbent can create the illusion of an overall welfare improvement before elections. Voters cannot learn their way out of this situation over repeated elections as long as they continue to observe the quality of government with a lag (the underlying cause is an asymmetric information effect, not an irrationality).

2.3. Optimal misgovernance paths

Substituting (4), (5) and (7) into (6) we obtain the problem

$$\max W_T = \sum_{t=1}^T \mu^{T-t} \left\{ c_t - \frac{\psi}{2} c_t^2 + (\alpha - \mu\sigma) \cdot q_{t-1} \right\} + (\theta - \sigma) \cdot q_T \quad (8)$$

Assuming that the country is not overwhelmed by the special interest group, so that $\sigma < \min[\theta, \alpha/\mu]$, and optimizing the Hamiltonian that corresponds to (8) and (2) with respect to optimal campaigning effort at each t we get:

$$c_t^* = \Gamma_0 + \Gamma_1 \cdot \left(\frac{\mu}{\delta} \right)^t \quad (9)$$

$$\Gamma_0 = \frac{1}{\psi} \left[1 - \frac{\gamma(\alpha - \mu\sigma)}{1 + \mu - \delta} \right], \quad \Gamma_1 = \frac{\gamma}{\psi} \cdot \left[\frac{\alpha + (1 - \delta)\sigma}{1 + \mu - \delta} - \theta \right] \cdot \left(\frac{\delta}{\mu} \right)^T$$

From this we can derive the quality of governance in each period which for $\delta > 0$ is:

$$q_t = A_0 - A_1 \cdot \left(\frac{\mu}{\delta} \right)^t - A_2 \cdot \delta^t \quad (10)$$

$$A_0 = \frac{\gamma}{1 - \delta} (1 - \Gamma_0), \quad A_1 = \frac{\gamma\mu}{\mu - \delta^2} \cdot \Gamma_1, \quad A_2 = A_0 - A_1 - q_0$$

For $\mu > \delta$, governance quality over $[0, T]$ is maximized at:

$$t^* = \frac{\ln[A_2 \cdot \ln(1/\delta)] - \ln[A_1 \cdot \ln(\mu/\delta)]}{\ln(\mu/\delta^2)} \quad (11)$$

From this it is obvious that for appropriate initial condition¹⁵ q_0 and parameter values we can get $0 < t^* < T$, that implies a cyclical behavior in the quality of governance according to the following pattern: After elections, campaigning declines and this allows more effort to be invested in improving – albeit for a while – the quality of governance, but as the new polls are approaching the incumbent increases campaigning effort while the quality of governance deteriorates reaching a low on the election day.

Misgovernance behavior is depicted for plausible parameter values in Figure 3 and is classified as a function of the importance of legacy θ , the strength of special interests σ and the campaigning factor ψ in the table below (under the additional restrictions that $\mu > \delta$, $\sigma < \min[\theta, \alpha/\mu]$).

Incumbent	Accountability factor	Quality of Governance
Benevolent	$\theta > [\alpha + (1 - \delta)\sigma] / (1 + \mu - \delta)$	Peaks on elections
Opportunistic	$\sigma + (1 - \psi) / \gamma < \theta < [\alpha + (1 - \delta)\sigma] / (1 + \mu - \delta)$	Troughs on elections
Embezzling	$\theta < \sigma + (1 - \psi) / \gamma$	Troughs with destruction

A government is ‘benevolent’ if it values the quality of governance it bequeaths very highly (large θ) and is not affected by special interests (low σ) leading quality of governance to peak on the eve of elections. Notice that a lower impact of campaigning on voting ψ only affects the overall level of the quality of government but not its pattern over time.

If legacy is less important (θ small), then $\Gamma_1 > 0$ which means campaign effort reaches a maximum at:

¹⁵ Solving the condition $0 < t^* < T$ for q_0 requires that the quality of governance inherited from the previous incumbent is neither too high nor too low. If it is too high, the opportunistic incumbent steadily erodes the public good for the benefit of campaigning without worrying that a critical deterioration will occur. In contrast, if governance is discovered after the elections to be very bad, even an opportunistic government will devote most of its resources to improve the situation.

$$c_{\max} = c_T^* = \frac{1 - \gamma(\theta - \sigma)}{\psi} \quad (12)$$

Such a government is opportunistic if it stops short of expropriating quality of governance to use it for campaigning (i.e. it at least respects $c_{\max} \leq 1$), which requires that $\theta > \sigma + (1 - \psi) / \gamma$. If it has even less of an interest in its legacy, or special interests are excessively strong, the incumbent is ‘embezzling’ part of the public good q by making $f_T < 0$ and uses the resources to campaign more intensely ($c_T > 1$). Between the benevolent and opportunistic parametrization there is a condition in which a ‘non-opportunistic’ government will not cause cycles since there $\Gamma_1 = 0$ and campaigning is constant over time. Between the benevolent and opportunistic parametrization there is a narrow condition in which there is no cycle at all.

A higher effectiveness of campaigning (small ψ) always lowers the quality of governance though cycles can even arise for very large ψ if special interests are strong enough (large σ). Cycles can arise if campaigning is powerful enough relative to the importance of legacy θ even in the limiting case where special interests do not exist ($\sigma=0$). Similarly, the effect of special interests can be isolated in the limiting case where $\delta = 0$, in which case campaigning is constant at $c_t = [1 + \gamma(\sigma - \alpha/\mu)]/\psi$ until the very last period at which it shifts to $c_T = [1 + \gamma(\sigma - \theta)]/\psi$. When legacy concerns are not very important (θ small) this implies a drop in the quality of governance in the last period, the duration of which is determined by the *duration of the information lag* that voters have relative to special interests.

Evidently, since the effects of special interests and campaigning interact and can be similar, it would be very difficult to identify the relative importance of each effect from an observed misgovernance path. In our empirical analysis we will use other considerations in order to try to ascertain the relative importance of special interests and campaigning incentives as drivers of electoral misgovernance (section 3.6).

While we do not model voters’ objective functions, the cycles are not an artifact of some voter irrationality. As long as voters are influenced by

campaigning and/or become informed about the quality of government more slowly than the powerful special interests these effects are likely to arise.

2.4. Previous explanations of electoral cycles

Misgovernance as signaling?

Starting with Rogoff (1990), much recent literature on political business cycles has emphasized the role of cycles in macro policy variables as an information signal of the incumbent's ability when an electorate can observe this less accurately than the incumbent. While our evidence of misgovernance can be interpreted in the context of this type of model, we do not think this is appropriate because the mechanism driving the model seems implausible when applied to tax evasion and wildfires.

Indeed, it seems implausible that among all the signals available to a government (including official monetary and fiscal policy) the incumbent would choose to signal its ability through a form of misgovernance that can only be observed in obscure data which is not easily accessible and is published well after elections take place (as is the case for the data we used in our empirical analysis). But most importantly there is no doubt that – contrary to what the logic of signaling is about - if a government openly announced it will allow forests to burn and selected businesses to cheat on taxes, the election result would be catastrophic. Interpreted as signals, easier granting of building permits and the laxity of tax auditing are mostly private.

Partisan misgovernance?

Another popular explanation of electoral cycles in macro data is that they arise as a consequence of partisan effects on policy (Hibbs, 1977; Alesina, 1987). However, we do not empirically observe any partisan effects on wildfires or tax evasion (see Section 3.2) so again this does not seem a good direction to explore for an explanation.

Opportunistic political business cycles

While the mathematics of the voting component of our government's incentives is in some ways similar to that of Nordhaus (1975) the standard widespread criticisms of this work do not apply here because of significant

differences in interpretation. In Nordhaus' model voters are repeatedly fooled by a temporary pre-election period of good economic conditions without realizing this will only lead to worse conditions after the election; in our model it is only campaigning that repeatedly influences voters, but it is much easier to accept that high levels of campaigning before elections will repeatedly influence voters over iterations of the election cycle. Furthermore, our model does not rest on naive voter expectations: instead we interpret the retrospective voting we use as a proxy for prospective voter behavior in an environment where the quality of governance before an election is a signal that is positively correlated with the expected quality of governance after an election. Indeed, our argument is that a government may be willing to sacrifice good policies that provide positive signals about ability in order to pursue campaigning just before elections which has no social benefit and serves only to influence the outcome of elections.

3. Empirical analysis

3.1. Effect of elections on tax evasion

While there is evidence that elections cause a reduction in tax revenues in many countries, as far as we know, there has been no suggestion that at least some part of this may be due to an increase in tax evasion rather than official fiscal ease.¹⁶ Perhaps relatedly, there is no obvious way of measuring changes in the degree of tax evasion from conventional annual revenue data since tax codes change from year to year as does the distribution of economic activity across sectors which causes variation in aggregate metrics like the revenue-to-GDP ratio.

On reflection however, a brief sharp spike in tax evasion around elections should be unmistakable from high frequency revenue data: it should lead to a temporary drop in revenues which cannot be due to changes in the tax code since the tax code does not change over brief intervals of a few months. Tax evasion should also be apparent in how any brief sharp drop is distributed

¹⁶ This may be especially important considering that the strongest electoral manipulations of fiscal policies have been observed in developing countries where tax evasion is likely to be rampant; see for example Brender and Drazen (2005).

across categories of tax revenues as well as in the behavior of government tax audits around elections. The key to observing electoral tax evasion is therefore appropriate tax revenue data.

Data

Our monthly tax revenue and Greek GDP data were transcribed from various editions of the Monthly Bulletin of the Bank of Greece and span the period 1972:1-2009:12 during which there were 13 elections. We also transcribed monthly revenue data broken down into subcategories from documents made available by the Ministry of the Economy's General Accounting Office at www.mof-glk.gr/ekdoseis/py.htm. The data is available since 2001 but the categories were changing and not sufficiently fine-grained to have subcategories of specifically tax revenues until 2008 so we can only use data for 2008 and 2009 from this source. We also transcribed data from documents obtained from the Ministry of the Economy's Office for Special Audits for the number of audits during the period July 2005 - August 2009.

We searched for similar data for other countries but found only scarce data available in the standard sources. We found *ad hoc* monthly tax revenue data for 13 additional countries for various subsamples across each country after 2001 in the IMF's International Financial Statistics database though we had to complement the online edition with the monthly CD-Rom editions since 2001 as the two sources had certain differences in coverage. Where there was a conflict in numbers we used the online version which is continuously updated to reflect more accurate measurements as they become available. Additionally where GDP figures were not available in the IFS database we complemented it from WDI Online.

Finally, we compiled an international monthly election date database using online data from the Political Database of the Americas, the African Elections Database and *Wikipedia* entries for elections in countries not covered by any other database.

In order to classify each country as a presidential or parliamentary democracy so as to decide which of several types of elections to focus on in each country, we used Persson & Tabellini's (2003) dataset but cross-checked it and complemented it with several online sources since it did not cover all countries.

The additional sources were the International Foundation for Electoral Systems, the International Institute for Democracy and Electoral Assistance, the Interparliamentary Union and again the Political Database of the Americas and the African Elections Database. Where there were conflicts we resolved them by studying each case in detail (for example in the Persson & Tabellini database, Greece is misclassified as a presidential democracy).

Empirical results

We have already seen a visual demonstration in figure 1 that tax revenues drop during the typical pre-election period which spans 40 days and therefore the month of the election as well as the previous month.¹⁷ Tax revenues in pre-election periods are *never larger* than *all* the collections in the four years surrounding each election year (for the same two-month period). In all elections held between 1974 and 2009, average bimonthly revenues expressed as percent of GDP were lower than the average of the respective figures in the two adjacent years.

Figures 4 and 5 show that this effect is localized primarily on these months and that there is no discernible reduction in tax revenues throughout the entire year (which was confirmed in unreported regressions with annual data where election dummies were insignificant). This is due to the fact that more aggregated data adds noise which masks the regularity that is clearly apparent in the monthly data (and not because any drop is reversed immediately after elections). This is similar to the effect reported by Akhmedov and Zhrauskaya (2004) who find that monthly government spending data can lead to very different conclusions than lower frequency data.

This visual analysis is confirmed in the standard election dummy OLS regressions (e.g. as in Alesina, Roubini and Cohen, 1997) reported in Table 1. There we find that during the election period there is a significant drop which is not compensated for by a post-election increase. We also find that there is no partisan effect and the results we report are stable over time.

In Table 2 we show that the drop in tax revenues in the latest 2009 elections was focused in subcategories where tax evasion can easily respond to brief

¹⁷ The minimum permissible time between the announcement of elections and the election date is three weeks in Greece but surprise elections of this type are extremely rare.

periods of less auditing because it simply involves evading taxes by underreporting sales (by contrast, evasion of direct taxes, e.g. on civil servants' wages taxed at source are unlikely to be affected by elections). In figure 6 we present direct evidence that the number of tax audits in the months just before elections does indeed drop drastically.

3.2. Effect of elections on wildfires

Data

We have obtained annual data collected by the Forest Agency of the Ministry of Agriculture of Greece for the period 1955-2007 for annual forest areas burnt by wildfires. According to experts there do not seem to be any significant changes in the way this data was collected or recorded during our sample, except for a minor definitional change in 1991 which requires that burnt areas of size less than one acre are included in all records starting that year. We have updated this data with data made available by the Greek fire service at <http://www.fireservice.gr/statistika/dasika.php> through to the end of 2009.¹⁸ The fire service also provides wildfire data decomposed by prefecture for 2000-2009 and we use this panel in some of the regressions that follow. We also obtained data on electoral outcomes broken down by prefecture from the Ministry of the Interior (<http://ekloges.yypes.gr/>).

We also compiled international data for 45 additional countries for various subsamples during 1980-2007 by merging online data from Eurostat, with data transcribed from a United Nations publication for forest fires (Timber Bulletin Volume ILV (2002) No4) and an EU report ('Forest Fires in Europe', 2005, report # 5). In addition, for the case of Italy which was of particular interest due to the close correlation of fires with Greece, we obtained additional data for the period 1970-1979 from the UN Economic Commission for Europe, 'Forest Fires Statistics', vol XXXVI supplement 7, February 1984 and for 2008-2009 from occasional publications of the EU-JRC on 'Forest Fires in Europe'.

¹⁸ Data for 2010 is available on a provisional basis only so we have not included it though it is clear that fires were much lower in 2010 (which was not an election year) than in any recent election years.

Finally, we use monthly temperature and precipitation data for 1955-2008 which we obtained by request from the Measurement Unit of Climatic Changes of the National Observatory of Athens as collected at four separate weather observatories stationed across Greece (Corfu, Methana, Larissa and Herakleion). In explaining international differences in observed electoral effects we used Transparency International's 2009 corruption perception index.

Empirical results

In our 55 year sample there were 18 elections (two were in 1989, so election years are 17). The total area burnt during 17 election years amounts to 949,900 hectares significantly exceeding the area burnt in the 38 non-election ones. The average area burnt on election years is almost two and half times larger than the annual average on years without elections while the standard deviation of the area burnt during election years is three times higher than that of non-election years. In figure 2 it is particularly striking that during the military dictatorship years of 1967-1974 when there were no elections, wildfires were also particularly low.¹⁹ Note also that in the period 1989-1990 there were actually three elections which may explain the relatively low effect of each election separately in those years.²⁰

¹⁹ We repeated the analysis with a dummy variable for that period but found the dummy was insignificant suggesting a relative paucity of fires during the dictatorship may be purely due to the lack of an election in this period. There is no evidence that the data was manipulated in this period and, to the best of our knowledge, experts have not questioned the accuracy of figures collected during the dictatorship.

²⁰ Three major wildfires were also observed in 1965, 1988 and 1998 during which no election took place. However, all three cases coincide with events that led to relaxations in law enforcement similar and probably more severe than those produced by electoral misgovernance. In 1965, there was a major political upheaval throughout Greece caused by the ousting of the elected Prime Minister and repeated attempts to impose a Government of defectors. The country was paralyzed from massive political rallies, while the functioning of the state was critically affected by the extreme frequency of changes in the executive. For example, the post of the forest-relevant Agricultural minister was filled with four nominations between July and September of that year. In October 1987, the Government passed Law 1734 according to which areas used for livestock grazing ("*voskotopia*") could be eligible for obtaining construction permits. This created incentives for diminishing the forest density of land and, according to Kailidis *et al* (2004), explains the intensity of wildfires that took place the following summer of 1988. In a separate analysis of fires due solely to agrarian activities, Dimitrakopoulos and Mitsopoulos (2006) show that they peaked in 1988 leaving 26,009 hectares of forest burnt, more than three times the average area of 8,600 hectares burnt for similar reasons over the period 1980-97. Wildfires in 1998 are perhaps the clearest case of the effects of a low quality of governance unrelated to elections: in an attempt to re-organize the wildfire management agency, the Government put fire-fighting responsibility with the Fire Brigades Commission, replacing a previous decentralized structure headed by the forest guard (for an account see Xanthopoulos, 2006). Lack of cooperation between the various groups resulted in a new peak of forest fires, and the new agency established credibility only after a substantial reduction in wildfires in subsequent years.

We follow up on our visual demonstration of an electoral effect in wildfires of figure 2 with the standard election dummy regression results of Table 3. The regression results suggest a very significant election effect, which remains stable over time and strong when we control for climatic conditions. We control for annual variation in climatic conditions in two separate ways, using data on relevant weather conditions and using data for wildfires in Italy which are closely correlated with wildfires in Greece, presumably because of similar climate conditions. In order to construct our weather variables, we note that precipitation matters not just during the fire season but also in preceding months since this affects air and soil humidity and water reservoirs. Since the annual wildfire season ends in September we construct a precipitation index that measures the stock accumulated during the 12 months spanning from October of the year $t-1$ to September of year t . On the other hand, temperatures only matter around the time of the wildfires so to keep things simple we averaged temperatures at the four observation stations from which we have observations and use summer measurements (June, July and August average). We found a strong interaction (multiplicative) effect whereby high temperatures after periods of little precipitation dramatically increase the area burnt by wildfires. To the best of our knowledge this is the first attempt at a regression analysis of the effect of climate on Greek wildfires with the exception of some studies of relatively narrow phenomena (Kalampokidis *et al*, 2007, find that meteorological and vegetation patterns help explain wildfire dynamics in an area in Northern Greece during 1985-95).²¹

It is worth commenting on the fact that it does not seem to matter whether the election takes place before or after the summer (when the vast majority of wildfires occur). Note first that this is entirely consistent with the patterns generated by our model (see Figure 1). Whether the peaks in wildfires are happening because of misgovernance due to inattention or to the promotion of special interests, the quality of governance can be low both before and immediately after elections according to our model. The quality of governance related to forest protection and building permits may be slower to respond to government policy than the number of tax audits which can be easily and

²¹ See among many others Flannigan and Harrington (1988), Swetnam (1993) and Larsen (1996) for evidence that weather conditions are related to wildfires. Our international data from other countries contained several other countries with wildfires highly correlated to Greece's such as Serbia but their span was much shorter than our data for Italy.

immediately adjusted up or down, which would explain why post-election adjustments are faster for tax evasion than for wildfires. Additionally, if the owner of a property that is a forest makes progress towards obtaining a building permit before elections that take place in February, he will nevertheless have to wait till the next summer to attempt to burn the forest that will by then have become a more pressing obstacle than it was in the previous summer. In other words, wildfires will happen in the summer *after any misgovernance* occurs which itself happens in a period of a few months before an election, meaning wildfires appear in the same year as an election regardless of the timing of the election relative to the summer.

As with tax evasion, there is no partisan effect in wildfires which we attempt to detect by adding a dummy variable for when the centre/socialist party was in office.²² In 1989 the dummy takes the value 0.5 because the incumbent was socialist in only one of the two elections of that year and in 1990 it is also 0.5 because both parties participated in an ecumenical government at the time of the election (other specifications deliver very similar conclusions).

Using cross-sectional data across Greece's 51 electoral prefectures, we find that competition tends to accentuate the electoral impact of wildfires (Table 5 and Figure 7). In particular, we find that where the outcome of the election tends to divide the seats of elected officials roughly equally between the two main parties, this leads to a larger election year effect on wildfires than where one party tends to dominate. This is in line with evidence in many other contexts that the degree of political competition matters for policy. For example, competition can lead to slower adjustment of budget deficits (Poterba, 1994) and the redistribution of spending across districts (Bickers and Stein, 1996).

²² Before the 1967 dictatorship the two main parties were the National Radical Union (conservatives) and the Centre Union (democrats). After the restoration of democracy in 1974, the conservative party was renamed and the centre party was largely absorbed by the newly-founded socialist party hence the common treatment. We also tried a number of alternative specifications that took into account whether the party leader was the incumbent Prime Minister at the time of the elections, the duration of each incumbency and other similar factors but were unable to detect any partisan effect.

3.3. Economic consequences of electoral cycles in misgovernance

In Table 4 we report estimates of the economic cost of wildfires and tax evasion based on our benchmark regressions of Tables 1 and 3. Based on Table 1, each election results in a decrease of tax revenue by 0.9% of monthly GDP for two months which means a reduction by 0.18% of annual GDP. For the 13 elections that took place in the period 1974-2009, this amounts to 5.7 billion Euros at 2008 prices.

Similar calculations lead to a rough estimate of the total area burnt because of an electoral effect during our sample. The *additional* area burnt on an election years relative to a normal year is significantly more than the normal year burnt area itself (i.e. election years have more than double area burnt). According to our analysis, over our entire sample, almost 6% of the surface of Greece has been burnt *because of elections*.

Without accounting for how these effects corrode social morality and institutions and increase uncertainty and unfairness, and without accounting for loss of human life and environmental consequences we still arrive at a cost of more than 8% of GDP for the cost of these effects over the years of our sample.

3.4. Effect of misgovernance on elections

A number of studies show that economic conditions affect election outcomes (e.g. Fair, 1978) and that benefits granted to particular constituencies also affect their voting behavior (see e.g. Levitt and Snyder, 1997). Yet finding similar evidence for a relationship between misgovernance and election outcomes may seem excessively optimistic for a number of reasons.

In our model of incumbent incentives there is no clear direction for the effect of electoral misgovernance on election outcomes: while voters punish misgovernance, they reward campaigning which can only be achieved at the expense of some degree of misgovernance. Unobserved variables like campaigning effort as well as variation in broader political conditions which modify the trade-off between campaigning effort and misgovernance between

elections make it difficult to empirically infer any relationship between misgovernance and election outcomes. Furthermore, to the extent that misgovernance is primarily a redistributive transfer rather than a product of inattention, it may or may not affect election outcomes depending on the reasons underlying the transfer (e.g. indirect benefits from special interests to incumbents may or may not be used for electoral purposes).

These observations suggest that if there exists a relationship between misgovernance and election outcomes then to observe it we must use an appropriate instrument which is highly correlated with misgovernance but uncorrelated with election outcomes so that potential endogeneity can be eliminated. We are fortunate enough to have an excellent instrument with these properties in the case of wildfires, namely weather data.²³ A 2SLS regression of the percentage lead of the incumbent in elections from 1955 to 2008 on the log of area burnt using the three weather variables that appear in Table 3 as instruments give a coefficient of 0.6 which has a p-value of 0.048. Interpreted literally this suggests that a 1% increase in area burnt leads to a 0.6% increase in votes for the incumbent (e.g. 0.3% of voters switch from the second party to the incumbent because of the increase in wildfires).

3.5. International evidence for effect of elections on wildfires and tax evasion

Combining several data sources we were able to amass a limited data set with which to offer a preliminary investigation into the relationship between elections, tax evasion and wildfires in other countries (Tables 6 and 7).

In sum, there is no effect of elections on wildfires and a very weak effect on tax evasion when pooling across all countries. However, there is some evidence that countries that are more corrupt tend to have more wildfires and more tax evasion on election years. Given the very short samples we have to work with in each country and the fact that institutional conditions may preclude these

²³ We could not find an appealing instrument in the case of tax evasion. Lags of changes in monthly tax revenue was the only instrument worth considering but has low correlation with current changes in revenue and may not be independent of anticipated election outcomes. Using it as an instrument we were unable to find a significant relationship between election outcomes and tax evasion.

specific manifestations of electoral misgovernance in many countries, we consider this evidence as highly suggestive of an international dimension to the misgovernance effect we describe.

3.6. Distinguishing between inattention and redistributive politics

We certainly do not wish to suggest that any explanation of the empirical evidence we have presented should be monocausal and indeed our model was developed to illustrate that both inattention and redistributive politics can be simultaneously relevant in a complementary way. However, we think it is also interesting to try to extract as much information as possible from the data regarding their relative importance. Interestingly, in the case of wildfires, the empirical evidence suggests a major role for the explanation based on redistributive politics for two reasons.

First, since wildfire prevention and tax audits are managed at the level of the central government it is hard to explain how inattention at the central government level could be responsible for the regional pattern presented in figure 7 according to which the wildfire effect is stronger in regions where the parliamentary seats are more heavily contested. On the other hand if redistributive politics were relevant and swing voters were being targeted, we would expect to see stronger effects in prefectures with more competition, which is exactly what we see in figure 7.

Second, the fact that there seems to be a strong positive effect of wildfires on re-election prospects (after correcting for any endogeneity) while at the same time public opinion is known to be very strongly in favour of forest protection suggests that this effect must be coming through the role of transfers to special interest groups.

4. Implications

Having presented strong empirical evidence that an electoral cycle exists in Greek wildfires and tax evasion and explained it as the outcome of redistributive politics and incumbent inattention cycles, it is important to consider the broader implications of these findings.

Once we accept our explanations for our empirical evidence of cycles in wildfires and tax evasion they immediately suggest the phenomenon of cycles is likely to appear in many other variables under the government's control. The main obstacle to studying additional variables is the paucity of data for sufficiently long time series of variables associated with government output. However, it seems plausible we have only seen the tip of the iceberg and that the economic forces driving these cycles are likely to have far reaching consequences. In this sense the cost calculations of Section 3 are a lower bound for the cost to Greece of these effects. Indeed, electoral cycles have almost certainly contributed to the poor state of Greek public finances: According to Walker (2010) 27,000 people were added to the public payroll before the election, despite the dire outlook in 2009, thus further fuelling its ongoing financial crisis. It has also contributed to a widespread feeling of social injustice as it is widely appreciated that public sector misgovernance has made some individuals wealthy by diffusing costs across many others.

It is worth noting that our explanations of electoral misgovernance cycles imply that their costs are entirely avoidable by better institutions which would e.g. allow incumbents to campaign without such a drastic impact on the quality of governance or limit parties' ability to use extremely leaky bucket transfers to woo swing voters. That is, we are not observing a cycle of higher misgovernance around some optimal average but instead are seeing a surge of misgovernance around elections which could be eliminated altogether.

This observation is also very important for how we interpret the implications of our analysis for other countries. The evidence presented in Section 3.5 that wildfires and tax evasion cycles may also exist in other countries is certainly not definitive and it is certainly possible to believe that even if these effects extend beyond Greece they do so in just a few countries. However, redistributive politics and inattention are likely to be important in many

countries without very strong public institutions – it is just that they may manifest their effects in different ways across countries. For example, redistributive politics can only be expected to induce wildfires in countries where property laws, land morphology and climate provide the appropriate incentives; tax evasion can only be the outcome of inattention in countries where elected officials are involved in the micromanagement of the tax collection process.

Intuitively, it seems very clear to us that redistributive politics and inattention cause important electoral effects throughout the globe. For example, the effort an incumbent needs in order to mount an election campaign almost certainly influences its incentives to start an avoidable or postponable war right before an election. Similarly, in many countries pork-barrel transfers are routinely announced before elections.

Identifying how redistributive politics and inattention cycles manifest in each country must be done on a case-by-case basis. In doing so it should be recognized that these forces may also be driving familiar cycles in macro variables such as cycles in government deficits and unemployment. Traditional explanations of these phenomena are hard put to explain cycles in phenomena like wildfires and tax evasion whereas our explanations might also be relevant in explaining traditional cycles like those in deficits and unemployment.

5. Conclusion

Using several data sets we collected especially for this study, we have reported striking increases of Greek wildfires and tax evasion around elections and complemented it with evidence that these increases are caused by government decisions on matters such as the intensity with which transactions are audited. There is evidence that the costs of these effects is large (around 8% of GDP throughout our sample), that the intensity of the wildfire increase may be larger in prefectures with more intense political competition and that wildfires may benefit incumbents once we control for endogeneity, despite apparent citizen outrage in response to large forest fires. Preliminary evidence based on limited

data suggests that these effects may occur internationally and may be stronger in more corrupt countries.

We discuss institutional details relevant to these observations and interpret this evidence on the basis of an explicit model for the incumbent's objective function which we believe captures relevant incumbent incentives. These incentives can cause the observed cycles through two channels. First, the incumbent must divide attention between campaigning and governing. Campaigning increases immediately in response to increases in attention, while the quality of governance decreases only slowly through depreciation when left unattended, so there is an incentive to govern less effectively around elections. Second, some kinds of misgovernance provide immediate benefits to special interest groups which can exploit temporarily lax enforcement of laws and furthermore this misgovernance is only observed with a lag by voters at large. Therefore around elections incumbents have an incentive to leave unattended those matters that benefit targeted special interest groups.

We conclude that tax evasion is caused by looser auditing of transactions for businesses which may or may not be specifically targeted as special interest groups (e.g. reduction of audits on the self employed may be preferred over reduction of audits on listed companies). Wildfire spikes on election years are caused by looser procedures for granting of building permits which raise incentives to burn forested land and possibly less competent fire prevention and firefighting. The evidence for a stronger effect where there is more electoral competition suggests some targeting of special interests since attention towards wildfire policy is administered at the national level. Targeting special interest groups seems worthwhile since in section 3.3 we found evidence that incumbents benefit electorally from more wildfires. That does not mean that governments directly benefit from more wildfires, rather our interpretation is that - for the magnitude of wildfires typically observed - governments benefit indirectly because wildfires generate the opportunity for facilitation of special interests via looser granting of building permits. Importantly, governments need not even be aware of the fact that wildfires and elections are somehow related.

Beyond the international evidence we provide, this work is broadly relevant because it suggests there are intuitive mechanisms through which clandestine but clearly harmful policies may be intensified around elections. Indeed, these mechanisms may be an additional cause of some of the regularities traditionally studied in the political business cycle literature. It therefore seems desirable to suggest institutions that would mitigate these effects. More extensive high frequency monitoring of government performance is key to eliminating incentives for inefficient redistributive transfers to special interests. Stronger post-term accountability and reforming the open-list election system could have a similar effect. In line with Romer's (2010) proposal for fighting corruption in Greece, our work suggests that an additional reason countries should ensure the civil service is organized independently of elected officials is to reduce the impact of their temporary inattention around elections.

Appendix

Table 1.

Determinants of monthly tax revenue ($\Delta\text{tax}/\text{gdp}$) in Greece and the effect of elections

	Benchmark	Post election	Partisan	Benchmark subsample1	Benchmark subsample2
	1972:1-2009:12	1972:1-2009:12	1972:1-2009:12	1972:1-1991:12	1992:1-2009:12
Constant	0.006** (0.001)	0.006** (0.001)	0.006** (0.001)	0.005** (0.002)	0.008** (0.002)
Post-Eurozone dummy	-0.010** (0.002)	-0.010** (0.002)	-0.010** (0.002)		-0.011** (0.003)
$\Delta\text{tax}/\text{gdp}(t-12)$	-0.295** (0.046)	-0.292** (0.046)	-0.294** (0.046)	-0.360** (0.069)	-0.204** (0.062)
$\Delta\text{tax}/\text{gdp}(t-1)$	-0.098 (0.046)	-0.096* (0.046)	-0.098 (0.046)	-0.107 (0.064)	-0.053 (0.069)
Post election dummy		0.003 (0.006)			
Election Period with CL incumbent dummy			-0.003 (0.008)		
Election Period dummy	-0.009** (0.004)	-0.009** (0.004)	-0.009* (0.004)	-0.012* (0.006)	-0.011* (0.006)
<i># obs</i>	432	432	432	216	216
R^2	0.12	0.12	0.12	0.144	0.12
\bar{R}^2	0.12	0.11	0.11	0.132	0.10
DW	1.99	1.99	1.98	1.9	2.06
F	15.04	12.08	12.05	11.85	6.96

Table 1. *Notes:* The dependent variable is measured at each month as the change of the tax-to-gdp ratio relative to the same month of the previous year. This eliminates any seasonalities associated with tax collection. The post-Eurozone dummy is one on all dates after Jan 2001 and captures a change in fiscal policy after this date. $d\text{Tax}(t-12)$ is the value of the dependent variable on the same month of the previous year. $d\text{Tax}(t-1)$ is the value of the dependent variable on the previous month. The Post election dummy takes the value one on the month after the election. The election period dummy takes the value one on the month of an election and the previous month. The CL incumbent dummy does the same but only if the incumbent was a centre-left government. ** denotes significance at the 1% level and * denotes significance at the 5% level. All estimates are based on OLS regressions. The p-value of the election period dummy is always close to 1% even when it is not quite smaller than it. There are 13 election months in our sample (1972:1 to 2009:12) of which 5 happened under a center-left government and 6 in the first subsample.

Table 2.

	Sep-08	Sep-09
Direct taxation	1.912	2.049
Income	1.666	1.629
Wealth	62	65
Arrears & other	184	355
Indirect taxation	2.078	1.889
VAT & other transaction taxes	1.331	1.154
Special consumption taxes (fuel, tobacco etc)	682	677
Arrears & other	65	58

Notes: All numbers in million Euros. Year-on-year reductions occur in tax subcategories in which there is considerable room for time-varying tax evasion. This leads to a reduction of VAT revenues as the intensity of audits is relaxed, while income tax revenues are not affected as income taxes are usually annual and not monitored through day-to-day audits that can easily be manipulated. On the other hand, incumbents often settle payments of income tax arrears *at a steep discount* before elections to gratify special interests, which is why we observe an increase in this category around elections.

Table 3.

Determinants of annual area burnt [ln(hectares)] in Greece and the effect of elections

	Benchmark	Partisan	Italy as climate proxy	Weather as climate proxy	election timing 1	election timing 2	Benchmark subsample1	Benchmark subsample2
	1955-2009	1955-2009	1970-2009	1955-2008	1955-2009	1955-2009	1955-1982	1983-2009
Constant	6.276** (1.173)	6.338** (1.191)	-3.418 (2.556)	-444.702** (163.921)	6.358** (1.206)	7.091** (1.258)	10.845** (1.293)	7.44** (2.017)
<i>trend</i>	0.019* (0.008)	0.020* (0.008)	0.009 (0.010)	0.014 (0.007)	0.019* (0.008)	0.022* (0.009)	0.090** (0.015)	-0.025 (0.023)
ln(area(<i>t</i> -1))	0.293* (0.125)	0.285* (0.127)	0.229 (0.117)	0.245** (0.114)	0.286* (0.127)	0.220 (0.135)	-0.296 (0.147)	0.291 (0.183)
ln(Italian area(<i>t</i>))			0.944** (0.225)					
ln(rain)				68.271** 18.017** (6.386)				
Temperature				-2.724** -0.979				
Temperature*ln(rain)								
CL incumbent dummy		-0.197 (0.444)						
election before current summer (same or previous yr)					0.144 (0.408)			
election after summer but in same yr						0.370 (0.275)		
election year dummy	0.820** (0.239)	0.876** (0.271)	0.596* (0.254)	0.726** (0.229)	0.742* (0.327)		0.849** (0.202)	0.868* (0.372)
# obs	54	54	39	53	54	54	27	27
R^2	0.31	0.39	0.57	0.55	0.39	0.26	0.7	0.28
\bar{R}^2	0.29	0.33	0.52	0.49	0.34	0.22	0.66	0.19
<i>DW</i>	1.99	1.94	1.89	1.98	1.97	2.02	2.12	1.82
<i>F</i>	15.04	7.71	11.26	9.32	7.68	6	17.77	3.04

Table 3. Notes: The dependent variable is ln(area burnt in hectares) and all variables are measured annually. The linear time trend starts at $t = 1$ and increments annually. A statistically insignificant lag of the dependent variable is used because it eliminates autocorrelation that would otherwise be present in the regressions. Standard errors in parenthesis. ** denotes significance at the 1% level and * denotes significance at the 5% level. The p-value of the election period dummy is always close to 1% even when it is not quite smaller than it. All estimates are based on OLS regressions. The 1955-2009 sample contains 17 election years, in nine of which the election occurs after the fire-season (after September; no elections happen *during* the fire season (June-September) in our sample). The regression with weather as a climate proxy contains strong multiplicative effects suggesting that when high temperatures coincide with little rain area burnt increases dramatically.

Table 4.

	Revenue	Area burnt
Regression measures of cost per election year	0.18% of annual GDP (in 2 months)	134% of average area burnt on non-election
Derived cost cumulated over sample (various measures)	€5.7 bn	€14.5 bn
	2.34% of 2008 GDP	5.9% of 2008 GDP
		783,600 ha (6% of total surface area of Greece)
Sample	1973-2009	1955-2009
	(432 months)	(55 years)
# elections in sample	13	17

Notes: Election effects are based on election dummy coefficients in benchmark regressions. The tax reduction effect is calculated as $0.009 \times 2 = 0.018$ of annual GDP since the monthly effect is 0.009 which occurs on 2 months for each election and over 13 years this is 2.34% of GDP. Similarly, the area percentage increase is calculated as $\exp(0.82)$ and we can use this together with the average area burnt on a non-election year to obtain the burnt area attributed to elections. The monetary cost of wildfires is based on an estimate of the cost of 2007 wildfires (see footnote 3) which is assumed constant per burnt hectare across time. All calculations use the (currently) official 2008 GDP which is €245bn. Cost calculations do not attempt to account for issues of fairness, loss of human life and environmental consequences beyond property damages. Note that election effects measure only the portion of tax evasion / burnt area that is attributed to an election not the full cost of tax evasion or wildfires on election years.

Table 5.
Forest wildfires across regions in Greece and local election closeness

	Normalized increase in area burnt averaged across election years
Constant	0.348**
	(0.037)
% of seats obtained by first party relative to total of top two parties	-0.154**
	(0.056)
# obs	51
R^2	0,14
\bar{R}^2	0,12
F	7,65

Notes: The dependent variables are measured in 51 prefectures and control for factors that affect all areas in a particular year and factors that affect an area on all years. They are based on the percentage increase in forest area burnt relative to the average for each area across years (thus removing the factors affecting each region systematically). This is then demeaned across years to remove annual effects affecting all regions (and then averaged across all election years to remove noise). ** denotes significance at the 1% level and * denotes significance at the 5% level. All estimates are based on OLS regressions. Our sample is 2000-2009 which contains four election years.

Table 6.

Country	number		year on year change in tax/GDP		p value	CPI
	election	non-election	election month	non-election month		
Romania	4	80	-0,023	0,001	0,004	3,8
Malta	2	22	-0,034	0,003	0,233	5,2
Norway	4	68	-0,025	0,001	0,260	8,6
Iceland	4	56	-0,014	0,001	0,272	8,7
Georgia	2	22	-0,010	0,001	0,279	4,1
Indonesia	2	58	-0,005	0,000	0,366	2,8
Jordan	2	22	-0,007	0,001	0,383	5
Greece	6	90	-0,002	0,000	0,394	3,8
Nicaragua	2	76	0,002	0,007	0,396	n/a
Croatia	1	47	-0,004	0,000	0,421	4,1
Lithuania	2	46	-0,002	0,000	0,439	4,9
Russia	2	10	-0,004	0,001	0,467	2,2
Mongolia	4	80	0,018	-0,001	0,740	2,7
Bahamas	2	40	0,009	-0,011	0,779	n/a

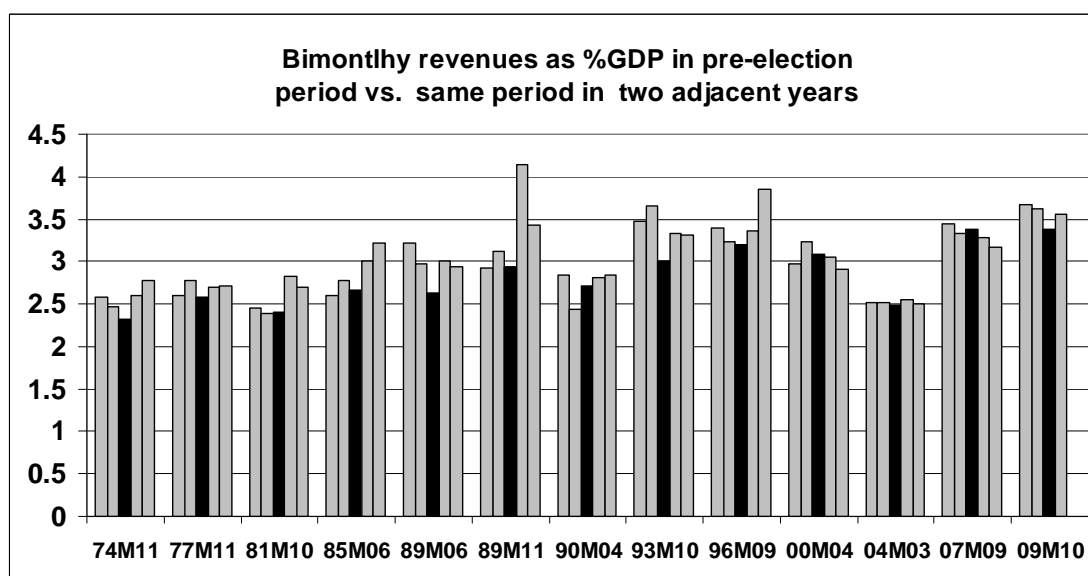
Notes: Countries sorted by p Values. Election months are months before and on an election (so are twice the number of elections in our sample). The p-Value in column 6 is calculated for a t-test of the Null of equality of mean monthly changes on and off election months versus the alternative that the election months have a lower mean. CPI refers to Transparency International's Corruption Perception Index for 2009. Pooling across countries and conducting a t-test for an effect gives a p value of 0.16. Pooling and regressing the difference between the election and non-election means on CPI we get a p-value of 0.08.

Table 7.

Country	number		area burnt as proportion of country time average		p value	CPI
	election	non-election	election	non-election		
Greece	8	21	0,75	-0,28	0,01	3,8
Serbia & Montenegro	4	7	0,27	-0,15	0,04	3,3
Moldova	3	8	0,90	-0,34	0,04	3,5
United States	3	9	0,34	-0,11	0,05	7,5
Turkmenistan	2	9	0,42	-0,09	0,06	1,8
Armenia	3	8	0,57	-0,21	0,06	4,9
Lithuania	5	13	0,49	-0,19	0,07	4,9
Czech Republic	5	11	0,49	-0,22	0,08	5,8
Portugal	7	22	0,33	-0,11	0,11	2,7
Austria	5	10	0,21	-0,11	0,23	7,9
Croatia	4	13	0,40	-0,12	0,23	4,1
Latvia	6	23	0,50	-0,13	0,26	4,5
Israel	3	9	0,07	-0,02	0,28	6,1
Romania	6	17	0,25	-0,09	0,31	3,8
Albania	5	7	0,08	-0,06	0,31	9,2
Sweden	4	13	0,15	-0,05	0,33	3,2
Netherlands	2	10	0,09	-0,02	0,34	2,2
Russian Federation	3	8	0,13	-0,05	0,39	8,9
Ireland	2	10	0,01	0,00	0,48	2,3
Azerbaijan	4	7	0,00	0,00	0,52	8
Norway	4	12	-0,06	0,02	0,56	8,6
Estonia	5	13	-0,10	0,04	0,60	3
Spain	8	21	-0,05	0,02	0,61	6,6
France	6	23	-0,08	0,02	0,62	6,1
Cyprus	4	15	-0,18	0,05	0,62	6,9
Switzerland	7	22	-0,16	0,05	0,65	6,6
Kazakhstan	2	9	-0,57	0,13	0,66	9
Bulgaria	4	15	-0,30	0,08	0,68	3,8
Ukraine	3	8	-0,60	0,23	0,68	2,2
Belarus	2	9	-0,48	0,11	0,69	2,7
Denmark	3	6	-0,35	0,17	0,69	3,8
The f.Y.R. of Macedonia	2	9	-0,26	0,06	0,69	2,4
Bosnia & Herzegovina	3	8	-0,11	0,04	0,70	9,3
Poland	4	15	-0,28	0,07	0,71	8,2
Georgia	3	8	-0,07	0,03	0,72	8
United Kingdom	3	9	-0,25	0,08	0,72	5
Belgium	3	9	-0,76	0,25	0,73	4,1
Finland	5	14	-0,17	0,06	0,74	7,7
Luxembourg	2	10	-0,37	0,07	0,74	7,1
Germany	5	14	-0,37	0,13	0,78	8,9
Slovakia	4	14	-0,37	0,11	0,80	4,5
Italy	8	21	-0,14	0,05	0,81	4,3
Hungary	5	13	-0,24	0,09	0,82	5,1
Canada	3	9	-0,56	0,19	0,87	8,7
Turkey	5	14	-0,29	0,10	0,88	4,4
Slovenia	5	13	-0,65	0,25	0,96	6,6

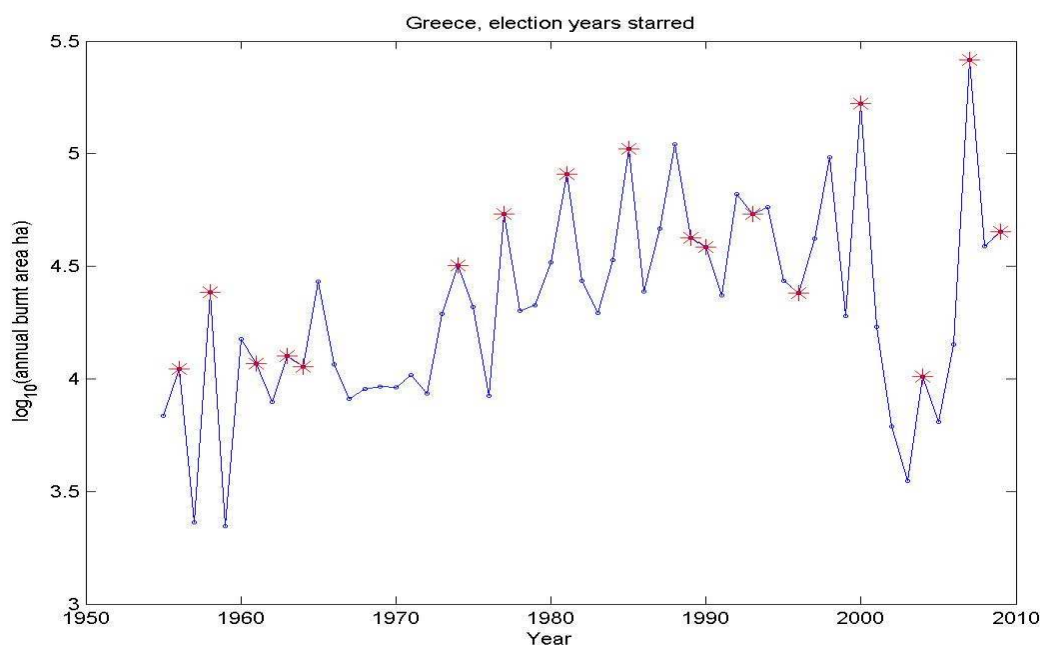
Table 7. *Notes* : Countries sorted by p Values. Area burnt for each year is divided by the country's average area burnt and then a mean is calculated on election and non-election years in columns 4 and 5. The p-Value in column 6 is calculated for a t-test of the Null of equality of mean area burnt on and off election years versus the alternative that the election years have a larger mean. CPI refers to Transparency International's 2009 Corruption Perception index. Regressing the difference of the mean on and off elections on CPI produces coefficients with a p-Value around 0.07. There is no election effect if all countries are pooled.

Figure 1. Drop of revenues in election periods



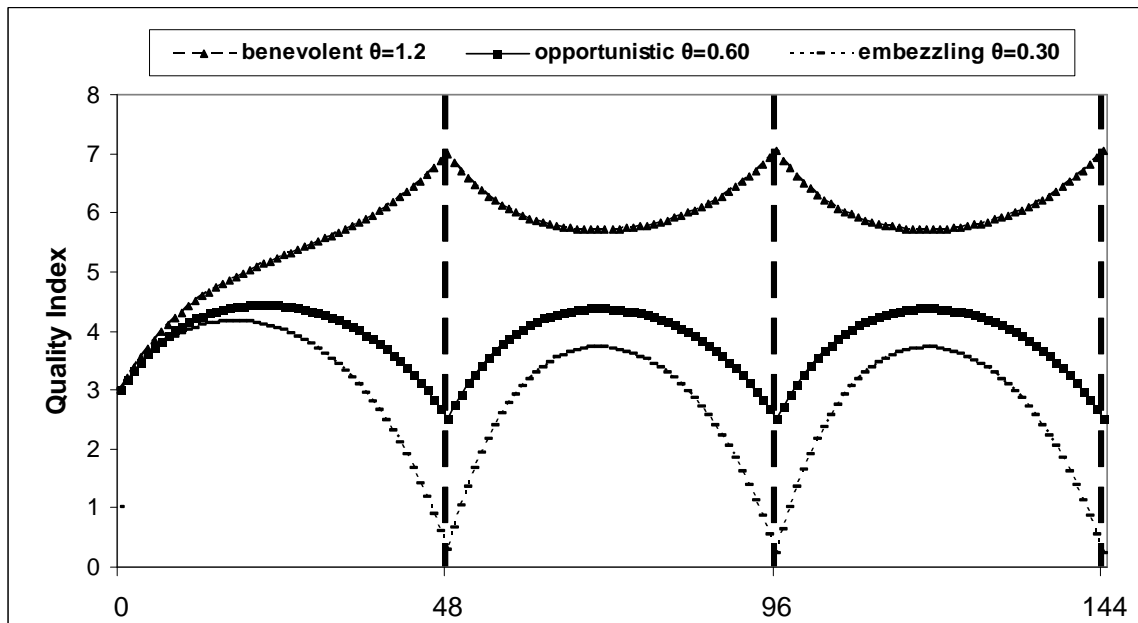
Notes: Bimonthly tax revenues (as % of annual GDP) in the pre-election period of year (N) vs. the two adjacent years (N-2, N-1, N+1, N+2). We use bi-monthly revenues because the pre-election period includes the prior as well as the poll month. Data is not seasonally adjusted and provisional for 2010, while data for 2011 are not available at the time of writing. Note that in some cases the adjacent revenues correspond to election periods (e.g. in 2007 and 1990 elections in which case the effect is somewhat mitigated as we would expect).

Figure 2: Peak of fires on election years



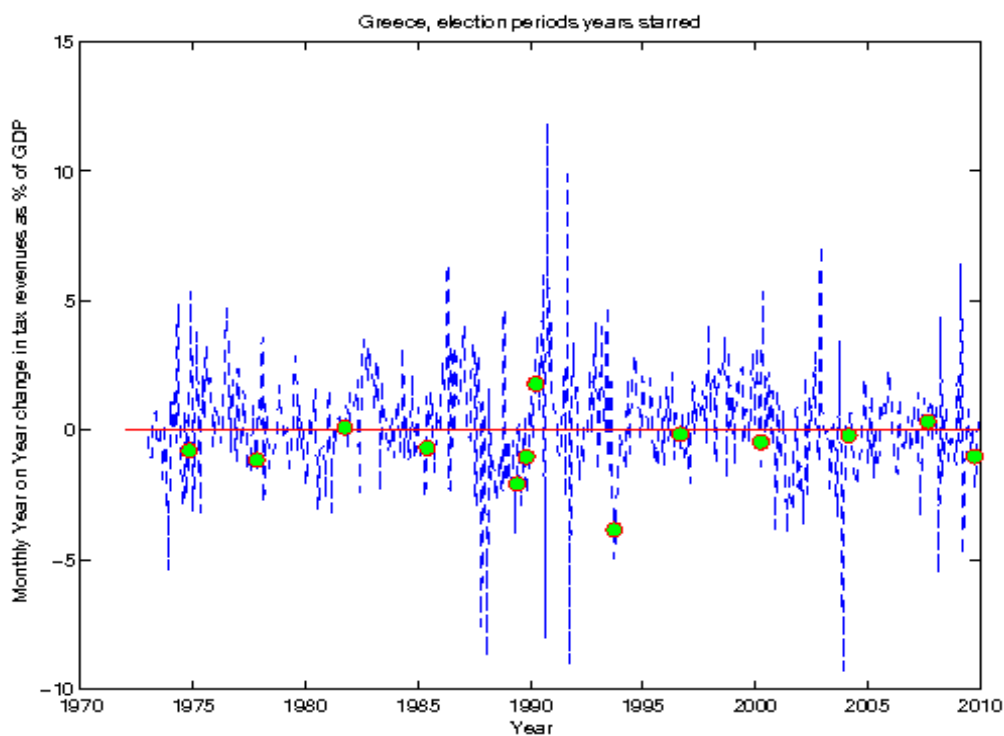
Notes: Forest fires in Greece 1955-2009 in log (base 10) hectares with election years are marked with a star. Years with wildfire peaks that are not elections (1965, 1988 and 1998) are discussed in the text.

Figure 3. Quality of governance path under various types of optimizing incumbents



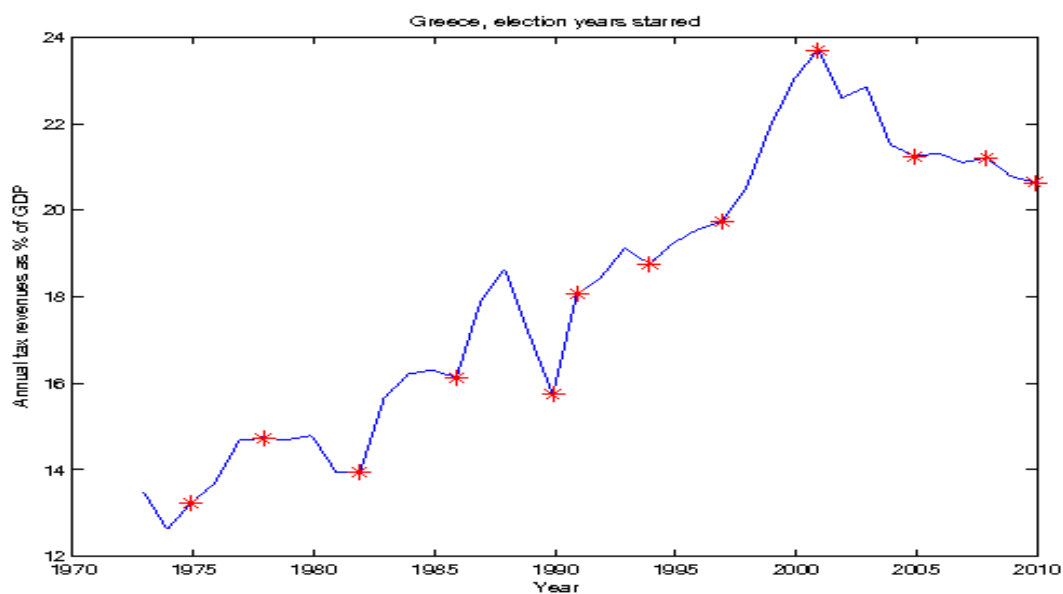
Notes: The quality of governance is measured in successive elections for various types of incumbents (different θ). We set $T=48$ months for the typical four-year interval between elections and assume that quality is observed with one month lag. We assign the discount factor $\mu=0.9765$ implying that $\mu^{12} = 0.75$, i.e. roughly one fourth of the electorate's memory fades away after a year, and $\delta=0.912$ so that $\delta^{12} = 0.33$ implying that governance deteriorates by two thirds in the same period if no attention is paid. Finally we set $\alpha=1$, $\sigma=0.20$ while γ is conveniently set at 0.88 to give a bliss level of 10. Inherited quality is assumed $q(0)=3$, so that cycles are generated from the first term.

Figure 4. Year-on-year changes in monthly tax/gdp



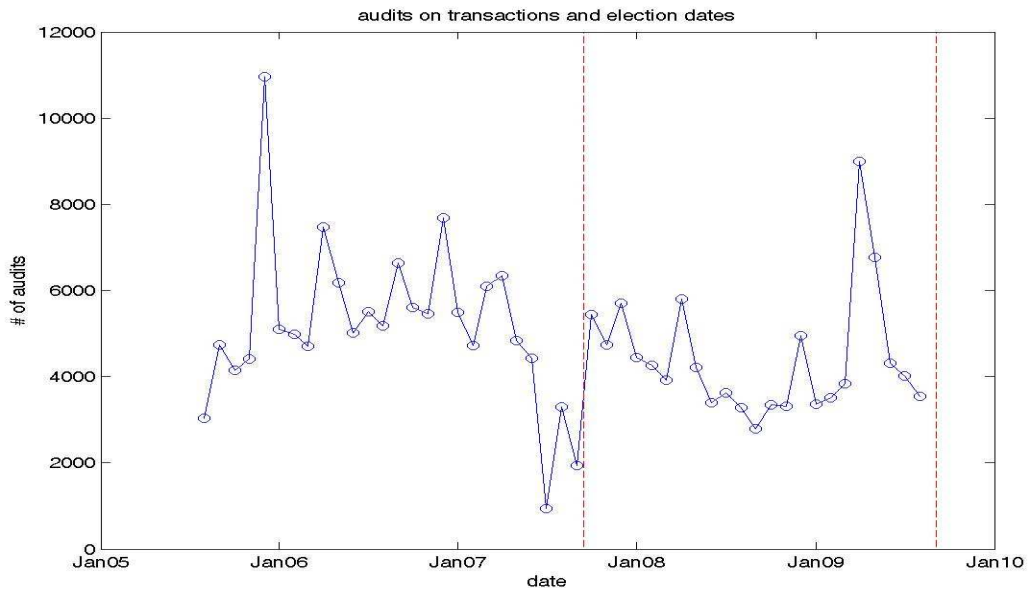
Notes: Only one election in 1990 is clearly above the mean change (straight line) which is just above zero. Most likely this attenuated effect is due to the fact that there were three elections in a space of less than two years in 1989-1990. Mean off-election is 0.002, mean on election is -0.007.

Figure 5. Annual tax/GDP



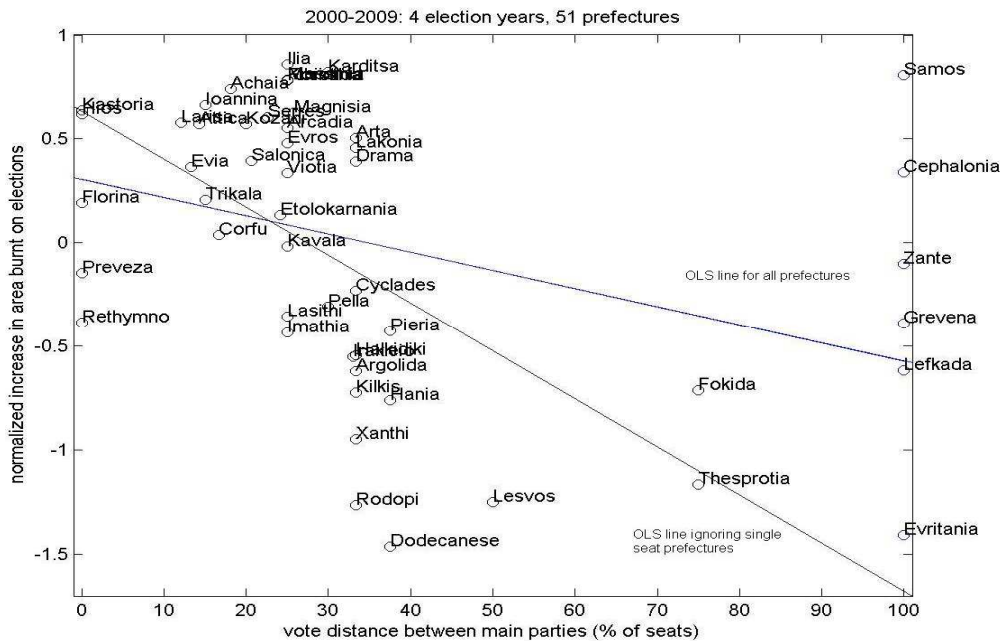
Notes: There is no election effect in annual tax revenue data. The declining trend after 2000 is associated with the effect of Eurozone entry.

Figure 6. Election effect on audits on transaction



Notes: There is a drop preceding the election dates for the total number of tax audits on transactions conducted by authorities. This is the tax category for which we also observe a drop in revenue.

Figure 7. Political competition effect on wildfires.



Notes: We remove wildfire conditions specific to each prefecture (individual effects) by measuring wildfire as a proportion of their time series average. We also remove conditions specific to annual conditions (time effects) by subtracting from each prefecture's measure the average change across all prefectures in each year. We then plot the average wildfire measure for each prefecture against the average absolute difference in seats obtained by the two main parties (both averages are across the four election years). We plot the OLS line both including and excluding the prefectures where there is only one seat. See Table 5 for regression analysis.

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