Electoral misgovernance cycles:
Wildfires and tax evasion in Greece

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Abstract

We present empirical evidence that around elections, wildfires and tax evasion increase significantly in Greece with important economic implications. We interpret this as a particular type of misgovernance manifesting itself through selective and difficult to detect relaxation of the degree of law enforcement. Since this mechanism is likely to be relevant in many countries, misgovernance around elections and its economic consequences may be much broader than has been assumed in the political business cycle literature. We demonstrate that our empirical evidence can be understood using standard models of electoral effects on policy though we argue that law enforcement relaxation is best viewed either as a wealth transfer by a rational incumbent to voters acting on the basis of retrospective utility or as the consequence of a shift in incumbent attention from governing towards the reelection campaign.

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 first author was Minister of Finance in Greece during 2001-2004, thus the description occasionally reflects personal insights and opinions that might not be viewed as balanced to all readers.

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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 misgovernance of important policy instruments such as budget deficits and money supply, analyzing the effects of this on variables of more primitive interest to voters like inflation and unemployment.[1] We present evidence suggesting that this view needs to be substantially broadened because misgovernance around elections can be more pervasive and therefore its effects have probably been significantly underestimated by the literature. Additionally, to the extent that the underlying causes of misgovernance are similar regardless of the details of the form it takes, our research adds a novel source of evidence even for the causes of the extensively studied misgovernance in inflation and unemployment.

The empirical evidence we present derives from the existence of strong pre-electoral manipulation of *the extent of law enforcement.* 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.

We report two particular regularities in misgovernance around recent Greek elections: 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). Regressions show that these effects are very statistically significant and indeed they can be easily recognized even with a simple graphical analysis. A proximate cause of these effects is the relaxation in enforcing the laws designed to protect forests and fight tax evasion. Apart from the laws criminalizing arson and tax evasion, there is a

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[1] Meanwhile, distortions and inefficiencies during elections beyond misgovernance *per se* have been publicly recognized and pragmatically accepted including - among many others - restrictions on the time interval during which major policy reforms are practically feasible ('the first 100 days') and the diversion of vast sums towards electoral campaigns.

battery of strict – but often overlooked - rules and provisions prohibiting the urban development of burnt land and enforcing efficient damage control once wildfires have been started or tax evasion is tracked down.[2] A detailed discussion of the institutions relevant to tax evasion and wildfires in Greece and on how rules are bent around elections is deferred until sections 2 and 3 respectively.

The models developed to explain cycles in macro policy can also be used to explain cycles in law enforcement as we demonstrate in Section 4 within the context of Nordhaus' (1975) classic model - though most other popular models such as that of Rogoff (1990) or Alesina (1987) could just as well be used. Extensive empirical applications of these models on the relatively scarce available data have not led to a consensus on the reasons for electoral cycles in monetary and fiscal policy. It may therefore be revealing to examine their plausibility as explanations of misgovernance more broadly, including effects on the degree of law enforcement around elections.

In section 4 we argue that models in which inefficient policies serve as a credible signal of incumbent competency (Rogoff, 1990) are unlikely to provide satisfactory explanations for electoral effects on tax evasion and wildfires because neither the underlying policies nor the precise extent of evasion or wildfires are easily observable and it does not make sense for an incumbent to try to signal using a policy that is poorly observed. Additionally, there do not seem to be any partisan effects in our data as is assumed by Alesina (1987) so this explanation also does not seem very plausible. Instead we suggest that attention shifts of incumbents towards getting re-elected rather than governing and voting based on retrospective utility that rewards inauspicious pork-barrel policies might be important parts of the explanation for misgovernance via relaxed law enforcement. This seems consistent with the fact that public opinion at large is against policy attitudes that tolerate tax evasion or are reluctant to fight wildfires.

However, such arguments should be interpreted with much more caution than the empirical evidence itself as preferred explanations will ultimately no doubt be strongly influenced by prior beliefs about controversial unobservables such as voter rationality and behaviour. This is particularly important since if we accept that government inattention and retrospective

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[2] That this is a real source of concern in Greece is evidenced by article 16 of law 28730 (passed in 2000) which prohibits tax executives from holding certain political positions with the local government administration in the same jurisdiction as the tax authority for which they work.

utility likely contribute to the misgovernance underlying law enforcement manipulations, it is natural to assume they also contribute to the misgovernance underlying fiscal and monetary policy manipulations.

The difficulty in observing and quantifying policies related to law enforcement that underlies the implausibility of them being used as a signal is also most likely the reason that such policies have been neglected by economists. Indeed, our research would not have been possible without identifying what type of law enforcement manipulations were likely to have occurred systematically in a particular country over several decades and of having data in which such manipulations could be made apparent. While the opportunity for a clear observation of such a manipulation may be rare, it is likely that its effect is not, since governments seeking reelection will have similar manipulation incentives in all countries and all domains where this is possible. For this reason we believe our results have implications that extend to other countries beyond Greece.

These characteristics of law enforcement manipulation also mean it will take a major research effort to gauge its full consequences globally, so we view our work as indicating the tip of an iceberg of unknown but potentially globally significant size. As is the case with monetary and fiscal policy, the latitude governments have to influence policy depends on institutions that can vary a lot between countries but there are surely many countries that are not too dissimilar in this respect to Greece. It is therefore quite possible that the manipulation of law enforcement once fully measured could have economic implications that dwarf the effects from monetary and fiscal policy.

The rest of this paper is structured as follows. In the next section we present our data and empirical evidence for an electoral effect on wildfires and in section 3 we do the same for tax evasion. In section 4 we demonstrate that the usual theoretical explanations for electoral effects on the economy can be adapted to explain the manipulation of law enforcement, illustrating in the context of Nordhaus' (1975) model and formalizing our explanation of the reported empirical observations. The paper closes with a section containing a short summary of our findings and a discussion of some implications.

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2. Empirical effect of elections on wildfires

Greece is a country particularly prone to destructive uncontrollable wildfires during its simultaneously dry, hot and often very windy summers. As is evident from figure 1, burnt areas have increased steadily in the period 1955-2008, presumably because of changing patterns of land use, climate and population. The unusual 2007 wildfires in a pre-election summer received global news coverage as they involved 84 deaths, 270,000 hectares of forest burnt (of a total 3.5 million), several villages with more than 2000 houses destroyed and direct economic damages exceeding 5 billon Euros.[3] Arson is known to contribute a significant fraction of wildfires each year, though the paucity of arrests has meant a lack of understanding as to the underlying reasons for this.
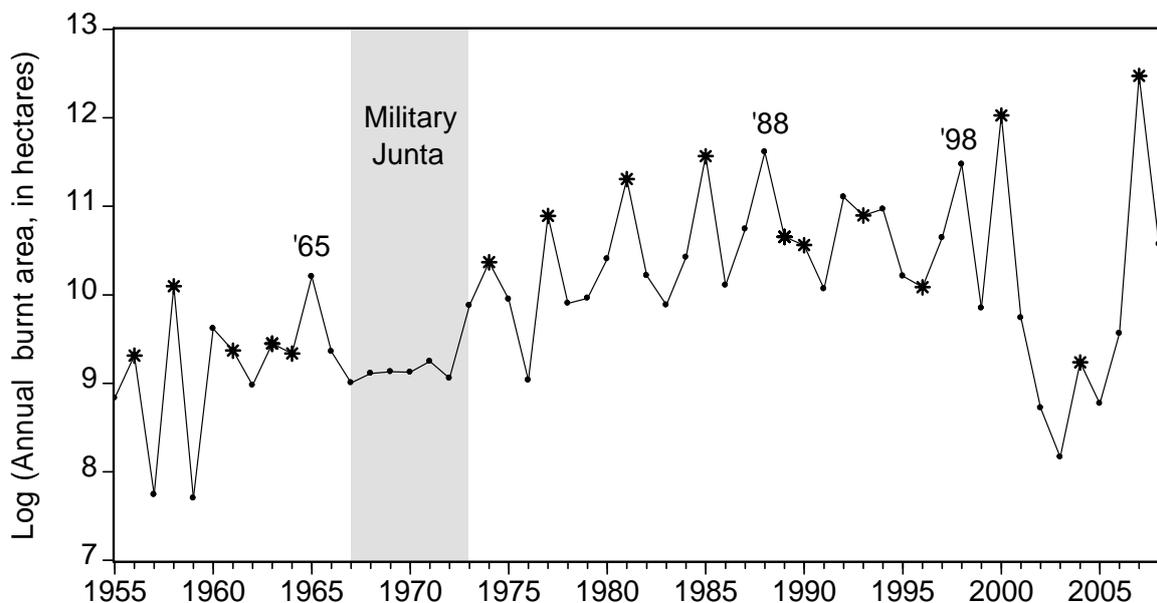
Figure 1: Forest fires in Greece 1955-2008 in hectares
Note: Data in logs. Election years are marked with a star. The years of military dictatorship are shaded. Peak non-election years 1965, 1988 and 1998 are discussed in the text.

Explanations for unusual wildfires in popular lore include that property developers exploit the lack of a land registry to burn forest areas in order to

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[3] See http://en.wikipedia.org/wiki/2007_Greek_forest_fires and http://earthtrends.wri.org/text/forests-grasslands-drylands/country-profile-73.html

develop them afterwards, that governments are incompetent at preventing and fighting fires. In other cases the incumbent government finds it politically advantageous to attribute forest fires to hostile acts aiming to destabilize the nation or at least its authority[4]. We are by no means the first to suggest that wildfires increase around elections - see among others Kailidis *et al* (2004), though to the best of our knowledge the empirics of this effect or its causes have not received a formal treatment.

Journalistic accounts suggest that large areas are claimed by owners for urban construction and development through a process of lifting previous categorization as forest land. Decisions by the Forest Agency are based on land characteristics observed many decades ago and disputes with the interested owners take a long time to settle, if ever. Lack of a thorough and updated Land and Forestry Registry results in a grey area of claims and this frequently invites clientelistic pressures to bend the rules in favour of land development. As characterization can change more easily the lower the density of the forest land, destruction by fire may be a worth-considered dirty job n periods of looser law enforcement.

We have been able to obtain annual data collected by the Forest Agency of the Ministry of Agriculture of Greece for the period 1955-2008 for areas (forest and agricultural) 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 made burnt areas of size less than one acre to be included in all records starting that year.[5]

During this 54 year period there were 17 elections (two were in 1989, so election years are 16) and even from Figure 1 it should be immediately apparent that election years seem to be associated with peaks in burnt areas. The total area burnt during 16 election years amounts to 949,900 hectares 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. Furthermore, the standard deviation of the area burnt during election years is three times higher than that of non-election

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[4] During the 2007 forest fires, a cabinet minister implicated the opposition by the memorable phrase *«the Greens burn the green"*. Though immediately disclaimed by the government, the allegation was widely debated in the media in the middle of the election campaign.

[5] In work we do not report we repeated the analysis that follows with a dummy variable for years after 1991 but found the effect was not at all statistically significant and had the wrong sign.

years, suggesting that on election years forest fires can lead to very extreme outcomes.

What we observe in Figure 1 is easily confirmed from a standard election dummy regression (e.g. Alesina, Roubini and Cohen, 1997) as in (1) below:

Equation 1

$$\log(\text{area}) = 6.218 + 0.020(\text{time}) + 0.293 \cdot \log(\text{area}_{-1}) + 0.853(\text{elections})$$

$$(1.178) \quad (0.008) \qquad (0.125) \qquad\qquad (0.245)$$

$$0.000 \quad 0.015 \qquad 0.023 \qquad\qquad 0.001$$

$$1955 - 2008, \quad nobs = 53, \quad R^2 = 0.382, \quad DW = 1.95, \quad Fstat = 10.12$$

The numbers in parentheses are standard errors and the numbers below them are p-values; *'Elections'* is a dummy variable that takes the value one on the 16 years on which there is an election and zero otherwise, *'time'* is an annual trend starting at 1955 and the suffix denotes lagged periods.

For comparison purposes, we also report the regression without the election dummy which significantly decreases the explainable variation in burnt areas:

Equation 2

$$\log(\text{area}) = 7.034 + 0.021(\text{time}) + 0.235 \cdot \log(\text{area}_{-1}) \ + \ (wf)$$

$$(1.277) \quad (0.009) \qquad (0.137)$$

$$0.000 \quad 0.022 \qquad 0.092$$

$$1955 - 2008, \quad nobs = 53, \quad R^2 = 0.229, \quad DW = 2.09, \quad Fstat = 7.46$$

where *(wf)* denotes the residual. From the parameter estimates in this regression we can get a rough estimate of the total area burnt because of an electoral effect during our sample. First note that the area burnt on election years is approximately $e^{0.853}$ or 234% larger than the area burnt on non-election years. This means that on an election year, approximately 2.34/(1+2.34) or 70% of area burnt is due to the election. Considering that in the period of our sample 1,872,335 hectares were burnt during 54 years with 16 election years, this implies 1,872,335*16/54*0.7 or approximately

390,000 hectares i.e. 21% of the total area burnt during the whole sample are due to the effect of elections. In our view this is a huge effect with important economic, environmental and social consequences.

In Figure 1 it is particularly striking that during the military dictatorship years of 1967-1974 when there were no elections, wildfires were also particularly low. In fact, 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[6]. Note also that in the period 1989-1990 there were actually three elections which may explain the relatively low effect of each election in those years as evident in figure 1.

We next consider whether we can detect an impact of burnt areas on election outcomes, assuming that the former affect the probability of incumbent re-election, but not vice versa. This is done using a simple logit model for the probability of re-election against the residual in regression (2) which is a proxy for unexpected wildfires. The probability of re-election is found to be:

Equation 3

$$\text{Prob}(reelection) = 0.504 \ + \ 0.220(wf)$$

$$(0.146) \qquad (0.152)$$

$$0.004 \qquad 0.169$$

$$1955 - 2008, \quad nobs = 53, \quad R^2 = 0.13, \quad DW = 1.72, \quad Fstat = 2.096$$

where (wf) is the residual from regression (2). Using a more direct method, the one-sided t-test that more wildfires help incumbents where we compare the probability of re-election conditional on wf being larger than its mean (83%) on elections conditional on it being smaller (40%) delivers a p-value of 10.27%. In sum, the evidence suggests wildfires do not damage incumbents and might help them though the statistical evidence for this is quite weak.

It is also relevant to consider whether there is a partisan effect in wildfires which we do by adding a dummy variable for when the centre/socialist party

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[6] 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 these figures.

was in office.[7] 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). The result is given in (4) below:

Equation 4

$$\log(\text{area}) = 6.220 + 0.022(\text{time}) + 0.287 \cdot \log(\text{area}_{-1})$$

$$\qquad\qquad (1.180) \quad (0.008) \qquad (0.125)$$

$$\qquad\qquad 0.000 \quad\;\; 0.010 \qquad\;\; 0.026$$

$$\qquad + 1.018(\text{elections}) - 0.438(\text{centre\&socialists})$$

$$\qquad (0.301) \qquad\qquad\quad (0.466)$$

$$\qquad\; 0.001 \qquad\qquad\qquad 0.352$$

$$1955 - 2008, nobs = 53, R^2 = 0.393, DW = 1.96, Fstat = 7.79$$

Evidently, while areas burnt by wildfires appear to be somewhat lower under centre/socialist governments on elections years, the effect is not statistically significant. A comparison of wildfires throughout each party's government (not just election years) also leads to insignificant differences.

Effects of misgovernance unrelated to elections
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, intentionally or not, led to rule-bending outcomes similar and probably more severe than those produced by electoral misgovernance.

In 1965, there has been 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 changing the executive. For example, the post of the forest-relevant Agricultural minister was filled with four nominations between July and September of that year.

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[7] Before 1967 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.

In October 1987, the Government passed the 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 have taken place in the following summer period 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 misgovernance due to coordination failures. In an attempt to re-organize the crisis-management agency, the Government put the 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 to a new peak of forest fires, and the new agency recovered credibility only after a substantial reduction in wildfires in subsequent years.

Robustness analysis
As a check on the robustness of these results we attempted to control for climate effects that according to the literature play an important role in the areas burnt by wildfires each year; see, among many others, Flannigan and Harrington (1988), Swetnam (1993) and Larsen (1996). The relevant data we were able to collect include precipitation and temperatures and 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).

We expect that forests become less vulnerable to fires as a result of increased precipitation not just during the fire season but also in preceding months since precipitation raises air humidity, reduces soil dryness and fills-up water reservoirs. Taking into account that the core wildfire season in which the vast majority of areas are burnt is June to September we construct a precipitation index that measures the stock accumulated during a period of 12-months spanning from previous-year October to current-year September.

Forests also become less vulnerable to fires when temperatures are low though, unlike the case with precipitation, the temperature during the wildfire season itself is far more important than in the period prior to it. To capture this effect, we average temperature measurements[8] in July since that month's measurement has the most significant impact. Precipitation and temperature data were provided by the Measurement Unit of Climatic Changes of the National Observatory of Athens (EAA) as collected at four separate weather observatories stationed at dispersed parts of Greece (Corfu, Methana, Larissa and Herakleion) over which we took the simple average. As was the case previously, our data covers the period 1955-2008 and yield the following specification:

Equation 5

$$\log(\text{area}) = 11.004 + 0.016(\text{time}) + 0.221 \cdot \log(\text{area}_{-1}) + 0.670(\text{elections})$$

$$(5.839) \quad (0.07) \qquad (0.120) \qquad\qquad (0.239)$$

$$0.065 \quad 0.040 \qquad 0.071 \qquad\qquad 0.007$$

$$-1.532 \cdot \log(\text{rain}) + 0.231 \cdot (\text{July\_temperature})$$

$$(0.626) \qquad\qquad (0.147)$$

$$0.018 \qquad\qquad 0.122$$

$$1955 - 2008, nobs = 53, R^2 = 0.478, DW = 1.80, Fstat = 8.60$$

This regression does not affect our analysis from (1) save that it suggests climate data can help in predicting wildfires. It also suggests a mild downward revision of our estimate of the impact of elections on wildfires.

We also expect that neighbouring countries may be subject to similar climactic effects – but no effect from elections in Greece – so we also explored data for wildfires in Italy, Spain, Portugal and France. Upon analyzing this data it was immediately obvious that there is a very strong

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[8] Climate data are treated here as independent, exogenous explanatory variables and are employed in a simple averaging mode. More elaborate models might reflect the positive feedback mechanism between forest fires and temperature and a negative one between temperature and precipitation as described in the greenhouse effect literature; for an account see IPCC (2007, Section 7.3.3.1.4).

correlation of wildfires in Italy and Greece but not with any of the other countries.[9]

Indeed, while our temperature and precipitation indexes do explain a significant portion in wildfire variation they are weaker than wildfires in Italy and become insignificant in a regression where all effects are included. For this reason we report only a final regression where area burnt by wildfires in Italy is used as a proxy for hazardous climactic conditions in Greece in the same year:

Equation 6

$$\log(\text{area}) = -2.418 + 0.239 \cdot \log(\text{area}_{-1}) + 0.681(\text{elections}) + 0.873 \cdot \log(\text{italy})$$

$$(2.583) \quad (0.119) \qquad\qquad (0.254) \qquad\qquad (0.234)$$

$$0.355 \quad 0.053 \qquad\qquad 0.011 \qquad\qquad 0.000$$

$$1970 - 2008, \ \ nobs = 39, \ \ R^2 = 0.532, \ \ DW = 1.84, \ \ Fstat = 13.30$$

Compared to (1), the effect of elections is somewhat weaker but still very significant. It should be noted that the sample here covers 39 years instead of 53 and contains 11 rather than 16 election years. A logit analysis based on the residuals from the above regression without including the elections leads to the same conclusions as that using the residuals of equation (2) though the p-value for the null that wildfires do not affect re-election probabilities is revised downwards a little to 0.12. This might be enough to convince someone who had an *a priori* belief in a positive relationship between the two and did a one-sided rather than a two-sided test. Adding a dummy in (5) or (6) to capture partisan effects does not lead to significant results.

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[9] Our data covered the period 1980-2007 and were transcribed from European Commission statistics as published in 'Forest Fires in Europe, Report No7, 2006' and the 'European Forest Fire Information System Newsletter', 2007, issue 3, published by the JRC Scientific and Technical Report of the Directorate-General Environment, available at http://effis-viewer.jrc.ec.europa.eu/UptodateSituation/. Following this observation we were able to obtain additional data for Italy for the years 1970-1980 from the UN Forest Fire Statistics (1984). The figure for 2008 is provisional and probably on the low side, taken from a journalistic report (Guardian, "Italian mafia accused of starting wildfires and hindering fire crews" by Tom Kington, 9/8/2008).

3. Empirical effect of elections on tax evasion

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 the figure of GDP by 9.6%. Consequently, tax evasion is widespread and occurs in both direct and indirect taxation.[10]

Additionally, unintentional delays due to archaic practices in collecting tax revenues have been quite common in Greece for several decades, causing substantial fiscal losses to the government in real terms appropriately discounted (for an account, see Christodoulakis 1994). Though the situation has improved in recent years, it is still possible that electoral revenue manipulations pass unnoticed as they are confused with traditional delays.

It is usually difficult to detect variation in tax evasion from low frequency revenue data because significant changes in tax codes that occur every few years confound the identification of the effect that is due to variation in the degree of evasion. Furthermore, because evasion goes up before elections but drops drastically immediately following an election, these effects cancel out to some extent in low frequency data. We have been able to measure tax evasion variation because we have access to a complete data set for revenues at a monthly frequency - which is higher than the frequency at which tax laws vary and thus allows a clear distinction between pre-election and post-election effects.

In particular, our data were collected from various editions of the Monthly Bulletin of the Bank of Greece and consists of aggregate direct and indirect taxation for the post-dictatorship period 1974-2008 during which there were

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[10] In direct taxation one trance of revenues is generated by retroactive auditing of tax statements, including the cross examination of factors such as sales, investment and property acquirement as indicators of potential profits. If past incomes are found to be understated, authorities demand higher tax payments and fines are imposed if evasion was deliberate. These form the so-called "certified revenues", the actual collection of which is set to take place gradually. The process is often influenced by political authorities who can reschedule the payment structure by extending deadlines or foregoing claims from the more distant past. Naturally, this type of intentional neglect is more extensively exercised in pre-election periods and leads to a reduction of direct tax payments relative to the revenues in non-election years. Regarding indirect tax revenues, collection involves on-the-spot auditing to check if sales and services are properly recorded for VAT payments. It is not uncommon for shop-owners and firms to protest against the intensity of audits, especially in periods of recession or after an adverse shock in local demand. Relaxations of tax auditing can happen through incumbent manipulation of the tax authorities but also because tax officials are directly involved in the election process as party activists or candidates for political posts, sometimes in the same constituencies they were responsible for revenue collection (see also footnote 2).

12 elections. The data were normalized by annual figures for GDP taken from the OECD, Main Economic Indicators series so that our measure is the proportion of each year's GDP that is collected as tax revenue each month.

While there is widespread evidence that elections cause a reduction in revenues in many countries – indeed this is usually a bigger effect than any increase in spending –there has been no suggestion, as far as we know, that at least some part of this may be due to an increase in tax evasion rather than official fiscal ease.[11] This does not accord well with the interpretation of electoral effects on revenue as credible government signals of their ability to compensate for a temporary misgovernance (e.g. Rogoff 1990) since effective signals ought to be more conspicuous.
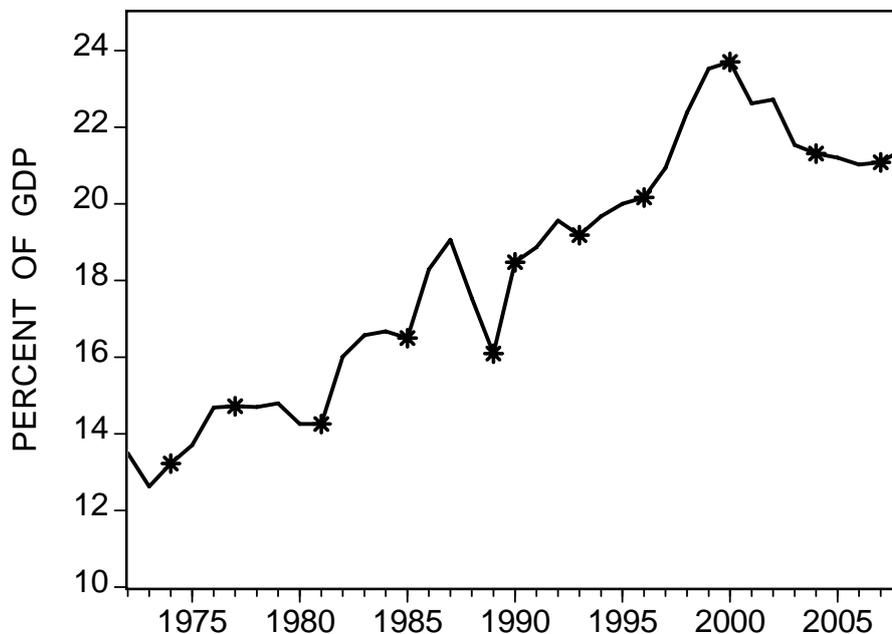
Figure 2: Annual taxes as percent of GDP. Election years are denoted by a star.

Indeed, in Figure 2 we plot the analog of Figure 1 for annual tax revenue where little effect of elections is observed; this is confirmed with a regression analog of (1) below which delivers an insignificant effect of elections:

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[11] 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).

Equation 7

$$annrev = 7.525 + 0.216(time) - 0.313(after2000) + 0.417(annrev_{-1}) - 0.366(elections)$$

$$(1.768) \quad (0.052) \qquad (0.085) \qquad\qquad (0.139) \qquad\quad (0.263)$$

$$0.000 \quad 0.000 \qquad 0.00 \qquad\qquad 0.005 \qquad\quad 0.174$$

$$1973 - 2008, nobs = 36, R^2 = 0.95, DW = 1.64, Fstat = 170.32$$

The election dummy is identical to that in the wildfires regressions for the years 1973-2008. We include an additional time trend to account for a systematic decline in taxation from 2000 onwards in the aftermath of Greece's accession to EMU in that year.

On the other hand, an electoral effect is readily detectable around the *month* of an election. Figure 3 plots the revenue as a proportion of GDP for each month in our 37 year sample, providing immediate evidence for the existence of an electoral effect in revenue.
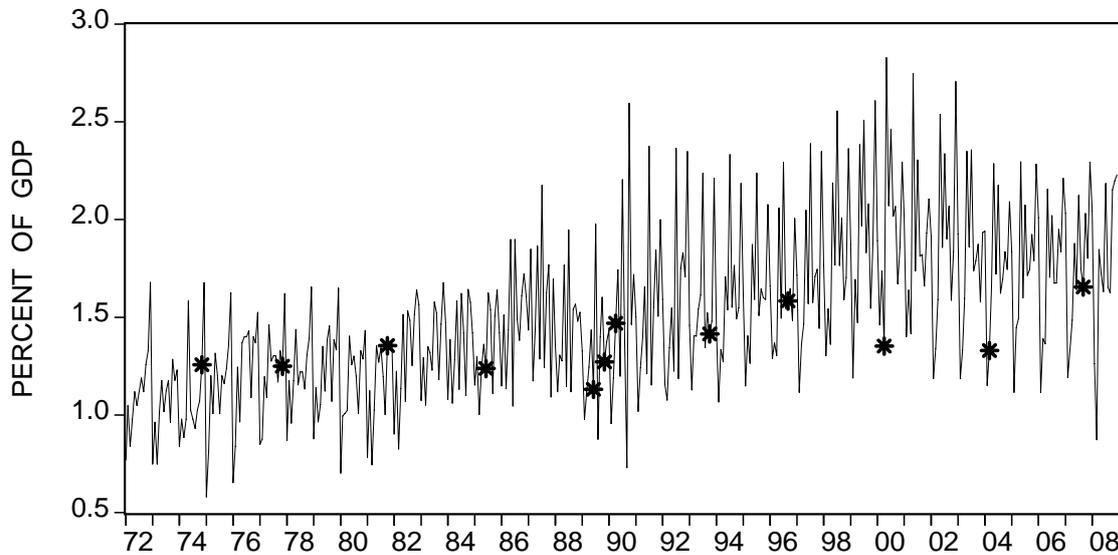
Figure 3: Monthly revenue as a percent of GDP. Election months are marked with a star.

Considering that a typical pre-election period has duration of around 40 days (the minimum permissible time between the announcement of the elections and the polls taking place is three weeks) during which most of the effect is

concentrated and that Figure 3 is noisy because of strong monthly effects, in Figure 4 we compare the revenue in the two months containing the pre-election period with the same two months in adjacent years.
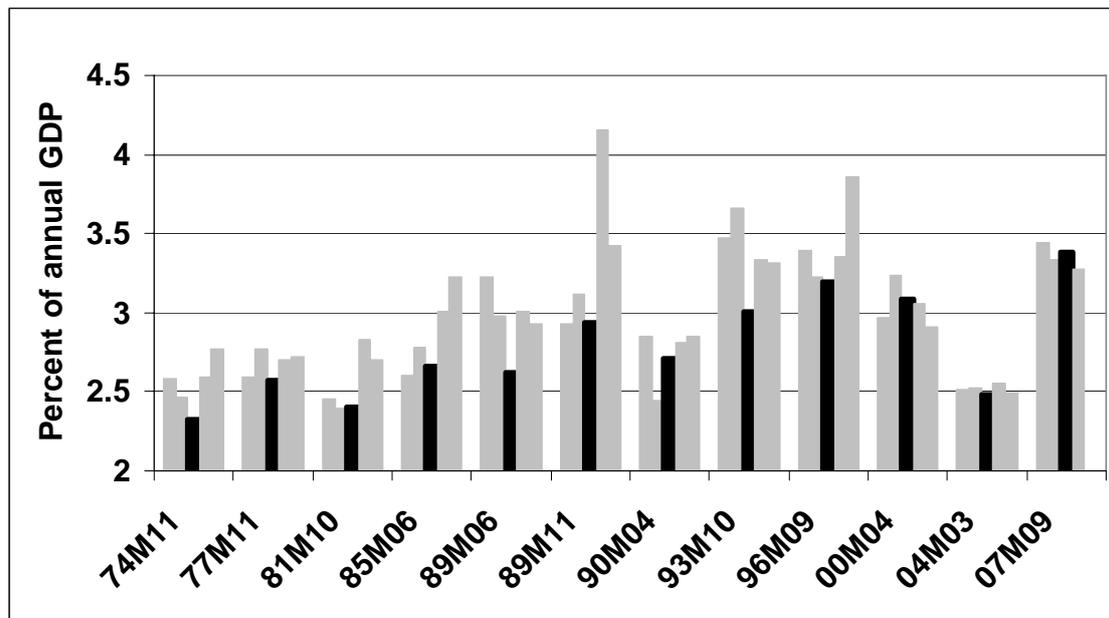
Figure 4: Bimonthly revenues in the pre-election period of year (N) vs. the two adjacent years (N-2, N-1, N+1, N+2), as % of annual GDP. We use bi-monthly revenues because the pre-election period includes the prior as well as the poll month. Data is not seasonally adjusted and data for September 2009 are not yet available.

Tax revenues in pre-election periods are *never larger* than *all* the collections in the four years surrounding each election (for the same two-month period). In all elections held between 1974 and 2008, average bimonthly revenues expressed as percent of GDP were lower than the average of the respective figures in the two adjacent years.

The evidence of a cycle in pre and post election revenue, is also quite striking in Figure 5 where a lot of noise is eliminated by averaging over elections to depict an 'average electoral cycle'. As noted earlier, these effects are easy to miss in annual data because of the rapid increase in revenue just after elections.

average across elections (12) during 1972–2008, with 4 month moving average
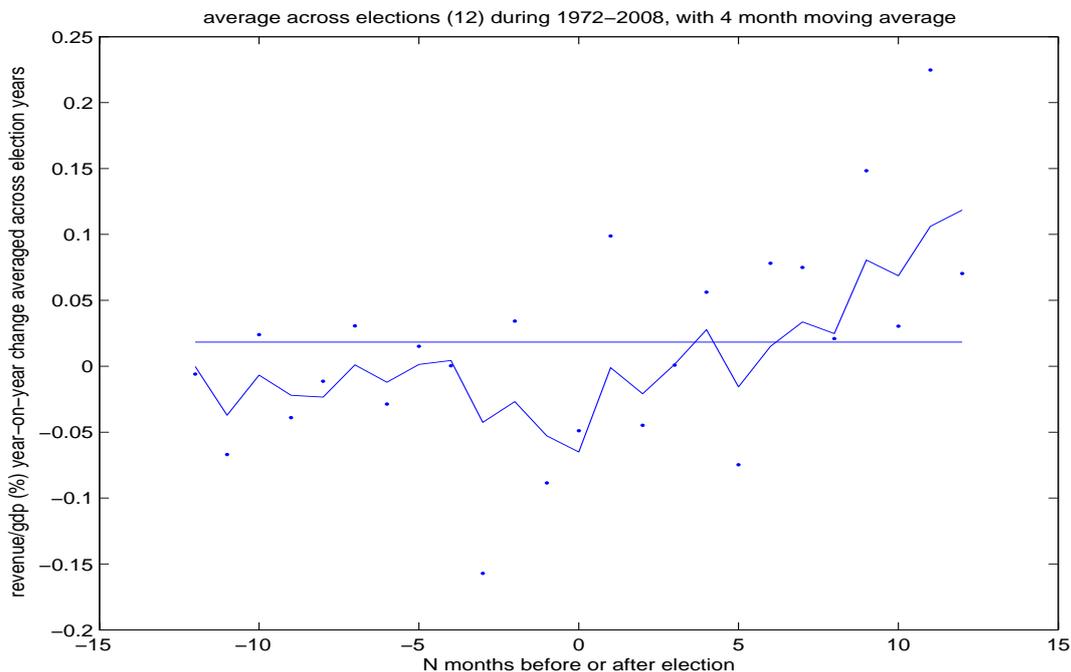
Figure 5: Dots represent the change (as a percentage of annual GDP) in monthly revenues relative to the same month of the previous year N months before or after the poll, averaged across election years. The line represents a four-month moving average (the average change across N-3, N-2, N-1 and N).

A striking aspect of this figure is the sudden increase in revenues immediately following the elections. This pattern as well as all the evidence of Figures 3 and 4 are very difficult to reconcile with changes in official tax policy which happen at a much lower frequency and we therefore can only attribute this to variation in the degree of tax evasion.

Turning again to a regression framework, we estimate a regression similar to (1), where the dependent variable is the year-on-year change in monthly revenue as a proportion of annual GDP. We work with the first difference of revenue because this eliminates the strong monthly effects and trends. To account for the near-two months pre-election period, we use a dummy variable that takes the value one on the months on which there is an election and the prior to it and zero otherwise. OLS estimation delivers the following results for the monthly revenues:

Equation 8

$$\Delta(\text{rev}) = 0.030 - 0.255 \cdot \Delta(\text{rev}_{-12}) - 0.0879(\text{elections})$$

$$(0.009) \quad (0.047) \quad\quad\quad (0.037)$$

$$0.000 \quad\quad 0.000 \quad\quad\quad\quad 0.020$$

$$1974:01 - 2008:12, nobs = 420, R^2 = 0.074, DW = 2.08, Fstat = 16.86$$

The effect of elections is statistically significant at this higher frequency and regression parameter estimates can be used to get a rough estimate of the total impact of electoral effects on revenue during our sample.

The estimation reveals that the two-month pre-electoral misgovernance causes a total loss in revenues equal to 0.176% of the annual GDP in each election. For the 12 elections that have taken place in the period 1974-2008, this amounts to 5.2 billion Euros in 2008 prices. Analogously to (2), the regression without the election dummy is:

Equation 9

$$\Delta(\text{rev}) = 0.025 - 0.252 \cdot \Delta(\text{rev}_{-12}) \quad - \quad (\text{losses})$$

$$(0.008) \quad (0.047)$$

$$0.004 \quad\quad 0.000$$

$$1974:01 - 2008:12, nobs = 420, R^2 = 0.062, DW = 2.08, Fstat = 28.00$$

where (losses) denote the negative residual of the regression.

As with wildfires, we can use the residual from this regression to consider whether we can detect an impact of revenue reductions on election outcomes, assuming the former are exogenous. Using a logit model for the probability of re-election regressed against the average negative residual from the autoregressive model for Δrev(t) across the two months prior to the election (a proxy for the electoral manipulation of revenue) we find:

Equation 10

$$\text{Prob}(reelection) = 0.779 \ - \ 1.357(\text{losses})$$

$$(0.108) \qquad (0.685)$$

$$0.000 \qquad 0.060$$

$$1974:10 - 2007:09, nobs = 372, R^2 = 0.285, DW = 0.28, Fstat = 3.92$$

Using a more direct method, a one-sided t-test that less revenue helps incumbents is conducted comparing the probability of re-election conditional on Δrev(t) being larger than its mean (which is 60%) against the probability conditional on Δrev(t) being smaller (29%) delivers a p-value of 16%. So the evidence for an adverse effect on the re-election prospects is rather weak.

Turning to examine the potential presence of a partisan effect around elections, we again find no significant effect:

Equation 11

$$\Delta(\text{rev}) = 0.030 - 0.255 \cdot \Delta(\text{rev}_{-12})$$

$$(0.009) \quad (0.047)$$

$$0.000 \qquad 0.000$$

$$- \ 0.101(\text{elections}) \ + \ 0.028(\text{socialists})$$

$$(0.051) \qquad\qquad\qquad (0.07)$$

$$0.051 \qquad\qquad\qquad 0.711$$

$$1974:01 - 2008:12, nobs = 420, R^2 = 0.075, DW = 2.09, Fstat = 11.26$$

The *"socialists"* dummy now takes the value one in the two months during and prior to the June election of 1989 (but zero in the other 1989 election) and 0.5 in the two months of the election in 1990 to reflect the fact that both parties participated in an ecumenical government at that time. A comparison of revenue growth throughout each party's government (not just election years) also leads to insignificant differences.

4. Implications of empirical results for theoretical models of electoral effects

Potential explanations

Much recent literature on political business cycles has emphasized the role of misgovernance as an information signal of the incumbent's ability when an electorate can observe this less accurately than the incumbent (starting with Rogoff 1990). In these models the probability of re-election of an incumbent is increasing in the optimally chosen level of misgovernance, an effect which is weak if at all present in our data (see equations 3 and 8). While our evidence can be interpreted in the context of this type of model, we do not choose to do so as the mechanism driving the model seems somewhat implausible when applied to tax evasion and wildfires for two reasons:

First because it seems implausible that among all the signals available to a government (e.g. official monetary and fiscal policy) the incumbent would choose to signal its ability through a form of misgovernance which is so noisily observed that has eluded even researchers working in this field and cannot be clearly detected without data that are not timely available. Second because this is even less plausible when one considers that most people would consider a policy that increases wildfires and tax evasion as a reason to vote against a government.

Another popular explanation of misgovernance is that it arises as a consequence of partisan effects in policy (Hibbs, 1977; Alesina, 1987). However, we do not empirically observe any partisan effects on wildfires or tax evasion so again this does not seem a good direction to explore for an explanation.

A classic, though older, explanation is based on the idea that election outcomes are affected by the well-being of the electorate during the incumbent's term with a larger weight being given to the period recently before the election. This was formalized in terms of a 'retrospective utility' by Nordhaus and is also consistent with more recent empirical studies that have found that levels of well-being immediately before elections are a major factor affecting voting behaviour regardless of whether the government is responsible (Achen and Bartels 2004, Wolfers 2002, Healy and Malhotra 2009, Leigh and McLeish 2009). With respect to the phenomena being studied, this explanation seems more consistent with our

data and with our experience. In particular, *inefficient* provision of regular public services have an immediate net *positive* impact on the well-being of targeted sections of the electorate that might play an important role in the election outcome, either through campaign funding contributions or through their own votes.[12]

For the cases in point, policies that increase law enforcement will reduce wildfires and tax evasion but will hurt land developers or those who can and do evade taxes – predominantly firms and the self-employed. While they may have a much larger positive effect on the overall electorate's well-being this only becomes apparent over a much longer time scale while the effects of the policy are visible only very noisily and with a lag when the government statistics for wildfires and revenues are eventually disseminated (may involve lags of more than a year and will therefore be known only after the election). This is consistent with retrospective voting and Nordhaus' (1975) model as applied to public investment (p. 188).[13]

An alternative plausible explanation is based on the idea that before elections the qualities of governance declines as elected officials turn their efforts to getting re-elected. It is no secret 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 own campaigns. In the US this can manifest itself for example in reduced attendance rates of representatives at Congress around the time elections take place in their constituencies. In Greece it can mean that a minister is less likely to be found in his office overseeing the efficient functioning of public auditors, or of a firefighting effort. This point of view leads us to think of public policy as requiring the labour of elected officials as an input, which is then reduced around elections because opportunity costs increase. The distinction from the previous explanation is that here law enforcement is exchanged for time spent in campaigning whereas in the previous one it is exchanged for a transfer of wealth to voters.

We now turn to an analysis of our empirical observations within the context of the formal framework of a variant of Nordhaus' model.

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[12] There are several well-documented examples of targeted pre-election fiscal transfers to benefit strategic constituencies even in the US, for example through changes in social security and veteran benefits – see e.g. Tufte (1978) and Keech and Pak (1989). There is also anecdotal evidence that in many countries parking tickets and the prosecution of petty offences drops before elections.
[13] Policies targeted at particular constituencies are discussed for example in Drazen (2000, p. 102) and Shi and Svensson (2006).

Analysis of empirical observations with a Nordhaus model

Our main goal in this subsection is to show that it is straightforward to map models that explain general misgovernance cycles into familiar theoretical frameworks for studying specifically unemployment / inflation cycles and we choose Nordhaus' model as an illustration of this, since it is arguably a plausible one for the cycles in law enforcement that we report. We believe more research is necessary in order to both gauge the full extent of misgovernance around elections and to understand which have been its most important driving forces.

Nordhaus (1975) presents a model in which an incumbent faces an election on year θ of its government and on each date maximizes a vote function or social welfare function:

Equation 12

$$V_\theta = \int_0^\theta g(u_t, \pi_t) e^{\mu t} dt$$

where u_t is unemployment and π_t is inflation at time t (see 17, p. 182) and g is a quasi-concave preference or utility function that is assumed (see 18, p. 183) to take the form:

Equation 13

$$g(u_t, \pi_t) = -u^2 - \beta\pi, \pi \geq 0, \beta > 0$$

As acknowledged by Nordhaus (footnote 2, p. 182), this voting function is 'myopic' in the sense that it does not represent rationally expected utility, but an exponentially weighted historic average during the incumbent's government (higher weight in more recent periods). While this assumption has been viewed as one of the most controversial features of Nordhaus' model, it is consistent with the idea of voting based on retrospective utility for which – as discussed in the previous subsection - there has been a recent wave of empirical support.

Nordhaus assumes further that expected inflation *v*, inflation and unemployment evolve according to the following dynamical system (see p. 183):

Equation 14

$$\dot{v}_t = \gamma(\pi_\tau - v_t)$$

$$\pi = \alpha_0 + \alpha_1 u + \lambda v$$

from which he derives an optimal policy:

Equation 15

$$u^*(t) = (\frac{\beta\alpha_1}{2} + \frac{B}{A})\exp[A(t-\theta)] - \frac{B}{A}$$

where $A = \gamma(1-\lambda) - \mu$ and $B = \gamma(1-\lambda)$

Analogously, we assume a retrospective voting function in which the utility function is:

Equation 16

$$g(c_t, q_t) = w(c) + \beta q, \quad \beta > 0$$

where $w(c_t) = \psi c_t - 0.5c_t^2$, $\psi > 0$, is a concave utility of private consumption and q is a public good that for the present purposes can mean '*quality of governance*', including enforcement of laws related to forest protection or revenue collection. Of course this may represent the voting behaviour of a particular constituency affected by a particular public good as long as the rest of the voters do not observe what is going on in this constituency until after the elections (as may be the case with wildfires or tax collections which are observed only with a lag unless one is directly affected).

We assume additionally that q depreciates over time at a rate γ and can be improved by public investment i at a rate ζ. We also assume that the incumbent follows a balanced budget policy so that qualities of governance, the private good and public investment evolve as:

Equation 17

$$\dot{q}_t = -\gamma q_t + \zeta i_t$$

$$1 = c_t + i_t$$

Using a Hamiltonian similar to that of Nordhaus, it is straightforward to show that for $0 \leq t \leq \theta$ the optimal private policy in this model is:

Equation 18

$$c^*(t) = (\frac{\zeta\beta}{\gamma - \mu})\exp[(\gamma - \mu)(t - \theta)] - \frac{\zeta\beta}{\gamma - \mu} + \psi$$

which is very similar to (15). For $\gamma > \mu$, i.e. the quality of governance decays faster than the memory of the electorate, consumption behaves similarly to the negative of unemployment and it rises as elections approach. Note that

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for $0 \le t \le \theta$ we have $c^* < \psi$, so that $w'(c) = \psi - c^* > 0$ as required. To ensure $0 < c^* < 1$ and $0 < i^* < 1$, it suffices that $[1 - e^{-(\gamma-\mu)\theta}] \zeta\beta/(\gamma-\mu) < \psi < 1$.

If q represents law enforcement, this follows a pattern similar to the negative of inflation in Nordhaus' model, so it falls as elections approach. Substituting (18) in (17) and solving for q(t) after the Nth election has taken place we obtain the following path:

Equation 19

$$q^*(t) = K_1 - K_2 \exp[(\gamma - \mu)(t - N\theta)] - K_3 \exp[-\gamma(t - N\theta)]$$

where the constants are given by:

$$K_1 = \frac{\zeta}{\gamma}(1 - \psi + \frac{\zeta\beta}{\gamma - \mu})$$

$$K_2 = \frac{\zeta^2\beta}{(\gamma - \mu)(2\gamma - \mu)} \exp[-(\gamma - \mu)\theta]$$

$$K_3 = K_1 - K_2 - q(N\theta)$$

Setting $q'(t)=0$, we find that the quality function reaches a maximum in every interval between the Nth and the (N+1)[th] elections at the point given by:

Equation 20

$$t_N^* = N\theta + \frac{1}{2\gamma - \mu} \cdot \log\frac{\gamma K_3}{(\gamma - \mu)K_2}$$

To ensure that $K_3 > 0$, $q''(t^*) < 0$ and $N\theta \le t_N^* \le (N+1)\theta$, it suffices that

$$K_1 - K_2 - \frac{\gamma - \mu}{\gamma}K_2 \exp[(2\gamma - \mu)\theta] < q(N\theta) < K_1 - K_2$$

For a monthly frequency, we set $\theta=48$ for the typical four-year interval between elections, $\psi=0.80 < 1$ as noted above and then assign the decay rates $\mu=0.023$ and $\gamma=0.033$ to imply that $(1 - e^{-12*0.023})$ or roughly one fourth of the electorate's memory fades away after one year and the quality of governance deteriorates by one third in the same period if no new public investment takes place. Parameter ζ is conveniently set 0.713 to give a maximum quality index of 10 and finally β is chosen so that the voter's utility due to the maximum governance quality to be, for example, half of that generated by the maximum consumption (i.e. $\beta q_{max} = 0.5w(c_{max}) = 0.25\psi^2$,

thus β=0.016). A graphical depiction for $q(t)$ is obtained in Fig. 6 with the familiar peaks and troughs over the electoral cycle.

It is easy to incorporate the intuition underlying an incumbent's attention shift to campaigning and away from governance in this model. Assume the same voting function as before but now interpret c as the quantity of campaigning, with the rest $i=1$-c of time being left for productive activities such as collecting taxes or protecting forests.[14]
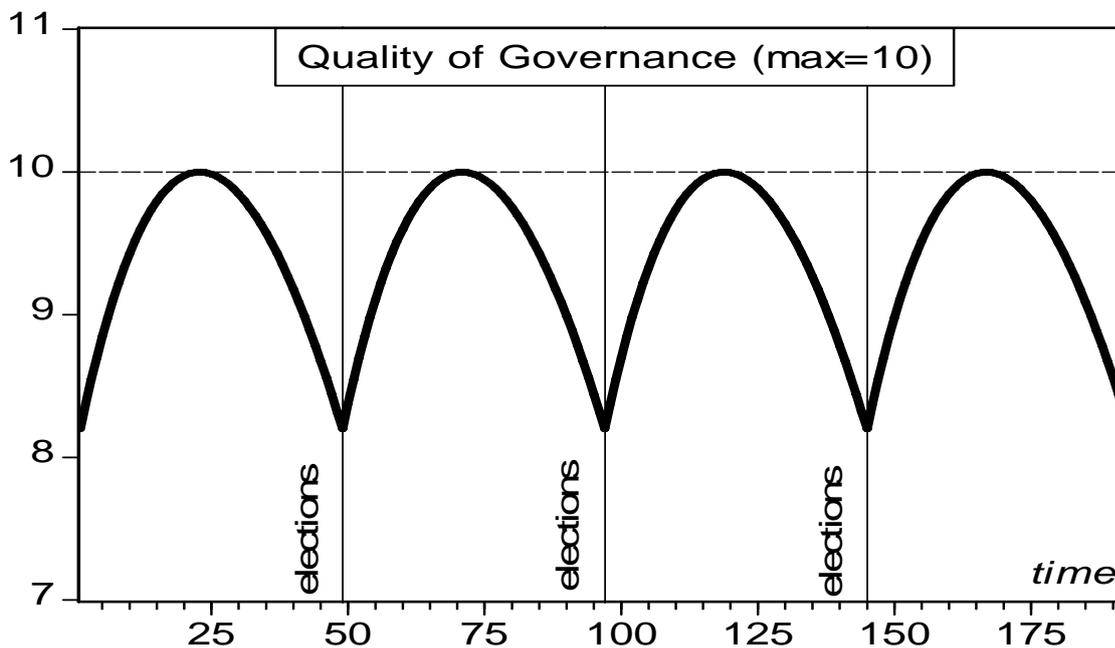
Figure 6: The pattern of quality of governance $q(t)$ between elections.

The main difference between our two interpretations of this model is that in the first, law enforcement is traded for private consumption (e.g. forests are burnt for the benefit of land developers just before elections) while in the second law enforcement is traded for time on the campaign trail. There is another important difference however which is that in the first scenario a voter who benefits from, say, a random (not due to the incumbent's decisions) positive shock in forest fires will experience this as an overall *increase* in his retrospective utility (because he can now get more consumption by building the land) and will therefore seek to re-elect the

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[14] One interpretation of this voting function is that campaigning directly affects voters' retrospective utility while another is that it merely affects their voting behaviour.

incumbent. In the second scenario the voter will experience this as an overall reduction in his utility because the environment has deteriorated while the level of campaigning will not have gone up since the cause of the fires is random. This is the distinction we exploited in the empirical section in order to try to identify the more empirically plausible model but found only weak evidence in favour of the first interpretation and only in the case of forest fires.

5. Conclusion

We have reported some striking effects of Greek elections on wildfires and tax evasion. One might be tempted to think of these as a form of pre-election fiscal transfer, a phenomenon that has been observed and modeled extensively, but there are some important differences. First, they are transfers that are effected through the relaxation of the enforcement of laws - a neglected mechanism that can have huge and unrecognized consequences suggesting electoral misgovernance may have far larger and broader costs than is usually thought. Secondly – and relatedly – they are transfers which are not easily observed except by the constituencies that benefit from them. Thirdly, they are a type of transfer that if adopted openly as a government policy would be very unpopular to voters at large because they benefit only a narrow ad hoc constituency. Finally, they are unlikely to be affected by partisan considerations and indeed our analysis reveals that both parties seem to affect them to a similar extent.

Considering these particularities, we find orthodox explanations of electoral effects on economic policy unsatisfactory for these phenomena. Instead we argue that the driving force is some combination of a shift of the incumbent's effort from governing to getting re-elected and the desire to gratify voters who vote on the basis of retrospective as opposed to expected utility. For this reason our work indirectly adds to the mounting evidence that behavioural effects such as attribution error can be effective or even necessary components of explanations of voting behaviour just as they are in a broad range of other behavioural economics applications. But it also extends this evidence by arguing that behavioural voting effects may have been systematically exploited by incumbents. Similarly, to the extent that the same incentives affecting Greek incumbents are also present in many other countries and relevant to all sorts of policies, our work indirectly suggests

that orthodox explanations of the political business cycle may be missing part of the picture.

Considering the significant costs and unpopularity of law enforcement relaxation for the electorate at large, it seems desirable to encourage institutions that help avoid it. This might involve more extensive monitoring and measurement of the degree of law enforcement as well as timely publication of appropriate statistics to alter incumbent incentives. Our work also suggests it would be desirable to re-organize the Greek civil service so as to increase its ability to deliver basic services independently of elected officials to avoid the consequences of temporary inattention or manipulation. We hope our work will help move in these directions.

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