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THE POLITICAL LEGISLATION CYCLE

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The political legislation cycle

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Abstract

The economic theory of legislation holds that laws, even when they do not involve financial resources, redistribute property rights. Politicians thus supply legislation to groups with the highest rate of political returns. By the same logic, politician should supply legislation *when* doing so has the highest rate of political returns. The dynamics of the supply of legislation should then follow the pattern suggested by the political business cycle theory. We develop a model of the behavior of coalition governments and voters that generates restrictions about the timing of the presentation and approbation of laws during a legislature. The approbation of laws should be concentrated towards the end of the legislature. We test these restrictions on data about the supply of legislation by the Italian Parliament during the legislation from I to XIII (1948 to 2001). The empirical analysis provides strong support to the theory: a legislation cycle occurs when the conditioning phenomena that the model indicates are satisfied.

JEL classification: H61, H62, C49

KEYWORDS: economic theory of legislation, negative binomial regression, political business cycle, voters.

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1 Introduction

A fundamental tenet of the economic theory of legislation (Stigler, 1971; Peltzman, 1976; Becker, 1983; Wittman, 1995) holds that laws, whatever their sort, redistribute property rights. Any law benefits certain groups of individuals at the expense of others. Legislators (politicians) act as brokers by supplying laws to groups that are politically more rewarding to benefit at the expense of groups that are politically less costly to hamper. It must be stressed that the redistributive nature of legislation is general and is not restricted to laws that move financial resources. Even a purely regulatory act, such as one that imposes wearing of a helmet on a motorcycle, favors the economic endeavours of certain individuals, the producers of helmets, and damages others, the motorcycles firms. A very large empirical literature poses the economic theory of legislation under various kinds of tests with generally supporting results (Crain and Tollison, 1991; and Stigler, 1988 are surveys).

The aim of this paper is to elaborate and verify a so far neglected implication of the economic theory of legislation; namely, that legislators should supply laws not only to whom, but also *when* it is politically most rewarding. If the whole set of legislation has a redistributive nature, the time profile of its production should be the same as the one of its subset characterized by the redistribution of financial resources. Legislators should maximize their probability to be reelected by concentrating the approbation of laws mostly before the elections, and engaging in other activities in different times. In other words, there should be a political *legislation* cycle alongside, or more precisely around, the political *budget* cycle.

Modern theories on the political budget cycle (Rogoff, 1990; Alesina, Cohen and Roubini, 1997) represent politicians' and voters' behavior consistently with the rational expectations hypothesis. In the context of the political legislation cycle, rationality excludes from the outset explanations of the clustering of the approbation of laws right before the elections based on voters' short memory and/or on politicians' imperfect use of the time allowed in a legislature (Di Palma, 1978; Pasquino, 1995). When an early election is a possibility (as we shall see, in the context of our sample it is actually a 50/50 chance) rational legislators seeking a reelection should have their laws approved at the beginning of the legislature, rather than at the end. Therefore, in Section 2 we provide a theory of the dynamics of the supply of legislation where all agents maximize their utility functions, given the others doing the same. This theory formulate testable restrictions not only about the dynamics of the legislative output, but also indicates relevant conditioning phenomena, such as the composition and stability of the governing and opposing majorities and the length of the legislatures. In Section 3 we test the theory on a sample of the laws approved during the first XIII legislatures of the Italian Republic, i.e., from 1948 to 2001. Section 4 summarizes the main results of the paper.

2 The model

The model is organized in two steps. The first step, based on the "pure presidential model" by Persson, Roland and Tabellini (1997), demonstrates that, during a legislature, voters rationally allow the government to appropriate a certain amount of "rents from holding office" $\overline{R}$. Although this appropriation reduces their welfare, voters still reelect the government in order to eliminate its incentives to divert even more. In this framework the government is considered a single agent and there is no political legislation cycle. The second step of the model, based on Padovano (1995), generalizes the institutional setup to the consideration of a plurality of agents, called parties, on the government side. Some of these parties form a government coalition, while the others are at the opposition. The consideration of more than one party in the government coalition increases the members' incentives to compete among each other in order to maximize voters' welfare and, by that, suffrages. Competition might then reduce the amount of appropriated rents to zero. Yet, the model demonstrates that, under certain conditions, parties' incentives to collude and appropriate each a share of the maximum allowed rents $\overline{R}$ are still higher than the incentives to compete. These conditions basically require that parties in the government coalition coordinate on the *timing* of the appropriation of $\overline{R}$. Specifically, they should concentrate the appropriation of rents up to $\overline{R}$ in the early stages of the legislature. By doing so, they can also punish the potential defector long enough to discourage any attempt to break the cartel down. Then, as the next elections draw near, parties' incentives to compete and satisfy voters' demands outweigh those to pocket private rents. At that time all parties switch to maximizing voters' welfare, in order to secure reelection for the next legislature. Since all parties act similarly and the coalition does not appropriate more than $\overline{R}$, voters reward all parties equally and have no incentives to prefer the opposition. Collusion is thus a stable equilibrium.

This theory generates empirical restrictions. In a time series setting (the one adopted in the empirical section of this paper) and under the assumption that parties choose a visible instrument to satisfy voters' demands, such as legislation, and less visible ones to appropriate rents, the model generates a *legislation cycle*. The number of laws approved is predicted to be at a minimum level when parties concentrate on the appropriation of rents; it increases when, as the legislature draws to the end, parties switch to maximizing voters' interests and approving laws to this end. The time of this switch can be interpreted as the beginning of the electoral campaign.

In a cross section setting, instead, the model predicts that, *ceteris paribus*, coalition governments should be more prone to generate a legislation cycle than governments held by a single party. The contrast between the first and the second step of the model highlights that the legislation cycle is a strategy to keep self interested government coalitions together. The larger and/or more heterogenous the coalition, the more difficult is to hold it united and the greater the amount of legislation that must be produced to this end.

2.1 First step: optimal amount of rents appropriated during a legislature

The model stylizes politics as a market where the traded good is some generic "public benefits". These can be thought of as a vector of public goods and services, that all voters similarly demand and the government supplies by approving laws. As Persson, Roland and Tabellini (1997) show, this is the easiest setup to analyze a problem of electoral accountability.

On the demand side of the political market voters have an infinite time horizon and conjointly maximize the following expected utility function:

$$\mathrm{E}\sum_{t=0}^{\infty}\delta^t U(b_t) \tag{1}$$

where E is the expectation operator, δ represents the discount factor ($0 < \delta < 1$), and $U(\cdot)$ is a concave utility function, monotonically increasing in b_t. b_t indicates the (random) amount of public benefits that the government supplies to the voters. These benefits may take the form of consumption goods and services, like a public health insurance program, but can also be immaterial, as in the case of a law that regulates the pollution standards. Time t goes from 0 to ∞ but can be subdivided in a sequence of intervals $[0, T]$ called legislatures. The constitution fixes the length of the legislature in advance.

There is a total mass 1 of "public resources", which can be thought both as tax revenues and as any private choice domain where the government intervenes. The government transforms these resources either into public benefits for the voters or into private rents for itself according to the following process. First it appropriates a (random) amount of rents r_t from the total of public resources. By doing so, the government leaves an amount x_t of resources available for the production of public benefits.

$$x_t = \theta_t(1 - r_t) \tag{2}$$

Rents r_t may be of various sorts, such as decisions about the allocation of certain public expenditures, the choice of firms involved in public procurement, the location of public projects, as well as money subtracted from the public purse. Equation (2) thus captures the conflicting interests between public officials and the general public regarding these decisions. Inasmuch as $r_t > 0$, the government is diverting resources that would otherwise benefit voters. On the contrary, if $r_t = 0$, the government is maximizing voters' welfare by not appropriating public resources. Implicit in (2) is the resource constraint $r_t \leq 1$ which limits the maximum amount that the government can appropriate in each period. The parameter θ_t, $0 < \theta_t < 1$ captures the (variable) efficiency of the fiscal system in transforming public resources into resources available to the production of public benefits x_t. θ_t can be interpreted as the amount of deadweight and administrative costs from taxation.

Second, the government transforms the available public resources x_t into the public benefits b_t and supplies these to the voters. To this end, the government uses a visible instrument, legislation. Resources available x_t and laws approved L_t are complementary inputs in the process of supplying public benefits b_t to the voters:

$$b_t = F(x_t, L_t) \tag{3}$$

where $\partial b_t/\partial x_t > 0$, $\partial b_t/\partial L_t > 0$, $\partial^2 b_t/\partial x_t^2 < 0$, $\partial^2 b_t/\partial L_t^2 < 0$. Furthermore, $\partial b_t/\partial(0) = 0$ implies that both laws and public resources are needed to produce and distribute the public benefits; and $\partial x_t/\partial L_t = k > 0$ indicates that there is an optimal combination of laws and available resources to generate benefits to voters. Too many laws that regulate the distribution of a certain amount of resources create ambiguity and reduce the availability of the resources. In other words, less b_t is mapped for a given amount of x_t. Similarly, a given amount of resources must be provided for a given law to produce benefits: too few resources may leave the law at the stage of a wishful document, while too many may create wastes in the distribution of benefits.

In this section we propose a very simple representation of the supply side of the political market. We suppose that government is held by a single agent (party) elected by the voters at the beginning of the legislature against a single opponent. The more complex (and realistic) case where there is a plurality of parties is examined in the following section. This simple context is useful to show why voters find it optimal to consent to some diversion.

The party in government maximizes the following expected utility function:

$$\mathrm{E}\sum_{t=0}^{\infty} \delta^t U(r_t) \tag{4}$$

The party's discount factor δ is the same as voters'; furthermore, $\partial U/\partial r > 0$ $\partial^2 U/\partial r^2 \leq 0, \partial U/\partial(0) = 0$.

Note that, using (2), equation (3) can be written as $F[\theta_t(1 - r_t), L_t]$. The executive realizes the maximum amount of diversion when $R_T = \sum_{t=0}^{T} r_t = 1$ and there are no budgetary resources directed to the production of public benefits. In this case voter's benefits become $B_T = \sum_{t=0}^{T} b_t = 0$. On the contrary, when $R_T = 0$ there is no diversion, and voters benefit of all the budgetary resources.

A sequence of events explains how the party gets rents from power and to what extent voters can control this appropriation. At the beginning of each legislature $[0, T]$ voters choose a "voting rule", conditional on their information acquired at the end of each period. Following Persson, Roland and Tabellini (1997), we consider the voting rule as a simple retrospective voting strategy conditional on economic outcomes. For simplicity we also assume that it is a pure strategy, independent from the history of previous periods, but not from the events of the current period. Voters decide whether or not to re-elect the executive according to the voting rule and on the basis of the amount of public benefits supplied. A party thrown out of office is substituted by the party at the opposition and is "never reappointed"[1]. The government chooses the action $R_T(\theta_t)$ and, residually, supplies $B_T(R_T(\theta_t))$, knowing the voters' strategy. The key point is that voters realize that a voting rule that conditions re-election to zero diversion by the party is suboptimal, since it would push the party to appropriate the whole budget in $[0, T]$ in the anticipation of being thrown out. This is the "take the money and run" strategy for the government. The opposing party would be elected, but under such a voting rule it would face the same incentives of its predecessor, would again take the money and run, and so on forever. The result of a zero diversion voting rule is a sequence of highly inefficient and instable governments. Voters then maximize their utility by adopting a voting rule that "minimizes the cost of democracy". Such a rule allows the party to appropriate some positive amount of rents while in office, with a promise of reelection. This form of electoral control will determine a stream of equilibrium values of resources, $\overline{R}_T$, that the party in government may appropriate in each legislature $[0, T]$ without losing power. Insofar as the party does not appropriate anything in excess than $\overline{R}_T$ it can be reelected forever.

Intuitively, for $\overline{R}_T$ to be acceptable for the government, it must at least equal the value of the rents that may be diverted under a take the money and run strategy. Hence, the following indifference condition must be satisfied in every legislature

$$U(1) = U(\overline{R}_T) + \delta EU(\theta') \tag{5}$$

where $EU(\theta')$ is the expected utility for the party in government of being re-appointed for a new term at every election under the "minimizing the cost of democracy" equilibrium voting rule and the realization of technology θ'. If (5) holds, the party is indifferent between "taking the money and run" - the maximum diversion ($U(1)$, left hand side) with the loss of office - and appropriating $\overline{R}_T$ in every legislature $[0, T]$. Equation (5) implies that, for all θ', the value of being re-appointed is

$$EU(\theta') = \frac{U(\overline{R}_T)}{1-\delta} \tag{6}$$

Substituting (6) in (5) and solving for $U(\overline{R}_T)$ we obtain:

$$U(\overline{R}_T) = U(1)(1-\delta) \tag{7}$$

Expressing (7) as an inverse utility function, we derive the equilibrium value of $\overline{R}_T$, which is the party's in government marginal rate of substitution between the maximum diversion compatible with reelection and total diversion *cum* loss of office at the end of the legislature, namely,

$$\overline{R}_T = U^{-1}[(1-\delta)U(1)] \tag{8}$$

[1] This assumption is made for computational ease and only implies that a party which has lost the elections must change something in its behavior, in a sense, become a different party, to have a chance to be re-elected to the government.

In the case of linear functions we obtain the equilibrium amount of rents appropriated by the party while in government during any legislature $[0, T]$, i.e., the optimal total diversion in a legislature

$$\overline{R}_T = 1 - \delta \tag{9}$$

In this simple model of accountability, the amount of diversion depends on:

1. The time elapsed between elections. Intuitively, if the executive is elected every two periods, $\overline{R}_T = 1 - \delta^2$ and voters' welfare would decrease.

2. The executive rate of discounting the future δ. If the future is not heavily discounted (the closer δ is to 1), the value of holding office increases, and the executive is forced to be more disciplined while in office.

Thus, it is in the voters' interest to have as short legislatures as possible in order to obtain higher levels of public benefits and lower diversion. Moreover, since $b_t = F[\theta_t(1 - r_t), L_t]$, the optimal amount of rents $\overline{R}_T$ determines a minimum amount of benefits $\overline{B}_T$ that voters must receive to reelect the party to the government for the next legislature. Since $\partial x_t / \partial L_t = k > 0$, for $\overline{B}_T$ to be supplied during the legislature a minimum amount of laws $\overline{L}_T$ must be passed. Should the government appropriate $R_T > \overline{R}_T$, then $X_T = \sum_{t=0}^{T} x_t < \overline{X}_T$. and $L_T < \overline{L}_T$. In this case the government will not be reelected. Finally, the production function (3) also implies that all laws have equal weight in the production of b_t.

2.2 Second step: Multiple parties and the legislation cycle

2.2.1 Setup of the model

When a plurality of parties hold the government as a coalition, rent extraction becomes potentially more difficult, since the parties must collude, i.e., coordinate their actions to satisfy the equilibrium condition (5). Yet, each of coalition members has an incentive to defect in order to maximize the probability to be reelected. In this section we show that the generation of a legislation cycle is one of the necessary condition to minimize the risks of defections and to extract the maximum amount of rents $\overline{R}_T$.

Following Tullock (1965), to model a plurality of parties in the political market we suppose that, in every legislature $[0, T]$, there is a fixed amount of parties N, each holding a share of seats in the legislature. The set N is composed by two subsets, G, $g = 1, ..., G$ and O, $o = 1, ..., O$ of parties member of the government and of the opposing coalition, respectively. For analytical simplicity, and with no loss of generality, we suppose that all parties have the same number of seats in the legislature. This assumption will be relaxed in the empirical analysis. Furthermore, all parties are office seekers and have no ideological differences. We introduce this hypothesis to restrict the set of strategies whereby collusion is a stable equilibrium. When voters can discriminate parties along only one dimension, in this case the amount of rents appropriated relative to the other coalition members, electoral control is maximized and so are the incentives to defect. Hence, if collusion is stable in the context of such a model, it will be so *a fortiori* in other frameworks where parties differ along many dimension and electoral control is looser.

In order to be reelected, parties in G should approve, by the end of the legislature, a total of at least $\overline{L}_T = \sum_t^T L_t$ laws. $\overline{L}_T$ is compatible with the appropriation of the maximum allowed amount of rents $\overline{R}_T$ and with the distribution of the minimum allowed amount of public benefits $\overline{B}_T$ as a coalition. Parties in O contribute nothing to the level of public benefits supplied to voters. Their role is to provide a costless alternative to voters should the government coalition supply $B_T < \overline{B}_T$. To approve a law all parties in the government coalition must supply a "legislative effort" e_{gt}. Legislative effort includes votes in the committees and in the floor, time and expertise in the preparation of the bills and so on. Thus, the approbation of a law can be described as

$$L_t = h(\sum_{g \in G} e_{gt}) \tag{10}$$

where $\partial L_t / \partial e_{gt} > 0$, $\partial^2 L_t / \partial e_{gt}^2 < 0$ and $\partial L_t / \partial(0) = 0$. To obtain $\overline{L}_T$ at the end of the legislature, parties $g \in$G must supply by the end of the legislature an amount of legislative effort compatible with reelection: $\overline{E}_{gT} = \sum_{t=0}^T e_{gt}$ such that $\overline{L_t} = h(\sum_{g \in G} \overline{e_{gt}})$.

To maximize electoral control and slant the conclusions of the model against collusive equilibria, we suppose that voters cast their suffrage in favor of the party that, in the time interval $[0, T]$ supplied the maximum amount of legislative effort and, by that, contributed the most to the production of laws that supply public benefits. This rule is the logical counterpart of the rule of step 1 in the situation with a plurality of parties. Voters' decision can thus be imagined based on a ranking of the legislative efforts exerted during the legislature E_{gT}. Those parties that are second or worse in this ranking receive zero votes and will find themselves out of the government coalition after the elections. This makes voters' strategy work like a *first-past-the-post* electoral system, the system that appears to perform best in terms of electoral control (Grofman and Lijphart, 1994). Theory closely reflects this fact; in the model the only chance of remaining in power for a party member of the government coalition is to be first in the voters' ranking, alone or tied with other parties. We can formalize voters' decision as a voting rule V that, given a mass 1 of votes, takes the following form:

$$V(E_{gT}) = \begin{cases} 1 & \begin{array}{c} \text{if } E_{gT} > \overline{E_{gT}} \\ \text{and } E_{gT} > E_{jT} \text{ for all } (j \neq g) \in G \end{array} \\ \\ 1/G & \text{if } E_{gT} = \overline{E_{gT}} \text{ for all } g \in G \\ \\ 0 & \begin{array}{c} \text{if } E_{gT} < \overline{E_{gT}} \\ \text{and } E_{gT} < E_{jT} \text{ for any } (j \neq g) \in G \end{array} \end{cases} \tag{11}$$

Equation (11) indicates that voters coordinate on pouring all the suffrages on the party $g \in$G that scores on top of the ranking of E_{gT}, provided that $E_{gT} > \overline{E_{gT}}$. In this case the opposition receives zero votes. Voters instead evenly split their votes on all parties in the majority if they all tie top on the ranking, i.e., they all provide $E_{gT} = \overline{E_{gT}}$ equally. Finally, if a party exerts a legislative effort inferior either to the amount $\overline{E_{gT}}$ required to supply $\overline{L_t}$, or to the one exerted by the other parties $j \in$G, it will receive 0 votes. By that voters exclude the party from the next government coalition.

Such a voting rule seems to give to every party a strong incentive to satisfy voters' demands in the last period of the legislature, $t = T$. For if all parties had always supplied the same amount of legislative effort in every time in the previous periods (compatible with the approbation of $\overline{L_T}(\overline{R}_T)$), the party that provided $E_{gT} > E_{jT}, \quad j \neq g$ in $t = T$ would become a monopolist in the following legislature. This incentive holds for all parties, so all of them will defect in $t = T$ and still tie on top of the ranking. Thus the incentive to defect is transmitted to period $t = T - 1$ and so on, by backward induction, in all periods of the time interval $[0, T]$. Otherwise, voters would exclude a party from the government even if it had delivered $E_{gT} < E_{jT}$, $j \neq g$ just one time more than the parties that had done so most often. In this setup the political process seems entirely demand driven, and the equilibrium amount of rents at 0, not $\overline{R}_T$.

Yet, such a conclusion is unwarranted. Even under such restrictive assumptions, it can be shown that parties will find it profitable to collude until a certain time $t^*, 1 \leq t^* < T$, rather than competing according to the backward induction strategy. From $t = 1$ to $t = t^*$, they all secure a share of $\overline{R}_T$ and produce no laws, by exerting a legislative effort $e_{gt} = 0$ for $t \leq t^*$. After t^* collusion is no longer stable, since at t^* the returns from defection for all parties exceed those from continuing to participate to the cartel. After t^*, parties revert to a competitive behavior, in the sense that they begin to produce legislative effort needed to approve a total of laws $\overline{L_t}$ compatible with the supply of public benefits $\overline{B_T}$. Furthermore, from t^* to T parties appropriate no more rents, otherwise they would secure $R_T > \overline{R}_T$ and lose the elections. Given this strategy, voters have no incentive to push any member of the government out of the coalition for the next legislature, because collusion makes all parties act identically with respect to satisfying voters' demands. In a sense, collusion puts all parties on top of the ranking, though with the minimum score compatible with reelection. This score will not be zero, that is, parties in government will not adopt a "take the money and run" strategy, since collusion cannot be carried up to the election period. The key condition for collusion until t^* to be enforceable is that parties be able to implement "discriminatory trigger strategies" (Friedman, 1985) to prevent or to punish defection in every period $t \leq t^*$. As we shall see, punishment of defection implies that the defecting party be excluded from the government coalition and the remaining parties be able to supply $\overline{L}_t$ nevertheless. From the opposition, the defecting party will not be able to contribute in any way to the production of public benefits and will thus drop in voters' ranking.

The specification of the conditions under which this strategy is an equilibrium, i.e., of the conditions where a discriminatory trigger strategy exists in the context of the model requires a further characterization of the political market.

2.2.2 Discriminatory trigger strategies and size of the coalition

To reiterate, parties' objective function is to maximize expected rents from political activities in the legislature $[0, T]$, subject to not being voted out of the market for the following legislature. The voting rule (11) indicates that voters reward parties for the legislative effort they exert to supply public benefits instead. In a sense, equation (11) is an indirect inverse demand function for public benefits, where votes V are the "full price" of legislative effort E_{gT} supplied in the production of these benefits Rents for each party g in the government coalition can be defined by the standard rent function $r_g = r(E_{gT}(G), [G-1]E_{jT}(G))$ - henceforth functions are in parentheses, products in brackets and $j \neq g$, $j, g \in G$. Since each party takes the behavior of all other parties as given, for every single party the expected rents from staying in government throughout a legislature take the form

$$\sum_{t=1}^{T} r_{gt} = \sum_{t=1}^{T} \delta \left[e_{gt}(G), [G-1]e_{jt}(G)\right] \tag{12}$$

Expected rents are a continuous and strictly concave function in e and G: specifically $\partial r_{gT}/\partial E_{gT} < 0$, $\partial r_{gT}/\partial G < 0$ and $\partial e_{gt}/\partial G < 0$. $\partial r_{gt}/\partial E_{gt} < 0$ suggests that an additional unit of legislative effort subtracts time and resources to the appropriation of rents; $\partial r_{gt}/\partial G < 0$ and $\partial e_{gt}/\partial G < 0$ instead indicate that more fragmented government coalition reduces unitary rents for the coalition members as well as the required legislative effort, since there is a greater number of parties that contribute to the approbation of laws. Continuity and strict concavity of (12) guarantee the existence of a continuous function $\phi_g([G-1]e_{jt}(G))$ defined by

$$r_g(\phi_g(\sum\nolimits_{j\neq g}^{G} e_{gt}) = \max_{e_{gt}}(e_{gt}, [G-1]e_{jt}(G)) \tag{13}$$

in every $t \in T$. Equation (13) is party g's reaction function. It defines the level of legislative effort that maximizes the party's rents given the other parties supplying in total $[G-1]e_{jt}(G)$ in every $t \in T$.

Given the oligopolistic nature of the political market, parties can attain two equilibrium levels of rents:

1. $\overline{R}_{gT} = \frac{1}{G}\overline{R}_T > 0$, when they collude and set $e_{gt} = 0$ in the period from $t = 1$ to t^*.

2. zero rents, either when they compete and set $e_{gt} = \overline{e}_{gt}$ from t^* to T, or when they are outside the government coalition.

$\overline{R}_{gT}$ can be attained only if collusion is a stable subgame perfect equilibrium. This in turn requires the existence of discriminatory trigger strategies that credibly threaten the defecting party (or parties) d to produce $e_d = 0$. In other words, in the period τ after a party d defects, the still colluding parties $j \neq d$ must be able to set $\sum_{\tau}^{T} \sum_{j}^{G} h(\overline{e}_{jt}) = \overline{L}_T$, so that the contribution of any defecting party to the production of $\overline{L}_T$ is $e_d = 0$. By the voting rule (11) such a party receives no votes and is effectively excluded from the next government coalition.

The profile of the discriminatory trigger strategy is structured according to Abreu's (1988) theory of optimal punishment. After the elections, parties collude, setting $e_g = 0$. The cartel is enforced until time t^*, when, as elections draw near, the returns from breaking the cartel outweigh the returns from staying in it. It has to be remembered that a defector party d goes momentarily on top of voters ranking setting $e_d > 0$, while the other parties j supply $e_j = 0$. From then on, the defector earns 0 rents, as it is pushed out of the market by the colluding parties. As T approaches, defection yields higher payoffs, because the length of the punishment period shrinks. From t^* on, all parties simultaneously set $e_g = \overline{e_g}$, satisfying the voters' demands. If, however, a party d has broken the cartel before t^*, by supplying $e_d > 0$ for one period, in the following period and until the end of the time interval the remaining parties j set $[G-1]e_j = \overline{e}$, obeying to voters and forcing the defector to supply $e_d = 0$. Since $\overline{e} > e_d$, voters will not cast any suffrage in favor of the defector, which will not even enter the government coalition in the following legislature. Defection is thus punished.

Harrington (1987) shows that, for the discriminatory trigger strategies to be a credible threat , there must be multiple equilibria in every single period t of the time interval $[0, T]$. A first type of equilibrium is the standard symmetric equilibrium where all parties earn positive rents at a level $R_T \leq \overline{R}_T$. The second class consists of asymmetric equilibria where the colluding parties j punish the defector d by setting $[G-1]e_j = \overline{e}, e_d = 0$ in every period t. The existence of both types of equilibria at any time t is crucial for this model. The first type allows all parties to satisfy voters in the electoral period after t^*. The second type ensures that, in case some party defects before t^*, the colluding parties can punish it, by forcing to produce $e_d = 0 < \overline{e}$, and still satisfy voters demand at the same time, by supplying $\sum_{\tau}^{T} \sum_{j}^{G} h(\overline{e}_{jt}) = \overline{L}_T$. Harrington (1987) proves that these multiple equilibria exist under the parameter restrictions defined by Theorem 1. As these restriction identify the number of parties that a government coalition must include for the discriminatory trigger strategy above to be a credible threat, Theorem 1 indicates the size of a coalition that makes collusion a stable equilibrium. Since Theorem 1 holds in any $t \in [0, T]$ we drop the time subscripts, since they would only clutter the exposition of the theorem.

Theorem 1 *If* $r(e(G), [G-1]e(G)) \geq 0 \geq r(\phi_d([G-1]e(G-1), [n-1]e(G-1)))$, *then* $G+1$ *Nash equilibria exist for the one period game as defined by equations (14) and (15):*

$$\overline{e}_1 = \overline{e}(G), ..., \overline{e}_G(G) = \overline{e}(G) \tag{14}$$

$$\overline{e}_j = \overline{e}(G-1), \quad e_d = 0, \qquad j \neq d \tag{15}$$

A numeric example gives an application of Theorem 1 and visualizes what parameter condition it involves. Since in Theorem 1 r and e are variables, the parameter of interest becomes G, the number of parties compatible with the enforcement of the collusive equilibrium. Suppose that the voting rule is a linear function, $V(E_{gT}) = a - bE_{gT}$, and that parties' cost functions to supply legislative effort are all identical and characterized by diminishing returns to scale, $C(e_g) = f + ce_g + d(e_g)^2$ in any $t \in [0, T]$ where $a > 0, b > 0, f > 0, c \geq 0, d \geq 0, a > c$. It follows that each party's reaction function is:

$$\phi_g([G-1]e(G) = \frac{a-c}{2(b+d)} - \frac{b[G+1]e(G)}{2(b+d)} \tag{16}$$

The party's optimal level of legislative effort is:

$$\bar{e} \equiv e(G) = \frac{a-c}{(G+1)b+2d} \tag{17}$$

The rent functions for the symmetric (equation (18)) and asymmetric (equation (19)) equilibrium are, respectively:

$$r(e(G), [G-1]e(G)) = \frac{(b+d)(a-c)^2}{[b(G+1)+2d]^2} - \frac{b[G+1]e(G)}{2(b+d)} \tag{18}$$

$$\pi(\phi_d([G-1]e(G-1), [G-1]e(G-1)) = \frac{[(b+2d)(a-c)]^2}{4(b+d)(Gb+2d)^2} \tag{19}$$

for any part $g \in G$. Inserting these profit functions into the inequalities of Theorem 1 and rearranging, one obtains that multiple single period Nash equilibria exist if:

$$\frac{(a-c)(b+d)^{1/2} - (b+2d)f^{1/2}}{bf^{1/2}} \geq G \geq \frac{(a-c)(b+2d) - 4d[f(b+d)]^{1/2}}{2b[f(b+d)]^{1/2}} \tag{20}$$

The fraction on left hand side exceeds the fraction on the right hand side if $\frac{(a-c)^2}{4(b+d)-f} > 0$. This expression corresponds to the equilibrium value of rents. Since we are interested in the case when multiple parties equilibria exist, this expression is assumed to be positive.

If we give the following values to the parameters: $a = 100$, $b = 1$, $c = 25$, $d = 0.25$ and $f = 125$, multiple single period equilibria exist if $G \in \{4, 5, 6\}$. To reiterate, when $G = 6$, there are 7 equilibria: one symmetric equilibrium that is the 6 parties solution, and 6 equilibria with one party in turn being pushed out of the market and the remaining parties achieving a 5 parties solution.

2.2.3 Determination of the optimal collusion time

The existence of multiple Nash equilibria for the one period game makes the discriminatory trigger strategies discussed above a credible threat. However, the presence of finite horizons in the legislature makes collusion a subgame perfect equilibrium only for a part of the legislature. There is a critical (trigger) time after which the incentives to compete and satisfy voters' demands outweigh those to collude and secure private rents. The time profile during $[0, T]$ is as follows: all G parties start off by playing cooperative; each supplies $e^*_{gt} = 0$. If no party has defected by period t^* then, for the remainder of the game, the government coalition moves to the G parties Nash (competitive) equilibrium, supplying $e_{gt} = \overline{e_{gt}} > 0$. If, however, a party defects during $t = 1 \sim t = t^*$, by supplying $e_d > 0$, the single period Nash equilibrium is achieved for the remainder of the game. This minimizes the payoff of the defector. This is the $G-1$ parties solution which entails the defector being pushed out of the political market. The threat is credible because it is a Nash equilibrium (Friedman, 1985).

Theorem 2 proves the existence of trigger strategy equilibria that support cooperative outcomes in this dynamic setting with a finite time. For every size G of the political market and length of the time interval $[0, T]$ between elections, Theorem 2 indicates what are the minimum discount factors and, consequently, the value of t^* that make collusion a subgame perfect equilibrium.

Theorem 2 *If* $r(e(G), [G-1]e(G)) \geq 0 \geq r(\phi_d([G-1]e(G-1), [G-1]e(G-1)))$, *then there exist a positive integer* $\gamma(\delta)$ *such that the trigger strategy described above is a subgame perfect equilibrium for all* $T \geq t^* + \gamma(\delta)$ *and all* $t^* = 1, 2, ..., T$ *if, for all* g*, inequality (21) holds*

$$\delta > \frac{r(\phi_d([G-1]e^*, [n-1]e^*)) - r(e^*, [G-1]e^*)}{r(\phi_d([G-1]e^*, [G-1]e^*)) - r(e^*, [G-1]e^*) + r(\overline{e}, [G-1]\overline{e})} \tag{21}$$

Given that the other $G-1$ parties collude, party g earns the discounted profits described below from also adopting it:

$$\sum_{t=1}^{t^*} \delta^t [r(e^*, [G-1]e^*)] + \sum_{t=t^*+1}^{T} \delta^t [r(\overline{e}, [G-1]\overline{e})] \tag{22}$$

The best alternative strategy is for the party to defect in period t^* by supplying $\phi_d([G-1]e^*) = \overline{e}$. The gain from defection is the same for all $t \leq t^*$, but the loss in future rents is minimized at $t = t^*$. At that period the punishment time is in fact shortest. The discounted rents from cooperating in periods $1, ..., t^* - 1$ and then defecting at t^* is:

$$\sum_{t=1}^{t^*-1} \delta^t [r(e^*, [G-1]e^*)] + \delta^{t^*} [r(\overline{e}, [G-1]\overline{e})] \tag{23}$$

In all periods after t^* and until T the defecting party d earns zero rents as it is forced to "exit" the political market. Friedman (1985) shows that if equation (21) holds, the payoff in (22) exceeds that in (23) for T sufficiently large (that is, $T \geq t^* + \gamma(\delta)$).

The same numerical parametrization used in section 2.2.2 illustrates this conclusion. The rent functions are:

$$r(e^*, [G-1]e^*) = \frac{(a-c)^2}{4(Gb+d)} \tag{24}$$

$$r(\phi_g([G-1]e^*, [G-1]e^*)) = \frac{1}{b+d}\frac{[(a-c)b(G+1)+2d]^2}{16(bG+d)^2} \tag{25}$$

Equation (21) then takes the following explicit form:

$$\delta > \frac{\frac{[(a-c)b(G-1)]^2}{16(bG+d)^2(b+d)}}{\frac{[(a-c)b(G-1)]^2}{16(bG+d)^2(b+d)} + \frac{(a-c)^2(b+d)}{[b(G+1)+2d]^2} - f} \tag{26}$$

It has been demonstrated that the parametrization adopted allows discriminatory trigger strategies to exist if $G = \{4, 5, 6\}$. For these different cases, equation (26) takes the following values:

$$\begin{array}{lllll} G & = & 4 & \rightarrow & \delta = 0.566 \\ G & = & 5 & \rightarrow & \delta = 0.797 \\ G & = & 6 & \rightarrow & \delta = 1 \end{array}$$

For alternative sizes of the political market, these values represent the minimum discount rates for which collusion can be supported as a subgame perfect equilibrium until period $t = t^*$. They can be called δ_{min}.

It is therefore demonstrated that, while slanting the model to produce competitive results, distancing the elections in time is sufficient to allow even a plurality of parties to collude and secure private rents from holding government. Collusion is stable up to a critical time, after which all parties revert to a competitive behavior and satisfy voters' demands.

2.2.4 Empirical implications

Beside demonstrating the possibility and profitability of collusion, this model also features the following testable empirical restrictions.

ER1 The adoption of discriminatory trigger strategies by the colluding parties inserts a discontinuity in the aggregate supply of public expenditures. As long as parties collude ($t = 1 \sim t = t^*$), they are going to provide:

$$Ge^* \equiv E^* = \frac{a-c}{2(b+d)} \tag{27}$$

From t^* on parties deliver what the median voter demands, namely:

$$G\overline{e} \equiv \overline{E} = \frac{G(a-c)}{b(G+1)+2d} \tag{28}$$

By looking at equation (27) and (28), $\overline{E} > E^*$. This suggests that, in this model, parties' supply of legislative effort, hence of legislation and public benefits, follows a pattern akin to a political budget cycle. *As elections draw near, the observable variable in the model, the number of laws approved, increases.*

The model thus offers an alternative explanation of the political budget cycle that is observationally equivalent to those existing in the literature. The legislative activity is lower immediately after the elections because parties are colluding in the appropriation of rents. When elections draw near, the cartel breaks down and all parties try to satisfy voters' demands in order to be reelected. Moreover, since this model describes a situation where voters are unable to act, it is consistent with the rational expectations hypothesis.

ER2 This model also places an interesting restriction on the size of the political business cycle. *Specifically, the magnitude of the cycle increases with the number of parties.* E^* is in fact invariant with the number of parties, while $\overline{E}$ is not. In the usual parametrization of the model, $E^* = 30$ for $G = 4$, $G = 5$, $G = 6$; $\overline{E} = 54.5$ for $G = 4$, $\overline{E} = 57.69$ for $G = 5$, and $\overline{E} = 60$ for $G = 6$.

ER3 Second, t^*, the times in which collusion is enforceable, varies according to G and T. For different values of $\delta_{min} \leq \delta \leq 1$ and T, t^* is the time period that satisfies the condition of equation (24) - payoff from collusion- be greater than equation (25) - payoff from defection. The relation between the length of collusion and the minimum discount factor required to achieve it is interesting too. As the discount factor decreases, the incentive to defect becomes greater. To offset this effect, the length of time in which the parties in the cartel punish the defector must increase. This results in a fewer number of periods in which the joint profit maximum is achieved.

It follows that longer legislatures both facilitate collusion and extend its period of enforcement. Longer legislatures, in other words, make the political process more unresponsive to voters' demands. A variable length of the legislature, determined by the possibility to call the elections early makes the cartel inherently more instable. The uncertainty about the time horizon increase parties' incentives to defect. *The probability to observe a political legislation cycle increases with the length of the legislature.*

3 Empirical analysis

3.1 Data description

In order to test empirical restrictions ER1-ER3 we have gathered data about the observable endogenous variable of the model, legislative production. The sample period consists of the legislative output of the Parliament of the Italian Republic during the first XIII legislatures (the current legislature is the XIV). The time interval thus goes from May 1948, when the Constitution of the Republic was enacted, to May 2001, when the last elections were held. As the economic theory of legislation posits that all laws have a redistributive nature, we have included in our database any parliamentary act that requires a vote (even a retrospective one) to come into effect. The data set thus includes ordinary laws, constitutional laws and government legislative acts (such as the *decreti legge,*the *decreti legislativi* and the *decreti delegati).* We have thus excluded 1) Parliamentary acts that do not require a vote; 2) Parliamentary votes of the budget sessions or related to the budget bill, in order to "subtract" the political budget cycle from our dependent variable. Both exclusion aim to obtain as precise a measure of the legislation cycle as possible. The Appendix provides information about the data sources.

The legislative production of the Italian Parliament represents an ideal sample to test the theory of Section 2. Not only it provides a very large number of observations (15495 laws approved over 637 months) that ensure the efficiency of the estimates, but also a considerable variability in the conditioning variables that the model foresees. Firstly, the time length of the legislatures varies considerably. Only 6 legislatures out of 13 ended in the 5 year period set by the Constitution (specifically, legislatures I, II, III, IV, X, and XIII), while in the other 7 elections were called in advance. This variability in the legislature length is important, since the model generates a political legislation cycle provided that the length of the legislature $[0, T]$ be known in advance. An indirect test of the model is that the legislation cycle takes place only in the legislatures that end regularly; no cycle should be observable when the legislature is closed in advance. Secondly, the parliamentary history of the Italian Republic is also very heterogeneous with respect to the size of the government majority. The 52 governments of the first XIII legislatures have been supported by all sorts of coalitions, from single party coalitions, to 5 party coalitions to grand coalitions, as in the late 1970s when the Communist Party too was in fact supporting the government. Furthermore, the type of government coalitions changed also during a single legislature. These changes may provide indirect ways to verify whether the government coalitions adopt the discriminatory trigger strategy which the theory foresees.

The upper side of Figure 2 shows the number of laws approved during each of the 637 months of the first XIII legislatures. The reference lines in the lower side indicate:

1. the "electoral periods", namely, the interval between the closing of a legislature and the sitting of the newly elected Parliament (long line);

2. the months when there has been a change of government (medium line);

3. the summer months, August and September, when the Parliament is not sitting for most of the time and the legislative activity drops to basically zero (short line).

The spike in the last months before the closing of a legislature is firsthand evidence of a legislation cycle. The spike is more pronounced in legislatures whose lifetime approaches the regular five years period (legislatures I-IV, X, XIII), while it is less evident in legislatures that end prematurely (legislatures V-IX, XI-XII). Legislature I, when the production of laws was sustained since the beginning, seems to be the only significant exception. Then the absence of a cycle can be rationalized in two ways: first, legislature I is still a "constitutional" legislature, characterized by the need to establish the institutions of the new Republic. A second explanation, consistent with model, is that the governments of legislature I were basically single party coalition, since the Christian Democracy held 48% of the parliamentary seats. This situation closely matches the framework of the first step of the model, where the government is a single agent with no need to generate a legislation cycle in order to hold the coalition together and secure reelection.

Figure 2 about here

The upward sloping fitting line of Figure 3 confirms a loose interpretation of prediction ER1., that the number of months from the beginning of the legislation (hereafter, time t) is positively correlated with the (log-transformed) number of laws approved in that month (hereafter, $\log L_t$). The scatter plot is constructed discarding outlying phenomena, such as summer months, government crises and inter-legislation periods.

Figure 3 about here

Besides time, theory suggests that also the size of the government majority G is a relevant conditioning variable in the dynamics of the production of laws. We have specified the theoretical variable G using two observable measures of the size of the government majority. One is MAJ_t, the minimum of the percentage of the parliamentary seats held by each government coalition in the Chamber of Deputies and the Senate. Since the Italian parliamentary system is a perfect bicameralism (all laws must be approved in the same reading by both chambers) not disposing of the majority in either chamber *de facto* makes the government a minority one. A positive and statistically significant sign on the coefficient of this variable supports prediction ER2, that larger majorities should produce legislative cycles of greater magnitude.

To keep the theoretical analysis as simple as possible, in the model we have assumed that all parties in the government and, implicitly, in the opposition coalition are of equal size. This assumption is an obvious oversimplification of reality and may cause the empirical model to be misspecified. To avoid such risk we have introduced the variable H_t, a composition of homogeneity indexes of the government and of the opposing coalition. This variable is specified as

$$H_t = HG_t \times (1 - HO_t)$$

where

$$HG_t = \sum_{g=1}^{G} f_{gt}^2$$

$$HO_t = \sum_{o=1}^{O} f_{ot}^2$$

f_{gt}^2 and f_{ot}^2 are the squared relative frequencies of the number of the overall parliamentary seats (Chamber of Deputies plus Senate) held by the government and the opposition coalition, respectively, at time t. The range of both HG and HO is between 0 and 1. They are equal to 1 when there is a single party in the coalition (maximum cohesion), while they approach 0 as the number of parties increases (heterogeneity). As it might be expected, these indexes are highly correlated; we have thus decided to mix them into the regressor H_t, so to avoid problems of multicollinearity in the regression analyses. In summary, H_t measures the degree of homogeneity within the government coalition, weighted by a measure of the heterogeneity within the opposition. Empirical tests of the war of attrition literature (Padovano and Venturi, 2001) show that in the Italian Parliament more homogeneous government coalitions (relatively to the opposition) are less plagued by internal hold-out problems; a positive sign should thus be associated with this regressor. Finally, both H_t and MAJ_t take the value of 0 in the months of a government crises, to capture the drop in the legislative activity of these periods.

Figure 4 shows how H_t and MAJ_t affect the relationship between the (log-transformed) number of laws and the time elapsed from the beginning of the legislature. When the government coalition holds the majority of the parliamentary seats (upper quadrants, MAJ_t between 50% and 90%) a change in the relative homogeneity of the government coalition raises the slope of the fitting line; this implies a somewhat greater likelihood of a legislation cycle. However, this effect is stronger when the government coalition is relatively weak (lower quadrants, MAJ_t between 0% and 50%), as the greater increase of the slope of the fitting line indicates.

Figure 4 about here

3.2 Regression analysis

3.2.1 Model 1

Since in our data set law approvals are counts, regression analysis through log-linear models is the standard approach to capture the general trend of the dependent variable within the sample period (McCullagh and Nelder, 1989). In these models, the dependence of the expected count $\mu_t = \mathrm{E}(L_t)$ on the predictors is assumed to be multiplicative and is usually written in the following logarithmic form

$$\log \mu_t = \alpha + \beta_1 t + \beta_2 H_t + \beta_2 MAJ_t \tag{M1}$$

If L_t were the counts of independent events over temporal intervals of fixed length, they would follow a Poisson distribution. In such a case, $\mathrm{Var}(L_t) = \mu_t$ and there would be no overdispersion. But Figure 2 shows that in our sample the variance does not increase linearly with the mean. This implies that the data are overdispersed. A preliminary descriptive analysis of the data suggests that the variance follows a quadratic function of the mean. We thus model the variance as

$$\mathrm{Var}\left(L_t\right) = \varphi\left(\mu_t + k\mu_t^2\right) \tag{29}$$

where k is a dispersion parameter and $\varphi > 1$ is an additional scale parameter that takes into account a possible "residual" overdispersion (underdispersion if $\varphi < 1$) with respect to the one expected by a Poisson distribution. As the dispersion parameter k goes down to 0, the parent distribution of the counts approaches the Poisson distribution. Finally, we assume that the counts follow a negative binomial distribution which is consistent with both equation $M1$ and equation (29). This last assumption allows us to jointly estimate the regression parameters of $M1$, as well as the overdispersion and scale parameters in equation (29) via maximum likelihood.

Table 1 gives two criteria for goodness of fit and the maximum likelihood estimates of $M1$.Figure 5 shows the predicted values. The model fits data very well (the deviance is 762.3762 with 633 degrees of freedom) and almost no overdispersion can be detected ($\varphi = 1.2044$). The signs of the estimated coefficients are the expected ones and are all statistically significant. As the time from the beginning of the legislature grows, the number of laws approved in that month increases. Moreover, the positive coefficient on MAJ_t, holding H_t constant, confirms the prediction ER2, namely, that larger government majorities are associated with a higher number of laws approved, *ceteris paribus*.

Table 1

Dependent variable: L_t

Criterion	*DF*	*Value*	*Value/DF*
Deviance	633	762.3762	1.2044
Pearson Chi-Square	633	545.5010	0.8618
parameter	*estimate*	*se*	$Pr > \chi^2$
intercept	1.8754	0.1078	<.0001
time	0.0230	0.0024	<.0001
H_t	0.7061	0.2097	0.0038
MAJ_t	0.0095	0.0018	<.0001
k	0.7530	0.0466	<.0001

Figure 5 about here

3.2.2 Model 2

Although indicative, Model 1 is not very adherend to the shape of the legislation cycle that the theory of Section 2 predicts. As equation (27) and (28) and Figure 1 show, there should be a discontinuity in the production of laws at the trigger time t^*, when the incentives to satisfy voters' demands to secure reelection outweigh the parties' tendency to appropriate rents from staying in the office. To test this restriction we adjust $M1$ for:

1. Drops in legislative activity during summer months through a dummy variable DS_t, which equals 1 if the month t is either August or September and 0 otherwise. The expected sign on this variable is negative.

2. Spike-type increases in legislative output near the end of the legislature. To capture this discontinuity we have introduced the dummy variable DL_t, which takes the value of 1 if the month t is one of the last three months of the legislature and the legislature has more than 46 months of life (14 months less than the standard length), i.e., it approaches the natural lifetime of 5 years. The choice of the three months maximizes the fitting power of the variable within our sample. A positive sign on this variable is consistent with the sort of legislation cycle predicted by the model of Section 2: with a discontinuity and conditional on a regular end of the legislature.

Model 2 is thus specified as follows:

$$\log \mu_t = \alpha + \beta_1 t + \beta_2 H_t + \beta_3 MAJ_t + \beta_4 DS_t + \beta_5 DL_t \qquad \text{(M2)}$$

Results after maximum likelihood estimation of $M2$ are reported in Table 2. DS_t has the expected positive sign and is highly significant. Figure 6 clearly shows that this variable significantly improves the fit of $M2$ with respect to $M1$. Moreover, both DL_t and the regressors already included in $M1$ are consistent with the theory.

Table 2

Dependent variable: L_t

Criterion	*DF*	*Value*	*Value/DF*
Deviance	631	772.6307	1.2245
Pearson Chi-Square	631	572.1849	0.9068
parameter	estimate	se	Pr > χ^2
intercept	1.9940	0.1014	<.0001
time	0.0192	0.0023	<.0001
H_t	0.5763	0.1947	0.0031
MAJ_t	0.0108	0.0017	<.0001
DS_t	-0.9533	0.0909	<.0001
DL_t	0.7718	0.2349	0.0010
k	0.6221	0.0405	<.0001

Figure 6 about here

3.2.3 Model 3

The previous models fail to capture the dynamic of the laws approved *within* the lifetime (t_0, t_1) of each government. Figure 6 indicates that the number of laws do not generally follow a strictly increasing trend within such a period. Rather, they start to increase during the first months of the government until a critical point, after which they seem to decrease, preluding to a government crisis. This dynamics is only in part consistent with the discriminatory trigger strategy described in Section 2. The consistency lies in the fact that at the beginning the legislative activity of the government coalition is limited, as if it is playing E^*.

Afterwards, the legislative activity of the government increases, possibly in the attempt to avert defecting behaviors by coalition members by playing $\overline{E}$. If, however, the defecting behaviors proliferate, the coalition breaks down and legislative activity drops to 0. However, the discriminatory trigger strategy of the model foresees that new elections be held after a coalition breakdown to punish the defector, not that a new government be formed. This discrepancy is due to the absence of uncertainty about the end of the legislature in the theoretical model. In reality this uncertainty exists, as every government expects to be the last one with a probability $\pi(t)$. Thus each government weights its incentives to adopt discriminatory trigger strategies and generate a legislative cycle by this probability $\pi(t)$. As t grows large, the probability to be the last government tends to 1 and the discrepancy between the model and reality diminishes. In line with this explanation, the last governments of the legislature are those that most closely match the behavior predicted by the model.

It then becomes important to control for the behavior of the "within legislature governments" too. The proxies for the government's tendency to approve laws included in M1 and M2, namely, H_t and MAJ_t, are insufficient, as they remain constant over the entire lifetime of the government. Hence we use the squared difference between the age of the government at time t and the remaining months to the change of the government

$$GOV_t = [(t - t_0) - (t_1 - t)]^2$$

for those months t when the seated government is not the last government of the legislation; in this case we set $GOV_t = 0$. Figure 7 depicts the behavior of GOV_t, which takes its minimum value at the middle point of the lifetime of each "within legislature government". Since these governments play $\overline{E}$ in the middle of their lifetime and $E = 0$ at the extremes, we expect the estimated coefficient of GOV_t to be negative.

Figure 7 about here

Table 3 and Figure 8 show the results after fitting the following model

$$\log \mu_t = \alpha + \beta_1 t + \beta_2 H_t + \beta_3 MAJ_t + \beta_4 DS_t + \beta_5 DL_t + \beta_6 GOV_t \qquad \text{(mod3)}$$

Table 3

Dependent variable: L_t

Criterion	*DF*	*Value*	*Value/DF*
Deviance	630	772.6388	1.2264
Pearson Chi-Square	630	575.4379	0.9134
parameter	estimate	se	Pr > χ^2
intercept	2.0313	0.1014	<.0001
time	0.0183	0.0023	<.0001
H_t	0.5069	0.1942	0.0091
MAJ_t	0.0119	0.0017	<.0001
DS_t	-0.9366	0.0905	<.0001
DL_t	0.7519	0.2332	0.0013
GOV_t	-0.0007	0.0002	0.0018
k	0.6124	0.0400	<.0001

Figure 8 about here

Again all regressors have the expected signs and are highly significant. In particular, the variable DL_t maintains its explanatory power even after the introduction of GOV_t, which implies that the data are consistent with prediction ER1 also after controlling for the behavior of the "within legislature governments". In other words, the discrepancy in the use of discriminatory trigger strategy by these governments highlighted above does not compromise the overall explanatory power of the model in any relevant way.

4 Conclusions

Many different phenomena seem to affect the production of legislation: the size of the government and opposing coalition, the stability of the government, the expected length of the legislatures, as well as other institutional features of the legislative process. Furthermore, the dynamics of this production is peculiar, as the approbation of laws is concentrated towards the end of the legislature, while the legislative activity is at a minimum for most part of the legislature itself. We elaborate a model that puts these elements together to provide some insights into the legislative process.

The presupposition of the model is that any legislation redistributes property rights; hence the time profile of the legislative process should match that of the political budget cycle, which essentially regards the subset of the laws that redistribute financial resources. We build on the models of political accountability to settle the necessary premise that in democratic settings voters find it optimal to consent to the governments some appropriation of rents and consequently an imperfect representation of their interests. Once we consider the possibility that a coalition of parties supports the governments, we demonstrate that the timing of the appropriation of rents is crucial to hold the coalition together. If the parties of a government coalition concentrate the appropriation of rents at the beginning of the legislature and then switch to satisfy voters' demands as the elections draw near, the coalition maximizes the private gains from holding office under a reelection constraint. Provided that legislation is required to accommodate voters' demands, but not to appropriate private rents, the model generates a political legislation cycle: the approbation of laws should remain at a minimum level during a legislature, then increase with a discontinuity as the legislature draws toward the end. This cycle is conditional on the length of the legislature and stability and size of the government coalition.

The test of the model on the sample of the legislative activity of the Italian Parliament during the first XIII legislatures provides strong support to the theory. The regression analysis finds evidence of a political legislation cycle of the type predicted by the model. A cycle takes place when the length of the legislature meets the agents' expectations and the stability of government coalitions is controlled for. Furthermore, the approbation of laws rises with a discontinuity just as the model predicts.

Further analyses of the legislation cycle should test the theory in other data sets and institutional frameworks, as well as consider other features of the legislative process, such as the presentation of laws, the choice of the legislative instrument and the complexity of the bill.

5 Appendix

Data on the legislative activity of the Italian Parliament are from Camera dei Deputati della Repubblica Italiana (various years) Senato della Repubblica Italiana (various years) and Libreria dello Stato (various years). Data on the size and fragmentation of the governing coalitions and of the opposition are from the website of the Presidenza del Consiglio dei Ministri (http://www.governo.it) and from La Navicella (various years).

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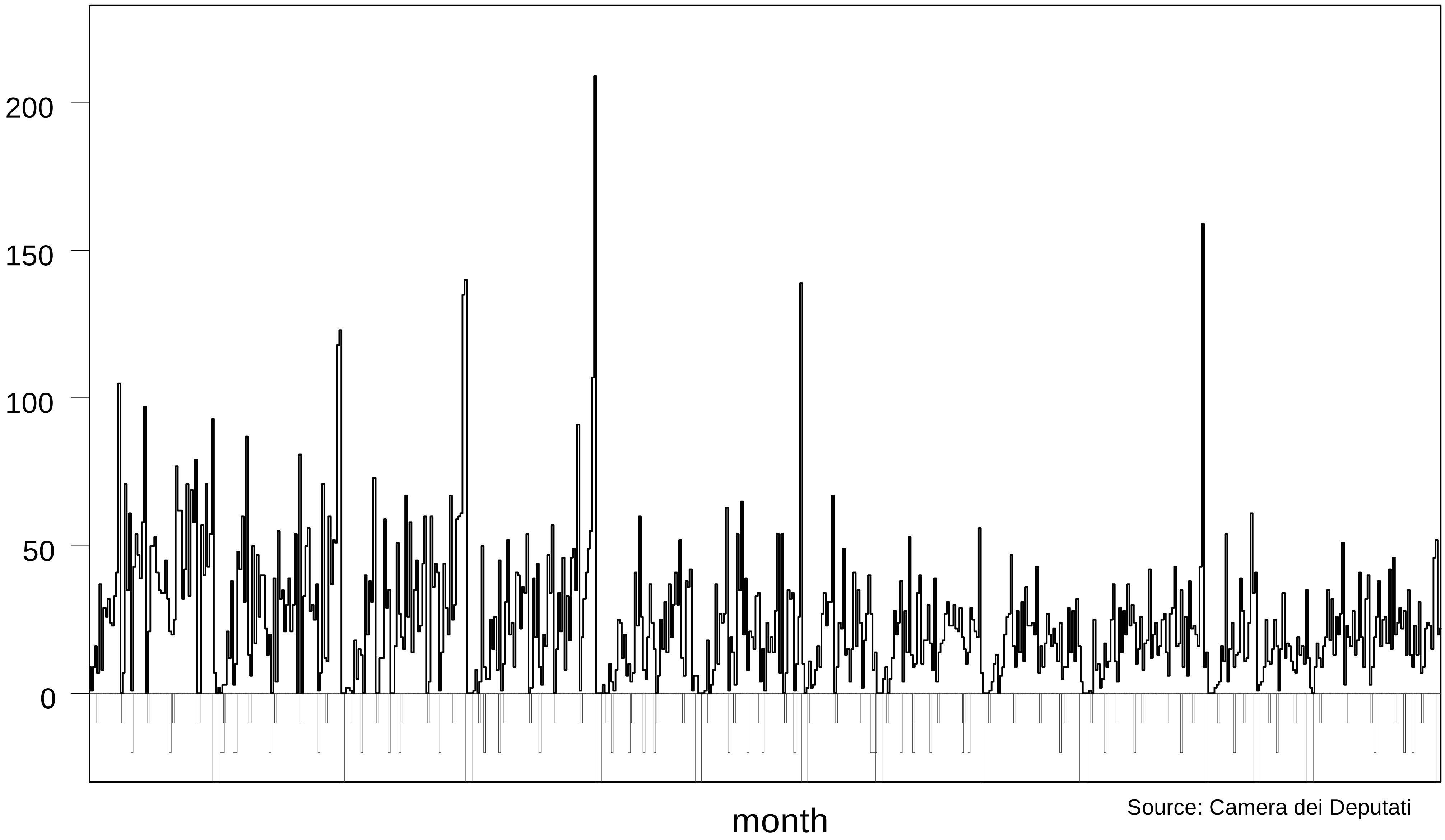

Fig. 2: number of laws approved by the Italian Parliament (may 1948 - may 2001); small (blue) lines refer to summer periods (august and september); medium (red) lines refer to months when a change of government occurred; high (green) reference lines denote inter-legislative periods.

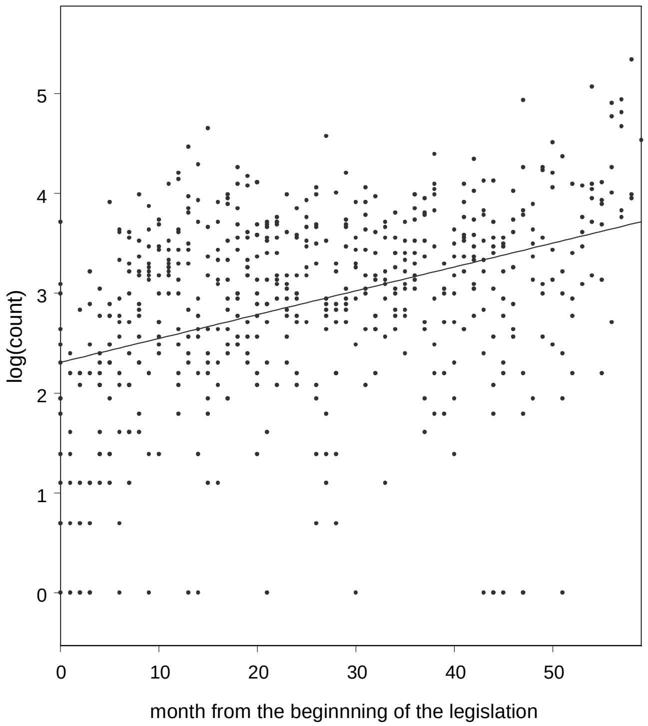

Fig. 3: log-transformed counts per month from the beginning of the legislation (source: Camera dei Deputati)

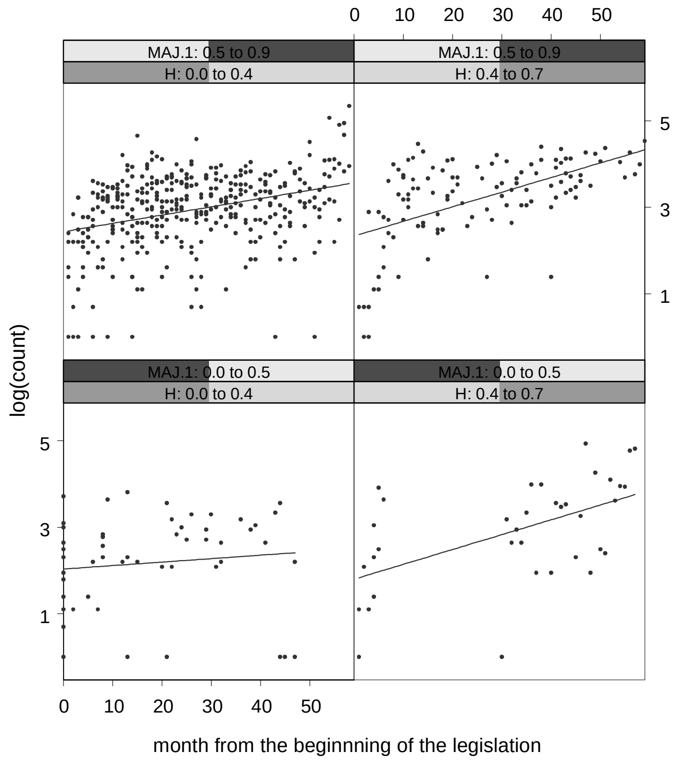

Fig. 4: log-transformed counts per month from the beginning of the legislation: conditional scatterplots given values of two predictors (indexes H and MAJ); all the observations are included (source: Camera dei Deputati)

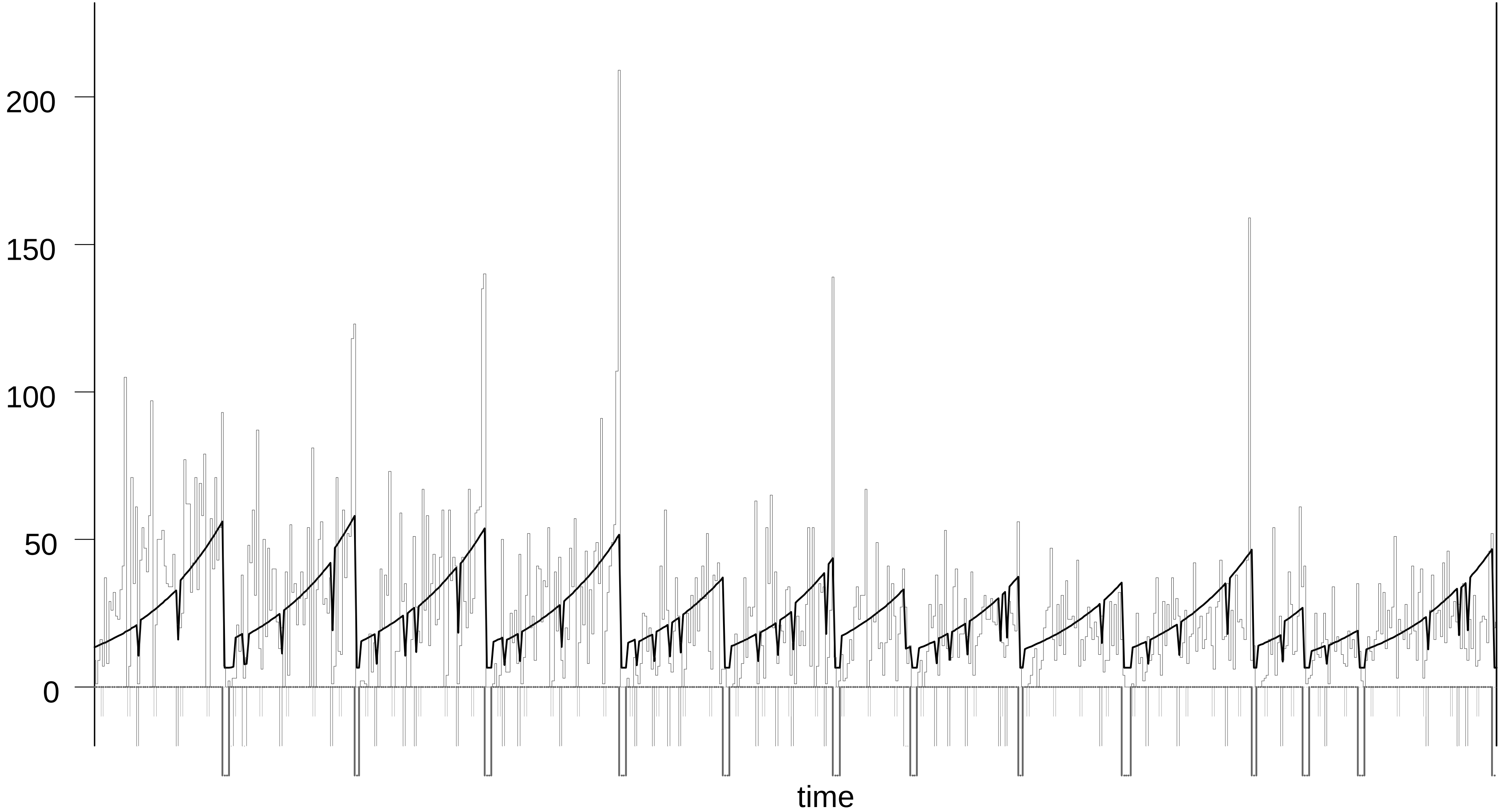

Fig.5: observed counts and counts expected by mod1

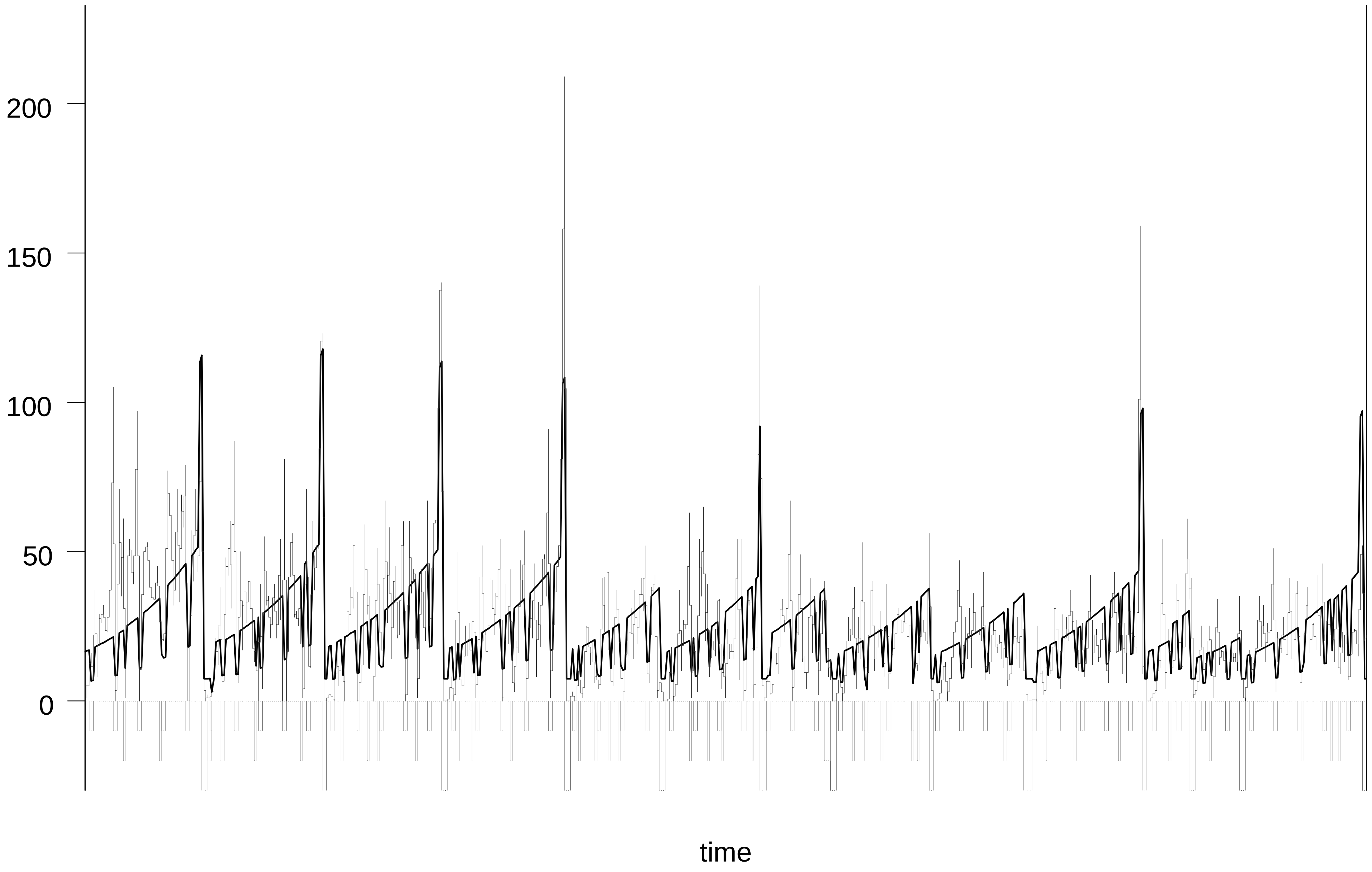

Fig. 6: observed counts and counts expected by mod 2

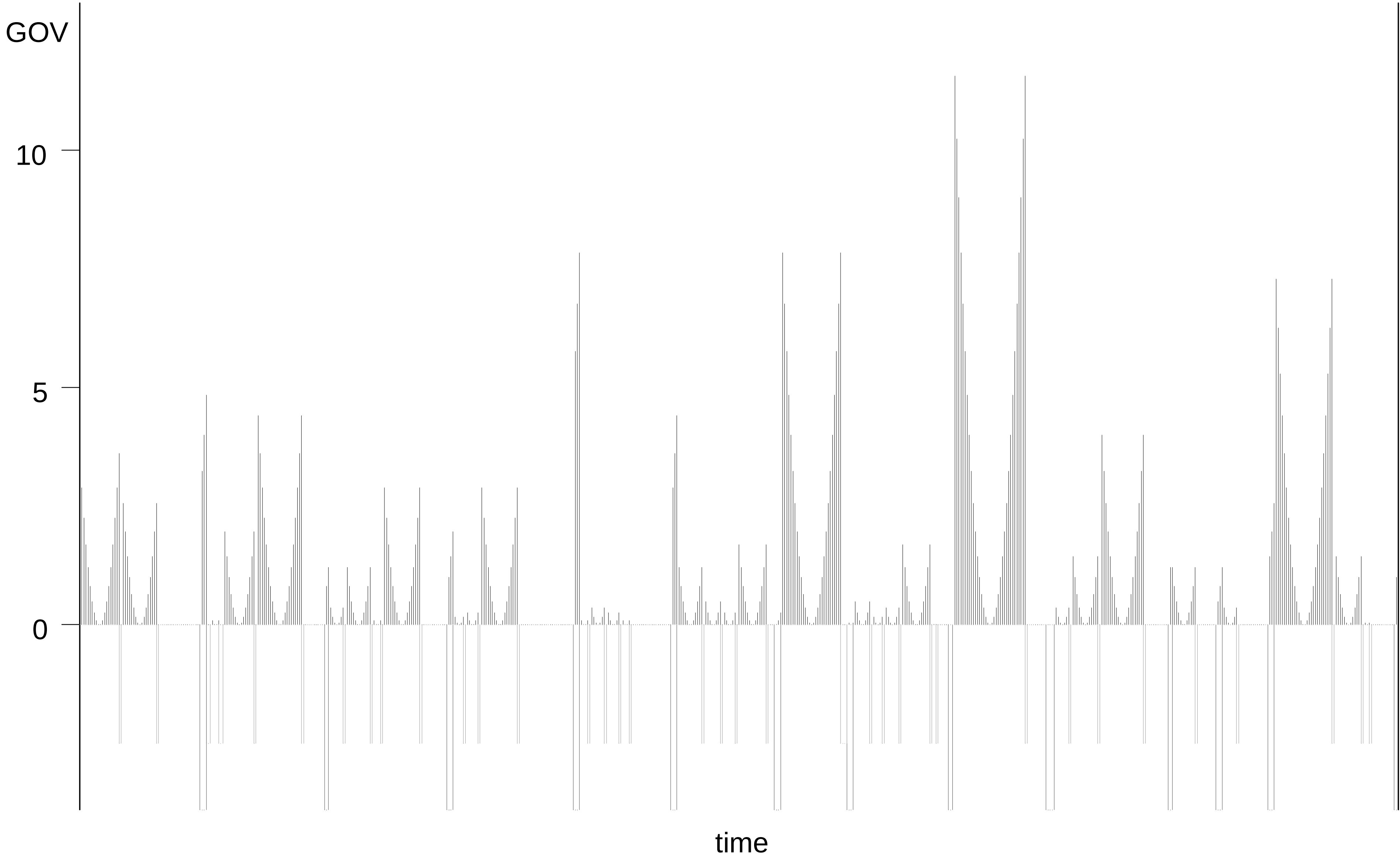

Fig. 7: predictor GOV; high (green) reference lines denote interlegislative periods; lower (yellow)lines refer to change of government
(GOV is equal to 0 when the last government of the legislature is in office)

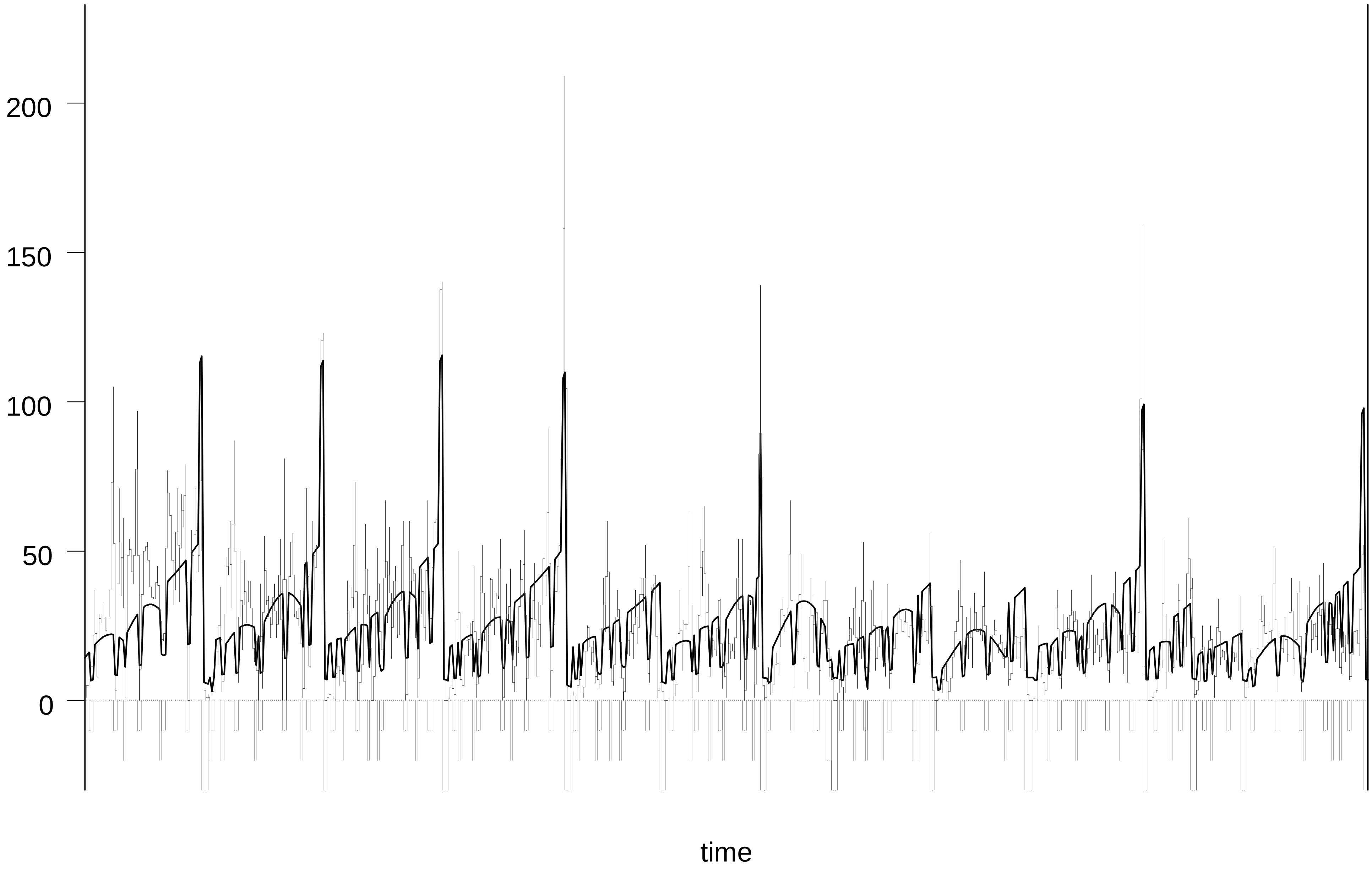

Fig. 8: observed counts and counts expected by mod 3

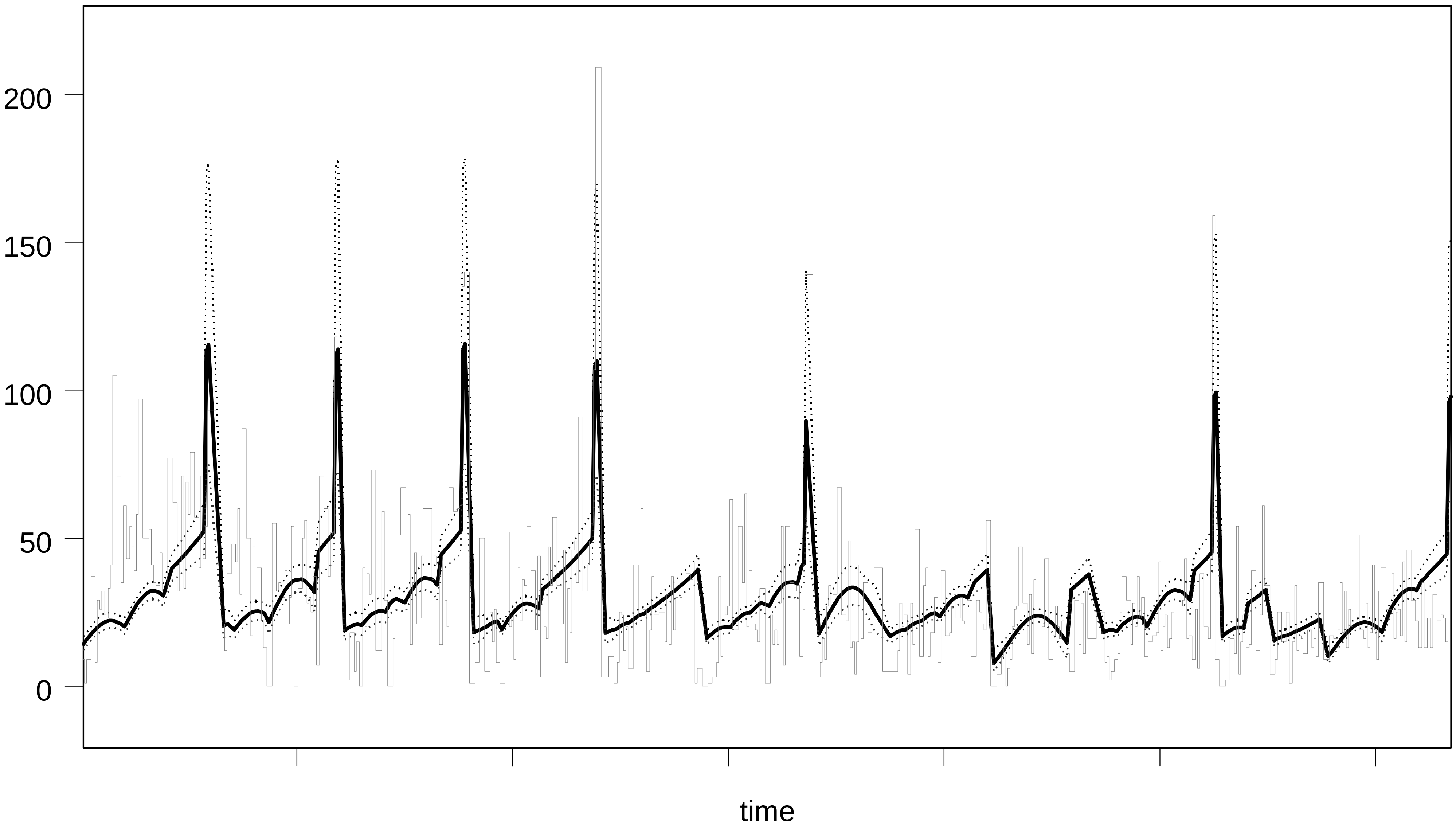

Fig.9: observed (hairline) and mod3-expected counts (black line) with 95% confidence intervals during regular periods; data at either summer months or interlegislative or intergovernment periods are discarded