Legislative processes as sequences: Exploring temporal trajectories of Italian law-making by means of sequence analysis

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1. Introduction

It is commonplace for political scientists and practitioners to refer to time as one of the scarcest commodities in politics (Döring 1995). The political relevance of decisions on the allocation of time in the decision-making process is comparable, if not sometimes superior, to that of decisions on the content of policies. Suffice to say that a mistake in the timing of a particular decision may undermine its final outcome, whatever its content. Parliaments, in their function of law-makers which collect social demands and try to respond through policies, act in time. For instance, according to analysts, it is really the time pressure exercised by Europe one of the reasons for the rising power of executives at the expense of legislatures in European affairs (for a review on the Europeanization of national legislatures, see Goetz and Meyer-Sahling 2008). Confronted with the current acceleration of social reality and the proliferation of inputs, both domestic and international, big assemblies struggle to keep the pace. The question of how national parliaments manage their time has never been more pregnant.

Despite its relevance for research on legislatures and law-making, the temporal patterns of legislative processes, namely their unfolding in patterned ways over time, are still poorly understood. Most studies, typically employing event-history analysis (EHA), have examined how the likelihood of bill enactment evolves with time (since a predefined starting event).[1] Their appeal lies in the fact that they allow analysing the relationship between dependent variables in the shape of time-to-event durations and independent variables of theoretical interest (Blossfeld

[1] Although this method has acquired a well-deserved standing in the social sciences, it is by no means the only technique available to make sense of longitudinal data. See, for instance, Markov Chain models or time-series cross-sectional regression.

and Rohwer 2001). Becker and Saalfeld (2004) tested whether an increase either in the number of partisan actors - i.e. the number of governmental parties - whose consent is required to enact a bill or in their ideological range slow-down the decision-making process. Däubler (2008) found out that an increase in their ideological range delays the passage of social entitlements bills, although the effect varies depending on the type of sponsorship. Martin and Vanberg (2004) suggested considering time as a proxy of the extent of parliamentary scrutiny (committee hearings as well as consultation with outside experts take time) on executive bills and analyse whether an increase in inter- and intra-coalition preference divergence is associated with longer adoption processes. What is of interest here is that the focus of these contributions is on the determinants of specific transitions or events, be it the final adoption of the bill or individual passages, given a certain amount of time has elapsed.

On the other hand, there has been so far no attempt to examine the *whole temporal trajectory* followed by a bill from its introduction to the floor to its final adoption as the unit of analysis. Although legislative procedures may vary substantially across political systems, a typical bill experiences a pre-determined series of episodes along its path: it is assigned to a committee, inserted in the agenda for committee discussion, it goes back to the floor for discussion, and it is passed by the floor. In bicameral legislatures, these very steps are replicated for at least another reading. Remarkably, each of these steps involves different actors, venues and rules. Moreover, their contribution to the overall duration varies extensively. Event history analysis is useful if one is interested in a stepwise analysis of each transition making up the sequence, such as the time-to-end-of-committee discussion or the time-to-adoption (i.e. Becker and Saalfeld 2004). The thrust of this article is that by focusing mainly on specific events or transitions, one may not grasp the unitary, *holistic*, dimension in the life of legislative processes, namely their simultaneous unfolding over time and space.

This article aims at introducing a new method for the study of temporal trajectories in legislative processes: Sequence Analysis (SA). SA is a primarily descriptive technique which takes whole sequences as the main unit of analysis.[2] The trajectory of a bill, the dependent variable, is formally described as an ordered list of fixed stages which vary in length. In this study, time will not be measured in absolute terms, but relative to overall duration which is standardized to a 100-unit length. For instance, a bill can spend half of its total adoption time on the committee agenda, 25% on the floor agenda and 25% on other readings. Another may go through the first reading rather quickly (25% of total adoption time) and be stopped for a longer time in other readings (75%). This analysis aims at studying the factors which explains divergence in the patterns of relative time spent at each stage of the process.

This paper is organized as follows. Section two motivates why using a sequential approach offers new insights into the temporal patterns of legislative processes. Section three introduces the employed methodology and describes the data. Section four presents the findings from an exploratory analysis of a sample of legislative acts adopted in Italy between 1987 and 2008. The final section summarizes the findings.

2. Quantitative studies of time in legislative processes

Large-N research dealing with legislative time understood it mainly as duration. The availability of large amounts of legislative data and the progressive sophistication of methodologies specifically

[2] The type of sequences studied in social studies is quite varied. Most applications study biographies, e.g. occupational or partnership histories (e.g. McVicar and Anyadike-Danes 2002; Aisenbrey and Fasang 2010). Other studies dealt with topics as diverse as the implementation of welfare policies (Abbott and DeViney 1992), the rhetorical structure of sociological journal articles (Abbott and Barman 1997) and the frequencies of lynching in the Southern United States (Stovel 2001).

tailored for dealing with temporal variation, such as event history analysis, laid the ground for a number of works focusing on the spell length between the presentation of the bill and its final adoption. Mostly, these works treated duration as a proxy for characteristics of the process which are difficult to measure, such as the *level of friction* surrounding the adoption of bills, namely the resistance to change due to differing political and substantive views present in the process.[3] It takes time to carry out the parliamentary scrutiny of controversial legislation (L. W. Martin and Vanberg 2004) or to defeat the obstructionist strategies of opposition Members of Parliament (MPs) acting from multiple venues (Becker and Saalfeld 2004; Daubler 2008; Manow and Burkhart 2008). A decrease in the friction of the process should accelerate the adoption of a bill and, vice versa, an increased level of resistance should correspond to a deceleration.

While these contributions have undoubtedly advanced our knowledge on the time dimension of legislative processes, it is arguable that the relationship between duration and friction is more a matter of empirical analysis than an undisputed assumption (Grzymala-Busse 2010). It might be a correct specification in specific national or policy-specific settings, where time on average is invested in debates and/or scrutiny activities. In other cases, however, duration may be understood as the final sum of many phases, not all of them requiring an active intervention of political actors. Each phase features different rules and actors and, as a consequence, different temporal dynamics. As mentioned above, a hint at the importance of partitioning legislative processes already emerged in the work by Becker and Saalfeld. They observed that "a great deal of time is 'lost' *between the different stages* […] while bills were 'waiting' to be dealt with by a committee" rather than in actual debate (2004, 74). In other words, the adoption of a piece of

[3] From this viewpoint, focusing on time offers a dynamic perspective on legislative processes which cannot be grasped by simply focusing on the static *level of gridlock* characterising a system, evidenced by the share of legislative proposals which are passed within a specific time spell (Krehbiel 1998).

legislation does not stretch itself evenly over time; rather it looks like an irregular stop-and-go process. The number of issues which can fit the agenda of a committee and, even more so, of the plenary is limited at any given time and issues are constantly competing to get the attention of the legislator (Jones and Baumgartner 2005). Even contentious bills drop sometimes off the legislator's radar and have to queue before being considered. In the meanwhile, time inexorably elapses. The added-value of understanding legislative processes as sequences, namely as a succession of particular states involving different actors and rules, is the possibility to analyse time patterns while not losing sight of the composite nature of our study objects. Legislative processes may be stopped at different stages. An holistic view can help revealing variation in the underlying structure of a bill trajectory.

Important insights on the unfolding of the process over time might come not only from the consideration of the nature and length of the states but by their interdependence. A tenet of SA is that "single events should not be isolated from each other but have to be understood in their continuity" (Aisenbrey and Fasang 2010, 421). Understanding the duration of each state in a legislative process as independent from the duration of earlier states might be misleading in the case of legislative processes. For instance, previous research on law-making has pointed out that politicians are widely aware of the scarcity of floor time; hence they normally delegate to various offices the power to propose and block proposals to the plenary (Cox 2006). The creation of offices endowed with special agenda-setting powers and their distribution among majority representatives interested in furthering their interests (which in many cases overlap with those of the majority party/coalition) implies that there exists some form of inter-temporal planning underlying each process. The relative time spent at each stage is not determined randomly, but it is strategically chosen to enhance the probability of bill adoption. For instance, a bill trajectory may be congealed for many months at a specific stage to build a supporting coalition behind it.

Once this is formed, one may witness a relative burst of activity and an acceleration of the process in later stages since major impediments to its adoption were eliminated. As a tool designed to deal with whole processes as units, SA should prove useful to gain new insights on this sort of inter-temporal dependencies.[4] Only as a subsequent step and in light of the regularities revealed by SA one may analyse the causes of particular transitions.

In the end, this work originates from the acknowledgement that elucidating the causal mechanisms underlying law-making requires a greater attention to aspects of temporality.[5] This does not imply that one should forcibly zoom in on specific cases. Neither, it is an invitation to discard regression-based methods such as event history modelling. Rather, it represents an original application of a technique, SA , which – albeit developed and applied in other fields – may represent a useful tool to explore available longitudinal data on law-making activities. To some extent, the introduction of SA to study legislative processes should be considered as "one way to more fully exploit the richness of available longitudinal data" (Aisenbrey and Fasang 2010, 425).

3. Applying sequence analysis to the study of Italian legislative processes

3.1 Defining legislative sequences

The popularity of SA in the social sciences is mainly due to its applications in life course analysis to describe life or employment histories. Each individual's life course is represented as an ordered

[4] This justification for a "holistic perspective" resonates to some extent with the "strong viewpoint" exposed by Billari (2001) to substantiate the usefulness of SA in life-course research.

[5] A similar rationale lies behind the work of Pollitt (2008) on the importance of the time dimension in contemporary public policymaking and management.

list of states (e.g. not married/married) or events (e.g. marriage, first child, second child, divorce). What distinguishes sequences in the social sciences from other kinds of sequences, such as the study of DNA in biology, is their time embeddedness: “The timing of event is often crucial in the social sciences as very often what matters is not only the events but when they occurs” (Lesnard 2010, 392). Longitudinal categorical data have to record not only the type and order of states but also their location in the time axis. So a sequence shall be defined as “a function associated with an individual, mapping portion of time to some state space” (King 2013) .

Similarly to individuals, also bills can be said to have their own “life” trajectory within a legislature before becoming laws. They are presented, discussed in different avenues, modified and ultimately adopted. In other words, they undergo a series of transitions which can be traced in time and space. That said, similarities end here and one enters the uncharted territory of defining how to demarcate specific states in an average bill trajectory. Every categorisation has to balance two constraining factors: 1) the capacity to cast light on relevant differences between sequences, while keeping in mind that each sequence should be invariantly a simplification of reality; 2) the availability of data (King 2011).

The definition of the so-called “sequence alphabet”, namely the list of possible states, is a crucial step in SA. One first point to consider is that legislatures are decision-making machines, so the discussion and approval of bills is extensively regulated and not left entirely to the whim of MPs. Thus, differently from (for instance) career histories, legislative sequences exhibit a fixed order. Secondly, outlining what is a pivotal event in a legislative process is dependent on research aims. The main goal of this work is to explain variability in the patterns of relative time spent by each bill at each specific stage of its adoption process, where each step in the decision-making chain is characterised by different actors and institutional requirements. Following a partitioning adopted

by Becker and Saalfeld (2004), the passage of a bill in the first House is decomposed into four institutional states:

- **Pre-committee assignment**, namely the time spent before the bill is assigned to a committee. The Rules of Procedure of both chambers state that after a bill is formally acknowledged by the assembly, the Speaker of the house assigns it to one of the fourteen standing parliamentary committees. Although this passage should be almost automatic and imply a minimum amount of discretion, it still requires time.
- **Pre-committee discussion**, namely the time spent before the bill is tabled for discussion in a committee. It is in this very preliminary phase that most of the bills 'get lost', that is they get virtually killed even before discussing them (Krutz 2005). In most cases, it is the speaker of the committee that has the final word on the committee calendar.
- **Committee discussion**, namely the time spent before the committee finishes discussing the bill. In this phase, the line committee may be required to consult with other permanent or special committees according to the bill's cross-sectoral implications. The committee is required to critically examine (committee acting in *sede referente*) and - if the procedure allows it - amend the legislative text (acting in *sede redigente*) before referring it to the floor. With specific exceptions (constitutional and budgetary laws, together with laws converting law-decrees), Italian committees can be authorized by the Speaker of the House to make binding decisions on legislation without further involvement of the floor (committee acting in *sede legislativa*).
- **Floor discussion,** namely the time spent under discussion on the floor. After the conclusion of the committee scrutiny, the ordinary procedure envisages that the bill is referred to the floor, where it is examined and voted. The power to set the legislative agenda in both Chambers is

vested on the respective Committees of Parliamentary Group Leaders and, in case of political standstill, the Speakers.[6]

Each of these steps is repeated in the Second House. The bill is approved only when both houses agree on the same draft, which implies the possibility of more than two readings. In terms of duration, the most important reading is by far the first with 50 weeks on average (s.d. 53). On average, the second reading lasts less than half as long as the first: 21 weeks (s.d. 25). 485 bills (37%) need three or more readings, which take on average 7 weeks (s.d. 1).[7] These figures suggest focusing the attention only on the composition of the first reading and treat the rest of the time spent in the process as a unique stage. To back this decision, it is also worth mentioning that the highest 'failure hazards' in the Italian legislative process lie in the first reading, with almost 85% of the initiative terminated before approval by the first House. When a bill passes the first reading, it means that there is some degree of political commitment behind it and that it has a high chance of being enacted. This agreement, if necessary, is built during the first reading. Other readings are used to rubber stamp the deal struck in the first house or to sort out divisions among the majorities in the two houses.

In the following, I differentiate between bills adopted in the first reading through the ordinary procedure, i.e. the floor approves them, and bills taking the decentralised procedure, i.e. a

[6] The adoption of the legislative program is decided by the Speakers after collecting the executive's and the parliamentary groups' preferences. In case of dissent, its passage requires a 75% majority among the delegates representing the parliamentary groups in the lower chamber, whereas the delegates representing the groups sitting in the Senate have to vote for it unanimously.

[7] Calculations made on 1286 ordinary laws adopted in Italy during the X, XIII and XIV legislatures (see *infra*). For more details on Italian law-making and time-related considerations, see Borghetto & Giuliani 2012.

committee approves them (sitting in *sede legislative*). This distinction is required not only by the different format of the alphabet, which is composed of respectively five and four states, but also by substantive reasons. Committees acting in their legislative capacity have played historically a relevant role in securing a swift passage for those laws, mostly of small size and with a micro-sectional and clientelistic nature, which enjoyed a wide backing among political forces (Di Palma 1976; Kreppel 1997).[8] In particular, they have favoured log-rolling practices among majority and opposition MPs, which could not have taken place under the spotlight of the floor. Given these peculiar traits, it may be expected that bills adopted in committee follow a different temporal logic with respect to ordinary bills and different factors impact on the relative distribution of time among stages. Descriptive measures of the absolute length of stages are reported in Figure 1.

FIGURE 1 HERE

3.2 Data

The data used to construct the bill trajectories studied in this work are extracted from the newly created Italian Law-Making Archive (ILMA, Borghetto et al. 2012). This archive records, beyond a series of bill- and context-specific attributes, the dates of the main events in the legislative process of every Italian act from 1987 to 2008.[9] For each reading, it reports the date of

[8] Bills approved through this procedure have to enjoy by definition a large consensus, since this autonomous legislative power can be withhold upon request by the government, one-tenth of the assembly, or one-fifth of the committee itself.

[9] Only adopted bills will be considered. This way one disregards those bills that were tabled but not approved because of the end of the legislature (the so-called right-censoring problem). Even so, it is difficult to agree on a general criterion to distinguish bills likely to reach the approval stage from the remaining background noise. In Italy – but not only - most bills are tabled and never move out of committee for a vote. In most cases, they are not meant to get ultimately enacted from

presentation, the date it was assigned to a committee, the date the committee started its discussion, when the committee ended the discussion and the bill passed to the floor, and when the floor adopted it. The duration of each stage is measured in weeks, since this is the cadence both the committees and the floor set their calendar. Each week spent in a specific state is an *element* of the sequence. Each sequence is then composed of four/five spells, namely by one or multiple consecutive elements (read weeks) of the same state.

For reasons of comparability, these data were collected only for "ordinary laws". All other types of primary legislation follow fixed (bills converting temporary decrees) or relatively pre-established calendars (budgetary laws), are characterised by supermajority requirements (constitutional laws) or are, for the most part, administrative in nature (laws ratifying international treaties) (these differences are illustrated in Borghetto and Giuliani 2012).

Since the legislative terms under study vary in their duration, we consider only the three legislatures lasting for the whole 5-year mandate (X, XIII and XIV). Legislature XI, XII and XV were all dissolved after approximately two years and were characterised by peculiar political conditions: political turmoil originated by the "Mani Pulite" trials in the early 1990s affected the XI, a caretaker government was in charge for half of the XII, a litigious and narrow majority governed the XV. Table 1 presents an overview of the three legislatures under consideration.

TABLE 1 HERE

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the origin. Rather, an MP might use them as signalling device directed at his/her respective constituency or to catch the attention of party leaders and enhance their career prospects. Conversely, a minister might use the presentation of bills to press new issues in the parliamentary agenda, though he is aware that the political situation is not ripe for their enactment.

3.3 The dependent variable

As already mentioned, the format of legislative sequences differs from standard life course data: the order and number of stages is fixed. What varies is the duration of each stage. Variation in the length of stages can be captured by using either absolute or relative values of time spent at stage x_i. The first measurement produces a partitioning of my group of sequences which reflects their different overall duration. While these distances may be informative, this analysis is not interested in explaining the total speed of the legislative process.

Rather, it aims at illustrating and accounting for overall patterns of relative durations, namely for the time spent at each stage and how it relates to previous and subsequent stages. Why do some bills spend a greater proportion of their time in committee while others on the floor? More in general, Why are some stages predominant with respect to others, irrespective of the total length of the process? For this reason, the chosen measurement is the relative time spent at a specific state. Sequences are expressed as duration vectors with a fixed number of distinct stages (x_1, x_2,… , x_n) and a standardized length of 100 time-units, wherein x_i denotes the relative time spent in the *ith* stage.[10] This implies that long and short processes may be identical if they present identical proportions of time spent in each stage (a similar standardization of time was applied by Abbott and Hrycak 1990, 169).

Disregarding the different length of processes may be problematic for very short processes, since even short interruptions of parliamentary working due to short holidays or trivial procedural disruptions may affect substantially the pattern of relative durations. This makes them hardly comparable with longer sequences which are less sensitive to the occurrence of this type of

[10] A sequence *x* characterised in its five dimensions by the following durations in weeks, x=(10,14,5,1,7) will be transformed into x=(27, 38, 14, 2, 19).

events. In order to minimize the effect of these occasional confounding factors, it was decided to drop sequences lasting less than 2 months.[11]

3.4 Method

SA has been primarily about the search for patterns in sequential data. It is essentially an exploratory tool which permits identifying recurring structures in a multitude of sequences differing along several dimensions. In part, it relies on visualization techniques. In part, it makes recourse to data reduction techniques which simplify the information contained in each sequence and, without making any a priori assumption, try to find out how they can be grouped together. Thus, one of the products of SA is often a dissimilarity matrix, namely a matrix containing the pairwise difference between sequences.

Although a number of techniques have been proposed for computing dissimilarities between sequences over the years, the lion's share of publications made recourse to the Optimal Matching Algorithm (OMA).[12] The recourse to OMA as a distance calculation technique have not been devoid of criticism (Levine 2000; Wu 2000, and for a reply Abbott 2000). The merits of the debate will not be analysed here. What should be remarked is that there is an agreement in the field that, for the time being, there is no superior heuristic device to extract knowledge from sequential data

[11] This decision led to dropping 25 ordinary and 78 decentralised processes.

[12] Although there exist several types of SA algorithms, OM has become the standard in the social sciences, so much that references to OM and SA often overlap (Elzinga 2003). OMA allows calculating the minimum cost of operations (substitutions and deletions/insertions) it takes to transform one sequence into another (for an illustration of how OMA works see Abbott and MacIndoe 2004). Each operation can be assigned a specific cost. It is normally required from the researcher to justify its cost setup because it determines how sequences are matched and, as a result, how similarity is computed.

and that "the use of SA is unlikely to follow a standard procedure, but each time has to be adapted to the data and the research problem at hand" (P. Martin and Wiggins 2011, 403).

Said that, the peculiarity of my sequences did not justify the recourse to OMA, which is more suitable for sequences differing in terms of order and number of stages. Since we are dealing with vectors and all coordinates/variables are expressed in the same unit, the dissimilarity matrix reports the Euclidean distance between each pair of relative duration vectors.

Based on the dissimilarity matrix, one can cluster together the sequences and, subsequently, analyse the association between cluster membership and a range of variables of interest. The analysis of clusters revealed that a plausible division of my relative duration vectors yields three general groups for both ordinary and decentralised bills.[13] This finding was expected since it reflects the regrouping of sequences based on their prevalent stage. Figure 2 plots each sequence on the vertical axis and its evolution over time on the horizontal axis dividing by cluster and type of procedure.[14] An analysis of clusters reveals that they are characterised by a remarkable heterogeneity of patterns. For instance in Cluster 1-Ordinary Procedure the prevalence of "committee discussion" can vary from 90% to 50%. No clear pattern can be identified in Cluster 3-Ordinary Procedure. This means that a lot of variance from the standard trajectory within each cluster remains unexplained and this simplification can lead to wrong conclusions about the relationship between legislative sequences and covariates.

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[13] The clustering of bills was carried out using the partitioning around medoids (*pam*) method. The number of clusters was selected based on the highest average silhouette score (Kaufman and Rousseeuw 2005), respectively .34 for ordinary bills and .40 for decentralised bills. They were computed using the WeightedCluster R package created by Matthias Studer (2013).

[14] To help readability, Figure 2 sorted sequences according to the first dimension of a principal coordinate analysis, so that similar sequences are closer on the vertical axis.

FIGURE 2 HERE

A solution to this problem has been recently offered by Studer et al. (2011). They propose a set of methods, which they called discrepancy analysis, allowing studying the relationship between states sequences and explanatory variables without resorting to prior clustering. This method is a generalization of the principles of the analysis of variance (ANOVA). Starting from the information contained in the distance matrix - the pairwise dissimilarities - they create a measure of discrepancy of sequences.[15] Using the share of total discrepancy which is "explained" by one covariate (or more when using a multifactor approach), they measure the "strength" of the relationship. Furthermore, they test its "significance" by means of permutation tests.[16]

Overall, discrepancy analysis is less assumption-laden with respect to traditional cluster-based analyses. The latter is appropriate for exploratory analyses where intra-cluster variation can be ignored or dealt with as an uninformative error term. On the contrary, discrepancy analysis is well-suited when the research aim is explanatory and the main focus is on the effect of exogenous factors as in this case. Clearly, the trajectories of legislative bills do not respond to an endogenous logic in the same way as humans' decision-making processes. Rather they originate from a complex interaction between diverse actors and conditions. As such, the focus on discrepancy permits to preserve the inter-individual variability of sequences while analysing the relationship between the trajectories and my explanatory factors.

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[15] In cases where the dissimilarity measure is expressed as an Euclidean distance, like the present one, it is recommended to square the computed distances to obtain the measure of discrepancy (Studer et al. 2011, 504–505).

[16] The tools of discrepancy analysis were implemented in an R package called TraMineR (Gabadinho et al. 2011). I refer for further information to the webpage of the package available at: http://mephisto.unige.ch/traminer/index.shtml

4. An analysis of temporal patterns in Italian legislative processes

I identified four candidate covariates which are potentially useful in explaining sequence discrepancy in the Italian case. I distinguish first between bills sponsored by the executive and bills sponsored by MPs. Because of the relative executive's greater control over the agenda, the first two stages (pre-committee assignment and pre-committee discussion) should never be prevalent with respect to others. Secondly, I test for the complexity of the bill, measured both in terms of its total length (measured as number of words) and range of affected policy sectors (measured as number of involved committees). From a mechanistic perspective, the expectation is that the intrinsic complexity of a bill should affect the trajectory it takes by involving more directly the committee system: more information has to be collected on what is feasible in a particular policy area and the possible legal and practical implications of its many provisions. Thus, complex bills should be associated with trajectories where committee discussion takes longer than other stages. Fourthly, I consider the impact of the branch of the house where the first reading took place. My expectation is that the higher number of MPs in the Chamber of deputies (630 deputies vs. 315 senators) should be associated with a higher number of bills competing for attention on the agenda, thus a greater likelihood of log jams. Problems of agenda crowding should be particularly apparent at the committee stage, both preceding and during discussion, which should then be dominant in comparison with other stages. In addition to these bill-specific features, the multifactor analysis controls for the legislature where the bill was approved, the prevalent policy sector it belongs to and the number of weeks from the presentation of the bill to the end of the legislature. Table 2 presents the list of covariates, spells out their operationalization and shows selected descriptive statistics.

TABLE 2 HERE

As a first step, Figure **3 presen**ts the results from the univariate analysis between the studied trajectories and each of the main covariates. It illustrates the results respectively for ordinary and decentralised processes using sequence regression trees (Studer et al. 2011). For the binary categorical variables, the procedure simply partition the set of sequences **in each** categor**y (to simplify the figure, the parent node is not plotted)**. For the three interval variables, the procedure selects the binary split which yields the highest pseudo-R^2**, namely the split explaining the greatest share of total discrepancy**. Within each node of the tree, sequences are visualised as sequence density plots, showing the proportion of legislative processes at each stage for each time point on the x axis (ranging from 1 to 100). Moreover**, at the top of each child node it is given the splitting criterion, the node size and the discrepancy** s^2. In addition, each tree figure reports: a pseudo-R^2, **"**measuring the share of sequence discrepancy explained by the grouping variable"; a pseudo-F, "to assess the significance of the association"; a Levene statistic, "to test the homogeneity of within-group sequence discrepancies" **(Studer et al. 2011, 473)**.

All the effects are significant (tests were conducted using 5000 permutations), although their strength (indicated by the pseudo-R^2 value) differs. Starting from the effect of sponsorship, it appears that executive bills spend comparatively less time waiting to be scheduled for committee discussion with respect to private bills, irrespective of the procedure in use. This finding seems to support the view that the executive's agenda powers matter at the moment of setting the calendar. As expected, a greater size of the law and a greater number of consulting committees increase the proportion of time spent in committee discussion, while comparatively reducing the pre-committee scheduling stage. In general, complex bills tend to exhibit trajectories where the committee discussion plays a prominent role. The chamber where the bill is examined on its first

reading affects more prominently the distribution of time across stages for decentralised bills (pseudo-R^2 = .11). Since these bills are by definition non-controversial, the relatively greater amount of time spent at the committee stage could be imputed to the greater crowding of the chamber of deputies' agenda.

FIGURE 3 HERE

As a further step, I carried out a multifactor discrepancy analysis, which tests the contribution of each covariate to the total discrepancy reduction, while controlling for other factors. The contribution of a covariate is measured as "the reduction of the between sum of squares that occurs when we drop it from the full model (i.e. from the model with all covariates)" (Studer et al. 2011, 493). It is measured once again through the pseudo-R^2 value. Table 3 shows the results for the two types of procedure in use in Italian law-making, ordinary and decentralised processes.

TABLE 3 HERE

Global F statistics are significant in both models, indicating that we should clearly reject the null hypothesis that my covariates collectively have no effect on the discrepancy of the trajectories. Overall, the model explains a slightly higher share of discrepancy between sequences when it is applied to decentralised ($\mathbf{R^2_{tot}}$ = .17.8) rather than ordinary processes ($\mathbf{R^2_{tot}}$ = . 159). As far as ordinary processes are concerned, the most significant covariate is the size of the law: its removal from the full model leads to a decrease of .045 of the R^2. As regards decentralised processes, the greatest share of the total discrepancy is explained by the branch where the first reading took place. Dropping it from the full model significantly reduces the pseudo-R^2 by 0.084. In both cases, their raw effects are lower with respect to those estimated in the univariate analysis.

Interestingly, “number of committees” and “time until the end of the legislature”, which were highly significant in the univariate model, do not display any significant effect when controlling for other factors. To sum up, if a bill follows the ordinary procedure, its size (a proxy of its complexity) provides the greatest information about the discrepancy of the trajectories. When it is approved in committee, it is largely a matter of which branch it is introduced first. All in all, these findings further support the decision to deal with the two procedures separately.

Although a multifactor analysis allows assessing the raw effect of each covariate on sequence discrepancy and its significance, it provides little information on the kind of resulting trajectories. For this reason, Studer et al. (2011) suggest complementing the multifactor approach with a tree-structured analysis of sequences. Figure 4a and 4b report the same kind information as the univariate analysis presented in Figure 2. They differ in that the effect of multiple predictors is accounted for: at each node, starting from the top, the regression tree subdivides the set of sequences on the basis of the binary split predictor which yields the highest pseudo-R^2.[18] The name and R^2 value associated with this predictor are showed at the bottom of each parent node. Figure 4a and 4b illustrate the branching of the tree respectively for ordinary and decentralised bills. The main advantage of this sort of visualization is that it eases the detection of interaction effects. With regard to ordinary bills (Figure 4a), the higher share of time spent by bigger laws in committee discussion is mostly accounted for by trajectories of laws in specific fields (economy, welfare and justice) and, within this subset, by laws adopted during the XIII legislature. Furthermore, as far as bills of smaller size (less than 1038 words) are concerned, their trajectories are conditioned on the time left until the end of the legislature. Whereas for small bills presented

[18] In this case the chosen stopping criteria are a *p* value of 5% for the F test and a maximal depth of 4 nodes. See Studer et al. (2011).

in the last two years before an election, time is more equally distributed between first and other readings, Figure 4a shows that bills presented earlier spend a comparatively higher share of time in committee and on the floor. Since we are dealing with very small acts, it is unlikely that such trajectories result from their controversial nature. Rather, they are more likely to be low-salient meaures presented at the beginning of the legislature to increase their hopes of success, which jump on and off the committee agenda during the first reading until they squeeze into the calendar and are eventually adopted. As regards decentralised bills (Figure 4b), the impact of the branch where the bill is introduced is mediated by the size of the law. Bigger laws require a bigger share of time for discussion in committee, while having to wait less time for being introduced in the committee calendar. Arguably the latter is a result not only of their complexity, but also of their greater saliency. Furthermore, the effect of executive sponsorship is significantly discriminating only the trajectories of smaller acts presented in the senate, thus better specifying the results of the univariate analysis. Finally, the figure reveals that the trajectory of one out of two bills introduced in the chamber of deputies is accounted for by their being small (<= 1755 words) and adopted in the X legislature. This finding substantiates the view that the use of the decentralised procedure underwent an evolution over the study time considered (Kreppel 1997).

FIGURES 4a AND 4b HERE

5. Conclusions

This paper represents a first attempt to study legislative processes as sequences. It was argued that this approach allows analysing temporal patterns while not losing sight of the specificities of each stage. Moreover, the holistic approach of SA helps bringing to light the inter-temporal dependencies between stages.

The empirical section made use of a novel dataset recording all relevant dates in the legislative trajectories of a sample of Italian laws. Each process was segmented into relative time spent by a bill at a specific stage before its adoption. After calculating the pairwise discrepancy (dissimilarity) between legislative sequences, it was studied whether and to what extent a set of inductively-derived factors could explain variations in the share of observed discrepancy. The analysis relied on both univariate and multifactor tests as well as visualisation tools such as regression tree diagrams.

The predictor explaining the greatest share of discrepancy among ordinary bills' trajectories is the size of the law, which is expected to capture the complexity of the issue addressed by the legislative act. Our analysis reveals that bigger laws are associated with comparatively lengthier examinations by committees. The time employed to analyse the bill and find an agreement at the committee stage saves time in subsequent stages. Interestingly, executive sponsorship is not the most significant covariate. This observation is in line with accounts of Italian legislative politics emphasising the relative weakness of the executive's agenda-setting powers (e.g. Capano and Giuliani 2001). On the other hand, for bills adopted through a decentralised procedure, the biggest part of the discrepancy of trajectories is explained by the choice of the house where they are presented. Since they are mostly highly consensual but low-salience clientelistic bills, their temporal path is typically determined by their capacity to be accommodated in the crowded committee agenda. In line with our expectation, committee agendas are more congested in the Chamber of Deputies, which due to its higher number of MPs has ordinarily to cope with a greater legislative initiative.

The current analysis constitutes but a first step in the enterprise of gaining a better understanding of temporal patterns in Italian law-making. It makes explicit the presence of multiple ways to get to the same destination (final adoption) and offers some insights into the general mechanisms

underlying the various roads. Likewise driving on a big busy highway, it might be a matter of windows of opportunity opening and closing rather unpredictably, of taking the fastest lanes, of setting off at the right moment. The main point of this paper is that, by reducing the complexity of trajectories through SA we can gain a better handle on the flow of traffic in the legislative process and advance more informed hypotheses on the strategies used to regulate it.

The complexity of life course sequences explains the wide application of SA in this study area. Yet, we showed that also its application to fixed-ordered sequences such as legislative processes can be analytically rewarding. In particular, the application of discrepancy analysis offers new means for addressing casual inquiries, thereby going beyond a traditional cluster-based approach. This might be intended as a preliminary demonstration of the possibilities of SA: the increasing availability of data on the individual stages making up legislative processes may open up new stimulating avenues of future research.

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Table 1. Italian legislatures under study

	Starting date	Ending date	Duration of legislature	Number of law	Average duration of laws
X legislatur	02/07/198	22/04/199	1756 days	645	523 days
XIII legislatı	09/05/199	29/05/200	1846 days	408	508 days
XIV legislatı	30/05/200	27/04/200	1793 days	233	565 days

Source: Italian Law Making Archive. 1286 ordinary laws approved in the X, XIII, XIV legislatures

Table 2. List of covariates

Variable	Description	Categories*		Descriptive values (absolute frequencies if not indicated)			
		Ordinary	Decentralised	Ordinary(408)		Decentralised(775)	
Sponsor	Signer of the bill	Executive Member of Parliament		221 187		354 421	
Size	Size of the bill measured as number of words of the bill a time of adoption	Small (<= 382) Medium (> 382 <=1038) Big (>1038 <= 3270) Very big (>3270)	 Small (<= 926) Big (> 926)	69 71 125 143	Mean: 3856 Sd: 5840	 	Mean: 1300 Sd: 1843
Number of committ	Number of committees cons	Small (<= 7) Medium (> 7 <= 10) Big (> 10)	 Small (<= 4) Big (> 4)	319 49 40	Mean: 5.6 Sd: 3.2	 504 271	Mean: 4.3 Sd: 1.9
Branch of 1st readin	House where the bills is first presented	Chamber of deputies Senate		230 178		380 395	
Legislature of adopt	Legislature where the bill wa adopted	X(1987-1992) XIII(1996-2001) XIV(2001-2006)		109 181 118		487 187 101	
Policy sector	Relevant policy sector of the	Economy** Environment Foreign Policy Government Justice Welfare		73 30 61 72 87 85		161 96 114 67 108 229	
Total duration	Number of weeks left before end of the legislature (since presentation of the bill)	Early (<= 228) Medium (> 228 <= 262) Late (> 262)	 Early Late	249 133 26	Mean: 188.8 Sd: 64.9	 655 120	Mean: 180.1 Sd: 66.1

Source: Italian Law Making Archive. 1183 ordinary laws with total duration longer than 60 days approved in the X, XIII, XIV legislatures

* Interval covariates (number of words, number of committees and total duration of the processes) were discretised into ordinal categories before running the multifactor discrepancy analysis (not mandatory, but recommended, because one does not assume a linear relationship). Cut-off points were selected through sequence regression trees. They iteratively split the data, based on the split that returns the highest pseudo R^2 at each step. All graphs are available as an online appendix available in the author's website.

** Regrouping of policy area categories assigned according to the Comparative Policy Agenda codebook [Borghetto et al. 2012]). Economy (Domestic Macroeconomic Issues; Banking, Finance, and Domestic Commerce; Energy; Transportation; Space, Science, Technology and Communications); Environment (Environment; Public Lands and Water Management; Agriculture); Foreign policy (Foreign Trade; International Affairs and Foreign Aid; Defense); Government (Government operations); Welfare (Health; Labor, Employment; Immigration Issues; Social Welfare; Community Development and Housing Issues; Education; Culture Policy Issues); Justice (Civil Rights, Minority Issues, and Civil Liberties; Law, Crime; Court Administration)

Table 3. Univariate and Multifactor Discrepancy Analysis

Univariate Analysis

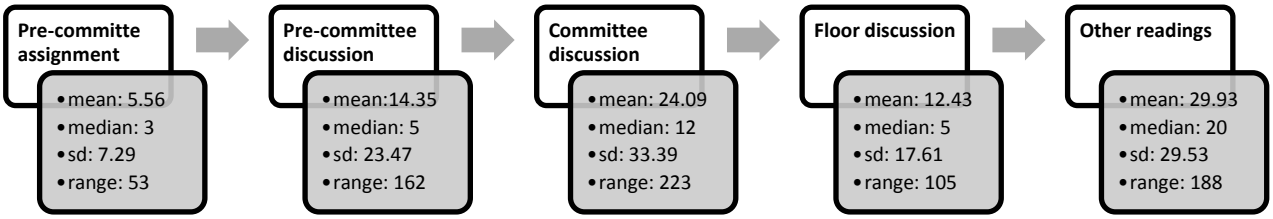
	Ordinary procedure			Decentralised procedure		
Variable	F	ΔR_v^2	Sig	F	ΔR_v^2	Sig
Sponsor	7.34	0.018	0.001	22.19	0.027	0.000
Size	7.52	0.052	0.000	24.19	0.030	0.000
Number of committees	5.80	0.027	0.000	11.61	0.015	0.000
Branch of 1st reading	4.07	0.001	0.009	96.85	0.111	0.000
Legislature of adoption	2. 72	0.013	0.017	5.27	0.013	0.000
Policy sector	2.19	0.026	0.008	1.79	0.011	0.049
Total duration	6.46	0.031	0.000	12.30	0.015	0.000

Multifactor Discrepancy Analysis

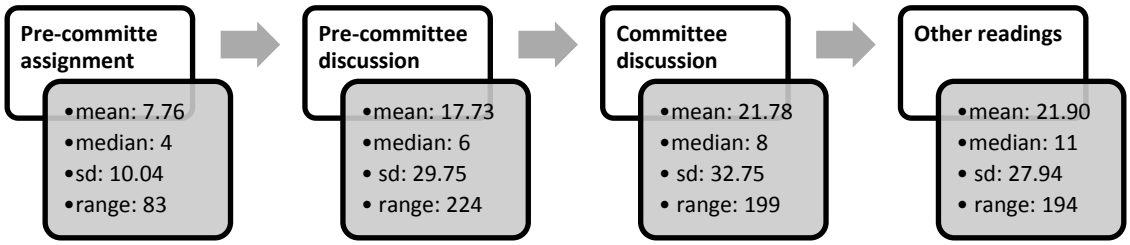
	Ordinary procedure			Decentralised procedure		
Variable	F	ΔR_v^2	Sig	F	ΔR_v^2	Sig
Sponsor	10.37	0.022	0.000	9.54	0.010	0.000
Size	7.10	0.045	0.000	16.51	0.017	0.000
Number of committees	2.34	0.010	0.032	1.28	0.001	0.273
Branch of 1st reading	3.28	0.007	0.020	77.48	0.084	0.000
Legislature of adoption	2.71	0.011	0.014	5.68	0.012	0.000
Policy sector	1.68	0.018	0.046	1.72	0.009	0.048
Total duration	7.01	0.030	0.000	2.04	0.002	0.114
	F_{tot}	R_{tot}^2	Sig	F_{tot}	R_{tot}^2	Sig
Global	4.62	0.159	0.000	13.77	0.178	0.000

Figure 1. Duration in weeks of stages according to procedure

A)Ordinary procedure (N=433)



B)Decentralised procedure (N=853)



Source: Italian Law Making Archive. 1286 ordinary laws approved in the X, XIII, XIV legislatures

Figure 2. Cluster analysis of legislative sequences

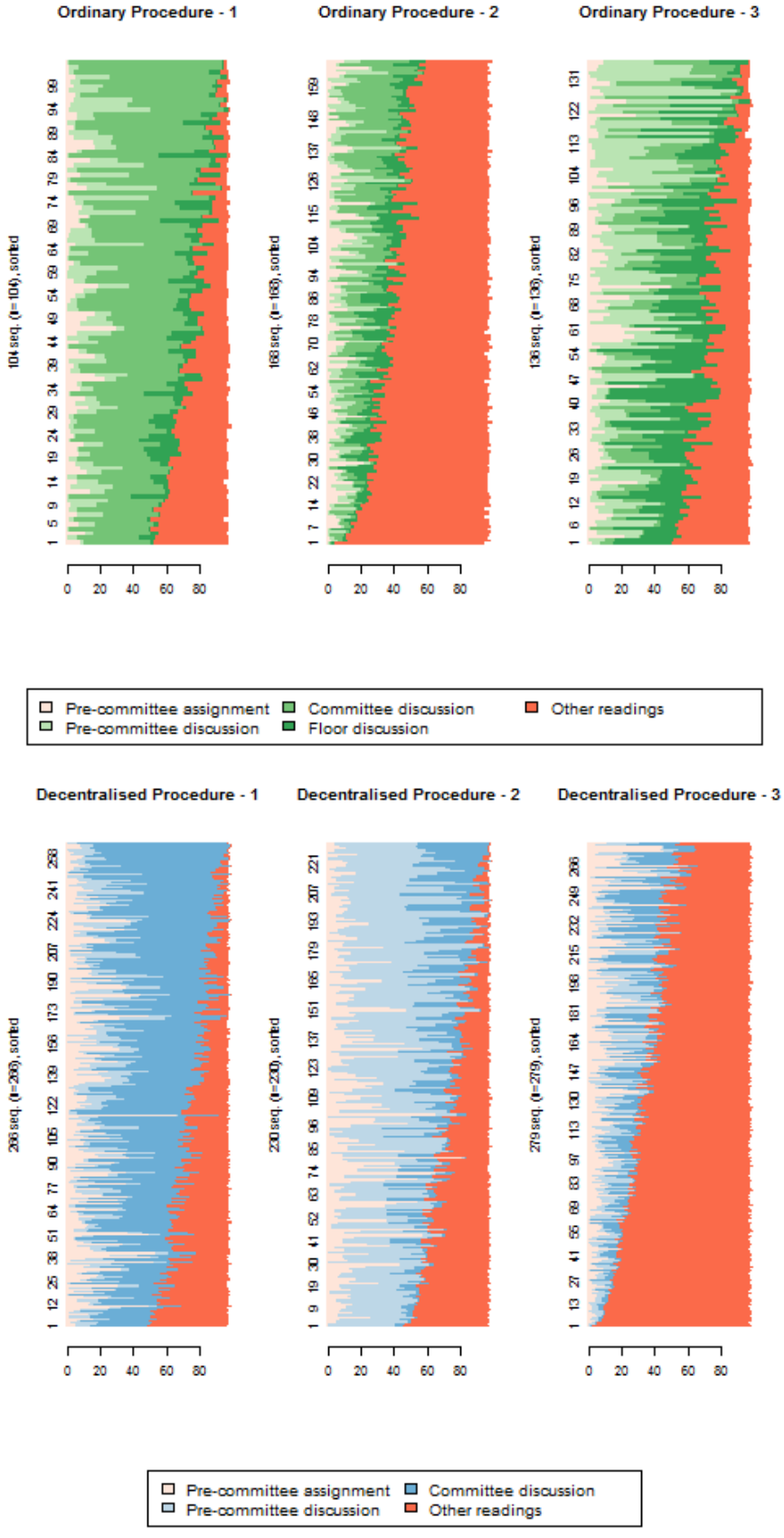
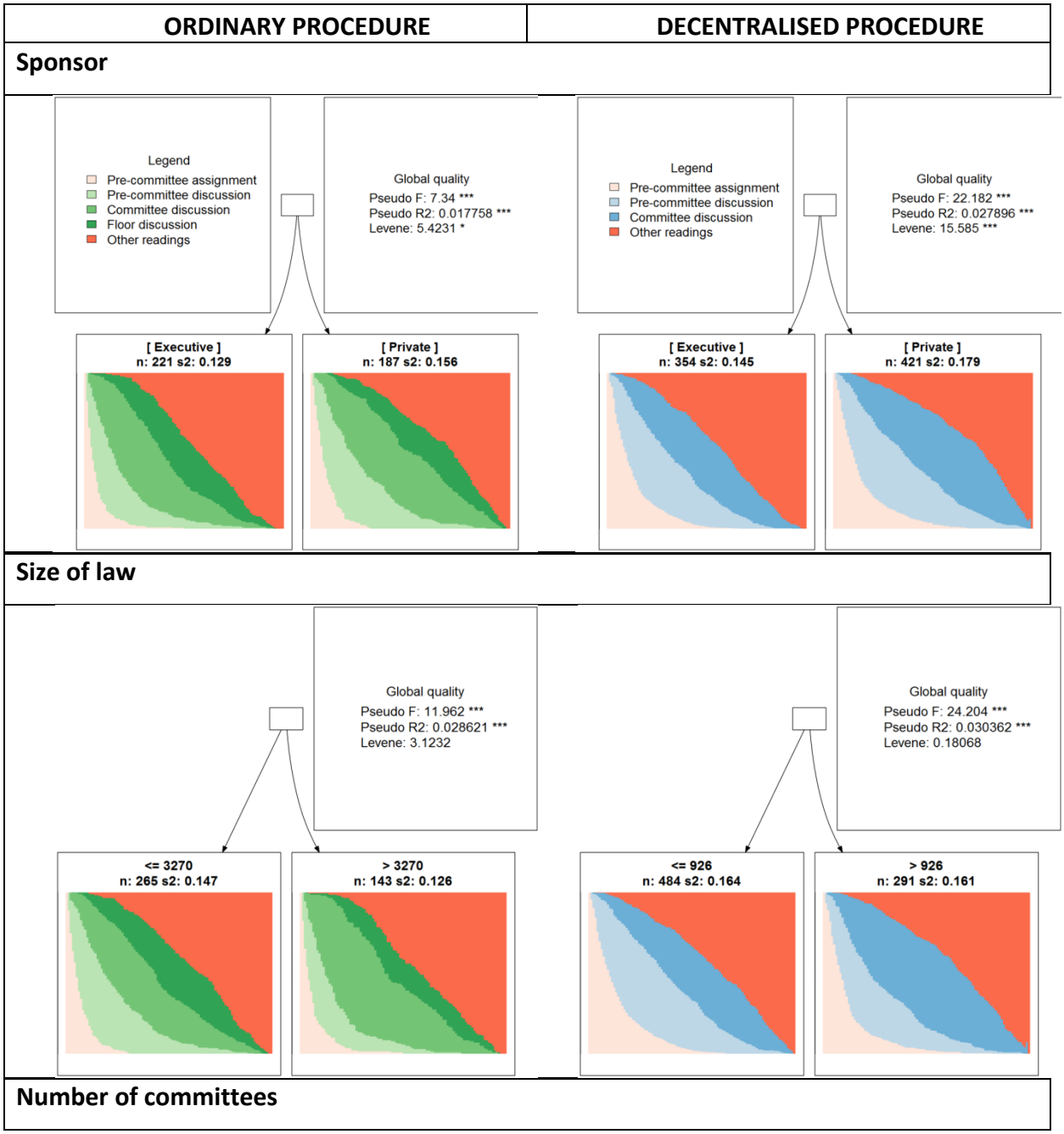
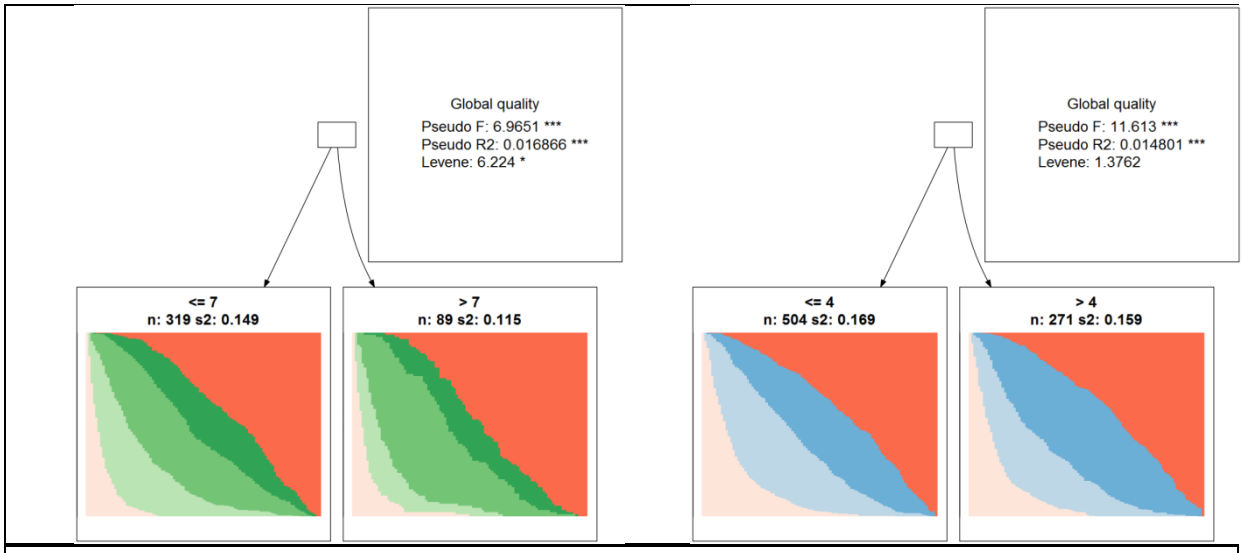


Figure 3. Univariate discrepancy analysis using sequence regression trees





Branch of the first reading

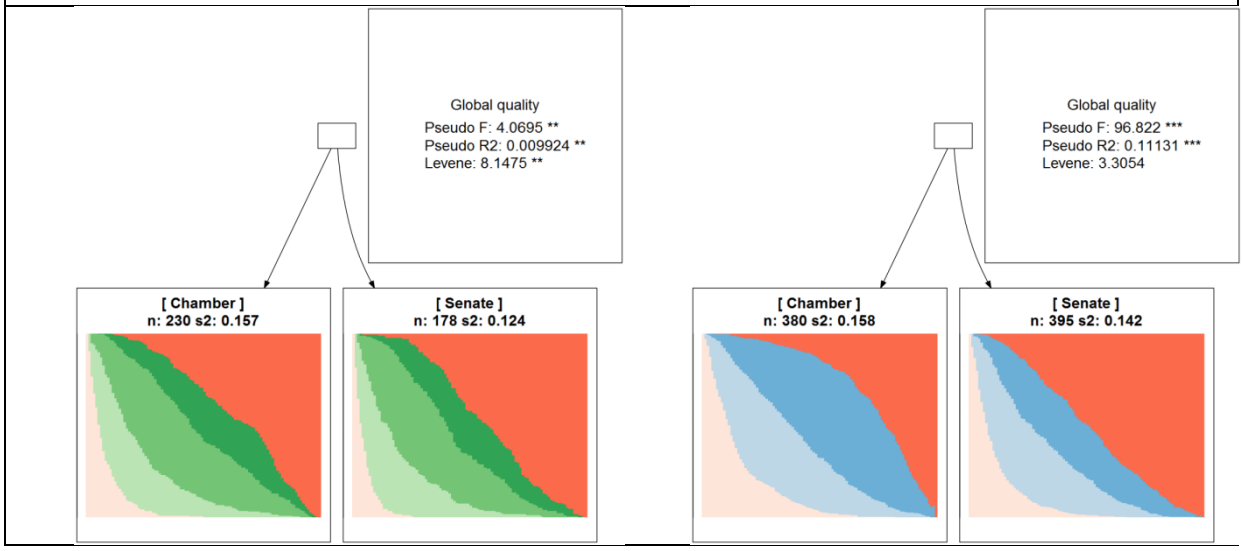
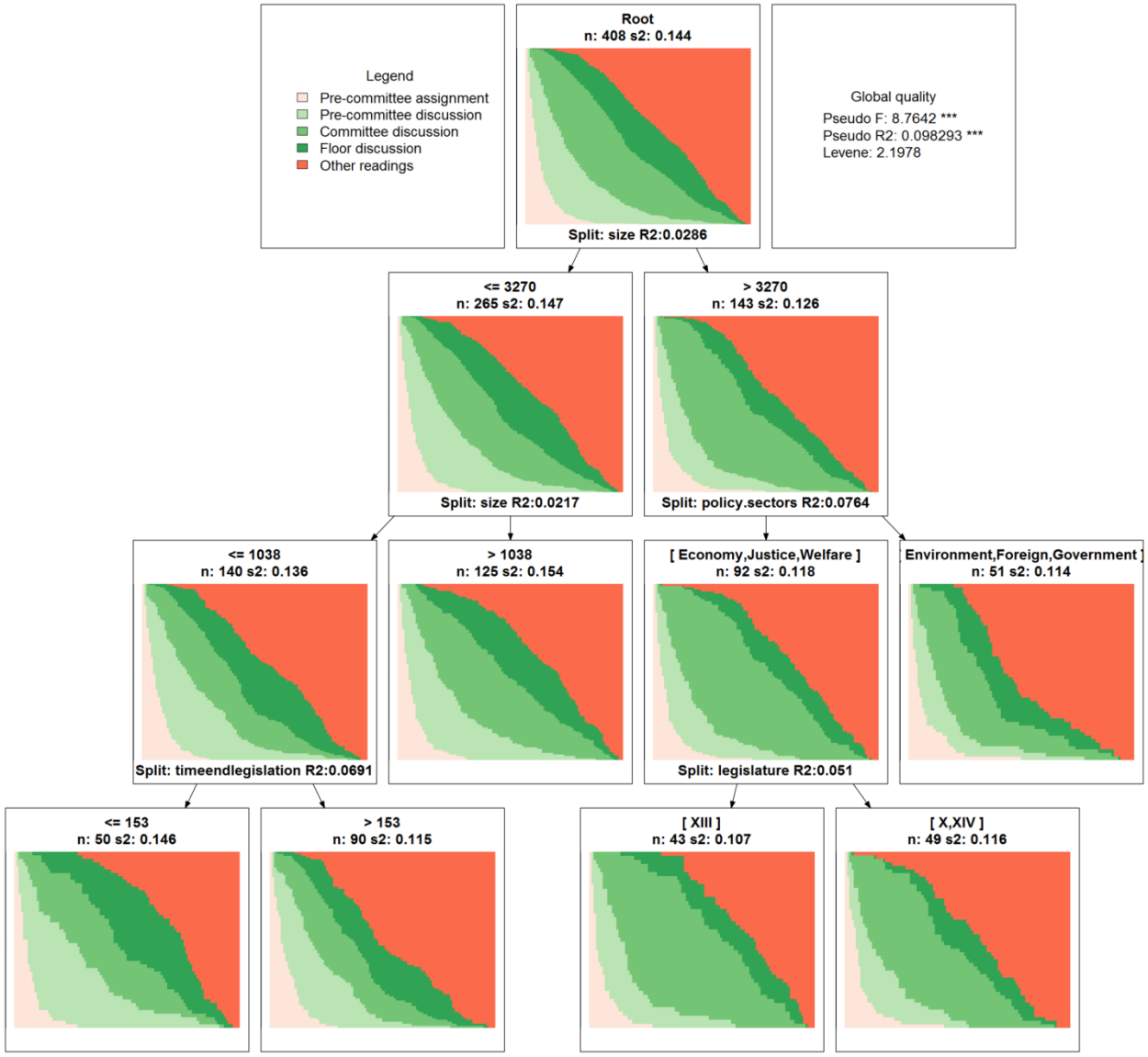


Figure 4. Multifactor discrepancy analysis using sequence regression trees

a)Ordinary procedure



b)Decentralised procedure