# Policy complexity in the European Union, 1993 – today: introducing the EUPLEX dataset

Steffen Hurka[1], Maximilian Haag[1], and Constantin Kaplaner[1]

[1]LMU Munich

Data available at: https://data.euplex.org/

Please cite the original paper when using the data or referencing the article:

http://dx.doi.org/10.1080/13501763.2021.1938174

**Abstract**

Despite its importance for the sustainability of democratic governance, policy complexity is still an understudied phenomenon. What makes policies complex? Why are some policies more complex than others? And what are the consequences of this complexity for the political, economic and societal level? These questions still lack answers, which is both due to a lack of conceptual clarity and a lack of suitable data. In order to tackle these challenges, we introduce the EUPLEX dataset, comprising information on the complexity of more than 6,000 policy proposals adopted by the European Commission between 1993 and today. Relying on automated methods of data collection and natural language processing, EUPLEX allows us to compare the complexity of Commission proposals over time, across policy domains, and institutional and political configurations. The dataset will be updated continuously in the future as new policy proposals become available and is available free of charge to the research community.

# Introduction

Complaints about the excessive complexity of European Union (EU) law are as old as the Union itself. Already back in 1975, at a time when only comparatively few political decisions were taken at the supranational level, the Council of the European Communities adopted regulations on the consolidation of existing agricultural policies, stating that 'the large number and complexity of these texts, spread among many different Official Journals, and the many successive amendments to them, could lead to a lack of clarity which would impede their proper application' (Council of the European Communities, 1975, p. 153). In 1992, then President of the European Commission Jacques Delors called upon the EU institutions to become 'inventors of simplicity', asking for 'a collective examination of conscience, firstly within the Commission, for whom the pen must be lighter and the texts plainer', as the texts of the compromises reached in the Council had become 'too complicated, even incomprehensible' (Delors 1992 , as cited in Economic and Social Committee (1995: pt. 2.3.1)). Most recently, the Commission stated its sustained interest in simplifying EU legislation in the context of its Better Regulation agenda with the goal that 'every single measure in the EU's rulebook is fit for purpose – modern, effective, proportionate, operational and as simple as possible' (Timmermans, 2015). As this timeline shows, the complexity of laws and regulations has been a recurring theme ever since the EU has been adopting legislation.

But why should we care about the complexity of public policies? First, complex policies entail transaction costs. For instance, the difficulty of acquiring high-quality information, the demandingness of political negotiations, the ability of legislative anticipation (Rauh, 2020) and ultimately the length of legislative processes (Hurka & Haag, 2020) are likely related to the complexity of the policy under scrutiny. Secondly, policy complexity affects several crucial aspects of democratic governance like the delegation of rule-making authority (Franchino, 2004; Senninger, 2020), the quality of policy implementation (Limberg et al., 2020) and the feasibility of policy evaluations (Adam et al., 2018). Finally, there are major ramifications for ordinary citizens, whose ability to comprehend, debate and criticize the policy status quo is likely to be affected by rising policy complexity (Adam et al., 2019). Yet, even though the complexity of

public policies has important normative implications for democratic governance, we still lack systematic data to investigate its nature, its origins and its consequences.

In this paper, we offer a comprehensive conceptualization and measurement approach for various aspects of policy complexity and provide the research community with a new dataset that facilitates the investigation of policy complexity in the EU. The dataset, which has been compiled in the context of the EUPLEX project, draws from publicly available information on the texts of policy proposals adopted by the European Commission since the coming-into-force of the Maastricht Treaty until today (1993– 2021), will be made available free of charge and will be updated continuously in the future as new proposals become available. The following section provides a brief overview of existing approaches to capture the complexity of legal texts. Next, we lay out our concept of policy complexity followed by a description of our dataset and an illustration of the evolution of policy complexity over time and across policy domains. We briefly discuss the various ways in which the dataset can be used to investigate central topics of EU research.

## Understanding the nature of policy complexity: existing approaches

Even though the complexity of laws and regulations is brought up repeatedly in public and political debates, there is only scarce literature on the subject in political science. To the extent that policy complexity has been addressed, it was mostly treated as a control variable of limited theoretical relevance. Some important exceptions exist, however. For example, Franchino (2004) used a range of different proxies of policy complexity to explain the amount of delegation provisions in major EU laws (see also Senninger, 2020). More recently, especially the lobbying literature has looked into the concept either as a determinant of lobbying success (Klüver, 2011) or as a driver of participation in Commission consultations (Røed & Wøien Hansen, 2018).

When policy complexity is of theoretical interest, the most common approach in EU studies is to assume that the complexity of a policy proposal is adequately captured by the number of recitals that precede the enacting terms (Rasmussen &

Toshkov, 2011; Steunenberg & Rhinard, 2010; Toshkov, 2008). Yet, while recitals clearly contain important information on the reasons behind a policy proposal (European Union, 2011, p. 39), they do not have any independent legal effects (Baratta, 2014). Moreover, recent research demonstrates that recitals have increasingly been misused by the drafters of EU law in recent years as vehicles for political statements and instruments for building compromise (den Heijer et al., 2019). Accordingly, focusing exclusively on recitals is insufficient, because the legally relevant content of a Commission proposal is located in its enacting terms.

Following this idea, some studies have analyzed legislative texts with regard to their interconnectedness, thus shifting the analytical focus from individual laws towards the legal system as a whole (e.g., Bommarito et al., 2010; Boulet et al., 2010; Fjelstul, 2019; Koniaris et al., 2018; Ruhl & Katz, 2019). These studies adopt network perspectives and provide rich accounts of cross-referencing and citation patterns across different types of legal texts and in different jurisdictions. Studies adopting a dynamic perspective agree that one of the most pervasive features of legal systems is their constant growth in size and density. In the context of the EU, Koniaris et al. (2018) demonstrated that the 'densification' of the EU legal landscape follows a power-law function, as the interconnectedness between EU legal texts grows faster than the number of legal texts itself. Furthermore, other scholars have begun to enrich the analysis of crossreferencing with a systematic analysis of the textual properties of legislative texts. For example, Katz and Bommarito II (2014) examined linguistic properties of the United States Code; Waltl and Matthes (2014) applied a similar approach to German Laws. In political science, the automated content analysis of the complexity of political texts has recently mainly focused on speeches (Benoit et al., 2019) and party manifestos (Bischof & Senninger, 2018). As one of the rare studies focusing on the textual characteristics of legislative texts, Senninger (2020) showed that a policy's textual sophistication and the degree of its interconnectedness strongly predict how complex it is perceived by individual 'end-users'. Yet, we still lack systematic data on the complexity of legislative texts that can serve as a foundation for detailed investigations into its origins and effects

# Conceptualizing and operationalizing policy complexity

How can we conceptualize policy complexity in a way that facilitates its empirical analysis? Drawing on existing scholarship in legal informatics (Katz & Bommarito, 2014; Waltl & Matthes, 2014), we argue that the complexity of a policy results from structural, linguistic, and relational aspects of the underlying legislative text. All of these aspects of complexity create different types of transaction costs for an 'end-user' engaging with the text, e.g., a decision-maker, implementer, or ordinary citizen (Bommarito et al., 2010; Hurka & Haag, 2020; Katz & Bommarito, 2014). In the remainder of this section, we explain the conceptual components of policy complexity and how they can be operationalized and measured.

## Structural policy complexity

The size of a policy text (i.e., the amount of legal provisions) directly impacts on the transaction costs of decision-makers and implementers when a proposal is negotiated or implemented. In line with the existing literature, we call this property the structural size of a policy (Katz & Bommarito, 2014). To measure structural size, we count the number of 'policy elements', i.e., recitals, paragraphs, points and indents. While there are other potential measures for structural size, like the number of words, our measure has the advantage that it is independent of the text's language (Figure 1).

Yet, the length of a text does not capture the level of detail it provides. Policies of the same size can consist of only few, but very detailed, or many, but rather general provisions. In other words, the length of a text does not tell us anything about how fine-grained the hierarchical structure of its contained legal provisions is. Accordingly, we are interested not only in the structural size of the entire proposal but also in the hierarchical level on which the proposal's policy information is located on average (Katz & Bommarito, 2014, p. 350). To assess this average element depth, we distinguish three levels within the enacting terms: single paragraph articles on level 1, numbered paragraphs in an article on level 2, and points within paragraphs on level 3 (see the vertical depth axis in figure Table 1). For example, a proposal featuring one

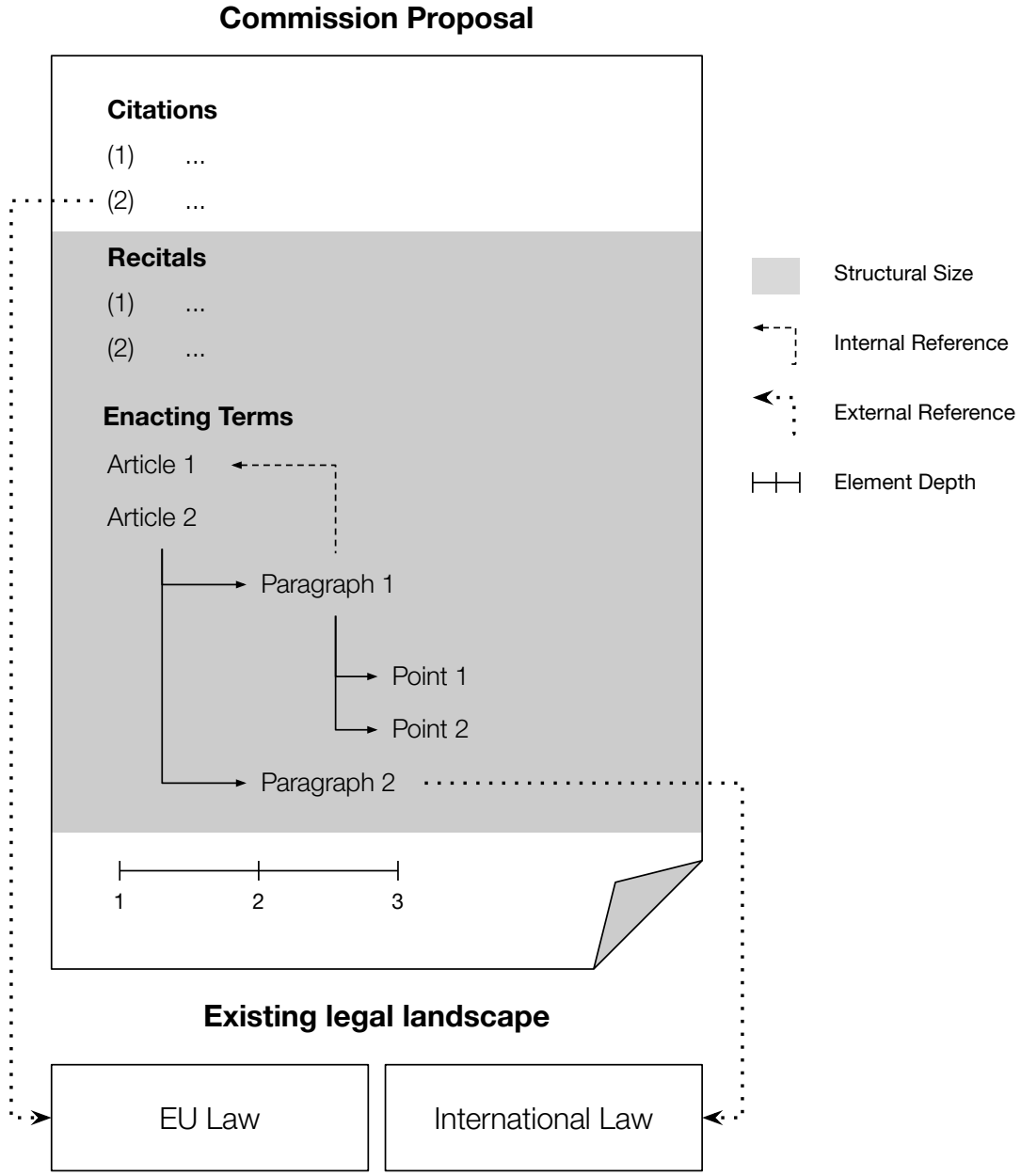


**Figure 1:** Illustration of structural and relational policy complexity

solo article (one element), another article with two paragraphs (two elements), and a third article with three paragraphs with three points each (twelve elements) features a total of 15 policy elements. The article level is not counted for the second and third article, because the level is empty here (i.e., it does not contain any text). Average element depth can then be calculated as follows:

$$\frac{(1) + (2 + 2) + [3 * (2 + 3 + 3 + 3)]}{15} = 2.53$$

Accordingly, the variable has a minimum of 1 (only single paragraph articles) and asymptotically approaches 3 as the number of level 3 elements grows. Low values indicate that a proposal is composed of rather general provisions, whereas high values indicate more detailed and specific provisions.

## Linguistic policy complexity

Beyond its structural features, linguistic aspects of political texts critically affect their perceived complexity (Benoit et al., 2019; Senninger, 2020; Tolochko et al., 2019; Tolochko & Boomgaarden, 2019). Even if two texts are similar in terms of size and depth, their respective terminology and sentence structure may influence how well an 'end-user' can understand the expressed content (Bischof & Senninger, 2018; Tolochko et al., 2019). For instance, long and convoluted sentences or the usage of unfamiliar, technical vocabulary can increase the cognitive ability required to grasp policy content and put it into context. We argue that this linguistic complexity entails two major components: signal uniformity and readability. While the former is related to the semantic diversity of the employed terminology, the latter essentially results from the text's syntactical properties (i.e., sentence and word lengths). Signal uniformity and readability are not necessarily related. It is well possible to organize a diverse variety of terminology in a readable manner (short words in short sentences) and to organize a rather uniform set of topics in a less readable manner (long words in long sentences). Thus, signal uniformity and readability reflect different aspects of linguistic complexity.

Furthermore, it is important to note that signal uniformity can also be viewed through a structural complexity lens. A greater variety of terminology and concepts within a legal text may very well be the result of a larger scope addressed by the text. While a less uniform signal in a law may be the result of a set of relatively simple rules governing a variety of different areas and conditions, it may also result from a variety of technical details and language related to a single topic. Hence, the source of signal uniformity may be of structural or linguistic nature depending on the corpus under study. We thus consider it important to account for the multiple dimensions of complexity when measuring the complexity of a law.

For the measurement of linguistic policy complexity, we rely on scores of word entropy to measure the text's uniformity and on the Lix score to measure its readability. The concept and measurement of word entropy are rooted in information theory and go back to the work of Claude Shannon (1948). Word entropy essentially captures the variety of the terminology employed in a text. A greater variety of terms requires more cognitive ability to predict the following sentence or paragraph based on the previous one (Hurka & Haag, 2020; Katz & Bommarito, 2014). In technical terms, word entropy measures the amount of storage space (i.e., bits) required to store the information in a given text. Simple texts with little conceptual diversity require less storage space than difficult texts with high conceptual diversity. The variable is calculated as follows:

$$-\sum_{w \in W} p_w log_2(p_w)$$

where $p_w$ is the probability $p$ of a token's occurrence in the given bag of tokens $W$. We use lemmatized unigram tokens of the proposal text to measure the word entropy variable. To measure the readability of the policy text, we rely on the Lix score (Björnsson, 1968), which is calculated as follows:

$$\frac{A}{B} + \frac{100 * C}{A}$$

where $A$ is the number of words, $B$ is the number of sentences and $C$ is the number of words longer than six characters. The Lix score thus increases as the average number of words per sentence and the relative number of long words increases (see also Bischof & Senninger, 2018).

## Relational Policy Complexity

Finally, no analysis of policy complexity can be complete without considering the embeddedness of the proposal in the existing legal order and the interdependence of the individual legal provisions within the proposal itself. First, expansions of the legal landscape raise the necessity of new laws to be compatible with an increasing amount of already existing laws. Yet, while some laws may be located at the very center of the system and are strongly embedded into the legal order, others exist at the fringes of

the legal landscape and hardly interact with other laws. We can measure this external relational complexity of a policy with the average number of external crossreferences per article in the underlying policy text.

Second, next to the embeddedness of the policy proposal as a whole, legal texts also feature varying degrees of interdependence among their legal provisions. Legal provisions can reference each other for a variety of reasons, e.g., to further specify and define the scope conditions under which a given legal provision applies or to introduce an exemption to the rule. Additionally, in EU law, internal cross-references are often used to refer to an article in which delegated and implementing powers of the Commission are specified. While these interdependencies between individual legal provisions are qualitatively different, they all raise the complexity of the policy content by introducing the necessity to engage with additional text to properly interpret or apply the outgoing legal provision. Applying the same logic as for external relational complexity, we measure internal relational complexity by the average amount of internal cross-references per article in the policy text.

In sum, we make the case that the complexity of a legislative proposal can emerge from structural, linguistic and relational dimensions and each of these dimensions can be further differentiated into individual sub-components. Table 1 presents an overview of our main complexity indicators and the text parts used in their measurement.

# The EUPLEX dataset

This section lays out our approach to create a continuously updated database, a 'living' dataset, of policy complexity in EU legislative proposals. The database is available on a dedicated website (data.euplex.org) and will be updated in regular intervals to include new legislative procedures. After a brief description of the data collection process, we present an empirical illustration of how policy complexity in the EU varies over time and policy domains.

| Dimension | Component | Indicator | Operationalization | Text |
|---|---|---|---|---|
| Structural | Size | Structural Size | Sum of policy elements | Recitals, enacting terms |
| Structural | Depth | Average Depth | Hierarchical level of the average policy element | Enacting Terms |
| Linguistic / Structural | Signal uniformity | Word entropy | Shannon information entropy | Recitals, citations, enacting terms |
| Linguistic | Readability | Lix Score | Lix readability score | Recitals, citations, enacting terms |
| Relational | Embeddedness | External references | Average number of external references per article | Enacting terms |
| Relational | Interdependence | Internal references | Average number of internal references per article | |

**Table 1:** Policy complexity: concept and operationalization.

## Technical approach

To obtain the data, we downloaded the procedure and proposal XML notices as well as the proposal texts in HTML format from EUR-Lex (eur-lex.europa.eu). Meta information on procedures and proposals was obtained from the XML notices, whereas the complexity measures were generated using the proposal texts. The EUR-Lex database is the main access point for data on legislative activity in the EU and is widely used in research (see also Ovádek, 2021). For our measures of policy complexity, we rely on extensive rule-based parsing of the proposal texts as well as automated natural language processing. Where applicable, text pre-processing for the linguistic measures was done using the implementations in the 'spaCy' Python module (Honnibal et al., 2020).[1]

While we rely on well-established measures to assess the linguistic complexity of a policy proposal, our structural and relational indicators are based on measures retrieved by rule-based parsing. We therefore checked the reliability of these measures by distributing a random sample of 110 proposals among a group of four coders with

varying levels of expertise, handcoding the proposals, and, finally, comparing these measures against the automatically coded data. We focused on five aspects: citations, recitals and articles as well as the number of internal and external references, which form the foundation of our structural and relational complexity measures. Citations, recitals and articles were reliably detected by our approach when compared to human coding with a Krippendorff's $\alpha$ between .927 and .974, assuming a nominal metric.[2] Regarding the number of internal and external references, we see a drop off in nominal reliability to $\alpha = .373$ and $\alpha = .450$. While this may appear concerning at first, it should be highlighted that high degrees of reliability on a nominal measurement scale (i.e., perfectly identical measures) are extremely difficult to achieve for the number of references, due to their ambiguity and very diverse shapes. As text length increases, the probability to miss or miscount a cross-reference increases as well. Yet, our automated approach is still well able to capture differences regarding the number of internal and external references on an ordinal scale ($\alpha = .797$ internal, $\alpha = .909$ external) and on an interval scale ($\alpha = .861$ internal, $\alpha = .821$ external). Thus, we can reliably detect the numeric differences (interval) and the relative rank (ordinal) of internal and external references between proposals. We aim to further improve also nominal reliability in future iterations of the dataset.

This first iteration of the dataset comprises a total of 19,845 EU legislative procedures that were initiated between 1 November 1993 and 18 March 2021, thereby covering the timespan from the entry into force of the Maastricht treaty to the present. The dataset contains complexity metrics for Commission proposals (regulations, directives and decisions) available in English in EUR-Lex that can be assigned to a legislative procedure via a CELEX identifier. We exclude some proposals as they did not allow us to reliably extract the text metrics of interest due to formatting issues.[3] Nevertheless, our dataset contains data for the full population of legislative procedures recorded in EUR-Lex for the selected timeframe. The number of complete observations totals 6,154. Table 2 lists the descriptive statistics for all complexity indicators. The dataset furthermore includes variables for the type of legislative procedure, the employed legal instrument, the EUROVOC domain categorization and various procedure-event and event-document related information. An overview of all

| Indicator | N | Min | Mean | Max | SD |
|---|---|---|---|---|---|
| Structural Size | 6,154 | 1.0 | 61.7 | 2,634.0 | 126.81 |
| Average element depth | 6,154 | 1.0 | 1.8 | 2.9 | 0.46 |
| Word entropy | 6,154 | 3.9 | 7.0 | 9.2 | 0.68 |
| Lix score | 6,154 | 34.9 | 62.4 | 141.5 | 8.06 |
| Internal references per article | 6,154 | 0.0 | 1.6 | 152.5 | 3.97 |
| External referemces per article | 6,154 | 0.0 | 1.2 | 42.5 | 1.78 |

**Table 2:** Descriptive statistics (complete proposal observations only).

variables and their operationalization can be found in the accompanying codebook in the online appendix, along with additional descriptive data analyses.

## Empirical illustration: the evolution of policy complexity in the EU

The EUPLEX dataset allows us to trace the evolution of policy complexity in the EU over the past decades until today. Figure 2 shows how our six indicators of policy complexity evolved over time.

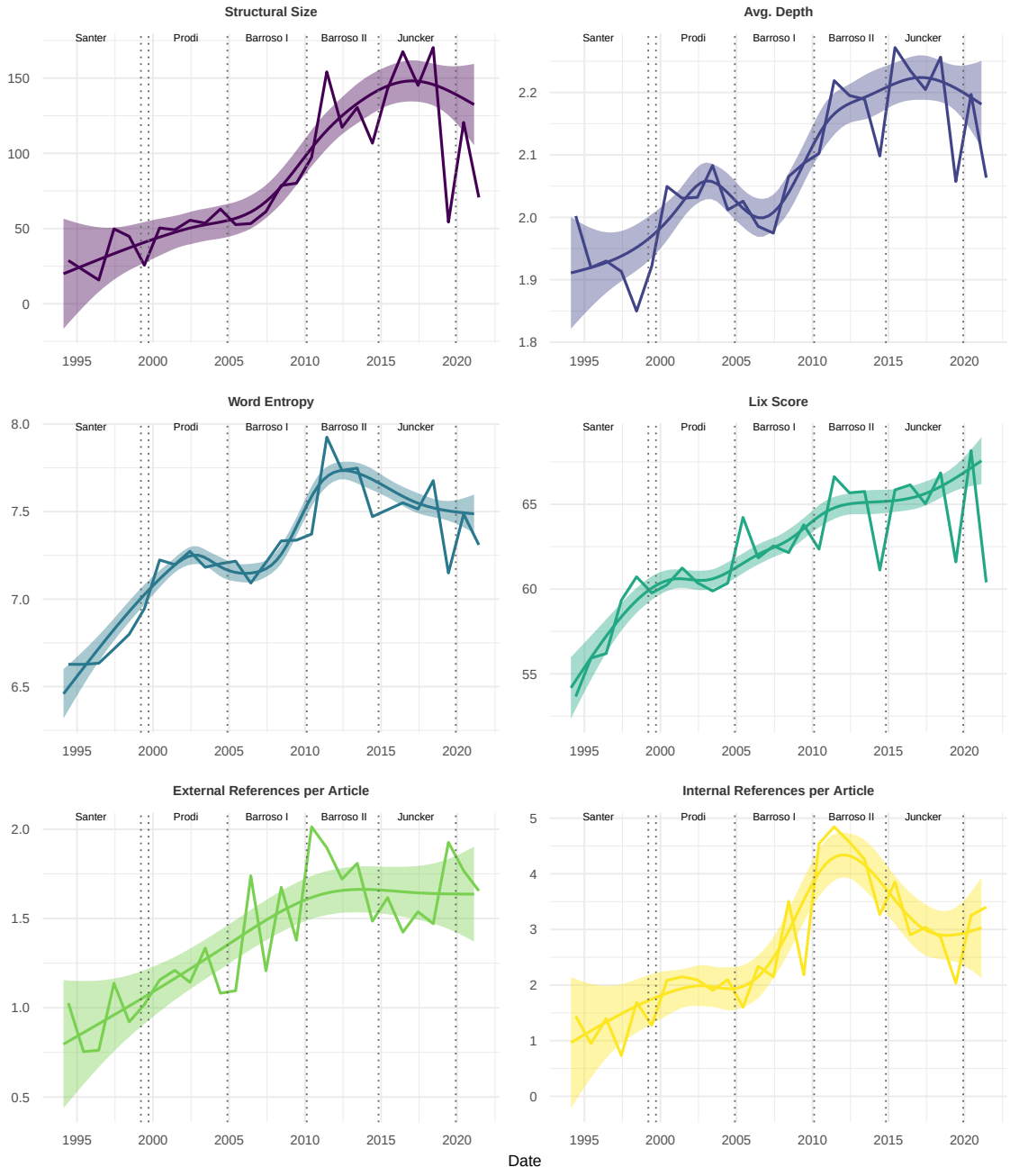


**Figure 2:** Evolution of policy complexity in the EU: six indicators. Note: N = 2,724 (subset of consultation and co-decision/OLP procedures). Solid line: Annual means. Smoothed estimates: Generalized Additive Model with cubic splines and 95% confidence intervals.

In general, the data show an upward trend in policy complexity over time. Structural size experienced roughly a sixfold increase between 1993 and today. Considering the fact that the measurement scale for average element depth only ranges from 1 to 3, also the increase in specificity and detail of Commission proposals appears quite substantial. The diversity of the terminology employed in Commission proposals

(i.e., their word entropy) has increased quite substantially over time, although some Commissions constrained the increase more than others. In contrast, the readability of the proposals has been declining steadily since November 1993, despite attempts to improve the clarity of language in EU laws. External cross-references also increased in a rather linear fashion for a long time, but leveled off around the year 2010.

When we compare the performance of individual Commissions, we find that several indicators increased particularly strongly during the first Barroso Commission (e.g., the structural indicators, word entropy and the number of internal cross-references per article), and some indicators have stopped their increase under Juncker or even changed their direction. This latter pattern materializes most clearly for the average number of internalcross references, but also the structural indicators no longer increased significantly after Juncker had taken over the Berlaymont. This could potentially be a direct consequence of Juncker's agenda to reduce the scope of new EU laws. Accordingly, although we find a general upward long-term trend, there are differences across indicators, short-term discontinuities, and often also non-linear developments over time.

In addition to these trends, the dataset also allows us to look into specific developments in individual policy domains. For this, we first sort the policy proposals according to their EUROVOC identifiers into their overarching EUROVOC domain. Each domain specifies a certain field, for example Environment or Finance. Domains are non-exclusive; therefore, a policy proposal can be part of several domains. Figure 3 illustrates how policy complexity developed in our 21 domains over time. To provide a general overview of aggregate developments, we show the evolution of the average standardized complexity score.[4] This score represents the deviation of a policy domain from the long-term complexity mean (values below zero indicate belowaverage complexity, values above zero above-average complexity).

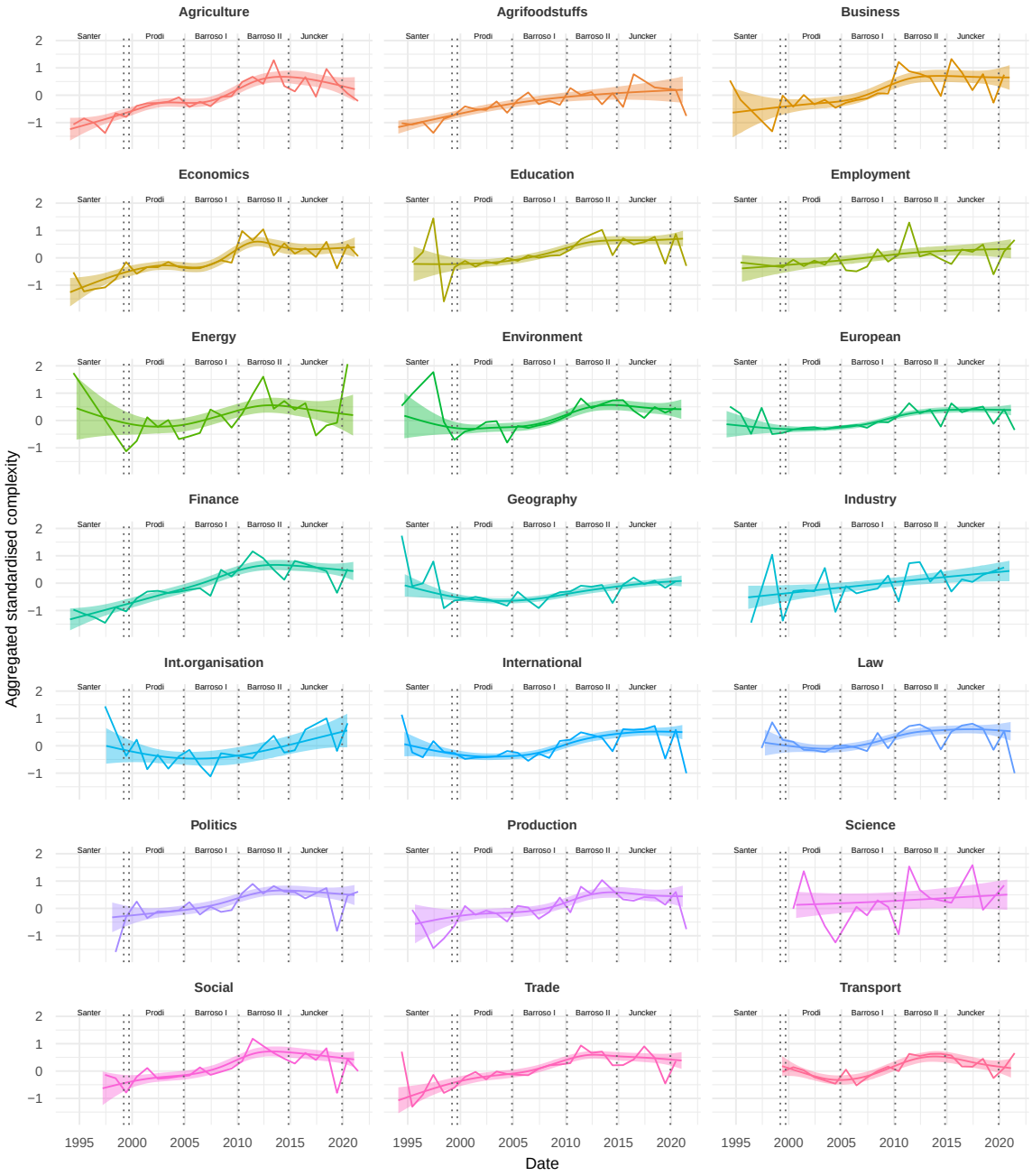


**Figure 3:** Evolution of policy complexity across policy domains. Note: The figures show the evolution of the standardized aggregated indicators (see description in text). N = 2724 (subset of consultation and co-decision/OLP procedures). Solid line: Annual means. Smoothed estimates: Generalized Additive Model with cubic splines and 95% confidence intervals.

Figure 3 shows that complexity varies across domains in terms of the overall level, variance, but also regarding the specific temporal development. On a general level, the differences in baseline complexity across policy domains indicate that policy complexity is driven in part by functional requirements imposed by policy-specific

problem structures. However, there is often also a quite substantial variance within individual policy domains, which could indicate that there might be strategic incentives for the Commission to calibrate the complexity of its legislative proposals in response to institutional and political scope conditions. For example, we find a rather substantial increase in complexity in areas like Agriculture, Economics, Finance and Trade. In other areas, the upward trend is not as pronounced (e.g., Transport, Education and Employment). We can also see that complexity varies more strongly in some policy areas (e.g., Energy, Industry and Science) than in others (e.g., Transport). We consider the description, explanation and normative evaluation of these empirical patterns an important task for comparative political science in general, and EU research in particular.

# Conclusion

The dataset we introduce in this paper will allow the research community to investigate a broad range of intriguing research questions: How do functional, institutional and political factors shape the complexity of policy output? Do more inclusive decision-making procedures incentivize more complex policy solutions? Does enhanced political conflict within the agenda-setting institution reduce or enhance the complexity of the policies it formulates? How does the complexity of a policy affect the timeliness of its transposition and the quality of its implementation? At this point in time, the dataset's focus on the proposal stage primarily makes it an attractive data resource for scholars of policy formulation and agenda-setting in the EU, but also for researchers interested in administrative and organizational dynamics in the European Commission. In the future, however, we plan to expand the dataset to include not only the complexity metrics of the Commission proposals but also of the amended, consolidated and final versions of these texts, which will allow for new insights into the dynamics of legislative negotiations in the EU. Questions on the nature, origins and consequences of policy complexity bear substantial relevance not only for the EU, but for all democratic political systems (Adam et al., 2021). As the current SARS-CoV-2 pandemic forcefully illustrates in many democracies around the world, whether and how demo-

cratic political systems and their bureaucracies can cope with varying degrees of policy complexity might heavily influence public acceptance and, maybe, also the effectiveness of political programs. Accordingly, we consider the systematic scientific inquiry into the origins and consequences of policy complexity a key task for political science in the years and decades ahead.

# Notes

1. The complete code of the complexity analysis can be requested from the authors and will be made available as a software package at a later point in time. For additional information on the generation of the dataset, please also consult the online appendix.

2. Please consult the online appendix for all reliability coefficients.

3. The first available proposal is dated 12 November 1993. Additionally, we currently do not analyze recast proposals as these proposals contain large blocks of crossed out and annotated text from earlier, existing legislation. On formatting issues, see also the online appendix.

4. In order to arrive at this metric, we first standardize all individual indicators in order to make their measurement scales comparable. We then calculate the average of these six standardized indicators and standardize this variable again. We plan to develop a more sophisticated index of policy complexity in future research.

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