

Narrative Aware Policy Design Under Uncertainty: An Analysis of Budget Statements

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Abstract

This study investigates narrative driven decision making under uncertain circumstances by examining the 2022 UK Budgets, including newspaper articles, through the lens of communication theories. With computational text analysis of 52 years of budget statements, systematic communication patterns are revealed that affect message consistency and innovation during crises. It proposes integrating narrative awareness into policy design to interpret stakeholder actions and perceptions. By using cognitive and emotional elements from theories like Narrative Attention Theory and Conviction Narrative Theory, the study highlights narrative influence on socioeconomic environments. The Latent Dirichlet Allocation algorithm identifies 20 distinct narratives in budget documents, representing mental models of socioeconomic situations. VAR Granger causality tests explore causal links between these narratives and macroeconomic variables. Findings show that inconsistent narratives during uncertainty lead to negative stakeholder responses, emphasising strategic narrative alignment during crises for effective communication and uncertainty management. This study underscores narrative economics' role in shaping fiscal policy and stakeholder perceptions.

Keywords: narrative, uncertainty, machine learning, text analysis

Word Count: ≈ 2000

1 Introduction

Institutions that navigate highly uncertain environments are confronted with tough choices regarding how they communicate strategic decisions. These choices in communication can trigger inherent narratives with potentially unforeseen downstream effects (Borup et al. 2023). In 2022, the UK entered a period of political and economic unpredictability, seeing three Prime Ministers in office within ten months. This turbulence was highlighted by the budget crisis in September, where the budget aimed at spurring economic growth resulted in a sharp decline in the pound’s value shortly after its announcement (Aldrick 2022). Simultaneously, there was an increase in government bond yields (Breedon 2022, Aldrick 2022).

While various economic fundamentals have been implicated in these market reactions (Chadha et al. 2022), this situation also exemplifies the role of narratives in decision making processes surrounding communication in uncertainty. It underscores the importance for policymakers to appreciate the complexities of the narratives embedded in their communications and their lasting effects. This understanding is crucial to counteract conformity’s negative effects, which can stifle innovation (Hansen & McMahon 2016) needed during crisis times.

Narratives can significantly impact the socioeconomic landscape, particularly in diverse, complex settings (Reed & Rudman 2023). This research contributes to the body of literature on narrative decision making in uncertain situations by suggesting that narrative insight should guide policy design. Within my analysis, I apply communication theories to the 2022 UK Budget context, marked by major disruptions in both government and markets, leveraging computational text analysis of budget statements from 1971 to 2023.

This analysis reveals systematic communication patterns over 54 years (Cloyne 2013), suggesting these patterns can strongly influence messaging conformity during crisis. However, when there is heterogeneity in stakeholder expectations, such conformity might not be beneficial. Thus, aligning stakeholder expectations with prevailing socioeconomic narratives may help prevent misunderstandings during crisis.

2 Background

Shiller (2017) introduces a useful paradigm in narrative economics, offering solutions for policymakers to integrate into their processes. This paradigm aids in understanding the vast quantities of available textual information (Gupta et al. 2009), proposing an effective way to merge this data with existing systems and strategies used by institutions, governments, and policymakers (Blanchard 2018). By weaving these insights into policy formulation, decision makers can better comprehend the influence of different narratives on stakeholder behaviour and risk assessment in various settings, identifying narratives that might trigger both localised and global disturbances.

However, Shiller (2017) equates ”story” and ”narrative,” a notion disputed by Roos & Reccius (2024), who insists on a clear distinction between them. Flynn & Sastry (2022) characterises narratives as belief systems regarding the economy that can spread, though he acknowledges their subjective nature and potential to distort reality. Meanwhile, Johnson et al. (2023) views narratives as shared stories for comprehending one’s surroundings. This research embraces these varied ideas, particularly leveraging Peterson (2018)’s Narrative Attention Theory (NAT), Hand et al. (2023)’s Narrative Policy Framework (NPF), and Johnson et al. (2023)’s Conviction Narrative Theory (CNT).

Based on this, I propose that socioeconomic interactions stem from geographic origins, generating stories that, over time, evolve into broader narratives. These narratives operate as mental models (Jones et al. 2011) that guide decision making within socioeconomic contexts. Such insights are especially crucial for organisations and governments when communicating policies that incorporate both technical aspects

(Townsend 1978, Wallis 1980) and the social dynamics inherent in risk evaluation (Borup et al. 2023).

NAT contends that narratives can highlight different aspects of the policy process, with their importance being most significant at the macro level (Peterson 2018). At this level, preferences generally remain more consistent (Peterson 2018). This consistency in preferences is akin to the previously described concept of a mental model. The NPF introduces the concept of the "policy narrator" (Hand et al. 2023). The NPF illustrates how policy actors craft and employ narratives to navigate unprecedented circumstances and mobilise support for policy initiatives (Hand et al. 2023). Policy narrators transmit cohesive narratives composed of identifiable structural elements while framing issues alongside solutions.

In my analysis, I argue that the 2022 mini-budget demonstrated 'identifiable structural components,' yet lacked a cohesive narrative relative to its successor and the media (Section 3). Nevertheless, concerns about "identifiable structures" relate to the risk of conformity, potentially restricting the innovative communication needed during crisis Hansen et al. (2018). But on the other hand, in crisis scenarios, familiarity can offer stability. I assert that the 2022 UK mini-budget straddled innovation and conformity, possibly rendering the narrator's ideas incoherent and unfamiliar (Hand et al. 2023).

CNT deals with decision making amid radical uncertainty, involving both cognitive and emotional dimensions of narrative communications (Johnson et al. 2023). Thus, it reflects the hysteresis traits inherent in narratives, noted earlier. The CNT suggests that conviction arises when 'approach emotions' (e.g., excitement) outweigh 'avoidance emotions' (e.g., anxiety) in narrative communications (Johnson et al. 2023). Consequently, applying a narrative aware strategy in policy design helps organisations anticipate how their choices and communications might be perceived and spread among stakeholders, potentially enhancing their ability to manage uncertainty and disruptions effectively.

3 Data Sources, Method, and Results

Throughout its extensive history, the UK has frequently employed fiscal policy to regulate its economy (Cloyne 2013). Consequently, I decided to utilise the Latent Dirichlet Allocation (LDA) algorithm (Blei et al. 2003) to examine a dataset of budget statements spanning 52 years. The LDA algorithm uses a mixed membership framework (Borup et al. 2023), assuming that topics within the dataset are formed by combinations of words (Blei et al. 2003).

Each document can express multiple topics in varying degrees, and each topic is associated with a probability distribution that ranks word relevance across the entire vocabulary (Steyvers & Griffiths 2007). This analysis revealed twenty distinct narratives (Table 1) within the fiscal policy statements, which serve as representations of the mental models (Jones et al. 2011) informing our perception of the socioeconomic environment. The narratives also featured a specific set of vocabulary (Blei et al. 2010) related to fiscal policy discourse. This is in line with my previously mentioned definition of narratives. Essentially, each budget speech is crafted from this limited vocabulary pool, which is rooted in the expressions of mental models. These models embody the socioeconomic narratives that have evolved through the diverse economic scenarios over these 52 years. Consequently, it is likely for common themes to recur within the budget statements, reflecting the narrative continuum, which is consistent with the mixed membership structure of the LDA model.

Table 1: Topic Labels and Associated Keywords

Topic	Label	Words
1	British Education	britain, education, school, service, skill
2	Energy Growth	energy, growth, plan, intervention
3	Economic Reform	taxation, economic, reform, strategy
4	North Sea	oil, sea, north, green, enterprise
5	Public Investment	business, government, public, investment, fund
6	NHS Economics	nhs, growth, conservative, gdp, childcare
7	Ideological Party	manifesto, party, deliver, choice, inheritance
8	Tax Savings	tax, save, pension, isa, generation
9	Financial Recovery	recovery, recession, bank, financial, mortgage
10	Debt Management	debt, save, local, surplus, domestic
11	Deficit Reduction	deficit, debt, welfare, forecast, export
12	Public Spending	spend, public, programme, service, government
13	Ideological Social	productivity, overseas, maintenance, expand
14	Family Benefits	child, family, benefit, parent, employment
15	Corporate Tax	company, business, vat, capital, duty
16	Covid Response	coronavirus, covid, relief, fiscal, grant
17	Digital Future	digital, future, productivity, deliver, fund
18	Personal Finances	bank, credit, deposit, lend, estate
19	Energy Resources	oil, energy, resource, subsidy, consumption
20	Price Inflation	price, inflation, cost, expenditure, monetary

Note: Topic modelling results showing 20 distinct thematic clusters identified from UK fiscal discourse. Each topic is characterised by its most distinctive keywords. The topics reflect key themes in UK budget announcements over a 52 year period.

To verify the extracted themes and establish causality concurrently; since current research (Shiller (2017), Johnson et al. (2023)) underscores the necessity of narratives in clearly demonstrating causal links, we integrate four key macroeconomic indicators into our study: Gross Domestic Product (GDP), Economic Policy Uncertainty (EPU), Consumer Price Index (CPI), and the Unemployment Rate. In order to explore and comprehend the causal relationships among these variables and the derived narratives, we utilise the VAR Granger causality test developed by Toda & Yamamoto (1995). This method is well regarded for its consistent and dependable outcomes, even when dealing with data that involve integrated and cointegrated processes (Toda & Yamamoto 1995). Notably, it bypasses the need for pretesting unit roots or cointegration (Toda & Yamamoto 1995), making it an efficient choice for our analysis.

Results are detailed in Table 4 in the Appendix, where causal effects of the budget narratives are shown. These results not only confirm the narratives but also provide a definitive framework closure to the narrative definition we proposed earlier. With the validation and support of the narratives within the budget corpus, I am now in a position to enhance the analysis further by incorporating network analysis. The visualisation of this network analysis can be found in Figure 2. I also analyse multiple network metrics, such as betweenness centrality and out-strength, which are documented in Table 2.

Figure 1: Directed graph of common Budget bigrams showing those that occurred more than 15 times

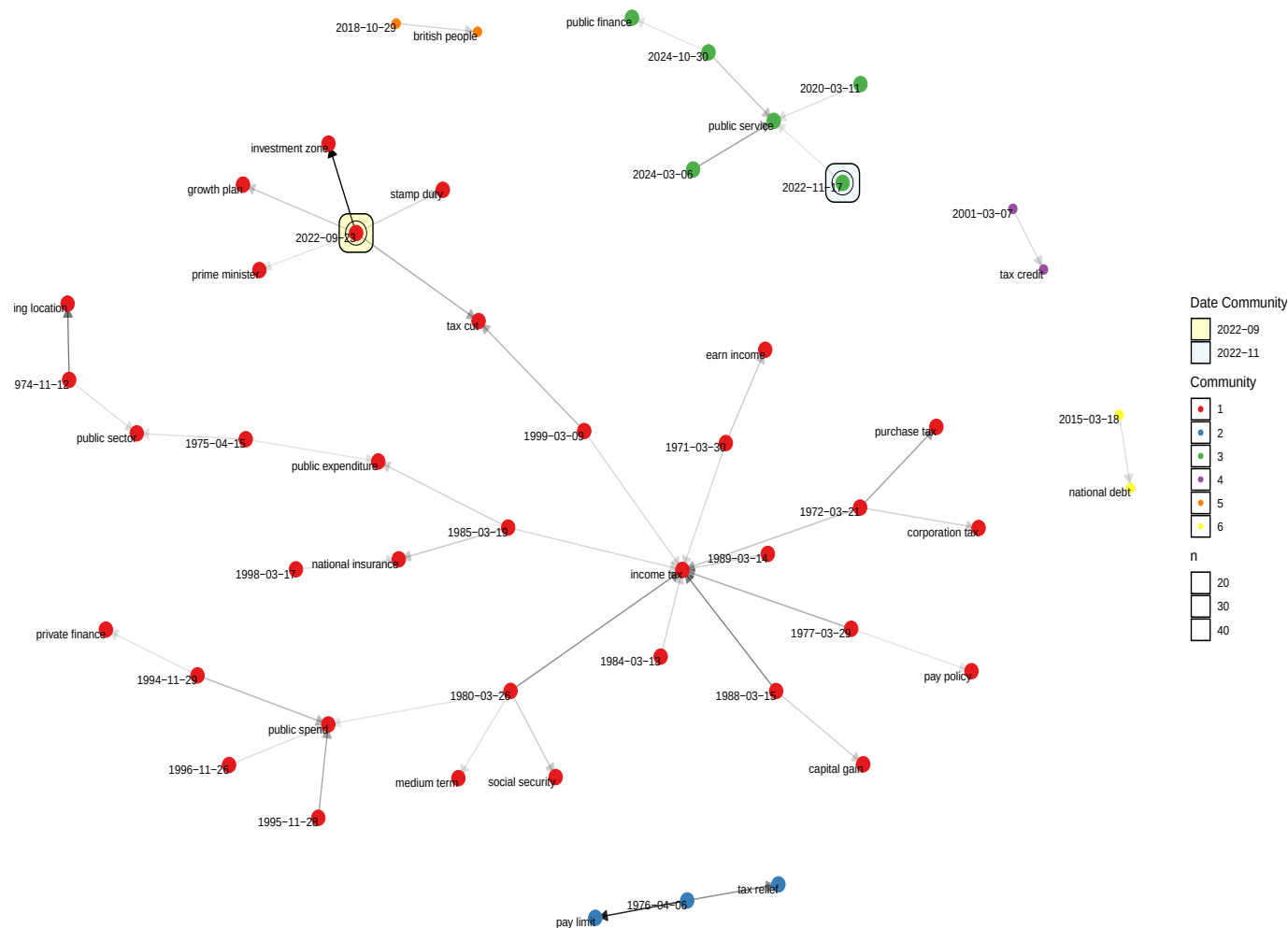
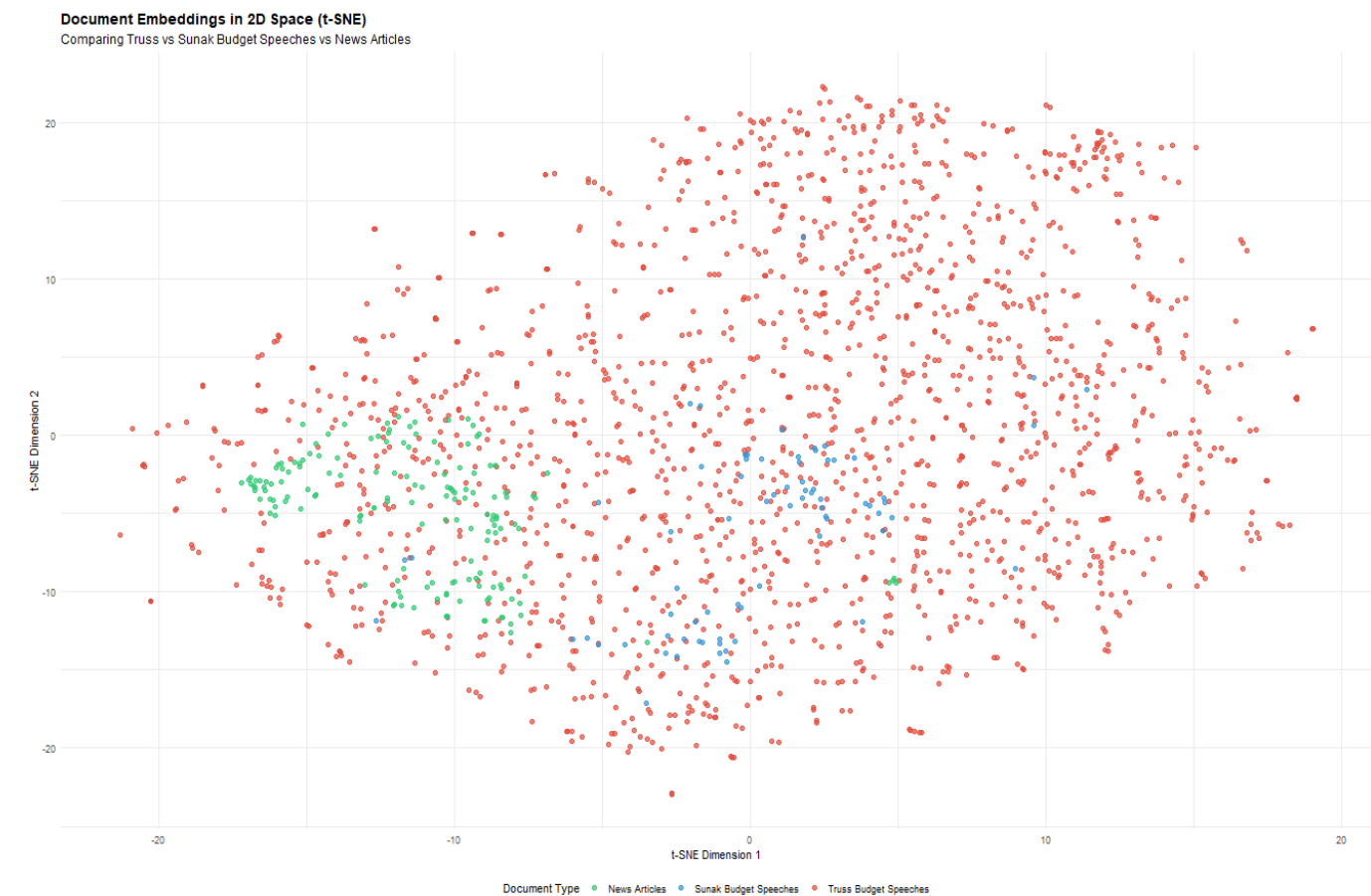


Table 2: Top Nodes by Betweenness and Out-Strength:

Betweenness		Out-Strength	
Rank	Node	Rank	Node
1	2022-09-23	1	2022-09-23
2	1976-04-06	2	1980-03-26
3	1974-11-12	3	1976-04-06
4	1988-03-15	4	1982-03-09
5	1980-03-26	5	1993-03-16
6	1972-03-21	6	1972-03-21
7	2024-03-06	7	1975-04-15
8	1995-11-28	8	1994-11-29
9	1977-03-29	9	1970-04-14
10	1999-03-09	10	1989-03-14

Note: Top 10 nodes ranked by betweenness centrality, identifying the most important bridging nodes in the network. The bridging dates align with major UK economic/political periods: 1970s cluster (1972-1977) - Oil crisis, 1980s (1980, 1988) - Thatcher reforms, 1990s (1995, 1999) - New Labour preparation, 2022-2024 - post-COVID economic policy. Also, top 10 nodes ranked by out-strength: These nodes represent the most significant sources of information or influence in the network, with 2022-09-23 showing the highest outgoing connections.

I extend these findings by utilising word embeddings (Zhang et al. 2020) on the budgets from September and November 2022. This study also considers newspaper articles gathered during Prime Minister Truss’s tenure, particularly prior to the mini-budget announcement. Word embeddings can build semantic representations of these documents and assess their similarity or dissimilarity (Zhang et al. 2020), aiding in the evaluation of the alignment of mental models.



Note: Document Embeddings in 2D Space (t-SNE) Comparing Truss vs Sunak Budget Speeches vs News Articles The visualisation reveals how semantically similar documents group together, with Truss budget speeches (red) dominating much of the space, while Sunak speeches (blue) and news articles (green) form smaller, more concentrated clusters. The wide scatter implies that “Truss Budget” encompass dramatically different topics, tones, or communicative purposes, reflecting the complexity and perhaps confusion of that administrative period. This type of analysis is particularly useful for understanding document similarity and thematic relationships of these documents.

Table 3: t-SNE Clustering Analysis: Document Source Characteristics

2*Source	Centroid Position		Cluster Dispersion	
	<i>t-SNE X</i>	<i>t-SNE Y</i>	σ_x	σ_y
Sunak Budget	−0.330	7.01	6.29	4.44
Truss Budget	0.960	−0.474	10.2	9.60
News Articles	−10.0	1.77	2.61	3.81

Note: Centroid position indicates the average location of documents from each source in the t-SNE embedding space. Cluster dispersion (σ) measures the standard deviation of document positions within each source category, revealing the compactness of semantic clustering for each document type.

4 Discussion

The network analysis offers a graphical depiction of the narratives and cognitive frameworks regarding the UK’s fiscal policy. Table 2 highlights the significance of the date 2022-09-23, marked by its top ranking in both Betweenness and Out-Strength metrics. This discovery reveals that the budget announcement on September 23, 2022, functioned as a critical junction, connecting distinct clusters within the budget network (betweenness centrality) and also extending influence outward (out-strength).

The analysis indicates that this announcement unified various policy aspects into a single communiqué. Community clusters suggest a bridging between well established organisational memory (red cluster) (Jones et al. 2011) that was employed to address emerging challenges, supporting Hansen et al. (2018)’s conformity effect. This budget did not merely present a range of themes; it lacked a cohesive narrative (Hand et al. 2023), leading to ‘avoidance emotions’ (Johnson et al. 2023).

This scenario underscored a misunderstanding of how embedded narratives and their structures could impact perceptions. This notion is further corroborated by the t-SNE embeddings, which reveal a semantic landscape among three distinct document categories. Each group occupies its own area within the high-dimensional space of economic discourse, illustrating how narrative structures and thematic content define natural separations.

The news articles emerge as the most semantically unified category, demonstrating tight dispersion with values ($\sigma_x = 2.61$, $\sigma_y = 3.81$) and positioned distinctly at the coordinates (-10.0, 1.77). This arrangement indicates that the mental models of most stakeholders within the socioeconomic realm generally adhere to stable thematic structures. Consequently, any disruption of this coherence during uncertain times often triggers ‘avoidance emotions’ (Johnson et al. 2023).

On the other hand, the Truss budget documents display significant semantic variability, with dispersion values above 10 in both dimensions, suggesting a collection marked by inconsistent messages, varied policy topics, or perhaps reflecting the volatility of that political period. At such a juncture, a coherent narrative (Hand et al. 2023) aligning with the media portrayal would have been advantageous.

The Sunak Budget finds itself positioned in moderate terms, both spatially and semantically. Located at (-0.330, 7.01) with moderate dispersion ($\sigma_x = 6.29$, $\sigma_y = 4.44$), it indicates more consistent policy messaging than the previous budget while retaining enough thematic diversity to tackle various economic issues. Its placement within the network, as shown in Figure 2, suggests it is balanced in coherence, innovation, and conformity to effectively address ongoing economic challenges. Consequently, its goal is to transform public emotions from ‘avoidance emotions’ to more favourable ‘approach emotions’ (Johnson et al. 2023). Furthermore, the budget frames the crisis at a macro level, especially by focusing on public services (Figure 2).

5 Conclusion

The study explores the critical role of communication strategies when operating under extreme uncertainty, such as the UK's political and economic climate in 2022. It highlights that strategic communication can trigger narratives with profound socio-economic impacts. The analysis of the 2022 UK Budget exemplifies how lack of coherent narratives can lead to market disruptions. Emphasising narrative awareness, I suggest that policymakers must comprehend these narratives' hysteresis characteristics to mitigate negative effects and foster the necessary innovation needed to navigate the crises.

By employing communication theories and computational text analysis, I studied budget statements over 52 years, identifying systematic patterns and influences on messaging conformity. The research incorporates theories such as Narrative Attention Theory and Narrative Policy Framework to understand socio-economic decision-making processes. Additionally, the study uses Latent Dirichlet Allocation to uncover fiscal policy narratives and employs macroeconomic variables and Granger causality tests to validate these narratives.

Network and word embedding analyses further enhance these findings, illustrating the semantic coherence or heterogeneity in communications. The 2022 UK mini-budget's narrative incoherence contrasted with its successor, highlighting the importance of cohesive narratives in crisis communications to manage expectations and emotions effectively.

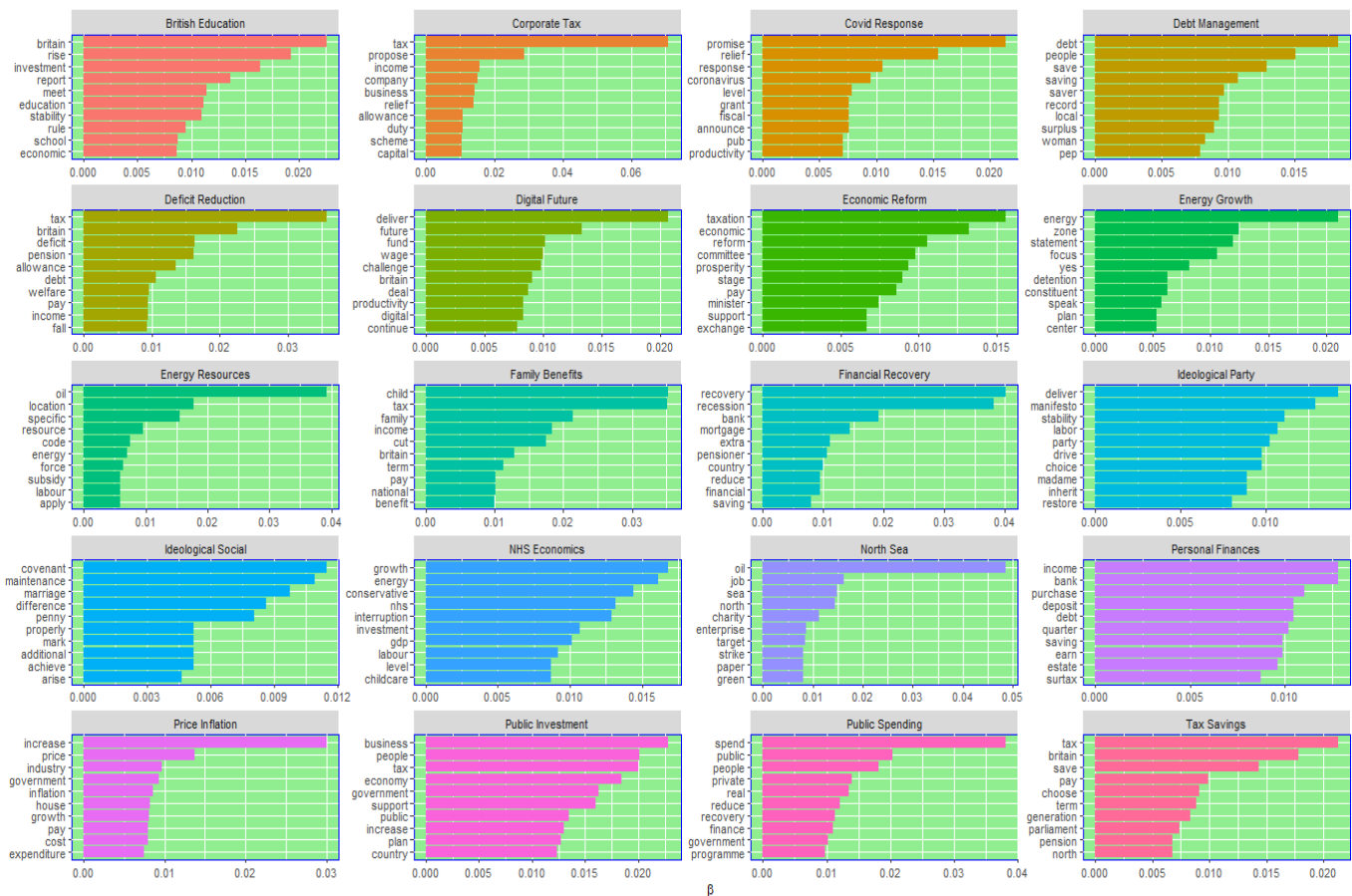
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6 Appendix A

Figure 2: The visualisation displays beta coefficients derived from topic modeling analysis, where higher values indicate stronger associations between terms and their respective policy topics. The color gradient represents the magnitude of term importance within each topic, providing insights into the semantic structure of political discourse across different policy domains.



Topic Distribution Analysis Across Policy Domains: Beta Coefficients for 20 Topics Derived from Political Documents. Every panel corresponds to a unique policy domain, illustrating the significance (beta values) of various terms within the respective topics. Topics encompass areas from British Education and Corporate Tax to Personal Finances and Tax Savings. Frequencies of terms appear along the horizontal axis, while the specific terms are arranged vertically.

7 Appendix B

The table displays Granger causality relationships that are statistically significant at a 0.05 level of significance. Chi-square statistics have been calculated using Wald tests, with lag lengths selected based on information criteria. EPU denotes the Economic Policy Uncertainty index. Bidirectional causality occurs when there are significant relationships in both directions between the same pair of variables.

Pair	Cause	Effect	Chi-sq	p-value	Lags
GDP - Energy Growth	Energy.Growth	GDP	19.5650	0.0033	8
GDP - Energy Growth	GDP	Energy.Growth	45.7104	0.0000	8
GDP - Public Investment	Public.Investment	GDP	12.0906	0.0167	3
GDP - Public Investment	GDP	Public.Investment	15.0964	0.0045	3
GDP - NHS Economics	NHS.Economics	GDP	45.6501	0.0000	5
GDP - NHS Economics	GDP	NHS.Economics	17.3650	0.0080	5
GDP - Ideological Party	Ideological.Party	GDP	15.0225	0.0201	5
GDP - Ideological Party	GDP	Ideological.Party	35.7787	0.0000	5
GDP - Tax Savings	Tax.Savings	GDP	113.1756	0.0000	8
GDP - Tax Savings	GDP	Tax.Savings	106.3631	0.0000	8
GDP - Financial Recovery	Financial.Recovery	GDP	9.5030	0.0497	3
GDP - Deficit Reduction	Deficit.Reduction	GDP	32.3040	0.0000	8
GDP - Deficit Reduction	GDP	Deficit.Reduction	51.5142	0.0000	8
GDP - Covid Response	Covid.Response	GDP	76.3879	0.0000	8
GDP - Digital Future	Digital.Future	GDP	168.6580	0.0000	8
UnemploymentRate - North Sea	UnemploymentRate	North.Sea	14.5452	0.0241	6
UnemploymentRate - Debt Management	Debt.Management	UnemploymentRate	9.8563	0.0198	2
UnemploymentRate - Ideological Social	Ideological.Social	UnemploymentRate	11.1985	0.0244	3
UnemploymentRate - Energy Resources	Energy.Resources	UnemploymentRate	14.9046	0.0210	7
UnemploymentRate - Price Inflation	UnemploymentRate	Price.Inflation	15.8542	0.0032	3
EPU - Energy Growth	EPU	Energy.Growth	31.0425	0.0000	7
EPU - Public Investment	EPU	Public.Investment	9.6271	0.0081	1
EPU - NHS Economics	EPU	NHS.Economics	14.1256	0.0283	5
EPU - Ideological Party	EPU	Ideological.Party	26.9917	0.0001	6
EPU - Tax Savings	Tax.Savings	EPU	21.5154	0.0003	4
EPU - Financial Recovery	Financial.Recovery	EPU	19.8253	0.0030	8
EPU - Deficit Reduction	Deficit.Reduction	EPU	32.0319	0.0000	5
EPU - Deficit Reduction	EPU	Deficit.Reduction	24.7616	0.0002	5
EPU - Covid Response	EPU	Covid.Response	28.3011	0.0001	8
EPU - Digital Future	EPU	Digital.Future	36.7286	0.0000	6
CPI - Energy Growth	Energy.Growth	CPI	20.2940	0.0025	6
CPI - Economic Reform	Economic.Reform	CPI	25.1850	0.0003	7
CPI - Economic Reform	CPI	Economic.Reform	13.2691	0.0390	7
CPI - North Sea	CPI	North.Sea	22.3402	0.0011	8
CPI - Public Investment	Public.Investment	CPI	12.5991	0.0499	8
CPI - NHS Economics	NHS.Economics	CPI	13.7927	0.0320	6
CPI - Corporate Tax	CPI	Corporate.Tax	18.1787	0.0058	7
CPI - Covid Response	Covid.Response	CPI	24.2656	0.0005	8
CPI - Digital Future	Digital.Future	CPI	14.2730	0.0267	6
CPI - Energy Resources	Energy.Resources	CPI	21.0657	0.0018	7
CPI - Energy Resources	CPI	Energy.Resources	14.9508	0.0206	7
CPI - Price Inflation	CPI	Price.Inflation	30.6123	0.0000	7

Table 4: Granger Causality Test Results for Economic Variables and Policy Topics