From Minutes to Insights: Prudential, Monetary Policy, and Governance Analysis of UK Bank Boards

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Abstract What do company boards actually say? These influential groups shape firms' behaviours, cultures, and strategies. Understanding their behaviour systematically can address key economic and governance questions. We use a unique dataset of over 150 UK-headquartered banks from 2014-2022 to analyse the content of board meetings. Our sample includes a range of banks, from global systemically important banks to local banks and building societies. Using various text processing methods, we build an index of the topics and sentiments expressed by boards and board members as they react to risks facing the global economy. After extracting these novel signals, we demonstrate their links to economic conditions, as well as supervisory and financial risks. Preliminary findings indicate that boards primarily discuss their regulatory environment over other topics. We find a complex relationship between the Consumer Prices Index (CPI) and mentions of inflation by firms in our sample. Our approach provides insights from an untapped source of managerial information. [1]

Key words: banks, boards, boardroom, corporate governance, directors, minutes, text.

JEL codes: G34 (Merger, Acquisition, Restructuring, Corporate Governance)

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1 Introduction

1.1 What are boards of directors?

Boards of directors are integral to the governance framework of modern firms, comprising both executive and non-executive directors. Executive directors are part of the company's senior management team, while non-executive directors bring external perspectives to the board's deliberations. Depending on board structure independent non-executive directors may also add an independent viewpoint to the group's decision-making.

The term 'director' in the context of current corporate governance structure of firms, particularly of financial firms was first used in the Bank of England's 1694 charter Gevurtz (2004). This governance structure had spread to US banks and is now a common practice in firms worldwide.

The general duties of company directors are specified in the Companies Act 2006 (171-177), and involve duties to 1) act within powers 2) promote the success of the company 3) exercise independent judgment 4) exercise reasonable care, skill and diligence 5) avoid conflicts of interest 6) not accept benefits from third parties 7) declare interest in proposed transaction or arrangement[2].

1.2 Who sits on boards of directors

Boards of UK banks comprise several roles: the board chair, executive directors (EDs, such as the CEO or CFO), and non-executive directors (NEDs), who may also chair board committees (e.g., Risk, Audit, or Remuneration).

The size of the boards changed across the time and varied between countries and type of organisations. Banks tend to have more people on their boards than non-financial firms. Adams (2017) reported that in the period 2001-2010 board of UK banks had on average 15.5 members. This size was larger than the US banks with 10.5 members on average. Typically, large UK bank boards have around 10 members. The details of these individuals are publicly available and analysed by regulators, academics, and private sector agencies[3].

Directors who serve on boards are often seasoned professionals with diverse backgrounds and expertise. Their roles are multifaceted, encompassing advisory functions, oversight responsibilities, and decision-making authority. They provide strategic guidance on critical issues, ensure accountability of senior management—including the CEO—and make key decisions that shape the company's direction and performance.

In the UK, the Financial Services Register, published online by the Financial Conduct Authority (FCA), allows verification of the details of certified and assessed persons (including directors) working in financial services[4],

[2] Companies Act 2006 Part 10 Chapter 2 https://www.legislation.gov.uk/ukpga/2006/46/part/10/chapter/2/crossheading/the-general-duties

[3] Ridgeway UK Bank Boards Analysis 2022 (13 Edition) https://boardagenda.com/wp-content/uploads/2022/02/UK-Bank-Boards-Analysis-as-of-January-2022.pdf

[4] https://register.fca.org.uk/s/

The composition and functioning of boards have evolved to address the complexities of business environments. Effective boards balance the need for robust oversight with the ability to respond to dynamic market conditions.

1.3 What are board minutes?

Board minutes are the official written record of the proceedings and decisions made during a board of directors' meeting. They serve as a formal documentation of the discussions, resolutions, and actions taken by the board members. These minutes are essential for maintaining transparency, accountability, and legal compliance within an organisation. They typically include details such as the date and time of the meeting, names of attendees, agenda items, key discussions, decisions made, and any follow-up actions required.

In the UK, the importance of board minutes is underscored by legal requirements. Companies Act 2006 (248) specifies that[5]:

1. "Every company must cause minutes of all proceedings at meetings of its directors to be recorded.
2. The records must be kept for at least ten years from the date of the meeting.
3. If a company fails to comply with this section, an offence is committed by every officer of the company who is in default.
4. A person guilty of an offence under this section is liable ..." [to a fine]

This legal framework ensures that companies, including banks, maintain accurate records of their board meetings, which are vital for regulatory compliance and corporate governance.

1.4 Why do regulators care about board minutes?

For banks, board minutes are particularly significant due to the stringent regulatory environment in which they operate. The Prudential Regulation Authority (PRA) requires banks to demonstrate robust governance practices, including the maintenance of detailed and accurate board minutes.

Minutes are used by supervisors[6] as evidence of

- Decisions and appointments
- Effective challenge and oversight

[5] Companies Act 2006 Part 10 Chapter 9 `https://www.legislation.gov.uk/ukpga/2006/46/part/10/chapter/9/crossheading/records-of-meetings-of-directors`

[6] Supervisory Statement (SS5/16). Corporate governance: Board responsibilities `https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2018/ss516update.pdf`

- Detailed board responsibilities and characteristics: a) Setting strategy b) Articulation and maintainance of culture c) Diversity of skills and experience.

These records provide evidence of the board's oversight and decision-making processes, which are critical for managing risks and ensuring the stability of the financial system. PRA supervisors routinely receive board minutes and accompanying documentation (e.g. presentation packs) as standard submissions from the firms they oversee.

2 Literature review

Boards play a central role in shaping the culture, strategy and outcomes of firms. Despite their significant influence, the inner workings of boards remain largely unexplored in existing literature. This is mainly due to sensitive nature of such information – board minutes are typically not made public.

As a result, researchers has traditionally focused on board composition (e.g. Ferreira et al. (2010)), the effects of board members on firm outcomes (Bandiera et al. (2020)), or relied on interviews with individual board members, often treating the decision-making process as a "black box"Adams (2017). These approaches fail to capture the diverse range of thoughts and discussions that occur during board meetings and how these contribute to final decisions.

Minutes offer a rare window into the actual workings of boards, capturing discussions, decisions, and dissent in a way that typical governance metrics cannot. Unlike publicly disclosed outcomes (e.g. CEO turnover, financial results) or static attributes (board size or composition), minutes document the behaviours and deliberations of directors themselves. This is particularly important in banking, where boards often times oversee complex, risk-laden organizations with broad stakeholder impact.

By analysing minutes, we can directly observe how bank boards engage with issues, revealing whether they actively challenge management or merely rubber-stamp decisions. For instance, Schwartz-Ziv and Weisbach (2013) note that minutes "tell us what actually is discussed" in boardrooms, providing advantages over conventional proxies and shedding light on how decisions are made. This inside perspective is invaluable for banks, where governance lapses can have systemic consequences.

In the UK, post-crisis reviews underscored the need for stronger board oversight of risk. The Walker Review (Walker (2009)) explicitly called for "materially increased" board engagement in risk-appetite discussions. Such policy appeals highlight the importance of understanding boardroom dynamics. Minutes of bank board meetings emerge as a critical source for regulators and researchers to verify if boards are fulfilling these heightened expectations.

Bank board minutes provide a view of governance that complements and challenges the insights from traditional data, offering a direct lens into board behaviour.

2.1 Findings from studies on bank board minutes

Research leveraging board minutes is still rare. This section reviews what the few existing studies reveal about board behaviour and decision-making in banks, drawing from global evidence (Israel, United States, India) and noting UK-related insights.

Schwartz-Ziv and Weisbach (2013) was among the first to systematically analyse board minutes. Examining Israeli firms with government ownership, they found boards predominantly acted in a monitoring capacity consistent with "supervisory" models of governance. In their sample, 67% of issues discussed were oversight-related and in 99% of cases management presented only a single option for board approval. Dissent was rare. These patterns suggest that, even in critical decisions, boards largely followed management's lead, aligning with the view that boards serve mainly to monitor management rather than to set strategy and act directly. However, the minutes also showed boards were not entirely passive: sometimes they requested additional information or updates, and they took initiative beyond management's proposal. In fact, in 63% of board meetings at least one such proactive action occurred or the board's vote did not fully align with the CEO's preference. Thus, while outright opposition was uncommon, boards frequently sought clarifications or minor course adjustments, indicating episodes of active engagement.

Schwartz-Ziv and Weisbach also leveraged the minutes to uncover dynamics invisible in public data. For example, they documented cases of CEO turnover where minutes clearly showed the board forced out the CEO, even though these would have appeared as "voluntary" departures in public records. In their small sample, half of the CEO departures were board-initiated firings masked as resignations – a striking finding that implies standard databases underestimate the true rate of board-driven CEO removals.

Additionally, their analysis found board size mattered: larger boards were more active in requesting information but also struggled with consensus, being less likely to vote unanimously and more prone to resist the CEO's proposals. The authors point out that many behaviours they observe echo those found in earlier interview-based studies of U.S. boards, suggesting some generalisability. Overall, their study demonstrates how board minutes can validate theoretical models (e.g. confirming boards' primary monitoring role) while also revealing subtleties (like incremental board activism and hidden CEO firings) that enrich our understanding of corporate governance in practice.

A notable example of analysing board minutes is a study of Indian banks' board meetings by Agarwal et al. (2022). The authors obtained a unique set of confidential board minutes from Indian banks (both private and state-owned) as part of a regulatory review. Their findings reveal an imbalance in board focus: on average only 10% of issues raised in board meetings pertained to risk management, whereas 41% dealt with regulatory or compliance matters and about 31% concerned business strategy. In other words, bank boards spent far more time on compliance and routine strategy than on discussing key risks. Moreover, most issues were not deliberated in depth, suggesting a tendency

towards "box-ticking" rather than substantive debate. The authors interpret this as evidence of under-investment in risk oversight and over-investment in compliance by bank boards. This pattern is worrisome because one would expect risk discussions to be central in banks. Their research, covering a segment of India's banking sector, is one of the first to systematically analyse bank board minutes. However, the sample used included only one board and one board-level committee meeting per firm which could skew the results.

2.2 Monetary policy applications

Commercial banks minutes, to our knowledge, have not been previously analysed to extract insights about monetary policy. However, pouring over minutes of policy setting bodies is a well-documented use case Hansen and McMahon (2016); Hansen et al. (2018).

The use of textual data to extract insights in economics and finance has expanded dramatically in recent years. Board minutes analysis fits into a broader trend of using unstructured textual sources as mirrors of organisational behaviour and outlook. In this context, we compare board minutes with another rich text source: earnings call transcripts, which have been used as a tool for extracting economic insights.

2.2.1 Earning calls

Earnings calls are quarterly conference calls where corporate managers discuss financial results and outlook with analysts. They are less about internal governance and more about management's communication and market sentiment, yet the analytical approach shares similarities with board minutes research.

Hassan et al. (2019) pioneered the textual analysis of earnings call transcripts to measure firm-level risk perceptions and economic concerns. By parsing what managers and analysts talk about during these calls, researchers can construct quantitative indicators of topics like uncertainty or risk that firms are facing. For example, Hassan and colleagues developed a measure of "political risk" exposure for firms by counting references to political issues and risk-related words in earnings calls. Using such natural language processing techniques, they showed that if a company devotes more discussion to, for instance, regulatory or political risks in its calls, this correlates with future actions like increased lobbying on those issues. In essence, the language used in earnings calls serves as a real-time barometer of the challenges and sentiments within the firm, which might not be immediately evident from financial statements. More broadly, Hassan and co-authors argue that systematically analysing unstructured corporate text – whether earnings calls, patent filings, or job postings – can greatly enhance economic surveillance by revealing insights that are hard to extract using traditional data sources. For instance, their work uncovered how firms reacted to major shocks (like natural disasters or geopolitical events) by examining shifts in the discussion content of calls, providing a timely read on the economic impact that standard metrics would only show after a lag Hassan et al. (2024).

Earnings call analysis has also been adopted by central banks and analysts to gauge corporate sentiment: for example, text-based sentiment indices derived from calls can indicate if firms collectively feel optimistic or pessimistic about demand and supply conditions, aligning with or even forewarning official economic surveys Andersson et al. (2023).

There are clear parallels between board minutes and earnings calls as textual data. Both are records of communication: board minutes capture dialogues and decisions among directors and executives behind closed doors, while earnings calls capture dialogues between executives and external stakeholders (investors/analysts) in a public forum. Both can be analysed with similar techniques – counting words, assessing tone/sentiment, identifying key themes. In fact, a recent study applied computational linguistics to various corporate texts (including earnings calls) to demonstrate how text analysis opens "new possibilities for real-time economic surveillance" Hassan et al. (2024).

However, there are also important differences. Board minutes are typically more structured and formal, often reviewed and edited for accuracy and confidentiality, whereas earnings call transcripts are verbatim records of spoken interactions (including unscripted Q&A). On one hand, this may mean board minutes omit certain candid remarks or conflicts (if they are toned down in writing), whereas earnings calls, while public, can sometimes reveal executives' unfiltered reactions under tough questioning Allee et al. (2024). On the other hand, since they are not for public consumption and are held to high legal standard mandating faithfulness, board minutes can also uncover unvarnished mentions of topics of genuine concern for board members even as they are more formal than earning calls. For instance, boards of distressed community banks discuss capital and solvability matters significantly more the closer they are to failure Bennett et al. (2024). While this may be adressed in an earning call, board minutes' nature as mandatory reporting make them a good tool for monitoring the landscape of topics of interest to corporate decision-makers.

Another difference between minutes and earning calls is in their perspective: minutes reflect internal decision-making processes (governance, oversight, strategic choices before they are executed), whereas earnings calls reflect ex post reporting and justification of decisions to outsiders. Despite these differences, insights from earnings call analysis complement the study of board minutes. Both approaches recognize that text contains rich signals about things like risk awareness, confidence, and priorities. For instance, just as an earnings call heavy on words related to "uncertainty" or "recession" signals a firm's worry about the economic climate, a board meeting minute document that barely mentions "risk" might signal a board's lack of focus on looming threats. In both cases, textual analysis can flag potential issues: Hassan's work shows that spikes in risk-related discourse foreshadow tangible actions or performance impacts, and similarly one could infer that a paucity of risk discussion in board meetings might foreshadow poor risk management outcomes. Both are valuable for surveillance: regulators and stakeholders can monitor these textual indicators as early warning signs or governance quality metrics.

In summary, the trend shown by Hassan's earnings call studies underscores

a broader point that also motivates the analysis of board minutes: unstructured textual information, when systematically analysed, can reveal real-time insights into economic and corporate dynamics that structured data miss. Earnings calls serve as an external narrative of the firm's situation, while board minutes serve as an internal narrative of the firm's governance. Together, they illustrate how text-as-data methods are enriching economic analysis – from understanding how firms perceive political risks to how bank boards deal with financial risks. The comparative lesson for governance scholars is that just as listening to what executives say (and how they say it) in public calls informs us about corporate sentiment and strategy, listening to what boards discuss in their private meetings can illuminate the quality of governance and foresight within firms. Harnessing these textual sources in parallel could provide a more holistic understanding of corporate health – for example, a misalignment between upbeat earnings call language and pessimistic boardroom discussions might itself be a red flag. As research advances, integrating insights from board minutes with those from other textual channels promises a more accurate oversight of banks and corporations in general Hassan et al. (2024).

2.3 Usage in Supervision

Board minutes are regularly reviewed by bank supervisors to enhance their understanding of supervised firms. Supervisors tend to be focused on one firm (if they are large) or several (in case of smaller banks), and rarely have an overview of the boardroom activity across the banking sector. This paper shows the aggregated insights acquired from the board minutes. Additionally, we demonstrate how board minutes can be used by central banks and supervisors in their everyday functioning.

A study by Bennett et al. (2024) analysed the content of minutes of failed US community banks. Their study compares "normal times" versus "distressed times" in the years leading up to bank failures, offering a view of board behaviour as a crisis unfolds. The authors document that in normal periods, community bank boards met regularly (mostly scheduled meetings), focusing heavily on loan portfolios and following formal procedures, and tone of discussions was generally neutral. However, as banks became distressed (approximately 3 years before failure), board dynamics changed markedly: director turnover increased (particularly independent directors leaving), regular meetings became less frequent while emergency meetings rose, and the overall sentiment in minutes turned negative reflecting heightened concern for the bank's survival. Importantly, the content of discussions shifted – boards in distress devoted sharply more attention to capital adequacy and regulatory compliance (often responding to supervisory pressures) and relatively less to routine lending business. They even set aside procedural formalities to focus on urgent solvency issues. This evidence suggests that, under strain, bank boards switch to firefighting mode, prioritising liquidity and regulatory matters over growth. Such minute-by-minute analysis provides detailed view of governance during crises, illustrating how boards react (or perhaps react too late) to mounting risks.

2.4 Management and governance

2.4.1 Board Roles and Activities

Schwartz-Ziv and Weisbach (2013) reveals that boards predominantly act as monitors, with two-thirds of discussions being supervisory using a dataset of 23 Israeli firms. Boards rarely disagree with CEOs but occasionally engage in managerial activities, highlighting the complexity of their functions. Similarly, Bennett et al. (2024) finds that community bank boards adapt their focus and meeting frequency in response to distress, emphasizing their supervisory role in the context of their dataset of 32 distressed and failed US community banks. Bezemer et al. (2014) also analyse the content of videotaped board meetings from two Australian firms, finding high levels of cognitive conflict and heterogeneity in decision-making processes whether managerial or supervisory. These studies analyse the actual discourse of board minutes. However, they suffer from very small sample sizes, and all highlight the need for more extensive data collection to elicit clearer patterns.

2.4.2 Board Diversity and Board Activeness

Most research into boards' behaviour will, for lack of available data, focus on board demographic information. Schwartz-Ziv (2017) shows that boards with at least three directors of each gender are significantly more active, particularly during CEO replacements. This increased activity is driven by the presence of a critical mass of women directors, underscoring the importance of gender diversity in fostering a dynamic board environment. Similarly, Simionescu et al. (2021) finds a positive influence of women on corporate boards on both accounting and market-based performance measures and Erhard et al. (2003) shows a positive association between board diversity and financial performance indicators such as return on assets and investment.

Studies have also turned towards network metrics of board members to understand how their position within a social network of relationships impacts their performance. Stevenson and Radin (2015) finds that an "inner board" of directors and CEOs, linked by network ties outside of board meetings, contains the most influential members who share cognitions about problems. This demonstrates a link between formal and informal positions and their impact on decision making Stevenson and Radin (2015).

2.4.3 The importance of board interactions – going beyond diversity

The question of how to go beyond statistical descriptions of board behaviour focuses on looking at board interactions by interviewing directors. Torchia et al. (2015) examines the relationship between deep-level diversity (background and personality) and board creativity and cognitive conflict. The study finds that higher levels of board diversity led to increased creativity and cognitive conflict, mediated by interactions among board members. This highlights the importance of considering interactions within the meeting as opposed to only static

descriptors of the meeting itself Torchia et al. (2015). The magnitude and direction of the effect of interactions on board meetings is still unclear and would be a large empirical contribution to board design and firm management. Barroso-Castro et al. (2017) examines how internal board processes facilitate the sharing and integration of knowledge, finding that boards that report 'comprehensive discussion processes' are linked to positive strategic involvement, they find no relationship between board meeting dynamics and strategic involvement.

2.4.4 Quality of records

Textual analysis has become a vital tool for assessing firm quality in the past two decades. Researchers increasingly examine text quality, complexity, and readability in corporate disclosures—such as annual reports, financial statements, and regulatory filings—to glean insights into a firm's financial performance and risk profile. The premise is that how a firm communicates (clarity vs. complexity) can signal underlying fundamentals.

- Classic Readability Indices: Measures like Fog Index, Flesch-Kincaid Grade Level, and SMOG assess the reading difficulty of text by looking at sentence length and word complexity (e.g. syllable count). For instance, the Fog Index used by Lehavy et al. (2011) counts average words per sentence and complex words (three+ syllables) to compute the grade level needed to understand a document. Many financial studies adopt these indices to compare disclosure clarity across firms.

- "Plain English" Metrics: Scholars have noted that standard formulas may misjudge financial text complexity because of domain-specific language (e.g. technical terms or required legal wording). Loughran and McDonald (2014) critique reliance on Fog or Flesch in financial contexts, noting that abundant jargon, acronyms, or numerical tables can inflate those scores without truly indicating obfuscation. They propose alternative proxies – for example, simply using the length or file size of a document (log of 10-K file size) as an intuitive proxy for complexity Loughran and McDonald (2011) Amadxarif et al. (2019) noted that longer regulations are generally harder to parse, and they can be seen as increasing the difficulty of reading banking regulations. Another readability metric is the "Bog Index" Bonsall and Miller (2017), which evaluates plain-English attributes like active voice and simpler phrasing; studies found many 10-Ks fall in the "poor" range by this measure.

In summary, over the last 20 years, the toolkit for assessing textual complexity in corporate communications has expanded. Researchers combine old and new NLP methods – from Fog Index to custom machine learning-driven indices – to quantify how readable or opaque a firm's disclosures are. These measures serve as proxies for information transparency, which the literature correlates with various firm outcomes as discussed next.

3 Data

3.1 Inclusion criteria

The original data collection involved manual retrieval of around 4600 documents. We enriched this with a machine-assisted collection of over 1700 documents meeting certain keywords such as 'board minutes' in their titles.

After the original data sweep, we only keep in our sample files that met the following criteria:

- PDF documents correctly parsed by the PyMuPDF parser, this excludes most image-based PDFs. Moreover, we also exclude portion of documents which contain Managerial Information packs as it is not relevant to this investigation focused on the minutes of meetings themselves.
- Documents with titles including the word *minutes* and excluding the words *committee* and *board risk*. This ensures that we focus on board documents.
- We exclude data outside of our date range 2014-2022.

Tables 1 and 2 summarise the final counts of documents, sentences and words in our sample.

Type of document	Meetings	Sentences	Words
Board	1910	406,172	8,750,325

Table 1: Meeting, sentence and word counts

3.2 Board minutes

We collected minutes of board meetings and board committee meetings from the eight largest banks and one building society domiciled in the United Kingdom. This data set is unique in many ways. It consists of banks that are both global systemically important bank (G-SIB), domestic systemically important banks (D-SIB) and other types of financial institutions (building societies or challenger banks). Firms included in this dataset continue operating and are some of the largest firms in this sector. This data is a unique representation of the banking sector boards of directors.

Minutes were collected for the period of 2014-2022. This choice was dictated by several reasons: the data for previous years was more incomplete, and more recent years were deemed to be more sensitive. Covering this period allows us to include important geopolitical, macroeconomic, and financial events occurring both in the UK and internationally.

The dataset includes slightly over 1,900 documents representing the meetings of 150 UK banks (and other financial institutions). Data was collated from the PRA's internal collection of documents, mainly stored in the unstructured format (pdf). Creating the final dataset required trawling through the internal

Table 2: Counts of different firm sizes

firm size	DSIB	GSIB	Other
Meetings	415	307	1188
Average number of sentences	191.61	186.22	189.2
Average word count	5643.29	5448.11	5323.7
Average unique words	1327.33	1388.2	1332.16
Flesh Kincaid Score	54.52	52.01	62.96
Dependency distance	3.83	3.62	3.54
First observation	2014-04-29	2014-09-18	2014-01-31
Last observation	2022-12-15	2022-12-21	2022-12-20

storage, parsing the documents for the right sections, and filtering the relevant materials. In cases where automatic extraction did not yield results, manual inspection of documents was used.

Based on our reading of provided minutes, we found infrequent evidence that minutes were collated using specialised software by certain banks. In our sample, only one firm explicitly mentioned using such a software. We have no insights into usage of other technological solutions that could help boards to record and prepare their minutes, for instance by using speech-to-text transcription, or Generative Artificial Intelligence to collate the reports. However, as this technology improves, it might become more commonly used for transcribing these high-level minutes.

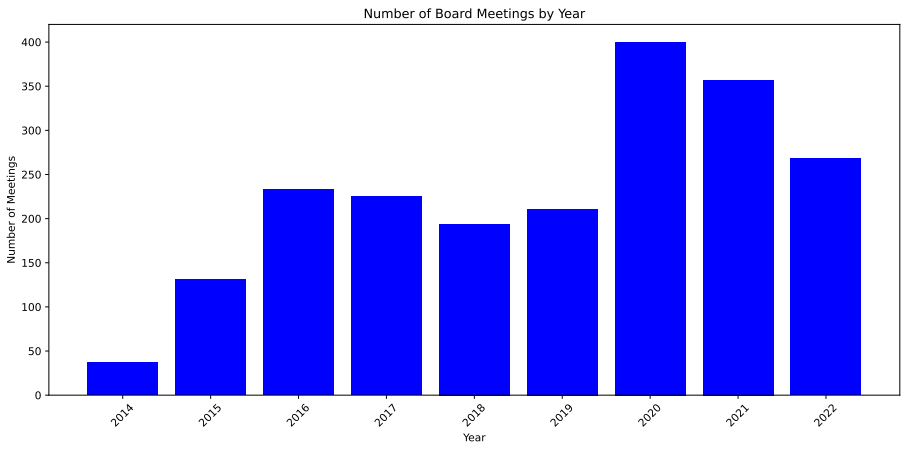


Figure 1: Board minute meetings over time

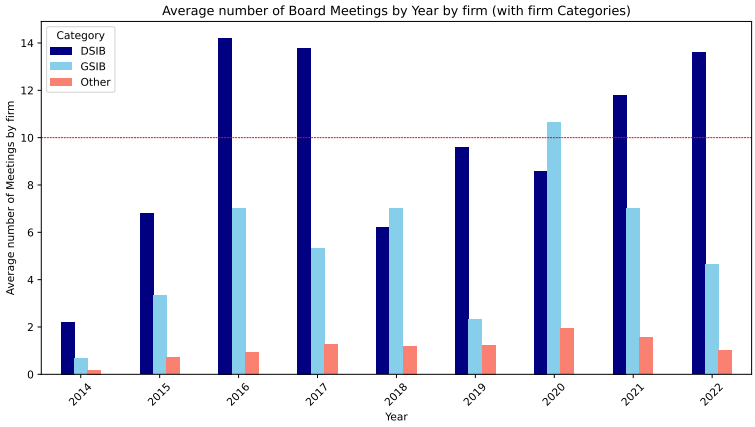


Figure 2: Board minute meetings over time by firm size

4 Methods

The volume of board minutes was deemed too high to be analysed manually. Therefore, we turned to computational techniques to extract insights. This approach is becoming increasing commons in economics (Ash and Hansen (2023)). Analysing bank board minutes presents unique challenges due to the complexity of conversations among multiple participants. To address these challenges, we employ three key Natural Language Processing (NLP) methods: text quality indicators, sentiment extraction, and dictionary models. These methods enable us to capture the content of discussions as well as the evolving dynamics and relationships among board members.

4.1 Text quality indicators

Given the high complexity of board minutes, it is important to assess their readability to ensure they are accessible to all stakeholders. We utilize the TextDescriptives package to extract readability metrics, including the Flesch-Kincaid score and Dependency Distance Hansen et al. (2023). The Flesch-Kincaid score assesses the reading grade level of a text based on sentence length and word complexity, helping us determine the accessibility of the board minutes. Dependency Distance measures the linear distance between syntactically related words, providing insights into syntactic complexity and cognitive load Zai et al. (2024); Han et al. (2024). These metrics are essential for evaluating the clarity of the minutes, as demonstrated in studies analysing complex legal and clinical documents.

4.2 Sentiment extraction

Sentiment extraction complements syntactic parsing by capturing the emotional or evaluative tone of each utterance. Conventional sentiment analysis tools often misinterpret specialized financial language. Therefore, we use FinBERT, a model adapted for the financial domain, which is trained on finance-specific texts Araci (2019). We validate the results of this sentiment detection approach by contrasting it with two other dictionary-based benchmarks. These are the Loughran-McDonald financial sentiment indicator Loughran and McDonald (2011) and the macroeconomic-focused model from central bank speeches Correa et al. (2017). FinBERT's embedding-based approach ensures that terms like "risk" or "credit" are evaluated in context, providing sentiment scores that reflect industry-relevant context. Aggregating these sentiments for each speaker throughout the meeting helps identify board members' consistent attitudes, whether optimistic or conservative. Meanwhile aggregating this sentiment across meetings allows us to measure the evolution of the overall sentiment expressed by board members across time. This analysis can reveal how sentiment correlates with particular topics or interactions, enhancing our understanding of each participant's stance and its evolution over time Araci (2019).

4.3 Dictionary models

In addition to these data-driven approaches, we develop and extend dictionary approaches present in the literature. We report the dictionaries that we use in the Appendix in Section 10.

4.3.1 Risk and uncertainty dictionaries

We adopt the approach of Hassan et al. (2024) to generate a dictionary of geopolitical terms, ensuring that our analysis reflects the nuances of international dynamics. In parallel, we construct a risk dictionary by utilising synonyms for "risk" and "uncertainty" from the Oxford Dictionary.

4.3.2 Economic Policy Uncertainty dictionary

Building on the methodology of Baker et al. (2016) for the Economic Policy Uncertainty (EPU) index, we recreate this index for our data. Reflecting the specificity of our domain, we further enrich this dictionary with UK-specific terms (e.g. "NHS"). This process yields three key indicators:

1. A baseline EPU indicator derived from the core few Economic, Policy and Uncertainty words for the UK taken from Baker et al. (2016)

2. A topic-specific EPU category indicator, we aggregate the mentions of every subtype of topic-specific dictionary, such as 'Monetary policy' or 'Regulation'.

3. A UK-topic-specific risk indicator that integrates additional domain-relevant terms to the topic-specific EPU category. We build it by adding UK-specific terms to replace statements made for an American newspaper setting such as 'Medicare' to terms that correspond better to a UK context such as 'NHS' or 'National Health Service'.

We combine the topic-specific and UK-topic-specific dictionaries with the risk and uncertainty indicators described in the previous section. This allows us to identify sentences which pertain to both a specific and relevant economic topic highlighted by Baker et al. (2016) and frame this topic through the lens of uncertainty.

4.3.3 Thematic Dictionaries

Complementing the above, we also employ a dictionary-based approach to identify specific supervision and management terms according to the typology developed in Schwartz-Ziv and Weisbach (2013). In this method, broader title sections (e.g. "Contracting or purchases") are decomposed into targeted keyword sets (e.g. ["contracting", "purchases", "procurement", "vendor management", "purchasing issues"]). This refinement facilitates a more granular and accurate identification of topic-specific language. Specifically, we replicate the approach

to quantify how many of the discussions of the boards are about either 'supervisory' aspects of board action In addition or 'managerial' aspects. Supervisory aspects include 'appointment of members, approving minutes of earlier meetings, audit issues, choosing a chairman ...' while managerial topics include for example ['business issues, business projects, cross-firm issues ...'].

We also incorporate thematic classifications from the World Bank's topological taxonomy based on Leetaru and Schrodt (2013)[7] containing terms like "Banking", "Capital" and "Economics"—to systematically capture broader economic themes. This allows us to identify discussions about the different topics from the financial and economic domain mentioned in the board minutes.

Lastly, following Hassan et al. (2019), we construct a dictionary of geopolitical terms highlighting large macroeconomic or geopolitical entities which correspond to specifically identifiable topics such as 'Covid-19', 'Brexit' or 'war'. To generate terms with which to enrich the dictionary, we used Microsoft Copilot with the following prompt: 'What terms correspond to this topic {topic}'. We then performed a hand-verification of the entries in this dictionary.

5 Results

5.1 Text quality, complexity and readability

We have calculated measures of complexity and readability of documents[8]. These measures have been used in the past to show the effort required to read the documents and the number of concepts covered (McMahon (2023); Amadxarif et al. (2019); Brookes and Munday (2021)).

Figure 3 describes the evolution of the Flesch-Kincaid readability score overtime by firm size. A readability score of 0-10 is considered of 'professional difficulty', 50-60 is considered 'Fairly difficult to read' and anything above 60 is considered readable at the college level and below. The plot shows that the readability of board minutes started to improve from the higher difficulty in the earlier years (around 2014) until roughly 2017 and then it flatlined.

Figure 4 describes the evolution of proportion of sentences attributed to one speaker. This can be seen as another indicator of text quality. This measure might be interesting to supervisors because it could allow supervisors to identify speakers in this large textual dataset.

Anecdotal evidence collected from supervisors suggested that there is a wide variation between the firms in the quality of note taking. Indeed, we found that the quality of note taking varies within our sample. This figure shows that the overall quality of note taking (i.e. proportion of attributed sentences) is gradually improving with time. This effect is particularly pronounced for larger firms (GSIBs and DSIBs).

[7] World Bank Group Topical Taxonomy Now in GKG (2015) `https://blog.gdeltproject.org/world-bank-group-topical-taxonomy-now-in-gkg/`

[8] Using the Python package TextDescriptives Hansen et al. (2023)

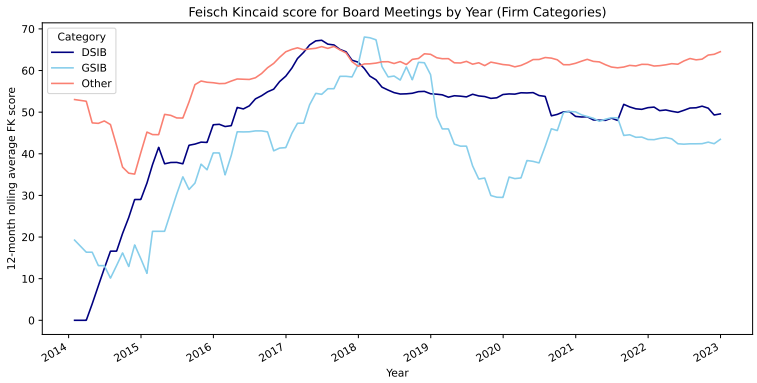


Figure 3: Flesh Kincaid Score over time by firm size

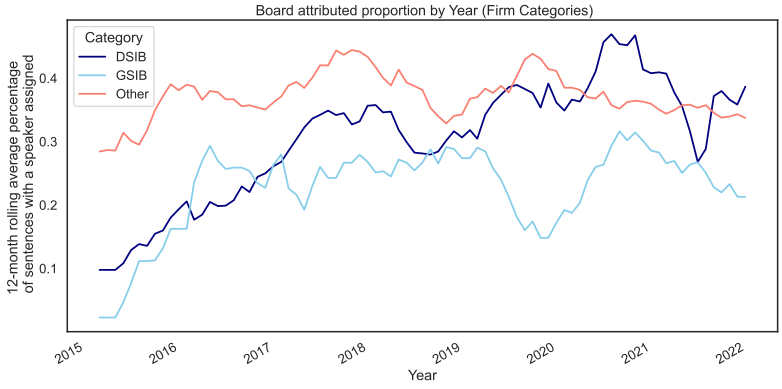


Figure 4: Board minute proportion of sentences attributable to one speaker

5.2 Mentions of inflation follow CPI

Figure 5 shows the relationship between the frequency of sentences mentioning the word 'inflation' over time and the Consumer Price Index (CPI), the headline measure of inflation in the UK. We also display the proportion of times that these mentions are accompanied by synonyms of the word 'risk' as described in Hassan et al. (2019). The trends in the text mentions follows CPI inflation, which suggests boards were highly responsive to the surge in prices following the pandemic.

We conducted several panel regressions to test how well text indicators (*inflation*) with different lags (1 and 6 months) predict the monthly CPI 3. The reduced regression with only the one month lag is described in Equation 10.1. We found that mentions of inflation lagged by one month predict CPI across all specifications. We have also added the lagged CPI (1 and 6 months) into the model to test for autocorrelation, which shows to be present with a one-month lag. This setup is described in Equation 10.1. We also evaluate the persistence of the relationship controlling for year-month fixed effects as described in Equation 10.1 and we find that the relationship between lagged inflation mentions and CPI persists even with those fixed effects.

To validate this effect, we have also explored if this effect holds when another measure of inflation holds. We have tested the same text-extracted indicators with year-on-year indicators. These variables were very closely aligned from 2021 onwards (see 16). The single lag setup is described in Equation 10.2, the full model with no fixed effects is described in Equation 10.2, while the full model with fixed effects is described in Equation 10.2. Statistical tests showed the same pattern as with the monthly indicator of inflation, but additionally showed a negative effect of the six-month lag (4).

5.3 Sentiment varies between firm categories and topics

Board minutes can serve as a direct indicator of sentiment within financial firms. Instead of relying on surveys, we extracted this information from the artefacts of corporate governance. Our assumption is that this information is less filtered than external-facing communications, such as earnings calls, and therefore can provide a strong and reliable signal of beliefs about the economy. Similar approach has been applied to analysing FOMC transcripts Shapiro and Wilson (2022).

Figure 6 shows the sentiment scores calculated with the FinBERT model over time. The overall sentiment shows variation between the firm categories. This analysis requires further exploration, as sentiment does not follow the expected pattern. For instance, only GSIBs show the sudden drop in sentiment around the onset of the Covid-19 pandemic. This suggests that further data cleaning is required, but we believe that extracting sentiment can offer valuable insights, especially if presented in relation to selected topics.

After exploring the overall sentiment of the minutes, we explored economically significant topics present in the dataset. Years 2014-2022 contained several

Table 3: Panel regressions - Predicting monthly CPI by mentions of *inflation* and lagged CPI.

	Dependent variable: CPI_ALL_ITEMS		
	First Predictor	Full (No FE)	Full (Year-Month FE)
	(1)	(2)	(3)
inflation_{t-1}	28.298***	1.823***	1.719**
	(1.808)	(0.628)	(0.713)
inflation_{t-6}		-0.186	-0.243
		(0.687)	(0.771)
$\text{cpi all items}_{t-1}$		0.897***	0.921***
		(0.059)	(0.067)
$\text{cpi all items}_{t-6}$		0.123*	0.099
		(0.062)	(0.071)
Observations	102	102	102
FE		No	Yes
R^2	0.710	0.996	0.996
Adjusted R^2	0.707	0.996	0.995
Residual Std. Error	3.677 (df=100)	0.434 (df=97)	0.467 (df=78)
F Statistic	244.892*** (df=1; 100)	6168.627*** (df=4; 97)	927.709*** (df=23; 78)
Note:			*p<0.1; **p<0.05; ***p<0.01

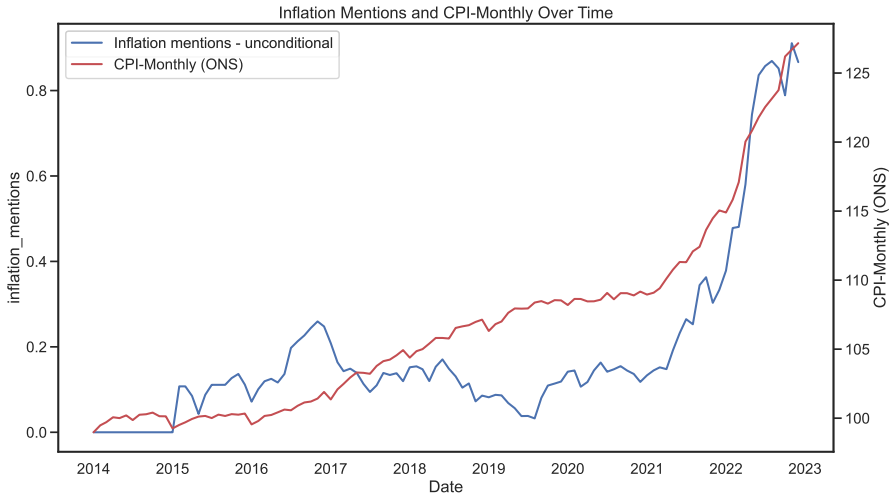


Figure 5: CPI Inflation (red) vs frequency of 'inflation' keywords in minutes.

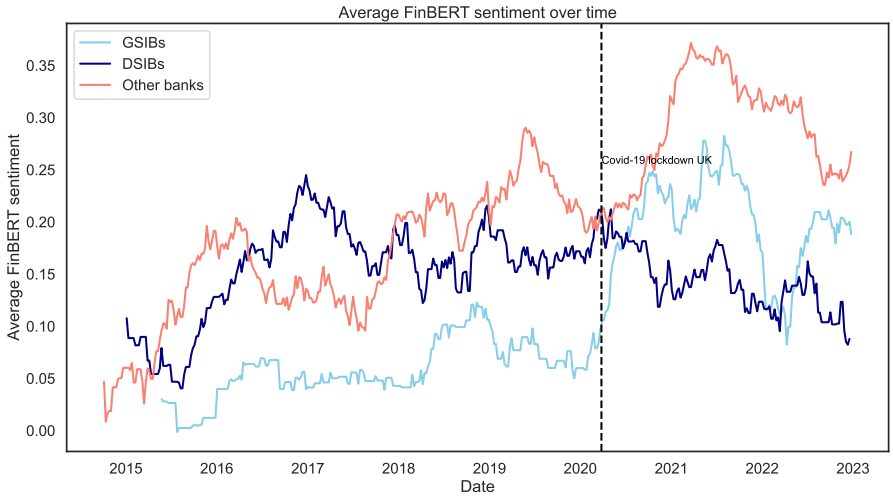


Figure 6: Sentiment of each meeting by firm category using FinBERT. Higher score means more positive.

major events that had an impact on the economy (e.g. Brexit of Covid-19). This approach acts as a sanity check but also provides validation for measures used previously. FinBERT-based sentiment analysis of these keywords (9) showed that the boards had negative sentiment towards Brexit, LDI crisis (however our sample only covers period until the end of 2022), and war. We expected the LM

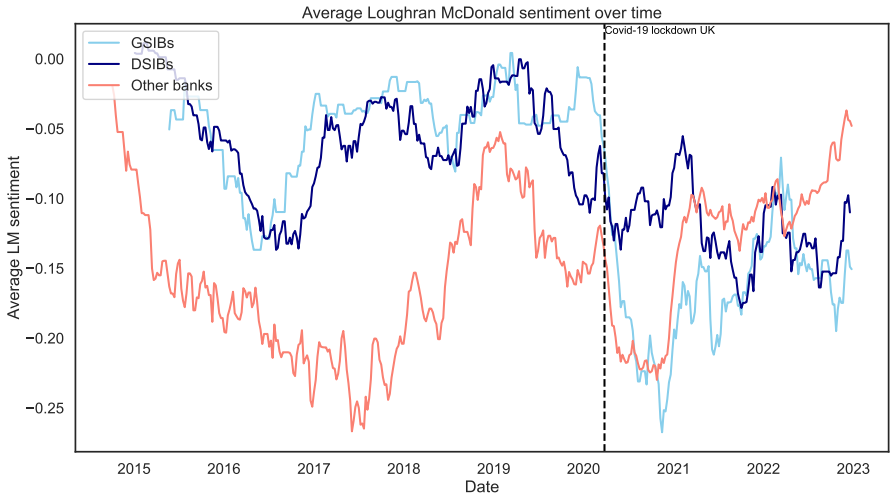


Figure 7: Sentiment of each meeting by firm category using the LM dictionary. Higher score means more positive.

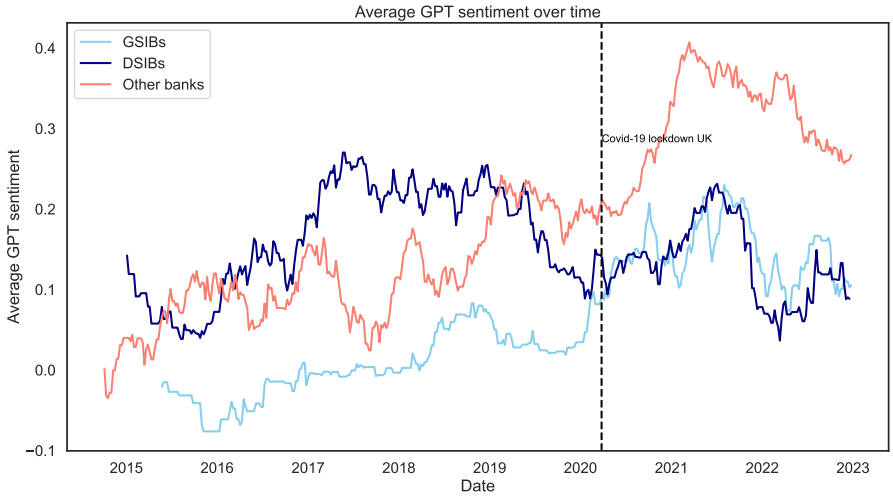


Figure 8: Sentiment of each meeting by firm category using the GPT-4o model. Higher score means more positive.

dictionary will provide more negative sentiment, as it is highly skewed towards negative terms. The results on 10 supports this assumption.

We validate the different sentiment measures by hand-labelling 500 sentences by hand. We label these sentences as either 'positive','negative' and

'neutral'. This allows us to compare the performance of the FinBERT (Table 7), Loughran-McDonald (Table 6) and GPT-4o (Table 5) sentiment labelling algorithms used above. This validation is common practice in similar studies using language models to extract a sentiment indicator Cajner et al. (2024). We report the F1-scores (a metric used to evaluate the performance of a classification model as the harmonic mean of precision and recall) as well as the confusion matrices showing the different error types. This hand-coding shows that the GPT sentiment classification pipeline corresponds best on average to human interpretation of sentiment of board statements (with an F1 score of over 72.00). This allows us to validate the use of the GPT-based indicator to describe board sentiment.

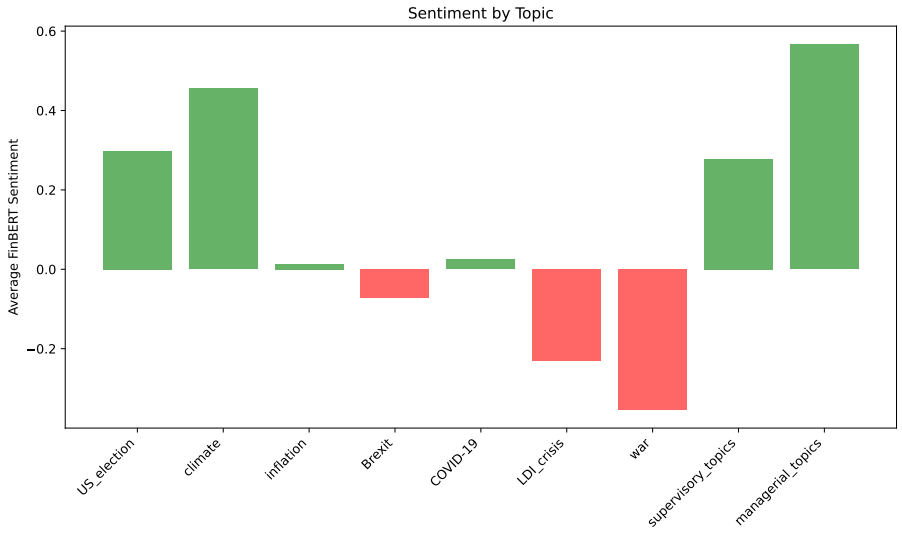


Figure 9: FinBERT sentiment by keyword. Green colour indicates positive sentiment.

Figure 13 shows the EPU indicator from Baker et al. (2016) (BBD) in orange. We compare it to the counts of different dictionaries for risk, uncertainty and topic dictionaries for 'Monetary Policy', 'Fiscal Policy' introduced in 4.3. The original EPU indicator fluctuates strongly across time. It spikes particularly around the Covid-19 lockdown in the UK. By contrast the blue lines indicate the UK-specific policy dictionaries react as strongly to these events. However, we can observe that the non-specific original BBD indicator without UK specific terms such as 'NHS' does not react as strongly to the language used in these UK bank board discussions. Moreover, the original E,P,U signal in red used to create the EPU index in the original publication is almost completely flat. Beyond the theme specificity of the words in the UK-adapted dictionary, it is important to highlight that the language contained in the board minutes is highly specific to the world of financial intermediaries. Therefore, the same

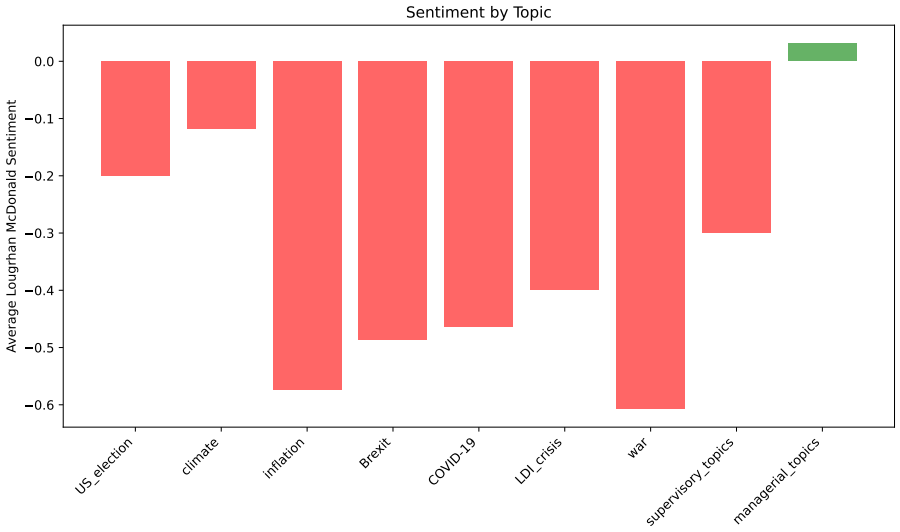


Figure 10: LM sentiment by keyword. Green colour indicates positive sentiment.

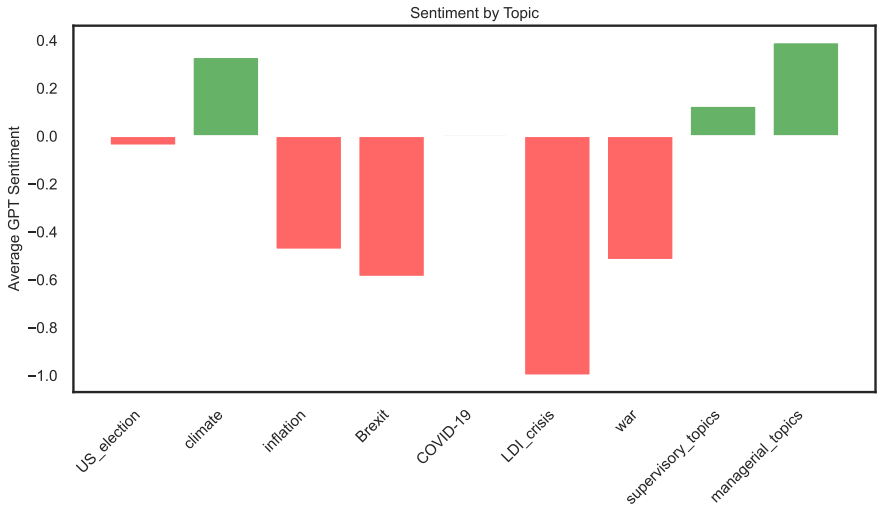


Figure 11: GPT-4o sentiment by keyword. Green colour indicates positive sentiment.

topics such as 'profits', 'interest rates' may interact differently with risk compared to the newspapers that the BBD work uses. The modified index using UK specific work can be seen as capturing a specific dimension of risk as perceived by highly influential financial actors. Due to this, in future work, we propose

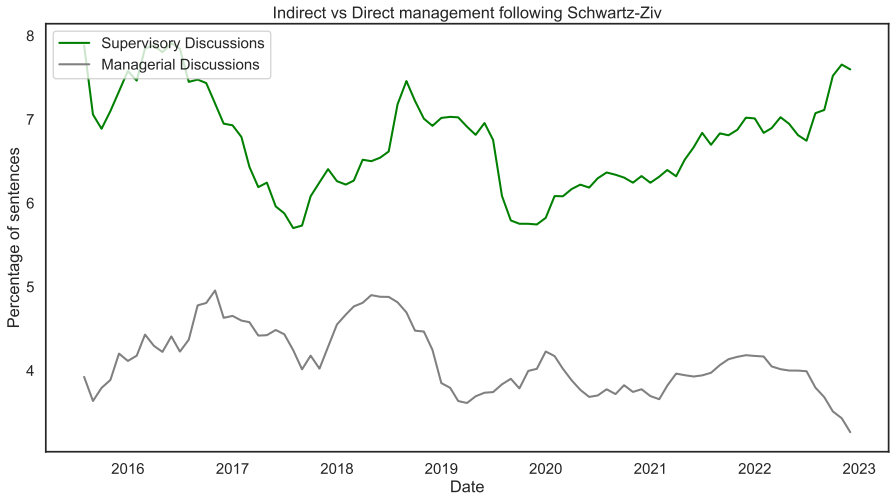


Figure 12: Discussions of supervisory vs. managerial topics.

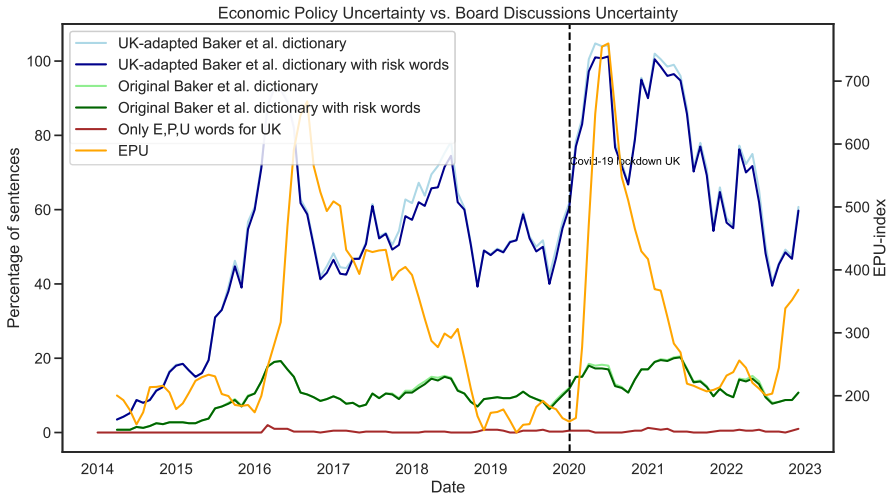


Figure 13: EPU index vs. Board EPU index

to extend the Board-based EPU indicator and use it as a predictive variable for the types of macroeconomic forecasts used in the original paper such as stock market volatility Baker et al. (2016).

5.4 Regulatory topics dominate discussion of banking boards

We explored the topics mentioned in the minutes by running a combination of topic models and keyword-based approaches. The simplest method, i.e. keyword-based, showed that mentions of *regulation* overshadow all other topics (14). We have also explored mentions of the major regulators based on the modified World Bank dictionary (12) and found that even though Basel-related topics are more prominent than those of other regulators, they are still pale by comparison to generic *regulation*. This result shows that one of the regulations are a major topic for banking boards.

In the follow-up analyses we will explore how mentions of regulations compare to other topics that we expect to be discussed (e.g. financial products or profits). Also, we plan to develop a bottom-up approach which does not rely on using of pre-defined keywords.

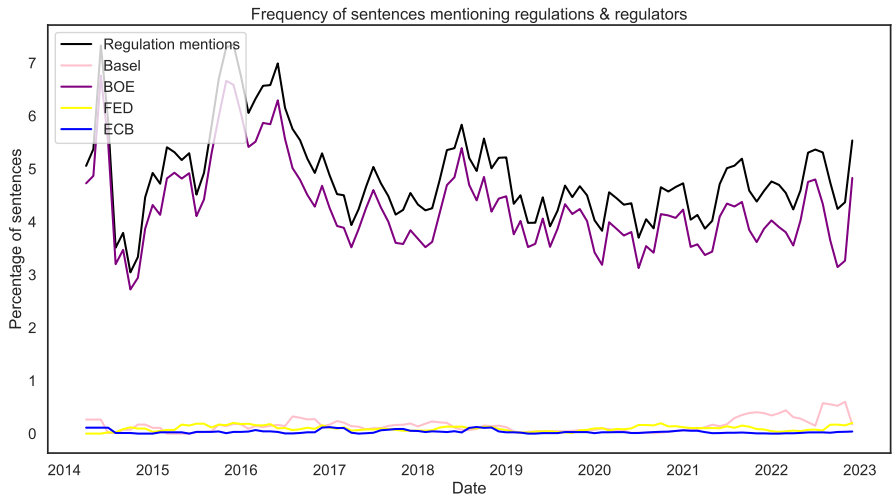


Figure 14: Percentage of sentences mentioning each regulatory topic

5.5 Supervisory topics are more frequent than the managerial ones

One of the functions of the board is supervision of firms. However, the boards might face requirements to be involved in managerial tasks. Schwartz-Ziv and Weisbach (2013) demonstrated that supervisory topics dominate discussion of boards. Here, develop an NLP approach to test this assumption on a larger set of board minutes. We used a dictionary approach to test for occurrence of supervisory and managerial topics (see the list in 10). Banking boards show the same pattern as non-banking firms tested by Schwartz-Ziv and Weisbach

(2013), with supervisory topics being more prominent than topics discussing managerial tasks.

6 Discussion

Board minutes are highly sensitive data, and access to them tends to be restricted to bank supervisors or regulators. In cases where supervisory responsibility is split between institutions (e.g. in the USA), each supervisory authority might have access only to minutes of institutions that they supervise. We show that analysis of board minutes can provide valuable information about bank behaviours, banking intermediation in financial markets and the evolution of the macroeconomic environment. In table 3, we show that mentions of inflation words in board meetings are useful in explaining out of sample inflation. This suggests that they might be a useful tool in macroeconomic forecasting or nowcasting of inflation. The board minutes dataset also offers possibilities to extend research into the behaviour of bank boards. In Figure 12, we find that bank boards discuss far more issues surrounding indirect supervision of executive directors instead of directly discussing management of the firm itself. This aligns with results found in Schwartz-Ziv and Weisbach (2013) and more broadly with a literature around the "supervisory" approach of boards where boards serve more as monitors and assessors of CEOs.

6.1 Limitations

This section outlines the limitations encountered during the analysis of bank board meeting minutes. Understanding these limitations is crucial for interpreting the findings and identifying areas for future research.

Although our data is exceptionally comprehensive, it does have gaps in coverage. Consequently, we depend on aggregated measures and cannot always break down the results. We hope to complete the data collection soon to address these gaps.

Pre-board meetings may have been used by firms to prepare for the main board meetings. This preparation could have resolved differences between members early on and addressed simpler issues. Separate events focused on strategy, known as "Strategy Days," might explain why board minutes often cover operational or routine topics. Strategic discussions may take place in these separate sessions instead of regular board meetings. Our sample had gaps on some days, and we are working to fill these gaps. Additionally, some firms in our sample were involved in mergers, which could influence the content and focus of the board meetings.

The next section, *Future work*, explains how to address these issues and expand this research.

7 Future work

The analysis of banking board minutes presents many opportunities for future research. The following areas are identified for extending the coverage and depth of the study:

- **Full universe of UK banks and building societies:** Future research should aim to include the complete set of UK banks and building societies to ensure comprehensive coverage and generalisability of findings.
- **Better temporal coverage:** Expanding the temporal scope of the data collection to include a longer historical period will allow for the examination of trends and changes over time, providing a more robust analysis.
- **More information on board members:** Incorporating detailed information on board members, such as data from the FCA Senior Managers Register or Boardex, will enhance the understanding of board dynamics and individual contributions.
- **Firm performance:** Linking board minutes with firm performance metrics will enable the assessment of how board decisions impact the financial health and success of the institutions.
- **Earnings calls:** Including transcripts and analyses of earnings calls can provide additional insights into the strategic priorities and communication styles of the board members.
- **Dashboard - LLM-enabled search:** Developing an interactive dashboard with LLM-enabled search capabilities, as suggested by Muhtar and Gorduza (2024), will facilitate more efficient and effective data exploration and analysis. This could become a useful tool for supervisors interacting with the board minutes.

7.1 Applications

Board minutes from UK banks can be used in several ways. Firstly, they can serve for the surveillance of perceptions of economic conditions. By analysing the discussions and sentiments expressed in these minutes, we can gain insights into how board members view the current and future state of the economy.

Secondly, for supervisory purposes, board minutes can be examined for mentions of specific topics, e.g. regulation. This allows supervisors to track how certain topics evolve over time and assess how firms discuss various topics.

Lastly, from a governance and management perspective, board minutes can be analysed to evaluate the quality of governance practices. This includes assessing the presence and effectiveness of board challenges to management, which are indicative of robust monitoring and oversight of firm risk.

8 Conclusions

This initial analysis highlights the potential applications of examining the minutes of bank board meetings. By leveraging extensive coverage, access to supervisory data, and innovative analytical techniques, we have broadened the scope of insights that can be derived from board minutes.

Our preliminary findings offer an overview of the discussions of UK banking boards. We focused particularly on selected topics, such as inflation and regulation that are of interest to central bankers and macroeconomists. Ongoing analysis aims to extract further insights and explore the relationships between text-based metrics and economic variables.

Additionally, we have gathered demographic data on the directors participating in these board meetings. Integrating this demographic information with textual data will enable us to provide novel insights into the characteristics of the speakers and the content of their contributions.

This research demonstrates how a novel dataset can be used to gain economic insights that is valuable for policymakers, but can also answer a longstanding academic questions about corporate governance. Given the difficulty in obtaining such information, the insights derived are expected to be unique. Historically, analyses of UK bank boards have primarily focused on board structure or firm performance. We anticipate that our analysis will expand the range of potential use cases, which will be of particular interest to central bankers, supervisors, and those interested in governance of banks.

9 Aknowledgements

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10 Appendix

10.1 Inflation mention vs CPI equations

$$\mathbf{CPI}_t = \beta_0 + \beta_1 * \mathbf{inflation_mentions}_{t-1} \tag{1}$$

$$\begin{aligned} \mathbf{CPI}_t = \beta_0 &+ \beta_1 * \mathbf{inflation_mentions}_{t-1} \\ &+ \beta_2 * \mathbf{inflation_mentions}_{t-6} \\ &+ \beta_3 * \mathbf{CPI}_{t-1} \\ &+ \beta_4 * \mathbf{CPI}_{t-6} \end{aligned} \tag{2}$$

$$\begin{aligned} \mathbf{CPI}_t = \beta_0 &+ \beta_1 * \mathbf{inflation_mentions}_{t-1} \\ &+ \beta_2 * \mathbf{inflation_mentions}_{t-6} \\ &+ \beta_3 * \mathbf{CPI}_{t-1} \\ &+ \beta_4 * \mathbf{CPI}_{t-6} \\ &+ \mathbf{Year_Month_FE} \end{aligned} \tag{3}$$

10.2 Inflation mention vs CPI year on year equations

$$\mathbf{CPI_YOY}_t = \beta_0 + \beta_1 * \mathbf{inflation_mentions}_{t-1} \tag{4}$$

$$\begin{aligned} \mathbf{CPI_YOY}_t = \beta_0 &+ \beta_1 * \mathbf{inflation_mentions}_{t-1} \\ &+ \beta_2 * \mathbf{inflation_mentions}_{t-6} \\ &+ \beta_3 * \mathbf{CPI_YOY}_{t-1} \\ &+ \beta_4 * \mathbf{CPI_YOY}_{t-6} \end{aligned} \tag{5}$$

$$\begin{aligned} \mathbf{CPI_YOY}_t = \beta_0 &+ \beta_1 * \mathbf{inflation_mentions}_{t-1} \\ &+ \beta_2 * \mathbf{inflation_mentions}_{t-6} \\ &+ \beta_3 * \mathbf{CPI_YOY}_{t-1} \\ &+ \beta_4 * \mathbf{CPI_YOY}_{t-6} \\ &+ \mathbf{Year_Month_FE} \end{aligned} \tag{6}$$

Table 4: Panel regressions - Predicting yearly CPI by mentions of *inflation* and lagged CPI.

	Dependent variable: CPI_ALL_ITEMS_YOY		
	First Predictor	Full (No FE)	Full (Year-Month FE)
	(1)	(2)	(3)
inflation mentions$_{t-1}$	0.125***	0.012**	0.011*
	(0.006)	(0.006)	(0.006)
inflation mentions$_{t-6}$		-0.006	-0.007
		(0.007)	(0.008)
cpi all items yoy$_{t-1}$		1.043***	1.067***
		(0.055)	(0.061)
cpi all items yoy$_{t-6}$		-0.108**	-0.127**
		(0.052)	(0.057)
Observations	90	90	90
FE		No	Yes
R^2	0.838	0.983	0.986
Adjusted R^2	0.836	0.982	0.981
Residual Std. Error	0.011 (df=88)	0.004 (df=85)	0.004 (df=67)
F Statistic	453.767*** (df=1; 88)	1201.271*** (df=4; 85)	210.818*** (df=22; 67)

Note: *p<0.1; **p<0.05; ***p<0.01

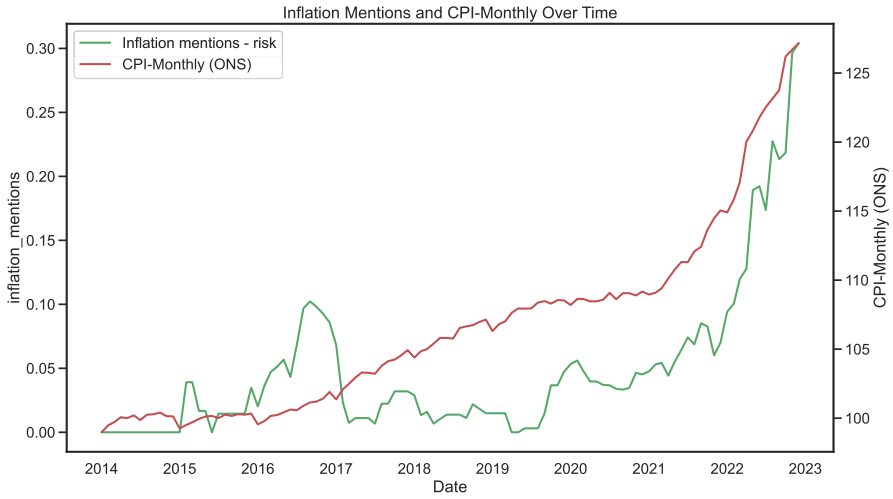


Figure 15: Inflation mentions with risk vs monthly inflation

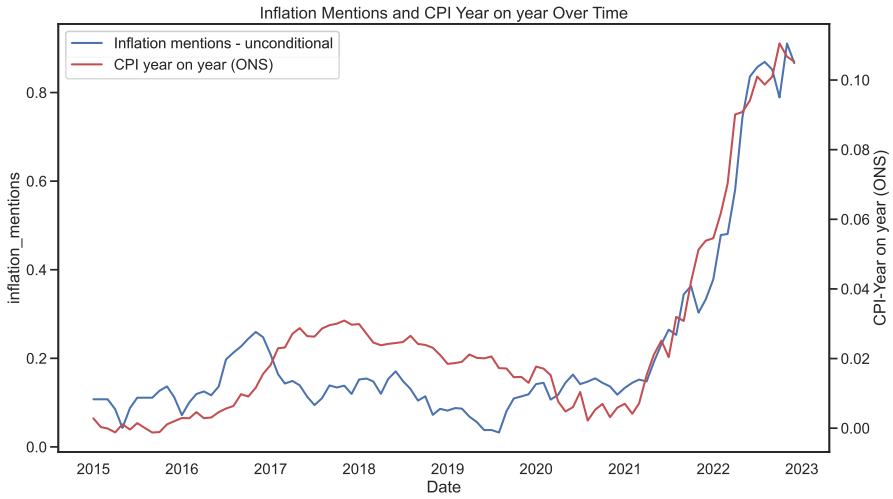


Figure 16: Inflation mentions vs. CPI year on year inflation

10.3 Additional inflation plots and tables

Additional plots to explore and validate the results from 5.2.

Table 5: GPT confusion matrix against human labelling

	positive	**neutral**	**negative**
positive	120	12	0
neutral	40	129	51
negative	5	25	115

10.4 Validation of sentiment scores

Table 5 displays the confusion matrix comparing GPT predictions against human labelling. Each cell shows the number of instances for the corresponding prediction and true label. The model achieved an F1-score of 72.62, reflecting a balanced performance in terms of precision and recall.

Table 6: Loughran-McDonald confusion matrix against human labelling

	positive	**neutral**	**negative**
positive	87	40	5
neutral	46	136	38
negative	13	61	71

Table 6 presents the confusion matrix comparing Loughran-McDonald predictions against human labelling for the classes "positive", "neutral", and "negative". The rows indicate the true labels and the columns represent the predicted labels. The model achieved an F1-score of 58.96, indicating modest performance in terms of precision and recall.

Table 7: FinBERT confusion matrix against human labelling

	positive	**neutral**	**negative**
positive	85	37	10
neutral	24	153	43
negative	11	32	102

Table 7 above presents the confusion matrix comparing FinBERT predictions against human labelling for the classes "positive", "neutral", and "negative". The rows indicate the true labels and the columns represent the predicted labels. FinBERT achieved an F1-score of 68.40, showing improved performance relative to the Loughran-McDonald model thought it is still inferior to the GPT4o model's performance.

10.5 Baker Bloom Davies (2016) dictionary

Key	**Value**

Taxes	['taxes', 'tax', 'taxation', 'taxed']
Government Spending Other UK	['government spending', 'federal budget', 'budget battle', 'balanced budget', 'defense spending', 'military spending', 'entitlement spending', 'fiscal stimulus', 'budget deficit', 'federal debt', 'national debt', 'Gramm-Rudman', 'debt ceiling', 'fiscal footing', 'government deficits', 'balance the budget', 'treasury', 'chancellor', 'exchequer']
Government Spending Other	['government spending', 'federal budget', 'budget battle', 'balanced budget', 'defense spending', 'military spending', 'entitlement spending', 'fiscal stimulus', 'budget deficit', 'federal debt', 'national debt', 'Gramm-Rudman', 'debt ceiling', 'fiscal footing', 'government deficits', 'balance the budget']
Fiscal Policy	['taxes', 'tax', 'taxation', 'taxed', 'government spending', 'federal budget', 'budget battle', 'balanced budget', 'defense spending', 'military spending', 'entitlement spending', 'fiscal stimulus', 'budget deficit', 'federal debt', 'national debt', 'Gramm-Rudman', 'debt ceiling', 'fiscal footing', 'government deficits', 'balance the budget']
Fiscal Policy UK	['taxes', 'tax', 'taxation', 'taxed', 'government spending', 'federal budget', 'budget battle', 'balanced budget', 'defense spending', 'military spending', 'entitlement spending', 'fiscal stimulus', 'budget deficit', 'federal debt', 'national debt', 'Gramm-Rudman', 'debt ceiling', 'fiscal footing', 'government deficits', 'balance the budget', 'treasury', 'chancellor', 'exchequer']
Monetary Policy basic	['federal reserve', 'the fed', 'money supply', 'open market operations', 'quantitative easing', 'monetary policy', 'fed funds rate', 'overnight lending rate', 'the fed', 'Bernanke', 'Volker', 'Greenspan', 'central bank', 'interest rates', 'fed chairman', 'fed chair', 'lender of last resort', 'discount window', 'European Central Bank', 'ECB', 'Bank of England', 'BOE', 'Bank of Japan', 'BOJ', 'Bank of China', 'Bundesbank', 'Bank of France', 'Bank of Italy']
Monetary Policy UK	['federal reserve', 'the fed', 'money supply', 'open market operations', 'quantitative easing', 'monetary policy', 'fed funds rate', 'overnight lending rate', 'the fed', 'Bernanke', 'Volker', 'Greenspan', 'central bank', 'interest rates', 'fed chairman', 'fed chair', 'lender of last resort', 'discount window', 'European Central Bank', 'ECB', 'Bank of England', 'BOE', 'Bank of Japan', 'BOJ', 'Bank of China', 'Bundesbank', 'Bank of France', 'Bank of Italy', 'PRA', 'Prudential Regulation Authority', 'FCA', 'Financial Conduct Authority', 'Bailey', 'Carney']

Healthcare	['health care', 'Medicaid', 'NHS', 'Medicare', 'health insurance', 'malpractice tort reform', 'malpractice reform', 'prescription drugs', 'drug policy', 'food and drug administration', 'MHRA', 'FDA', 'medical malpractice', 'clinical negligence', 'prescription drug act', 'medical insurance reform', 'medical liability', 'partd', 'affordable care act', 'Obamacare']
National Security	['national security', 'war', 'military conflict', 'terrorism', 'terror', '9/11', 'defenses pending', 'military spending', 'police action', 'armed forces', 'base closure', 'military procurement', 'saber rattling', 'naval blockade', 'military embargo', 'no-fly zone', 'military invasion']
Financial Regulation	['banking supervision', 'bank supervision', 'glass-steagall', 'tarp', 'thrift supervision', 'dodd-frank', 'financial reform', 'commodity futures trading commission', 'cftc', 'house financial services committee', 'basel', 'capital requirement', 'Volcker rule', 'bank stress test', 'securities andexchange commission', 'sec', 'deposit insurance', 'fdic', 'fslic', 'ots', 'occ', 'firrea']
Regulation	['banking supervision', 'bank supervision', 'glass-steagall', 'tarp', 'thrift supervision', 'dodd-frank', 'financial reform', 'commodity futures trading commission', 'cftc', 'house financial services committee', 'basel', 'capital requirement', 'Volcker rule', 'bank stress test', 'securities andex change commission', 'sec', 'deposit insurance', 'fdic', 'fslic', 'ots', 'occ', 'firrea', 'truth in lending', 'union rights', 'card check', 'collective bargaining law', 'national labor relations board', 'nlrb', 'minimum wage', 'living wage', 'right to work', 'closed shop', 'wages and hours', 'workers compensation', 'advancenotice requirement', 'affirmative action', 'at-will employment', 'overtime requirements', 'trade adjustment assistance', 'davis-bacon', 'equal employment opportunity', 'eeo', 'osha', 'antitrust', 'competition policy', 'merger policy', 'monopoly', 'patent', 'copyright', 'federal trade commission', 'ftc', 'unfair business practice', 'cartel', 'competition law', 'price fixing', 'class action', 'healthcare lawsuit', 'tort reform', 'tort policy', 'punitive damages', 'medical malpractice', 'energy policy', 'energy tax', 'carbon tax', 'cap and trade', 'cap and tax', 'drilling restrictions', 'offshore drilling', 'pollution controls', 'environmental restrictions', 'clean air act', 'clean water act', 'environmental protection agency', 'epa', 'immigration policy']
Sovereign Debt and Currency Crises	['sovereign debt', 'currency crisis', 'currency crash', 'currency devaluation', 'currency revaluation', 'currency manipulation', 'euro crisis', 'Eurozone crisis', 'european financial crisis', 'european debt', 'asian financial crisis', 'asian crisis', 'Russian financial crisis', 'Russian crisis', 'exchange rate']

Entitlement Programs UK	['entitlement program', 'entitlement spending', 'government entitlements', 'social security', 'Medicaid', 'medicare', 'government welfare', 'welfare reform', 'unemployment insurance', 'unemployment benefits', 'food stamps', 'afdc', 'tanf', 'wic program', 'disability insurance', 'part d', 'oasdi', 'Supplemental Nutrition Assistance Program', 'Earned Income Tax Credit', 'EITC', 'head start program', 'public assistance', 'government subsidized housing']
Trade Policy	['import tariffs', 'import duty', 'import barrier', 'government subsidies', 'government subsidy', 'wto', 'world trade organization', 'trade treaty', 'trade agreement', 'trade policy', 'trade act', 'doha round', 'uruguay round', 'gatt', 'dumping']
E	['economic', 'economy']
P	['spending', 'policy', 'deficit', 'budget', 'tax', 'regulation', 'Bank of England']
U	['uncertain', 'uncertainty']

Table 8: Updated dictionary used by Baker et al. (2016)

10.6 Geopolitics dictionary

Key	Value
Brexit	['transition period', 'free trade', 'customs union', 'divorce bill', 'no deal', 'WTO rules', 'fishing rights', 'level playing field', 'withdrawal agreement', 'brexit', 'british exit', 'UK referendum']
other_disease ['quarantine', 'isolation', 'vaccine', 'virus']	
COVID-19	['personal protection equipment', 'covid vaccine', 'community spread', 'covid', 'coronavirus']
GILT	['gilt*', 'bond*']
prices	['price*']
equity	['equity*', 'stock*', 'share*']
mortgage	['mortgage*', 'home loan', 'home loan rate']
loan	['loan*']
pension	['pension*']
checking_account	['checking account*']
savings_account	['savings account*']
credit_card	['credit card*']
LDI_crisis	['autumn budget', 'Liz Truss', 'Kwasi Kwarteng', 'autumn statement', 'mini-budget', 'mini budget', 'pension fund crisis', 'LDI crisis', 'Liability-driven investing crisis', 'Gilt crisis']
US_election	['dollars', 'USA', 'US election', 'Clinton', 'Trump', 'caucus', 'primary', 'delegate', 'superdelegate', 'exit poll', 'electoral college', 'swing state']
UK_general_electio	['liberal democrats', 'Conservative party', 'Labour party', 'ballot box', 'candidate', 'constituency', 'coalition', 'devolution', 'dissolution of Parliament', 'by-election', 'manifesto', 'polling station']
China	['China', 'yuan', 'Hong Kong', 'Chinese Communist Party', 'Belt and Road Initiative', 'Great Firewall', 'Xi Jinping', 'economic reform', 'social credit system', 'One Country Two Systems', 'Taiwan', 'South China Sea']
Russia	['Russia', 'ruble', 'Vladimir Putin', 'Kremlin', 'sanctions', 'Soviet Union', 'Crimea', 'oligarch', 'Gazprom']
Japan	['Japan', 'yen', 'Shinzo Abe', 'Tokyo', 'Shinto', 'Abenomics', 'Fukushima', 'bullet train', 'robotics']
Iran	['iran', 'Ayatollah', 'nuclear deal', 'sanctions', 'Tehran', 'Shia Islam', 'Revolutionary Guard', 'Persian Gulf', 'oil exports', 'Mahmoud Ahmadinejad']

North_Korea	['North Korea', 'Kim Jong Un', 'Pyongyang', 'Juche', 'demilitarized zone', 'nuclear weapons', 'sanctions', 'propaganda', 'military parade']
EU	['euro', 'European Commission', 'Eurozone', 'Schengen Area', 'Brussels', 'European Parliament', 'common market', 'austerity', 'migration crisis', 'France', 'Germany', 'Netherlands', 'Poland', 'Spain', 'Italy', 'Austria', 'Greece', 'Portugal', 'Belgium', 'Sweden', 'Denmark', 'Finland', 'Ireland', 'Czech Republic', 'Slovakia', 'Slovenia', 'Croatia', 'Hungary', 'Romania', 'Bulgaria', 'Estonia', 'Latvia', 'Lithuania', 'Cyprus', 'Malta', 'Luxembourg']
India	['india', 'rupee', 'Narendra Modi', 'New Delhi', 'Bollywood', 'Hinduism', 'caste system', 'Ganges River']
Middle_East	['middle east', 'Arab Spring', 'ISIS', 'oil reserves', 'Sunni', 'Shia', 'Israel-Palestine conflict', 'Gulf Cooperation Council', 'refugee crisis', 'Yemen war', 'Irak', 'Egypt', 'Tunisia', 'Algeria', 'Lebanon', 'Jordan', 'Turkey', 'Syria', 'Saudi Arabia', 'Kuwait', 'Qatar', 'UAE', 'Oman', 'Bahrain']
natural_disaster	['natural disaster', 'earthquake', 'tsunami', 'hurricane', 'wildfire', 'flood', 'volcano', 'tornado', 'drought', 'landslide']
war	[' war ', 'battle', 'military', 'invasion', 'casualties', 'peace treaty', 'siege', 'warfare']
inflation	['inflation', 'price increase*', 'price rise', 'rise in prices', 'increase in prices', 'CPI']
unemployment	['unemployment', 'joblessness', 'job loss', 'job cuts', 'layoff*']
GDP	['GDP', 'aggregate output', 'gross domestic product', 'economic growth']
interest_rates	['interest rate', 'saving rate', 'bank rate', 'MPC (decision—rate)', 'monetary policy committee (decision—rate)', 'base rate', 'repo rate', 'policy rate']

climate	['cbes', 'cfrf', 'co2', 'esg', 'gas', 'ghg', 'ice cap', 'ipcc', 'oil', 'acid rain', 'afforestation', 'aquaculture', 'aquaponic', 'arctic', 'bike lane', 'biodegradable product', 'biodivers', 'biofuel', 'biomass energy', 'blue economy', 'blue hydrogen', 'cap and trade', 'cap-and-trade', 'carbon', 'carpooling', 'clean development mechanism', 'clean energy', 'climate action', 'climate activism', 'climate adaptation', 'climate advocacy', 'climate change', 'climate communication', 'climate crisis', 'climate education', 'climate feedback', 'climate financ', 'climate justice', 'climate mitigation', 'climate model', 'climate polic', 'climate projection', 'climate refugee', 'climate related', 'climate research', 'climate resilien', 'climate risk', 'climate sensitivity', 'climate technology', 'climate variabilit', 'climate vulnerabilit', 'climate-related', 'coal', 'compost', 'cop[0-9]+', 'coral reef', 'corporate social responsibilit', 'cyclone', 'deforestation', 'desertification', 'drought', 'e-waste', 'eco-friendly transport', 'eco-label', 'ecotourism', 'ecoliteracy', 'ecolog', 'electric automobile', 'electric automobile', 'electric car', 'electric vehicle', 'emission', 'emitter', 'energy conservation', 'energy efficien', 'energy independen', 'energy storage', 'energy transition', 'energy use', 'energy-efficien', 'environmental', 'ethical consumption', 'extreme precipitation', 'extreme weather', 'flood', 'food security', 'food wast', 'forest conservation', 'forest restoration', 'fossil fuel', 'gasoline', 'gasoline consumption', 'geothermal energy', 'glacier', 'global temperature', 'global warming', 'green bond', 'green building', 'green econom', 'green financ', 'green growth', 'green hydrogen', 'green job', 'green new deal', 'green roof', 'green stock', 'greener', 'greenest', 'greenhouse gas', 'greenwash', 'heat island effect', 'heat stress', 'heat wave', 'heatwave', 'hfcs', 'hurricane', 'hybrid automobile', 'hybrid car', 'hybrid vehicle', 'hydro power', 'hydroelectric power', 'hydropower', 'kyoto protocol', 'land degradation', 'land use change', 'landfill', 'mangrove', 'marine conservation', 'marine protected area', 'methane', 'natural disaster', 'net zero', 'net-zero', 'ngfs', 'nitrous oxide', 'nuclear energy', 'ocean', 'ozone', 'paris agreement', 'passive solar design', 'permafrost', 'physical risk', 'plastic', 'pollution', 'pollution', 'rainwater', 'recycl', 'redd+', 'reforestation', 'refrigerant', 'renewable', 'sea ice', 'sea level', 'sea-level', 'shale', 'soil erosion', 'solar', 'sulphur hexafluoride', 'sustainable agriculture', 'sustainable development', 'sustainable fisher', 'sustainable packag', 'sustainable tourism', 'tcfd', 'tidal energy', 'tornado', 'transition risk', 'typhoon', 'unfccc', 'urban heat island', 'urbanisation', 'urbanization', 'waste disposal', 'waste management', 'water conservation', 'water scarcity', 'wave energy', 'wildfires', 'wildlife conservation', 'wind power', 'zero emissions', 'zero waste', 'zero-emissions']

Table 9: Geopolitics dictionary

10.7 Schwartz-Ziv and Weisbach dictionary

Key	Value
audit issues	['audit issues', 'auditing', 'audits', 'audit questions', 'issues surrounding the audit']
contracting or purchases	['contracting or purchases', 'contracting', 'purchases', 'procurement', 'vendor management', 'purchasing issues']
legal	['legal', 'legal matters', 'legal issues', 'compliance', 'legal questions', 'regulatory compliance']
ratification of audit committee	['audit committee', 'ratification of audit committee', 'audit committee approval', 'audit committee ratification', 'confirming audit committee', 'audit committee endorsement']
business issues	['business issues', 'business challenges', 'corporate issues', 'business concerns', 'business problems']
business projects	['corporate project', 'business project', 'business projects', 'corporate projects', 'project management', 'business initiatives', 'project planning']
cross-firm issues	['bank-wide', 'entire bank', 'whole bank', 'whole business', 'whole firm', 'entire business', 'entire firm', 'multiple divisions', 'inter-firm issues', 'cross-company issues', 'within-firm issues', 'company-wide issues', 'accross the firm', 'accross the company']
ongoing general issues	['ongoing general issues', 'general issues', 'continuous issues', 'persistent issues', 'recurring issues']
ratification of operational committee	['operational committee approval', 'operational committee ratification', 'confirming operational committee', 'operational committee endorsement', 'operational committee', 'operations committee', 'ratyfying operations committee', 'operations committee']
regulation and government	['regulation and government', 'regulatory', 'regulation', 'government regulations', 'regulatory issues', 'government compliance', 'regulatory compliance', 'government']
strategic issues	['strategy', 'strategic issues', 'strategic challenges', 'strategic concerns', 'strategic planning issues', 'strategic problems']
budget	['budget', 'budgeting', 'financial planning', 'budget issues', 'budget management']

state budget	['UK budget', 'Exchequer', 'Treasury', 'state budget', 'national budget', 'government budget', 'public budget', 'public spending', 'public finance', 'public funds', 'public money', 'public expenditure', 'public accounts', 'public purse', 'public sector', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money', 'public sector expenditure', 'public sector accounts', 'public sector purse', 'public sector budget', 'public sector spending', 'public sector finance', 'public sector funds', 'public sector money']

firm budget	['budgeting', 'financial planning', 'budget issues', 'budget management']
financial reports	['financial reports', 'financial statements', 'financial reporting', 'financial disclosures', 'financial summaries']
investment or finance	['investment', 'financing', 'financial management', 'investment strategies', 'financial planning']
ratification of financial committee	['ratification of financial committee', 'approving financial committee', 'financial committee approval', 'financial committee ratification', 'confirming financial committee', 'financial committee endorsement', 'financial committee']
appointments of members	['appointments of members', 'member appointments', 'committee appointments', 'board appointments', 'member selection']
approving past minutes of meetings	['minutes of the past', 'minutes of the previous', 'past minutes', 'approving past minutes of meetings', 'meeting minutes approval', 'minutes ratification', 'confirming past minutes', 'endors* meeting minutes']
choosing a chairman for the meeting	['new chair', 'choosing a chairman for the meeting', 'selecting a chairman', 'chairman appointment', 'meeting chairman selection', 'chairman election', 'chair appointment', 'appointing the chair', 'electing the chair']
formal issues	['matters of procedure', 'formal issues', 'procedural issues', 'formal matters', 'official issues', 'formal concerns', 'procedure', 'motions']
appointing or firing an executive	['appointing or firing an executive', 'appointing an executive', 'firing an executive', 'executive appointment', 'executive termination', 'executive management', 'fired manager', 'appointed manager']
organizational change	['organizational change', 'organisational change', 'change management', 'organizational transformation', 'organisational transformation', 'organizational development', 'organisational development', 'organizational restructuring', 'organisational restructuring']
personnel and benefits	['personnel and benefits', 'personnel', 'employee benefits', 'human resources', 'staff management', 'employee relations']
ratification of human resources committee	['hr committee', 'ratification of human resources committee', 'human resources committee approval', 'human resources committee ratification', 'confirming human resources committee', 'human resources committee endorsement']

supervisory topics	['audit issues', 'auditing', 'audits', 'audit questions', 'issues surrounding the audit', 'contracting or purchases', 'contracting', 'purchases', 'procurement', 'vendor management', 'purchasing issues', 'legal', 'legal matters', 'legal issues', 'compliance', 'legal questions', 'regulatory compliance', 'audit committee', 'ratification of audit committee', 'audit committee approval', 'audit committee ratification', 'confirming audit committee', 'audit committee endorsement', 'financial reports', 'financial statements', 'financial reporting', 'financial disclosures', 'financial summaries', 'regulation and government', 'regulatory', 'regulation', 'government regulations', 'regulatory issues', 'government compliance', 'regulatory compliance', 'government', 'appointments of members', 'member appointments', 'committee appointments', 'board appointments', 'member selection', 'minutes of the past', 'minutes of the previous', 'past minutes', 'approving past minutes of meetings', 'meeting minutes approval', 'minutes ratification', 'confirming past minutes', 'endors* meeting minutes', 'new chair', 'choosing a chairman for the meeting', 'selecting a chairman', 'chairman appointment', 'meeting chairman selection', 'chairman election', 'chair appointment', 'appointing the chair', 'electing the chair', 'matters of procedure', 'formal issues', 'procedural issues', 'formal matters', 'official issues', 'formal concerns', 'procedure', 'motions', 'personnel and benefits', 'personnel', 'employee benefits', 'human resources', 'staff management', 'employee relations', 'hr committee', 'ratification of human resources committee', 'human resources committee approval', 'human resources committee ratification', 'confirming human resources committee', 'human resources committee endorsement', 'operational committee approval', 'operational committee ratification', 'confirming operational committee', 'operational committee endorsement', 'operational committee', 'operations committee', 'ratifying operations committee', 'operations committee', 'ratification of financial committee', 'approving financial committee', 'financial committee approval', 'financial committee ratification', 'confirming financial committee', 'financial committee endorsement', 'financial committee']

managerial topics	['appointing or firing an executive', 'appointing an executive', 'firing an executive', 'executive appointment', 'executive termination', 'executive management', 'fired manager', 'appointed manager', 'budgeting', 'financial planning', 'budget issues', 'budget management', 'business issues', 'business challenges', 'corporate issues', 'business concerns', 'business problems', 'corporate project', 'business project', 'business projects', 'corporate projects', 'project management', 'business initiatives', 'project planning', 'bank-wide', 'entire bank', 'whole bank', 'whole business', 'whole firm', 'entire business', 'entire firm', 'multiple divisions', 'inter-firm issues', 'cross-company issues', 'within-firm issues', 'company-wide issues', 'across the firm', 'across the company', 'investment', 'financing', 'financial management', 'investment strategies', 'financial planning', 'ongoing general issues', 'general issues', 'continuous issues', 'persistent issues', 'recurring issues', 'organizational change', 'organisational change', 'change management', 'organizational transformation', 'organisational transformation', 'organizational development', 'organisational development', 'organizational restructuring', 'organisational restructuring', 'strategy', 'strategic issues', 'strategic challenges', 'strategic concerns', 'strategic planning issues', 'strategic problems']

Table 10: Dictionary used by Schwartz-Ziv and Weisbach (2013)

10.8 Risk and uncertainty dictionary

Key	Value
risk	['risk(?!scommittee)', 'concern*', 'volatil*', 'exposu*', 'worr*', 'danger*', 'risks', 'threat*', 'possibility', 'prospect', 'specula*', 'uncertain*', 'hazard*', 'likelihood*', 'probabilit*', 'gamble*', 'chance*', 'venture*', 'leap in the dark', 'peril*', 'danger', 'menace', 'dare', 'endanger*', 'jeopard*', 'imperil*', 'take a chance on', 'put in jeopardy', 'expose to danger', 'take the plunge', 'skate on thin ice']
uncertainty	['uncertain*', 'unpredict*', 'precarious*', 'state of suspense', 'ambigu*', 'unreliability', 'fickle*', 'inconclusiveness', 'chanc*', 'changeableness', 'doubt*', 'confu*', 'dilemma*', 'misgiving*', 'qualm*', 'bewilderment*', 'quandar*', 'puzzlement*', 'perplexi*', 'mystification*', 'hesita*', 'indecision*', 'lack of confidence', 'vagueness', 'irresolution', 'unsureness', 'scepticism', 'ambivalence', 'disquiet', 'vagueness', 'hesitancy', 'vacillation', 'lack of conviction', 'irresolution', 'dubiety', 'doubtfulness']

Table 11: Risk Uncertainty dictionary

10.9 World Bank typology dictionary

Key	Value
Agent Banking	['Banking Correspondents', 'Agent Banking']
Bank Asset Quality	['Asset Quality']
Bank Auditing	['Audit(?!committee)']
Bank Capital Adequacy	['Capital Adequacy Ratio', 'Tier 2 Capital', 'Tier 1 Capital', 'Capital Adequacy']
Bank Downscaling	['Downscaling']
Bank Earnings	['Earnings']
Bank Internal Controls	['Internal Controls']
Bank Liquidity	['Liquidity']
BOE	['Bank of England', 'PRA', 'ICAAP', 'BOE', 'Prudential Regulation Authority']
FED	['Federal Reserve', 'FED']
ECB	['ECB', 'European Central Bank']
Bank Regulation and Supervision	['Bank of England', 'PRA', 'ICAAP', 'BOE', 'Prudential Regulation Authority', 'Regulator', 'Federal Reserve', 'FED', 'ECB', 'European Central Bank', 'Financial Sector Oversight and Policy', 'Banking Supervision', 'Financial Sector oversight and policy/banking regulation restructuring', 'Banking Regulation and Restructuring', 'Banking Regulation', 'Bank Regulation and Supervision', 'basel', 'bcbs', 'cpmi', 'bis', 'fsb', 'Banking Supervision International Standards', 'International Standards for Banking Supervision', 'BCBS', 'Core Principles for Effective Banking Supervision', 'Basel Committee on Banking Supervision', 'Bank for International Settlements','Financial Stability Board']
Bank Resolution and Crisis Management	['Insolvency', 'Resolution and Crisis Management']
Bank Sensitivity	['Sensitivity']
Bank Treasury Management	['Treasury Management']
Banking Delivery Channels	['Delivery Channels']
Banking Institutions	['Banking Institutions', 'Institution Strengthening and Building']

Banking Management Information System	['Management Information System']
Banking Network Management	['Network Management']
Banking Organization Design	['Organization Design']
Banking Risk	['Risk Diagnostic', 'Risk Governance', 'Risk Management', 'Operational Risks', 'Risk Packages', 'Banking Risk and Compliance', 'Concentration Risk', 'Risk Concentration']
Banking Strategy	['Banking Strategy']
Banking on Women	['Banking on Women']
Bankruptcy and Liquidation	['Insolvency', 'Closing of Business', 'Business Debt Resolution', 'Bankruptcy and Liquidation']
Branchless Banking	['Branchless Banking']
Central Banks	['Central Bank*', 'Central Banking Institutional Set-up', 'PRA', 'ICAAP', 'Regulator', 'Federal Reserve', 'European Central Bank']
Commercial Banking	['Commercial Bank*']
Core Banking Products	['Core Banking Products']
Core Principles for Effective Banking Supervision	['Banking Supervision International Standards', 'International Standards for Banking Supervision', 'BCBS', 'Core Principles for Effective Banking Supervision', 'Basel']
Corporate Governance of Banks	['Corporate Governance']
Cyber Security for Banking	['cyber', 'Computer Security for Banking', 'Cyber Security for Banking', 'Technology Strategy and Planning']
Financial Architecture and Banking	['Financial Architecture and Banking']
Internet Banking	['Online Banking', 'Electronic Banking', 'E-Banking', 'Internet Banking']
Merchant Banks	['Merchant Banking', 'Merchant Banks']

Mobile Banking	['app', 'WAP Banking', 'Wireless Application Protocol (WAP) Banking', 'Mobile Banking']
Performance Evaluation and Incentives in Banking	['Performance Evaluation and Incentives']
Postal Savings Bank	['Postal Savings']
Product Design in Banking	['Product Design']
Retail Banking	['Retail Banking']
CBDC	['digital currency', 'CBDC', 'digital pound']
crypto	['crypto*', 'bitcoin', 'ethereum', 'btc', 'eth']
SME Banking	['Small and Medium Enterprise', 'SME']
BASEL	['basel', 'bcbs', 'cpmi', 'bis', 'fsb', 'Banking Supervision International Standards', 'International Standards for Banking Supervision', 'BCBS', 'Core Principles for Effective Banking Supervision', 'Basel Committee on Banking Supervision', 'Bank for International SettlementsFinancial Stability Board']

Table 12: Modified World Bank typology dictionary