REPRESENTING DATA TO IMPROVE POLICY RECOMMENDATION ON CORRUPTION

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ABSTRACT

Corruption is a significant problem that challenges democracies around the world. It may not be that widespread in the United Kingdom, but it has long been a source of contention in the parliament for many years now. The ambiguity of donations to political parties in power and opposition is one of the major reasons for this which also leads to seeds of doubt in the mind of citizens who wonder about the purpose of the donation. Just having a graphical representation of the analysis of the raw data would help researchers, policymakers, law enforcers, and the general public to understand the influence of such financial contributions in terms of policy or decision-making. In this project, we use the electoral commission's dataset of political donations reported by the parties to them to analyze any kind of trends or anomalies in terms of donation value, method, donor name, political alliance, and location over the timeline of 2010 to 2022. We use the business intelligence tools of PowerBI to visualize these analytical findings into a detailed Interactive dashboard. The analysis of the donation dataset shows that there was an increase of around 80% over the average value of the timeline in the donation amount from companies and individuals during the election year of 2019. Furthermore, there was a surplus of 28% and 30% in the donation amount for the election years of 2015 and 2017 respectively. This suggests that there is a trend for the donation amount coming from companies and individuals to increase prior to the elections.

***K*eywords** Corruption · Political Party · Donations · Data Analysis · Data Visualization · Interactive

1 Introduction

It has been a long time since Corruption and its complications were a concern for democracies across the globe, with not much impact in some countries but showing presence in all [1]. While corruption can be done in many forms such as clientelism, embezzlement, lobbying, patronage, etc the most common way it is done is through bribery as mentioned in [2]. One of the methods of bribing for personal profit is through political donations to a party since there is no limit on how much a party can accept in terms of donations[3]. Political donations can be traced back to

the founding of the United Kingdom's democratic institutions. Historically, wealthy elites, often aristocrats and industrial magnates, funded the country's political parties in order to exert influence over political events, monitoring the sources and means of distribution of political donations is crucial for safeguarding political transparency and the democratic values of the legislation [4][5]. According to a 2021 article from BBC News [6] some parties spent upwards of £50 million during the general election of 2019. Financial Contributions made by individuals, companies, trade unions, and other sources serve as a backbone to the political parties as it helps them run the election campaign, create new policies and run other political activities[7] [8] [9]. Forced disclosure of political donations over £7500 to the general public was introduced in the Political Parties, Elections and Referendums Act (PPERA) in 2000[10] making the data availability for past donations limited and visualizing it a daunting task. It also made it mandatory for the parties to disclose donation requirements, the number of donations accepted and establish donation limits. [11] gives us an idea of how there have been variations in the tendencies of political donations depending on whether there were any events in that time frame which displays how crucial determining trends over time in terms of transparency for each party is. In addition, evidence shows that contributions from companies have grown in popularity, generating concerns about big businesses' unwarranted influence on policymaking [12].[13] also suggest that as corporate donations are frowned upon in the UK political landscape, Individual donation often go unnoticed as such we can see that sometimes companies don't directly donate to a political party but associate individuals under the corporate supply the financial remunerations and these type of fundings have been gaining popularity. Although the law requires political parties to report donations, the complexity of the fundraising ecosystem often makes it difficult to collect comprehensive and easy-to-understand statistics, incomplete or misleading reporting and potential loopholes can hinder efforts to get a full picture of political contributions as stated in another BBC article of 2021[14], which also explains how the parties exploit these actively.

Williams et al., define data visualization as "a cognitive process performed by humans in forming a mental image of domain space. In computer and information science, it is, more specifically, the visual representation of a domain space using graphics, images, animated sequences, and sound augmentation to present the data, structure, and dynamic behavior of large, complex data sets that represent systems, events, processes, objects, and concepts."[15]. This type of representation would contribute to helping researchers, policymakers, law enforcers, and civil organizations who make reformative decisions and policies in enforcing transparency and fairness regarding monetary donations in the political landscape.

The study aims to gain insights into several concerning questions found in the data such as:

(a)What is the overview of the domestic political donations in the UK political system?

(b)What are the sources and nature of these donations for each party and whether there is a bias in certain types of donors towards any?

(c)Whether there is any change in trends of the incoming donations sources for the parties over time and is there any discrepancy in the number and amount of donations between the non-election years and election years?

(d)how do such financial contributions impact the campaigning strategies for parties and does the location play into account during the elections?

We provide customized interactive dashboards for the overview of the UK and the city of London specifically according to user requirements with analysis and graphical representation of all the insights. It can be used by anyone who wants to gain information about the topic by using a

visual demographic. The work is reproducible with the used dataset, the progression steps and the dashboard itself uploaded to a public project repository.

2 Related work

The related work on this topic is recognized into two sub-topics based on the process:

2.1 Political Data visualization

Corruption isn't a new incident and has also been dated back to the reform act of 1832 for England [2]. Multiple study comparisons between the UK and other countries of the world have been conducted to get an idea of the impact of donations based on geographical, cultural, and technological differences among them. As the restriction on corruption activities started increasing in the UK and new reforms started forming from PPERA in 2000 [10] to the Bribery Act in 2010[16] and the National Anti-Corruption Strategy 2017–2022[17], the data related to such events started coming to light.
Fischer provides a view on how the value of domestic political donations have often seen a trend change during the election cycle and the sources of donations are often biased towards one over another party which suggests concerns about the democratic integrity regarding this funding culture. [18] Knowing Sources of donations is also really important in terms of policy making as in the UK political scene monetary donations coming from individuals are not paid much attention, Danielle tries to uncover how company directors indirectly make donations for the company's personal agenda under the pretense of individual donations by measuring the political affiliations and sensitivity of different groups of industries during the 2010 general election[13].
Mirko et al., shines a light on how the resources gap between the political parties has increased now to approx £27 million as opposed to the average £8-10 million from ago and how just a few donations from some "super donors" have been influencing the political scene in recent years by analyzing the donation data of different political parties for the past 20 years[19].
This study aims to further explore the data and gain new insights about the donations, investigate discrepancies during any event during the temporal frame of the data, add a geospatial perspective, and also do deeper research on the data of some parties that were not included in the related work.

2.2 Analysis using powerBI

Interactive dashboards and visualizations allow the users to easily understand, organize and navigate through complicated data and help them in making better decisions through improved effectiveness of the analysis displayed[20]. Khatuwal and Puri demonstrate the need and usefulness of BI(Business Intelligence) software used for interactive visualizations and user engagement by comparing a number of dashboard tools like Tableau, PowerBI, and others [21].
PowerBI is one of the most popular software in this aspect as it can easily transform extensive datasets into clean and detailed analytical reports which are easy to share using the web as well for group research or as conveyed by Krishnan et al. [22]. Webb teaches us how the power query feature of PowerBI following the ETL(Extract, Transform, Load) process flow can be used to shape and manipulate data by performing tasks like removing rows, changing the datatypes of the columns, adding new or derived columns or even writing custom formulas and codes [23]. Bhargava et al showcase the use of default and custom visual tools to create a dashboard from scratch consisting of multiple types of data and how it can be portrayed to the user using a different visual tool based on the needs[24]. Clark talks about how data containing location components can be easily mapped on

map tools like Sypnotic Panel, Globe Map, or ArcGis by Esri to get the geographical viewpoint of the data[25]. Jesús et al., demonstrate how predictive analysis can be done in PowerBI with the forecasting features by using the past gaming industry data of three years from 2017-2019 to predict the increasing trend and generate revenue sales for the next 5 years[26]. Taylor suggests how the layout and purpose of a PowerBI dashboard should be by explaining the key concepts such as optimization, user-friendliness or customization needed for a dashboard and how it should be methodically catered to a specific objective or business problem for it to be a valuable tool for both the researcher and the user [27]. The aim of the study is to use different tools like charts, cards or maps and methods of analysis such as key point indications or forecasting of the PowerBI software to create interactive dashboards that convey the answers to challenging questions of the data.

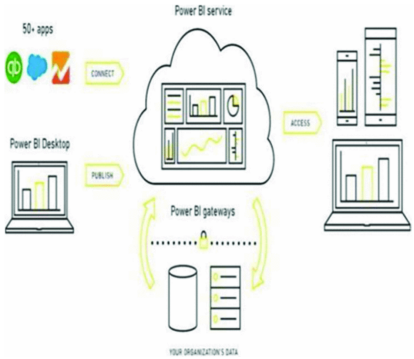


Figure 1: PowerBI process workflow from [21]

3 Methodology

The study follows the same approach specified in Fig. 2 starting from data transformation to the final dashboard creation and insights documentation.

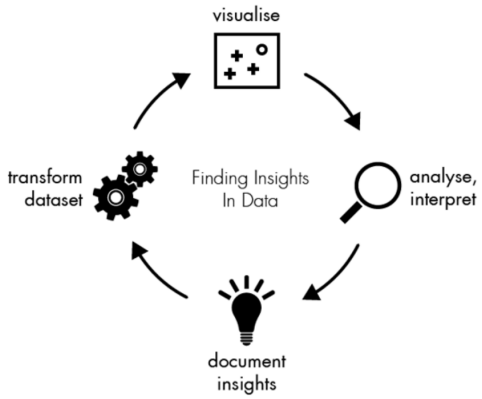


Figure 2: Adopted Methodology flow from [28]

3.1 Data Introduction and Preprocessing

The data used in this project is taken from the public electoral commission database which stores information on the registers of Political Parties, Non-party campaigners, and Referendum Participants in the database of donations, loans, election/referendum spending, and party accounts [29]. This dataset contains data about donations from 2001 to 2023 but we select the data from 2010 to 2022 as it is more relevant for the scope of this study. The dataset contains 48 thousand entries with the amount of donation, method of donation, type of donor when the donation was received and accepted by the party, and the party it was donated to.
For visualizations to be precise and clear for understanding it is very important for the imported data to be clean and in the right format as noisy or incomplete data will only harm the analysis and could lead to incorrect or biased representation of the data [30]. In this aspect, we first filter out the blank rows and corrupted rows from the dataset. Then for the temporal analysis, we change the datatype for the dates and convert it into a DD/MM/YYYY format, we also extract the year from it as a separate column to get more precise information for the yearly analysis. The data field value for the column containing the postcode is changed to the location field. Some column values such as 'limited liability partnership' and 'Company' of donor status which are essentially the same have been merged together with others to create a single-column value for a more clear perspective. Similar preprocessing has been done to multiple columns to further tidy the data.

3.2 Dashboard Design

3.2.1 Overview

The aim of the dashboard design is to be minimalistic, consistent, responsive, have user freedom, and be informative using tools available from Microsoft PowerBI.This includes presenting the different types of visualization and data analyzed to be aesthetically appealing and insightful to the users using shapes and formatting the visuals [31]. The Dashboard is designed to be flexible and efficient with the use of buttons and filters to navigate between pages and manipulate data according to necessity. We also use custom slicers and drill-through features for a more in-depth analysis of a graph. The colours used for the background were taken from the Tableau 10 colour palettes which is a collection of distinctive colors selected specifically to be more visually elegant, easier to distinguish, take color blindness into account and compatible on screen as well as a print[32]. The corresponding graphs and card labels are grouped together with respect to similarity and in a clean organized format with refined titles, fonts, axis names and sizes, and background effects. An image panel has been used to display the menu for the navigation between the dashboards and bookmarks have been used to switch between the visuals.

3.2.2 User-Centric Approach

The study was co-supervised together with researchers from Spotlight on Corruption, with an expert in corruption research and one expert well-versed in anti-corruption laws. The data was explored to get a better idea of what information was available and a few of the challenges were discussed. One of the important challenges was to see how the donation from donor sources like companies, individuals, and trade unions were during the timeframe. Another was to see how the political landscape of the 24 postcodes of the city of London was. An iterative design approach was taken for the study with a constant discussion about the objectives identification, visualization prototyping,

analytical evaluations, and the construction of the final dashboard designs containing the graphical representation of critical information.

3.3 Visualization Methods

3.3.1 Comparative Analysis and Visualization

Comparative analysis and visualization are the studies of two or more referential entities, and can also be seen as a multidimensional visualization i.e. political parties in the case of this study. Johanna explains the different types of flows through which comparative analysis can be done[33], we employ the superposition approach from it using graphs to compare the data of major parties like the Conservative Party, Labour Party, Liberal Democrats, and the Scottish national party. We also compare the method of donations such as cash, non-cash, and public funds using bar and donut charts between the parties. The colours used to denote each party is the official colour assigned to them[34]. We also compare the amount donated by the type of donor which are the Company, Individual, trade union, public fund, and unincorporated associations with the help of ribbon and line chart.

3.3.2 Temporal Visualization

The definition of temporal visualization is the process of exhibiting data over time points to see progress or changes in trends over time. Verena et al. explains how visualizing temporal data helps us further develop our understanding of event outcomes over the time domain [35]. Visualization tools such as line charts and bar charts were used since they are extremely efficient and accurate to represent the time data. In our case, we used bar charts to compare the trends in the method of incoming donations for different parties as the labels and consistent colour usage make it easier to understand for any user. The trend line feature is also used to show the pattern of donations to individual parties every year. There are also seasonal variations in terms of donations with respect to any events happening in between major elections, we used a line chart to display such occurrences as the donation disparity during the Brexit Referendum in 2016. The line chart is also used to show the overall tendency of the donations for each party with markers for major events such as the elections during the timeline.

3.4 Forecasting

Visualizations that have a time series aspect can also be used to forecast future patterns by analyzing the existing data and the seasonality changes. Liu and Chen demonstrate how quantitative data over a temporal scale can be used for forecasting by predicting the annual sales growth rate of an enterprise and comparing it with actual sales data to find out the accuracy of the method [36]. Adel describes the need and methods for forecasting using powerBI in simple steps[37]. We use this method to predict the total amount of donations expected annually from the city of London postcodes for the upcoming years up to 2030 with a seasonality of 5 years for general elections.

3.4.1 Geo-spatial Visualization

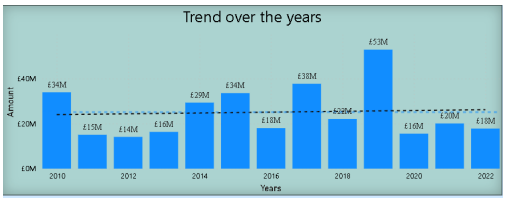
Geo-spatial visualization is the representation of data points in a geographical context such as a map. Another benefit of this type of visualization is that we can merge it with the temporal analysis to gain insight into how the trends have changed over time and highlight locations that have huge amounts or huge numbers of donations to signify the influence on the political scene [38]. Since there is no

data available on postcodes of individual donations, we only track the locations of companies, trade unions, public funds, and the unincorporated associations. We tried multiple map options like shape, heat, and filled but used the ArcGIS map to display for individual parties as it provides the more refined version of the map and its easier to find patterns or concentrations of donations and use the PowerBI map feature for the overview of the UK and City of London as it provides a more detailed street view for comparative study among parties. The colours used to represent the data points on the maps are the corresponding party colours which help in determining the party the donation was made to and the size of the bubble corresponds to the amount that was donated from that location.

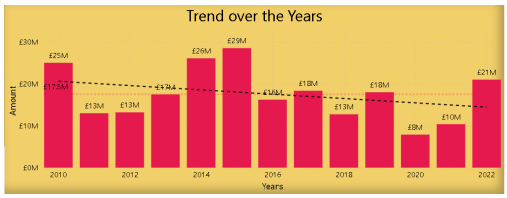
4 Results

4.1 Trend Analysis

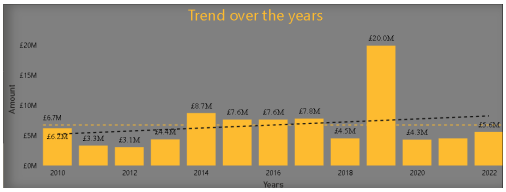
The amount of donations for each party was summarized and distributed annually.



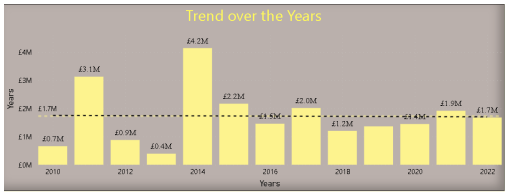
(a) Conservative Party



(b) Labour Party



(c) Liberal Democrats



(d) Scottish national party

Figure 3

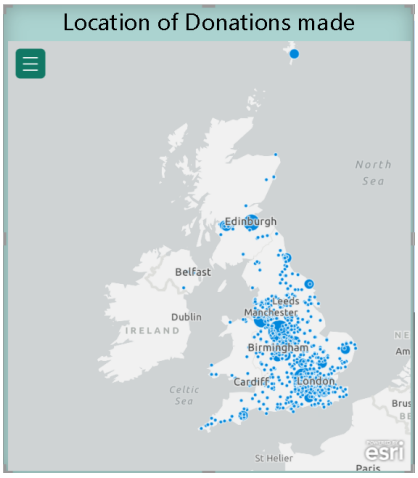
Fig.3 reveals how the distribution of the donation value over the time was for all parties and how the value of donations changed over time, with spikes and drops. We can clearly see a slightly increasing trend in donation amounts for the Conservative Party after 2010. The average donation for the Conservative Party was approx £25.1 million over the years, the donation amount for Liberal Democrats showed a trend of growth as well with the average donation being £6.7 million. Similarly, the donation amount for the Scottish National Party also saw a slight increase in trend over the years with the average donation amount being £ 1.7 million. Labour Party was the only party that showed a negative trend in the donation amounts with a drop of an average donation amount of 17.5 million for the 12 years.

The highest amount of donation for the Conservative party was £ 53 million in 2019 which accounted for 16.20% of the overall donations which was an increase of 275% over the lowest amount donated in 2012 which was £ 14 million. Similarly, for the Labour party, the highest donation was in 2015 with £ 29 million which amounted to 12.52% of the total donation amount and was a 262% difference over the lowest amount of £ 8 million in 2020. For Liberal Democrats the highest amount was £ 20 million in 2019 which accounted for approx 23% of the total donation value, it was a 553% increase from the lowest donation which was £ 3 million in 2012. Scottish National Party had the highest amount of donations in 2014 with an amount of £4.1 million which was 18.46% of

the total amount donated over the year and a 956.62% difference from their lowest donation valued at £400 thousand in 2013.

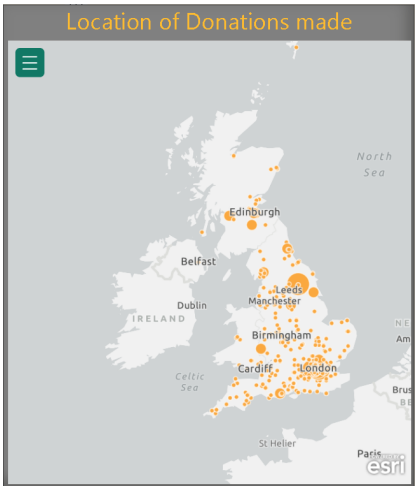
4.2 Location Analysis

The contributions apart from individuals are coming from other sources of donations registered to a location with a postcode. By analyzing the number and amount of donations we can find favorable locations for each party.

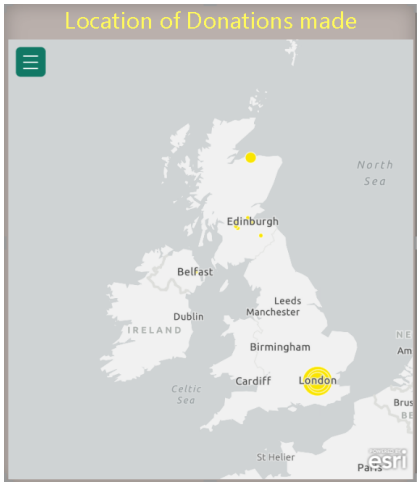


(a) Conservative Party

(b) Labour Party



(c) Liberal Democrats



(d) Scottish national party

Figure 4

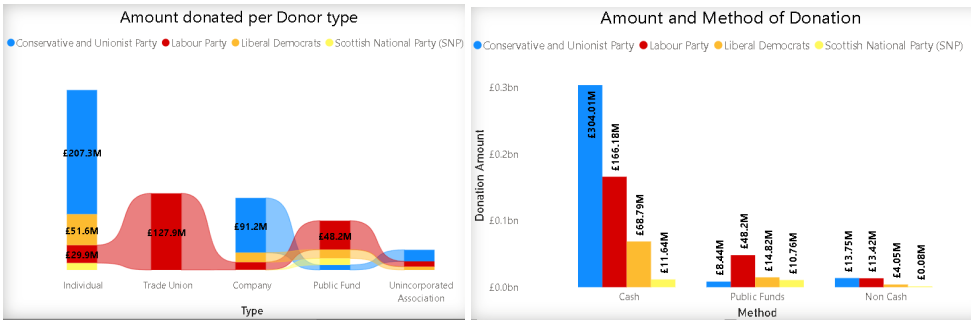
As Fig 4. suggests, while many of the sources of donations seem to be based in or around the city of London other parts of the UK can also be seen prominently supporting different parties. Conservative party seems to have influence in large donations being offered from areas near a number of major cities such as Birmingham, Liverpool, Newcastle up to Edinburgh. Labour Party has had leading donations from sources based in Manchester, Hull even Glasgow. Liberal Democrats have received big donations from places near York, and Glasgow, and a number of donations from near Southampton. Huge Donations for the Scottish National Party seem to be coming from the northern part of the UK near Edinburgh.

4.3 Source and Method of Donation

Donations from sources are often biased towards a certain party which they are often allied with.

Political Party	Company	Individual	Public Fund	Trade Union	Unincorporated Association
Scottish National Party (SNP)	£193,466.65	£11,529,352.84	£10,763,998.37	-	-
Liberal Democrats	£15,912,565.99	£51,558,408.4	£14,820,312.24	-	£5,372,148.26
Labour Party	£12,816,244.04	£29,932,645.19	£48,202,561.87	£127,862,580.01	£8,985,719.12
Conservative and Unionist Party	£91,247,455.57	£207,272,917.36	£8,442,387.17	-	£19,243,842.81
Total	**£120,169,732.25**	**£300,293,323.79**	**£82,229,259.65**	**£127,862,580.01**	**£33,601,710.19**

Figure 5: Tabular representation for Method of Donations



(a) Sources of Donations (b) Method of Donations

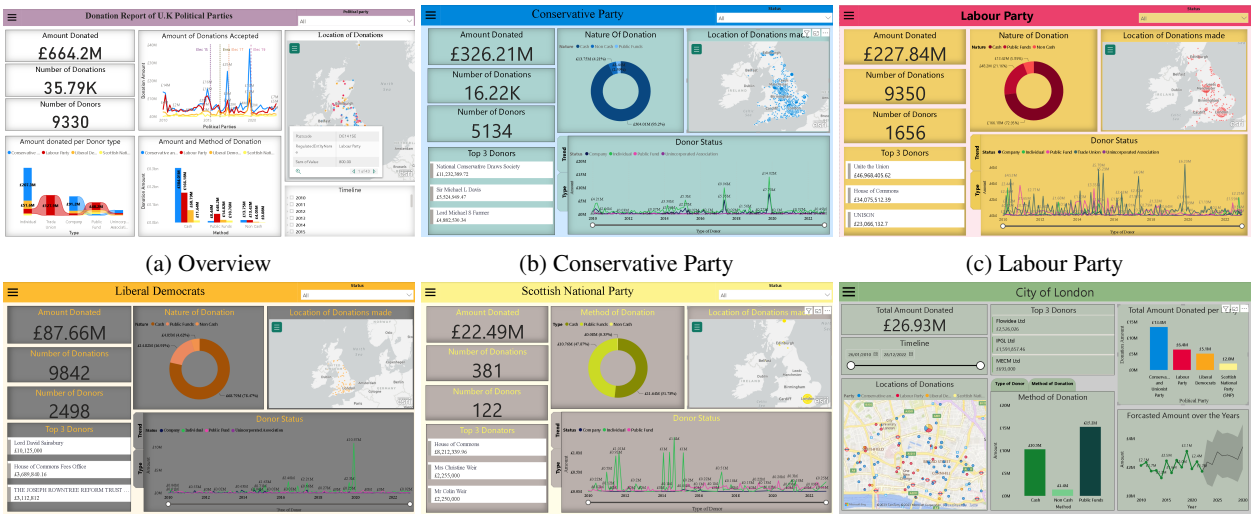
Figure 6: Graphical representation for Source and Method of Donations

Fig 5 and Fig 6(a). demonstrates the different sources and their political party alliance with the Conservative Party getting £207.3 million from individual donations and £91.2 million from Company donations itself, The Labour Party on the other hand got £127.9 million from Trade Unions alone, and Public fund of £ 48 million, Liberal Democrats had £51.5 million from individual donations and approx £15-16 millions from public fund and company respectively. Scottish National Party had £11.5 million from individual contributions and £10.7 million from public funds.
From Fig 6 (b). , it can be concluded that most of the donation funding was done through cash as the method with the amount of £550.6 million out of the overall £664.2 million. The next popular method was the public fund which tallied to £82.2 million and lastly, the Non cash method was the least used method with a value just amounting to £ 31.3 million of the total.

4.4 Dashboards

There are dashboards designed for an overview, of the Conservative Party, Labour Party, Liberal Democrats, Scottish National Party, and the City of London.

Multiple graphical representations of the key findings and critical insights such as the donation trends during important time periods such as the elections of 2015,2017,2019 and the Brexit referendum in 2016 marked on the timeline and the geospatial representation donation of all political parties for the whole of the UK and City of London is done in Figure 7. The City of London dashboard also contains visualizations of nature i.e. the method and sources of donations and also the top 3 donors for the city. Similarly, the top 3 donors for each party along with the number of donations and donors are also displayed on their respective dashboards.



(a) Overview (b) Conservative Party (c) Labour Party

(d) Liberal Democrats (e) Scottish national party (f) City of London

Figure 7: Designed Dashboards

5 Discussion and Conclusion

After conducting a number of analyses and representing it using graphical visualizations, multiple dashboards displaying the critical information were designed. The study successfully analyzed the donation value trends for each party and found an increase in the amount over the years except for the Labour Party with the amount donated between the highest and lowest value ever in a year being a difference of 275% for the Conservative Party,262% for Labour Party, 553% for Liberal Democrats and Scottish National Party with a huge 956% disparity and the trend change in the donation amount between the parties.The bias among the sources of donations was also found out with high individual and company donations for the Conservative Party and the Trade Unions donating to the Labour Party. There were a few limitations to the study such as there was no geographical location of individuals recorded which amounted to the majority of the donations data. As there was only one quantitative element which was the donation value which made the visualizations a bit dependent on that variable. Since there was limited data not much modeling could be done. There is potential for future scope in this study, with a larger dataset containing data from years prior to 2010 and different methodologies new insights can be found. More political parties can be included in the research. With different visualization software, distinctive visualizations can be created. By using different language scripting such as Python or R various modeling techniques can be implemented on the data with more precision. Although this study only focuses on domestic political donations, Foreign political donations can also be researched and combined with the data to get an overview of the political funding of the UK.

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