Supplementary Material

List of Abbreviations

MP Members of Parliament, or persons elected by all those who live in a particular area (constituency) to represent them in the House of Commons. MPs consider and propose new laws, and can scrutinise government policies by asking ministers questions about current issues either in the Commons Chamber or in Committees

UK United Kingdom of Great Britain and Northern Ireland

NATO North Atlantic Treaty Organization

EU European Union

EEC European Economic Commission

BBC British Broadcasting Corporation

DUP Democratic Unionist Party

SNP Scottish National Party

Hansard

The following are the most relevant links related to the data extraction phase:

- http://explore.data.parliament.uk/?endpoint=commonsdivisions
  This contains the URI code, i.e. a six-digit identifier for each division: 1109556, 1108905, etc.

- `http://lda.data.parliament.uk/commonsdivisions/id/1109556.json`
  This is the link which I use to extract the voting (Aye / No) data for each MP. Note that I replace the 6-digit URI code to refer to different divisions.

Network Visualization

The base framework of the force-directed algorithm that is used in this work is taken from Jacomy et al. (2014). The attraction force F_a between two nodes $\mathbf{a}$ and $\mathbf{b}$ is directly related to its edge, or the weighted distance $w(e) \times d(\mathbf{a}, \mathbf{b})$:

$$F_a = w(e) \times d(\mathbf{a}, \mathbf{b})$$

Meanwhile, the repulsion force F_d between two nodes **a** and **b** is a function of their weighted distance, each node's number of links (i.e. the degree) and a parameter k_r:

$$F_r(\mathbf{a}, \mathbf{b}) = k_r \frac{(deg(\mathbf{a}) + 1)(deg(\mathbf{b}) + 1)}{w(e) \times d(\mathbf{a}, \mathbf{b})}$$

where k_r are user-defined settings on the gravity and scaling of the network

The other details in the network implementation are as follows. For full definitions and explanations for each parameter, refer to Jacomy et al. (2014).

- **Number of threads** imply more speed (more multithreading jobs). The setting was set to 3.
- **Tolerance** implies the amount of swinging, and a lower number implies more precision. The setting was 1 (default).
- **Scaling** is the repulsion parameter of the graph, where higher numbers show greater sparsity. The setting was set to 2.
- **Gravity** attracts nodes to the center, and prevents nodes from drifting. The setting was default (1).
- **Edge weight influence** was set to "normal." The other option was "no influence."

Accuracy score calculation

Using the computed eigenvector centralities for each MP, we compared each predicted result with their actual vote on the Brexit bill proposed on October 22, 2019. There were two debates held that day on the withdrawal agreement bill, one at 7:00 pm, where the Ayes won 329-299; and a second debate at 7:16 pm on the expedited timeline, where the Noes won 308-322. We compared their predicted result with their response to the second debate.

We predicted the rebels using the elbow method, where we plotted the distribution of all 639 eigenvector centralities and selected the inflection point of the curve as the cut-off. The elbow of the distribution is at the value 0.21, as illustrated in Figure S1, and MPs with centralities to the left of the curve (≥ 0.21) were predicted as rebels.

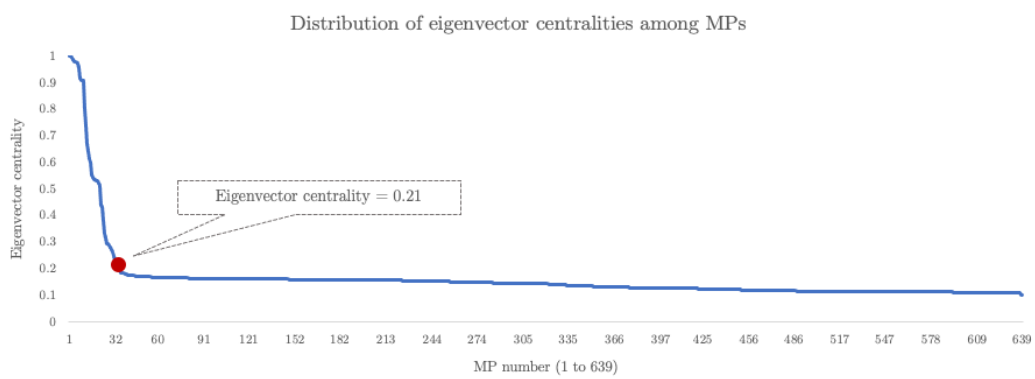

Figure S1: The eigenvector distribution.

Plotting the confusion matrix, we get the following result in Table S1. The accuracy score, calculated by $(TN + TP)/(TN + FP + TP + FN)$, is $(580 + 20)/(20 + 14 + 25 + 580) = 94\%$.

		Actual: Rebel = Yes	Actual: Rebel = No
Predicted	Rebel = Yes	20 (TP)	14 (FP)
	Rebel = No	25 (FN)	580 (TN)

Table S1: Confusion matrix of voting outcomes for all 639 MPs.