Entangled Politics: Measuring Parliamentary Specialization and Politicization using Topic Linkage

Ruben Ros[a], Melvin Wevers[b]

[a]*Leiden University Center for Digital Humanities, Leiden University, Leiden, the Netherlands*
[a]*Dept. of History, Leiden University, Leiden, the Netherlands*
[b]*Dept. of History, University of Amsterdam, Amsterdam, the Netherlands*

Abstract

1. Introduction

After the Second World War, Dutch parliament drastically expanded its scope, as the state intervened in an expanding array of areas. Consequentially, the expertise-infused administration pressured parliament to bolster its efficiency and knowledge about increasingly complex policy areas [1]. This led to specialization in parliament, expressed by the formation of permanent committees in 1956 and a growing informal role for party specialists. As a result, parliamentary deliberation witnessed the rise of isolated, technical discussions in which ideological conflict was moderated by consensus among specialized members [2, 3]. At the same time, the nature of parliament and politics, then and now, runs counter to specialization. As speakers posit new ideas, attack or propose legislation, amendments, or motions, they engage in politicization, challenging existing ideas about what is considered political, and what is not [4, 5]. This open-ended nature of parliamentary politics threatens specialized expert-driven ways of approaching politics, since consensual technical discussion leaves little room for contingency and ideology.

This paper examines how the interaction between specialization and politicization unfolded between 1946 and 1967. It specifically asks if, when, and how specialization is visible in the postwar Dutch Lower House. Moreover, it asks how politicizing phenomena confront and interact with specialized discursive communities. We investigate these questions by considering specialization as a specific form of increasing topical connectivity. Variation in the connectivity between policy areas is likely to indicate the emergence of specialized fields of parliamentary politics. Using topic modelling and network analysis, we measure this process. Building on this idea of specialization as increased linkage, we consider politicization to be the inverse of this trend. If a topic is politicized, its connections change and intensify, disrupting the stable (specialized) community structure it resided in. We expect to find discursive specialization, especially in the 1950s, when the literature suggests specialist power was institutionally embedded in the parliamentary procedure [3, 1]. However, we also expect the politicization of topics to appear consistently through this period. Using our method, we aim to shed light

DH Benelux, May 31 - June 2, Brussels, Belgium
r.s.ros@hum.leidenuniv.nl (R. Ros); melvin.wevers@uva.nl (M. Wevers)
http://www.rubenros.nl (R. Ros); http://www.melvinwevers.nl (M. Wevers)
0000-0002-5303-2861 (R. Ros); 0000-0001-8177-4582 (M. Wevers)

on the interaction between specialization and politicization, and uncover who and what were important drivers for this entangled politics.

2. Data

We use the digitized parliamentary proceedings of the Dutch Lower House for the period 1946-1967 [6, 7]. We prepared the data by removing stop words, speeches shorter than ten words, and words other than nouns, verbs, adjectives, and adverbs. We also omitted speeches made by the House chair, who commonly introduces large amounts of procedural, repetitive, non-informative, language.[1]

3. Method

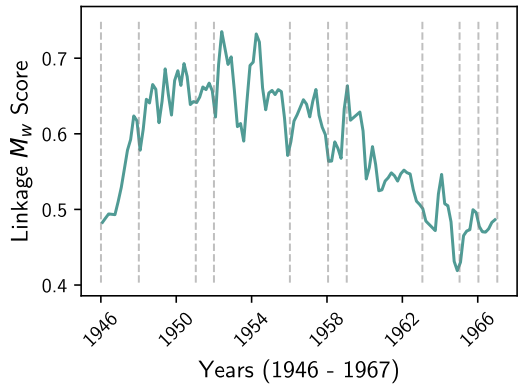
Rather than examining the parliamentary debates in all their complexity, we turn to **topic modeling** [8] to transform the texts into probability distributions of words across a limited number of topics, and topics across documents, hereby effectively reducing the complexity of the texts (see Appendix A for more details). Next, we use this distribution to compute **topic linkage**, a variant of mutual information, that expresses how connected the topic structure of a set of texts is [9]. Linkage relies on conditional probabilities that express how probable it is for topic A to appear in a text that also mentions topic B (for more on linkage, see Appendix B). Finally, we use the temporal linkage scores as inputs for **network analysis**. With linkage scores as edges between topic-nodes, network metrics can be leveraged to investigate diachronic change and the changing architecture of (specialized) parliamentary topics. The network metrics include the network-level descriptive statistic: modularity, and two node-level statistics: degree and betweenness to look at topic connections.

Modularity is a common metric used to determine the extent to which a network is marked by a community structure [10], in our case areas of specialization. High modularity would indicate the existence of siloed and specialized communities. **Degree** measures the general connectivity of a node, while **betweenness** indicates the degree in which a node has a bridge function between communities [11]. We hypothesize that sudden bursts in connectivity could be caused by the topic being connected to new topics. Also, high betweenness could indicate a topic being politicized, forming new connections to previously unconnected topics. However, using node-level degree and betweenness to measure politicization is constrained by two factors. First, both could be dependent on topic prominence. Second, degree and betweenness tell us little about the novelty of the new connections. Only if a topic is connected to topics outside a specialized community would rising degree or betweenness indicate politicization. In what follows, we explore how these metrics interact.

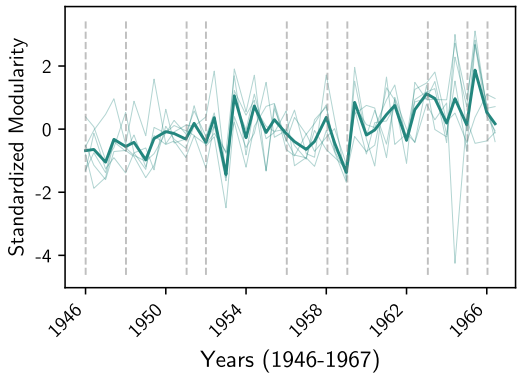
4. Results

Specialization increased over time. Figure 1a shows the weighted topic linkage, i.e. the general connectivity of parliamentary discourse, over time. The time series shows two clear trends. First, between 1946 and 1952, we see a period of steady increase, first rapid—during the

[1] This type of language disproportionately affects the topic model and the subsequent linkage scores. In addition to the conceptual reason, we left it out for methodological reasons.



(a) Linkage M_w over time 1945-1967. A non-linear adaptive filter is applied to extract a clearer signal [15].



(b) Modularity over time 1945-1967. The dark line shows the mean diachronic modularity calculated over different edge weight thresholds in the range of 0-4 (the lighter lines). These thresholds remove connections with a linkage score lower than the threshold, leading to differently structured networks.

Figure 1: Linkage and Modularity Scores. In both figures, grey lines indicate the moments a new government was formed after elections.

Beel-I government—and a stabilization, with strong fluctuations after 1948. This is followed by a long period of steady decline.[2] This suggests that parliamentary discourse first became more entangled, i.e. speakers connected more topics in their speaking time. The steep increase in linkage might suggest a diversification of topics and thus the possibility for speakers to link them. The linkage decline after 1948 reflects an increasing focus on specific topics, which suggests specialization. Figure 1b shows a slight, gradual increase in modularity, indicating the formation of discursive clusters. High modularity points to the existence of siloed and specialized communities.[3] Also, the fluctuations in linkage are reflected in variation in the modularity scores.

Politicization: a three-way interaction between degree, prominence, and novelty Specialization—the emergence of stable clusters—is challenged by politicization, as expressed by a sudden increase in a topic's entanglement. Using topic-level degree and betweenness scores, glimpses of this process are visible. In Figure 2 a movement toward the degree-betweenness diagonal is visible, confirming the process of specialization. Moreover, the visualization shows outliers that may hint at politicization. Topics with disproportionally high degree scores could point towards politicization because they are connected to many other topics. Those with high betweenness are bridges between communities, functioning as politicizing devices and challenging the specialized clusters.

[2]There is a slight uptick in the late 1960s, but we need to extend the period to determine whether this translates into a trend.

[3]Other so-called "community quality metrics", such as *coverage* (the ratio of edges within communities and the total number of edges) and *performance* (the counted pairs of nodes in the same community) similarly indicate a gradual increase in community structure [12, 13, 14].

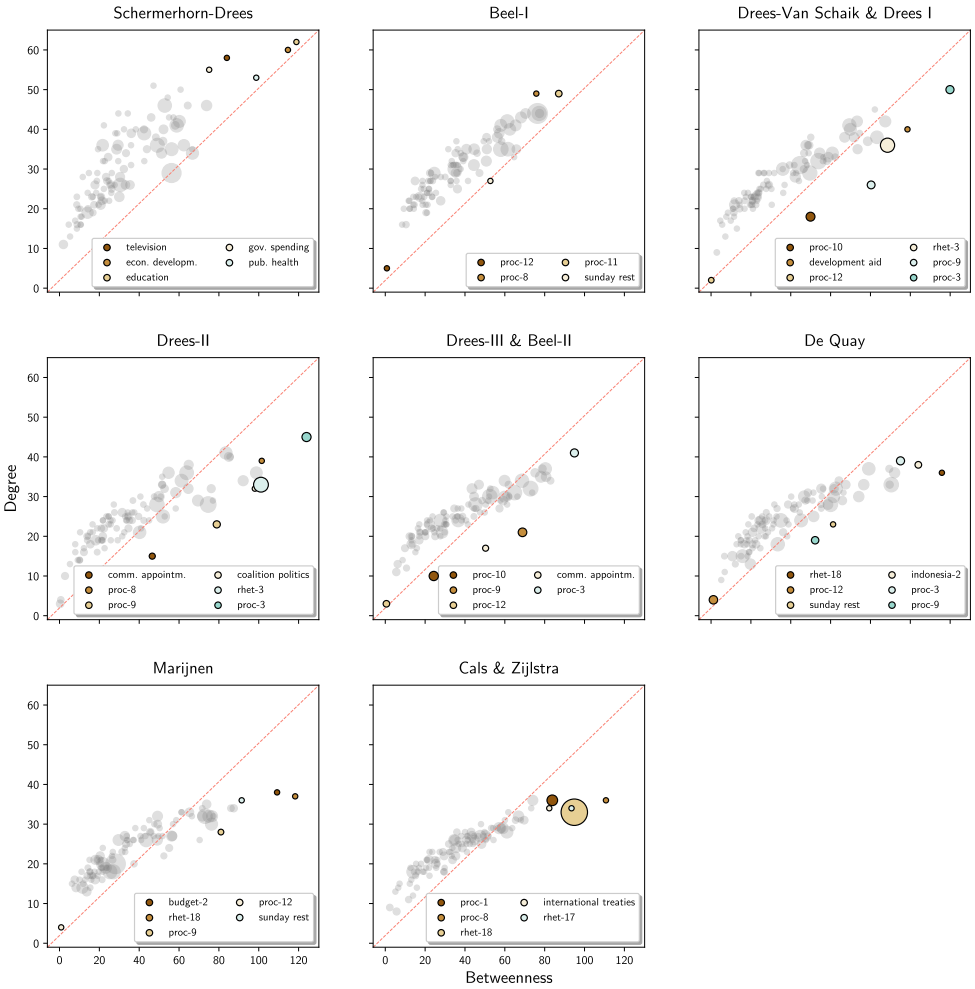


Figure 2: Relationship between degree and betweenness of topics in the linkage networks in different cabinet periods. We manually identified outliers. Some cabinets are mere (short-term) intermediaries and continue the policy of their predecessors. In this figure, these cabinets are merged to prevent imbalances in the subsetted data. Nodes are sizes according to topic prominence in the cabinet period.

Figure 2 hints at politicizing outliers, but the stable presence of procedural topic shows that it is hard to differentiate between contingently politicizing topics, and topics with a permanently high degree and/or betweenness. In other words, politicization can only be detected with taking into account the diachronic evolution of topic degree and betweenness. Here, we also need to take into account the variation in topic prominence. If a topic is talked about more in parliament, we expect degree and betweenness to be higher. This can still occur in the context of specialization. A topic can remain in the specialized community, but the community itself could expand as the result of higher prominence, leading to higher topic degree.

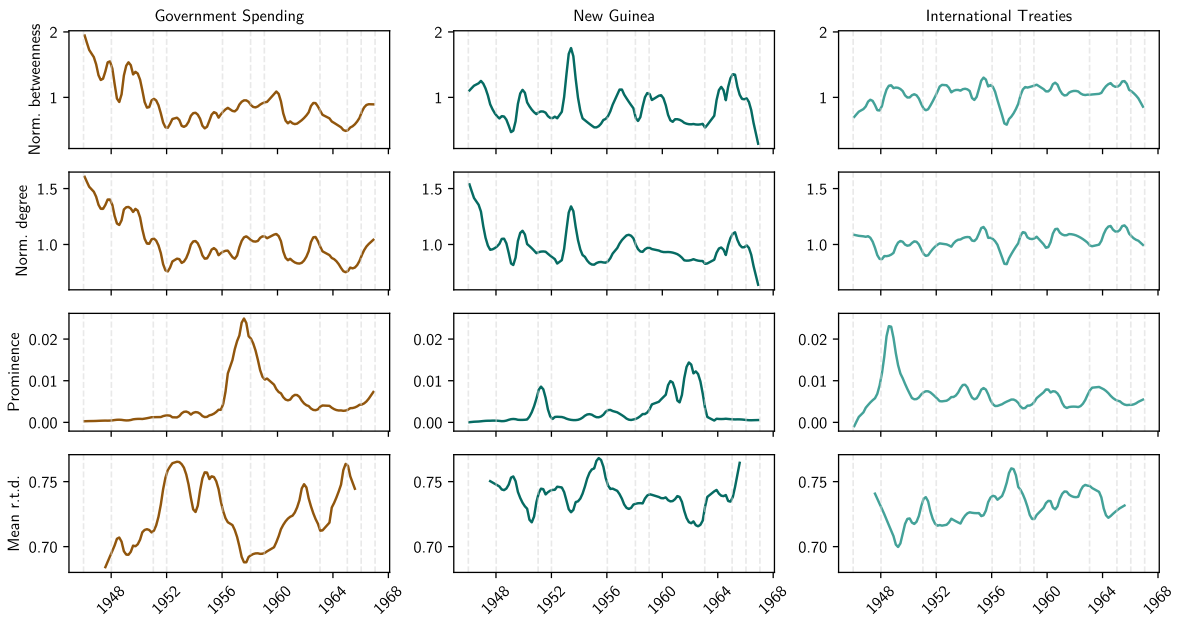


Figure 3: Diachronic normalized topic degree, topic prominence and windowed rank turbulence divergence for three example topics. For each topic, the diachronic betweenness and degree is visualized, along with the prominence of the topic across the period. The bottom row shows the novelty of the topic connections, calculated by averaging rank turbulence divergence scores of the top 25 most connected topics in a period compared to those in the six preceding periods. All time series are smoothed using non-linear adaptive filtering.

For this reason, we investigate politicization by comparing time series of topic betweenness, degree, prominence and novelty. Topic novelty indicates the extent to which a topic is connected to new topics. We calculate novelty using rank turbulence divergence, an instrument designed to compare complex systems based on rankings [16]. We take the top twenty-five most connected topics to a topic and compare this ranking with rankings in previous time periods. Figure 3 show the resulting four time series for three example topics. The figure demonstrates the different dynamics between degree, betweenness, prominence, and novelty.

In all topics, prominence is not as strongly correlated to degree and betweenness as one would expect. In the case of "government spending", the 1957 burst in prominence—caused by debates on the so-called "bestedingsbeperking" (spending limit)—is accompanied by only a minor surge in degree and betweenness. The same is visible when the topic of "international treaties" bursts in 1948. Degree and betweenness show only a modest increase. This may suggest the specialization of the two topics, exhibited by a lacking surge in connectivity when the topic is discussed more prominently in the House. Alternatively, in the case of the New Guinea topic, betweenness and degree spike in 1953, when prominence shows no increase. This indicates the politicization of the topic in a moment when the topic is not extensively discussed.

The diachronic novelty of topics adds another layer to these dynamics of politicization. In the examples in Figure 3, it seems to decline with peaks in prominence, which indicates that as a topic is increasingly discussed in parliament, it becomes more stable in its connections. Novelty, however, also introduces new moments of change, adding to the multi-layered nature of politicization as measured through linkage.

All in all, our results suggest complex dynamics of politicization at work in parliament. In

the full paper we will expand on the varieties of politicization in parliament and elaborate on the more general trends in politicization.

5. Future work

This paper has demonstrated how topic linkage in combination with network statistics can help examine historical phenomena such as specialization and politicization in a complex system, such as parliament. In the full paper, we further flesh out the interaction between the macro dynamics of specialization and politicization, expressed through topic prominence, novelty and degree, with specific drivers in terms of speaker, cabinet, and topic. Through this computational approach, we hope to shed light on one of the central question in political history [17]: how have the boundaries of "the political" changed over time?

References

[1] C. Hoetink, Macht der gewoonte. Regels en rituelen in de Tweede Kamer na 1945, Vantilt, 2018.

[2] E. H. Karel, Boer en politiek. opkomst en teloorgang van het groene front, Historia Agriculturae 44 (2013) 31–56.

[3] S. Keulen, Monumenten van beleid: De wisselwerking tussen Nederlands rijksoverheidsbeleid, sociale wetenschappen en politieke cultuur, 1945-2002, Uitgeverij Verloren, 2014.

[4] K. Palonen, Four times of politics: Policy, polity, politicking, and politicization, Alternatives 28 (2003) 171–186.

[5] K. Palonen, Parliamentarisation as politicisation, in: Rethinking politicisation in politics, sociology and international relations, Springer, 2021, pp. 63–85.

[6] M. Marx, N. Aders, From documents to data: linked data at the dutch parliament, in: Proceedings of Online Information, 2010, pp. 17–22.

[7] M. Van Gompel, M. Reynaert, Piccl: Philosophical integrator of computational and corpus libraries, https://github.com/LanguageMachines/PICCL, 2013.

[8] J. W. Mohr, P. Bogdanov, Introduction—topic models: What they are and why they matter, 2013.

[9] C. Perry, S. DeDeo, The cognitive science of extremist ideologies online, arXiv preprint arXiv:2110.00626 (2021).

[10] M. E. J. Newman, Modularity and community structure in networks, Proceedings of the National Academy of Sciences 103 (2006) 8577–8582.

[11] L. C. Freeman, Centrality in social networks conceptual clarification, Social networks 1 (1978) 215–239.

[12] T. Chakraborty, A. Dalmia, A. Mukherjee, N. Ganguly, Metrics for community analysis: A survey, ACM Computing Surveys (CSUR) 50 (2017) 1–37.

[13] M. Renedo-Mirambell, A. Arratia, Identifying bias in cluster quality metrics, arXiv preprint arXiv:2112.06287 (2021).

[14] S. Emmons, S. Kobourov, M. Gallant, K. Börner, Analysis of network clustering algorithms and cluster quality metrics at scale, PloS one 11 (2016) e0159161.

[15] K. L. Gray, Comparison of trend detection methods, University of Montana, 2007.

[16] P. S. Dodds, J. R. Minot, M. V. Arnold, T. Alshaabi, J. L. Adams, D. R. Dewhurst, T. J. Gray, M. R. Frank, A. J. Reagan, C. M. Danforth, Allotaxonometry and rank-

turbulence divergence: A universal instrument for comparing complex systems, arXiv preprint arXiv:2002.09770 (2020).
[17] T. Mergel, Cultural turns and political history, Ricerche di storia politica 20 (2017) 33–42.
[18] A. K. McCallum, Mallet: A machine learning for language toolkit, http://mallet. cs. umass. edu (2002).

6. Appendix A: Topic Modelling

Using Mallet, we train a topic model using speeches as documents [18].[4] The model is trained using default settings and 100 topics.[5] We manually label every topic based on domain knowledge of postwar parliamentary politics. Besides topics pertaining to specific policy areas, we also distinguish topics related to procedural matters, general rhetorical strategies, and topics consisting of non-sensical terms.

6.1. Topic Labels and Words

The table below shows the labels manually added to the topics and the top five most relevant words for each topic.

7. Appendix B: Linkage

Linkage first requires calculating the joint probability of observing two topics i and j in speeches or sessions from a specific period (k).

$$P_{ij} = \frac{1}{N} \sum_{k=1}^{N} P_i(k) P_j(k)$$

The linkage between topics i and j is then calculated as the mutual information, expressing how much more two topics co-occur than expected by their theoretical probabilities:

$$R_{ij} = \log_2 \frac{P_{ij}}{P_i P_j}$$

Using these mutual information scores, we are able to study the variation in linkages between the topics in our topic model over time. One specifically important metric, is the general linkage (M) in a period. For this we use the conditional probability $P(j|i)$, expressing the probability of topic j occurring given that topic it occurred. For a specific time-window (w), we then sum over the product of the mutual information and the conditional probability:

$$R_i = \sum_{j=1}^{w} R_{ij} P_{j|i}(k)$$

[4] We are primarily interested in the speech-level model, as this captures how speakers on the level of speeches make connections between fields of interest, or topics. At the level of the session, we can capture the diversity of themes discussed on a day, reflective of the parliamentary agenda.

[5] We choose a model K based on manual inspection of models with a K in the range of 50-500. This revealed that a K of higher than 100 mostly produced more procedural and rhetorical topics, instead of identifying more relevant topics. More importantly, the trends observed in this paper are similar across this range of K's.

Finally, we sum over the product of R_i and the probability of topic i to get a weighted linkage score (M_w):

$$M_w = \sum_{i=1}^{N} R_i P_i(k)$$

	label	words
0	proc-10	beraadslaging, artikel, stemming, aannemen
1	rhet-3	gaan, goed, mens, krijgen
2	committee appointments	commissie, raad, advies, lid
3	rhet-1	bezwaar, geval, gaan, groot
4	civil service wages	overleg, ambtenaar, salaris, organiseren
5	war reparations	schade, vergoeding, regeling, treffen
6	proc-1	artikel, wet, lid, bepaling
7	television and broadcasters	televisie, programma, radio, reclame
8	municipal affairs-2	gemeente, gebied, grens, amsterdam
9	proc-3	memorie, antwoord, verslag, voorlopig
10	art subsidies	subsidie, kunst, nederlands, onderwijs
11	rhet-7	punt, zaak, ogenblik, vraagstuk
12	postal service and traffic	verkeer, ptt, bedrijf, tarief
13	civil code	burgerlijk, wetboek, recht, vereniging
14	taxation-1	belasting, fiscaal, inkomstenbelasting, inkomen
15	rhet-9	bewindsman, gaarne, antwoord, groot
16	proc-8	hoofdstuk, vaststelling, departement, dienstjaar
17	police and intelligence	politie, justitie, burgemeester, vluchteling
18	indonesia-1	indonesie, regering, nederlands, nederland
19	party politics	kabinet, politiek, partij, ministerpresident
20	indonesia-2	indonesie, republiek, indie, nederland
21	rhet-14	pet, jaar, cijfer, aantal
22	overseas affairs	suriname, antillen, statuut, nederlands
23	fisheries	visserij, waterstaat, verkeer, plan
24	businesses and profits	onderneming, bedrijf, staat, bezitsvorming
25	proc-6	amendement, artikel, voorstellen, lid
26	spatial planning	ordening, ruimtelijk, belang, plan
27	wage politics and negotiations	stichting, bedrijfsleven, loonpolitiek, arbeid
28	new guinea	nieuwguinea, nederlands, regering, indonesie
29	proc-4	zaak, jaar, antwoord, departement
30	housing	woning, bouw, bouwen, woningbouw
31	municipal finance	gemeente, uitkering, rijk, financieel
32	sunday rest	openbaar, zondag, wet, wetsontwerp
33	judicial affairs-1	rechter, raad, rechterlijk, beroep
34	higher education-2	onderwijs, universiteit, student, wetenschappelijk
35	families-1	vrouw, man, huwen, huwelijk
36	employment	arbeider, werk, werken, werkloosheid
37	defense and conscription	militair, dienst, officier, dienstplichtig
38	credit markets	bank, nederlandsche, geld, rente
39	budget-2	millioen, uitgaaf, jaar, regering
40	economic development	economisch, investering, ontwikkeling, beleid
41	monarchy	pers, huis, koninklijk, nederlands
42	regional development	gebied, provincie, land, industrie
43	lower education	onderwijs, school, openbaar, bijzonder
44	rhet-6	achten, afvaardigden, mogelijk, opmerking
45	elections	partij, verkiezing, kamer, politiek
46	international conflict	verenigde, politiek, land, wereld
47	rhet-2	gaan, zaak, goed, denken
48	constitutional reform	grondwet, artikel, kamer, overeenkomst
49	public insurances	sociaal, verzekering, uitkering, groep
50	european integration-2	europees, politiek, europa, gemeenschap

	label	words
51	judicial affairs-2	straf, geval, justitie, strafrecht
52	pensions	pensioen, pensioneren, jaar, pet
53	rhet-16	groot, volk, economisch, leven
54	higher education-1	onderwijs, school, leerling, laag
55	land consolidation	grond, pachter, bedrijf, grondkamer
56	social work	maatschappelijk, werk, departement, particulier
57	european integration-1	europees, eeg, land, nederlands
58	rhet-18	regeering, nederlandsche, gaan, meening
59	proc-9	motie, kamer, indienen, orde
60	proc-11	nota, plan, kamer, gegeven
61	rhet-13	overheid, algemeen, recht, belang
62	small businesses	middenstand, bedrijf, economisch, kleinbedrijf
63	wages	prijs, loon, arbeider, regering
64	agricultural prices	prijs, landbouw, melk, boer
65	prices and cartels	economisch, mededinging, wet, consument
66	development aid	land, regering, nederlands, hulp
67	proc-13	kamer, adres, commissie, lid
68	defense	verdediging, militair, marine, defensie
69	pbo	organisatie, bedrijfsorganisatie, publiekrechterlijk
70	religion	kerk, geestelijk, christelijk, katholiek
71	taxation-2	belasting, omzetbelasting, verhoging, tarief
72	rhet-5	woord, goed, laten, zaak
73	communism and democracy	volk, land, regering, nederlands
74	rhet-17	regering, gods, groot, volk
75	budget-1	bedrag, jaar, begroting, min
76	families-2	kind, ouder, gezin, jaar
77	coalition politics	kabinet, min, regering, beleid
78	social benefits	sociaal, kinderbijslag, uitkering, verzekering
79	nonsem	jaar, termijn, maand, januari
80	proc-12	stemmen, heuvel, stem, tilanus
81	traffic and infrastructure	vervoer, spoorweg, klm, vergunning
82	international treaties	verdrag, nederland, land, nederlands
83	rhet-10	maatregel, groot, mogelijk, moeilijkheid
84	proc-2	wetsontwerp, wet, regeling, ontwerp
85	municipal affairs-1	gemeente, burgemeester, staten, gedeputeerde
86	rents	woning, huurverhoging, huren, huur
87	rhet-11	regering, kamer, zaak, standpunt
88	exports	land, industrie, nederlands, prijs
89	rhet-12	beleid, ontwikkeling, duidelijk, denken
90	education	onderwijs, school, voortzetten, leerling
91	agriculture	landbouw, bedrijf, boer, klein
92	rhet-15	groot, jaar, goed, plaats
93	proc-7	kamer, commissie, behandeling, zaak
94	rhet-8	groot, mogelijk, aandacht, belangrijk
95	civil service	dienst, departement, ambtenaar, taak
96	proc-5	brief, zaak, mededelen, mededeling
97	government spending	miljoen, uitgaaf, begroting, regering
98	public health	volksgezondheid, ziekenhuis, medisch, gezondheid
99	rhet-4	opmerking, betoog, woord, punt