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Abstract

Words with the suffix -ism are reductionist terms that help us navigate complex social issues by using a simple one-word label for them. On the one hand they are often associated with political ideologies, but on the other they are present in many other domains of language, especially culture, science, and religion. This has not always been the case. This paper studies isms in a historical record of digitized newspapers from 1820 to 1917 published in Finland to find out how the language of isms developed historically. We use diachronic word embeddings and affinity propagation clustering to trace how new isms entered the lexicon and how they relate to one another over time. We are able to show how they became more common and entered more and more domains. Still, the uses of isms as traditions for political action and thinking stand out in our analysis.

Keywords

isms; ideology; political language; diachronic word embeddings; affinity propagation clustering

I INTRODUCTION

Words with the suffix -ism are indispensable terms for understanding politics and society, yet they are complex words that give rise to plenty of confusions. It is hard to tell how different isms ranging from communism to Protestantism and further to impressionism and positivism really relate to one another. For sure, people using everyday language seem to uphold the link between isms, and from a analytical perspective it is clear that most words with the suffix serve some sort of reductionist function. They are words that describe something complex in just one heading [Spira, 2015].

The most common take on a particular ism is to regard it as a set of ideas that can be traced throughout history. For instance, in the case of liberalism, there is a debate on which theoreticians can be argued to have formulated key ideals of liberalism. This entails a kind of search for the origins of an ism. A critique of such a quest has started to emerge and has shifted focus from searching for origins to understanding different historical understandings of liberalism. [Leonhard, 2001, Bell, 2014, Rosenblatt, 2018, Freeden et al., 2019]. The more historicizing approach has also tried to make sense of isms as a whole by producing typologies for understanding their areas of application or characteristics [Cuttica, 2013, Höpfl, 1983].

This paper seeks to take the historical approach further by trying to provide an overview and understand the historical process in which new isms emerged and developed. Isms have been used to categorize things ever since antiquity. In English a separate word, ism, emerged in the seventeenth century to denote them collectively. Ever since the sixteenth and seventeenth

centuries isms have spread to many new domains in life, covering religion, politics, science, arts, and more. Isms have also gained a global reach so that they are used as cognate loans or direct translations in many languages [Höpfl, 1983, Spira, 2015, Kurunmäki and Marjanen, 2018b].

The development of isms varies depending on political context and language used. French, German and English coinages dominate in Europe as isms from those languages were often introduced and adapted into other European languages. At the same time, smaller languages also produced their own isms and it is often unclear where a particular ism originated as the easy cognate translations could be about loans across languages, but also about nearly simultaneous coinages in different places. Focusing on Finland provides a particularly interesting case in understanding these transnational developments. The Finnish data includes both Finnish-language and Swedish-language newspapers, which were in constant interaction, but also developed at different speeds. Swedish-language papers were until the end of the nineteenth century usually quicker to adopt new concepts from abroad, but translations to Finnish were usually quickly introduced due to many actors functioning in both languages [Marjanen et al., 2019, Engman, 2016]. In this way the Finnish case provides an example in which we see isms being deployed in the same political context, but in one Germanic and one Fenno-Ugric language.

It shows an interesting instance of the interplay between local political contexts and different languages. As such, we cannot extrapolate results for other countries based on the Finnish case, but it is particularly interesting point of comparison. From 1809 to 1917 Finland was a Grand Duchy in the Russian empire and in this relatively short period of time it gained many state institutions of its own [Jussila, 2004]. As a part of this process Finnish actors also introduced new political vocabulary and developed an independent press [Hyvärinen et al., 2003]. All these processes are present in the available data.

By focusing on the nineteenth century and using digitized historical newspapers from Finland, this paper provides a new perspective on how isms became important in public discourse. Although linguists have paid attention to the productivity of isms [Hahn, 1981], large-scale digitized data sets provide a possibility to look at historical language change in a statistically more robust way than before. They also allow for data-driven ways of clustering and modelling the development, which helps us chart the expansion of isms suggested by earlier research such as [Kurunmäki and Marjanen, 2018b,a].

We use word embeddings to analyze the spread of isms in the Finnish context. This method, drawn from natural language processing (NLP), differs from traditional approaches in history and political science, but the possibility of clustering isms in a relatively large historical data set has several benefits also for scholarship in the humanities and social sciences. As we will show, it can partly confirm the narrative of isms becoming especially political and even ideological in the course of the nineteenth century, but also that isms relating to psychology and the sciences entered the lexicon at this time. The clustering clearly shows how these isms belonged to different language domains. Further, the method can point out interesting new findings about the scope and nature of particular isms and their use in the Finnish context, which are discussed in the results section.

II RESEARCH QUESTIONS AND DATA

2.1 Research questions

This paper studies isms as particularly laden keywords in societal discourse in Finland in the long nineteenth century. It covers a period of time when many isms were introduced into the

Swedish and Finnish languages and the printed public sphere expanded a lot in Finland. In the early nineteenth century only one newspaper was published in the country, whereas the amount of titles by the turn of the century 1900 had grown to around 130 newspapers [Marjanen et al., 2019, Tommila and Salokangas, 1998].

We address the following research questions:

1. How did the vocabulary of isms expand in the period?
2. Which isms appear as similar based on their embeddings?
3. How does the theme of politics distinguish itself in the clusters of isms over time?
4. Are there interesting continuities in the enriched clustering that takes into account nearest neighbors of the isms?
5. How does the language of isms in the two languages relate to one another?

The questions are partly informed by our reading of example texts in the newspapers and some of the interpretations of research results also build on those readings, but the questions are motivated and designed to be answered primarily by computational methods.

2.2 Data

To answer our research questions, we use a digitalized collection of nineteenth-century Finnish newspapers freely available from the National Library of Finland [Pääkkönen et al., 2016]. Though the archive contains newspapers starting from 1770s, the earlier time periods do not have enough data for the analysis we apply in this paper. Thus, we keep to the data from 1820 to 1917. Even for the the period from 1820 to 1860 data is relatively scarce, particularly for Finnish, and the amount of different isms is still low. Still, it is crucial to keep this period as a part of the study as many key political isms such as liberalism, socialism and communism, were introduced into political discourse in Europe at this time. This way we have an idea about the introduction of isms into political discourse in Finland and the interplay between the Swedish and Finnish languages.

The collection contains newspapers in the Swedish Finnish, Russian and German languages, with the former two as the main languages. In our analysis, these dominant languages are treated as two separate corpora even though contemporaries often relied on newspapers in both languages. The period has been described as an interaction between three languages in Finland, Swedish being the main language for administration and learned life, Finnish being the primary language of the majority of the inhabitants in Finland and increasingly seen as the language of the future, and Russian as the language that most people in Finland did not read, but it still loomed in the background as the main language of the Russian empire [Engman, 2016].

In this paper we use the Finnish and Swedish corpora, leaving the far more smaller data sets of Russian and German for the further research. The total amount of words in the corpora is presented in Table 1. Both corpora are lowercased and lemmatized using LAS, an open-source language-analysis tool [Mäkelä, 2016].[1] It is a meta-analysis tool that provides a wrapper for other existing tools developed for specific tasks and languages. Though LAS supports multiple languages, most efforts were done to process Finnish data, including historical Finnish. The output for our Swedish data is more noisy. In particular, the Swedish LAS lemmatizer is unable to predict the lemma for out-of-vocabulary words, e.g. *boulangismen* (definite form of 'boulangism'). Thus we applied additional normalization by converting all words ending with *-ismen* or *-ismens* into *-ism* forms. For all other words we use the LAS output; implementation

[1] https://github.com/jiemakel/las

Table 1: Corpus size by double decade.

Time slice	Millions of words	
	FINNISH	SWEDISH
1820–1839	1.3	25.5
1840–1859	10.3	77.9
1860–1879	90.6	326.7
1880–1899	805.3	966.9
1900–1917	2439.0	953.0
Total	3346.6	2355.2

of proper Swedish lemmatization is beyond the scope of this paper, as most of our findings are based on clustering the isms only, thus perfect lemmatization of other words is less crucial.

III METHOD

3.1 Diachronic embeddings

To trace semantic shifts in word meanings we split a lemmatized corpus into double decades (1820–1839, 1840–1859, and so on until 1900–1917) and train continuous embeddings [Mikolov et al., 2013] on each time slice. We use the Gensim Word2Vec implementation [Řehůřek and Sojka, 2010] using the Skip-gram model, with a vector dimensionality of 100, window size 5 and a frequency threshold of 100—only lemmas that appear more than 100 times within a double decade are used for training. In this way we try to ensure that each word in a model has a reliable amount of context and the embeddings are trustworthy. However, we lose some isms because they appear less than 100 times in a double-decade. For example, the Finnish-language word *feminismi* was mentioned 91 times between 1900 and 1917 and was excluded from our analysis, while in Swedish its counterpart was mentioned 242 times and is visible in our results. Our models allow us to detect when a word became frequent, in what context it was used and what is the difference between the two language contexts. They do not allow us, however, to check when the word appeared for the first time and comparison of word distributions between languages is not fully reliable for less frequent words.

Since training word embeddings is a stochastic process, the particular values of vectors do not stay close across runs, though distances between words are quite stable. To ensure that embeddings are aligned across time slices, we follow the vector initialization approach proposed in [Kim et al., 2014]: embeddings for $t+1$ time slice are initialized with vectors built on t; then training continues using new data. The learning rate value is set to the end learning rate of the previous model, to prevent models from diverging rapidly. Evaluating the quality of diachronic word embeddings is currently a challenge because of the lack of gold standard data for different languages and time periods [Shoemark et al., 2019]. We use this approach since it has been previously used in a similar study [Hengchen et al., 2019] with slightly different data.

Temporally aligned embeddings have been used before to trace semantic drift by computing distances between vectors representing a word in two time periods or by measuring differences in nearest neighbours for these vectors [Hamilton et al., 2016]. However, most studies that tackle semantic shift detection in computational linguistics deal with clear cases of word meaning change such as the complete change of meaning of the word ‘gay’ or acquiring of a new completely different sense such as words ‘virus’ or ‘cell’. These rapid transformations could also be found in our data: e.g. Swedish word *flygare*, which initially meant an insect but changed its meaning to “aviator” in the beginning of the twentieth century. The embedding models that we

trained is able to detect this change, since the nearest neighbors of *flygare* completely changed. At the same time, distance-based methods seem to be less useful for isms, since their meanings do not change to that extreme. For example, 'patriotism', whether it had positive or negative connotations, always has a meaning semantically close to "love of one's country". At the same time, the political and social context in which the word was used changed over time. Further the term could be used for quite different rhetorical purposes and it carried new social and affective meanings that are not as readily visible in the embeddings. [2] As such, *patriotism*, and most other isms, are vague in their meaning making it difficult to assess what exactly is meant when they are used in historical texts. In this paper we do not lean on distances between word vectors across time to extrapolate meaning, but instead use clustering to find which isms were closer to each other—i. e., had similar contexts—in various periods of time.

There are many ways of constructing diachronic word representations other than the word embedding and alignment approach that we use here, but we opted for this method because it has been shown to produce reliable results [Schlechtweg et al., 2019] and training times are relatively fast even for large corpora. Simpler methods, such as studying collocates and using them for clustering, would also require having enough instances to produce reliable clusters, whereas more complex methods, such as deep contextualized embeddings or continuous time representations, have not yet been proved to produce better results for historical data with some OCR noise. For our purpose of understanding a historical development, using word embeddings is for the moment the best match.

3.2 Clustering

To investigate the expansion of the vocabulary of isms we cluster words into closed groups based on their embeddings. Since our task is mostly exploratory and the number of clusters cannot be known in advance we apply the Affinity Propagation clustering technique [Frey and Dueck, 2007]. The method splits all datapoints into *exemplars*, i.e., cluster representative tokens, and *instances*, i.e., other members of clusters. At the initial step all datapoints present a cluster of their own. Then for each instance-representative pair a likelihood for an instance to be represented by an exemplar is computed by taking into account all other instances of the exemplar and all other available exemplars for the instance. This computation is repeated until convergence is reached; if an exemplar has no instances it is dismissed. We use the standard implementation of this algorithm from the Scikit-learn package [Pedregosa et al., 2011] with default parameters.

Affinity Propagation has been previously used for various language analysis tasks, including collocation clustering into semantically related classes [Kutuzov et al., 2017] and unsupervised word sense induction [Alagić et al., 2018]. The main advantages of the method are that it detects the number of clusters automatically and is able to produce clusters of various size. As a side effect it returns exemplars, i.e. cluster representatives, which are not necessarily equal to the geometric centre of the cluster.

The main drawback of the Affinity Propagation is pairwise computations. The method is quadratic in time and memory and cannot be applied to large data sets, such as a whole corpus vocabulary. Thus, data selection is an unavoidable step. In this paper we use Affinity Propagation in two experiments.

In the first experiment, we extract from the corpus all ism words. i.e. words that end with *-ism* in Swedish and *-ismi* in Finnish and cluster only this set of words. We exclude from the list

[2] For social, affective and other types of meaning, see Leech [1974]

words that are shorter than 5 characters for Swedish and 6 characters for Finnish. This is to filter out obvious errors that appear due to OCR issues such as 'ism', 'tism', or 'rism'. Though the words 'ism' and 'ismi' exist in the Swedish and Finnish languages, they are very uncommon in nineteenth-century press. The extraction allows us to identify how close these words are to each other given other isms in the corpus.

In the second experiment, we try to put isms into a richer context and trace other words associated with them in the respective double-decades. We extract from the corpus all words which have a cosine similarity to any isms that is less than 0.5. Then we perform clustering on this enriched data set. Finally, the clusters are filtered so that only clusters that contain at least one isms word are presented for qualitative analysis. An output of this procedure is different compared to the first experiment, i.e. words that were clustered together in the isms-only clustering, can break up into different enriched clusters, since in the latter setting they have more exemplar options.

Henceforth we refer to the results of the first and the second experiments as *ism clusters* and *enriched clusters* respectively. We discuss the outcomes of the two experiments interchangingly since they give different perspectives on the development of ism vocabulary. The first experiment helps us to understand the main question about the expansion of isms, whereas the the second experiment provided additional results for interpretation and is used especially in the section on separatism.

Clustering is performed separately for each time slice. To link clusters across time we perform visualization with Sankey charts. In the Sankey diagram, clusters from time slice t are linked to clusters in time slice $t+1$ if they have words in common. The magnitude of the link is the sum of the word frequencies of the common words between the linked clusters from adjacent time slices. We use the frequencies from the source cluster, that is the cluster from time slice t.[3]

IV RESULTS

Some of our results are directly related to the political history of Finland and the development of newspapers as a medium, whereas others go well together with previous notions of the development of the language of isms in general. They strengthen earlier interpretations by giving more robust proof for interpretations that have mostly relied on the qualitative reading of sources. Other findings come across as surprising also for historians of political ideologies, and may at least to some extent force us to rethink how we look upon the history of political discourse. In what follows, we will present the findings in this order.

4.1 Swedish-language and Finnish-language clusters in comparison

As expected, Finnish-language and Swedish-language isms cluster differently in terms of timing and themes that are present (see Figure 3 and Figure 4). There are three main reasons for this:

1. Swedish-language press in Finland developed earlier and included more abstract content earlier in the century, whereas newspapers in Finnish—and the Finnish written language—was maturing only in the latter half of the century. Consequently, we have been able to produce meaningful clusters of isms for 1820s onward for Swedish and only from the 1860s onward for Finnish. As described earlier, the languages were in constant interaction, but the scope of Finnish-language newspapers was much smaller in the first half of the century and the content was to a lesser degree theoretical and political. Furthermore, Swedish-language newspapers were quicker in adopting new terms from pub-

[3] Code for our experiments is available at https://github.com/ezosa/Diachronic-Embeddings

FINNISH

Time slice	*ism*	*close*	*cluster*	*select*
1820 - 1839	0	-	-	-
1840 - 1859	0	-	-	-
1860 - 1879	1	157	1	12
1880 - 1899	35	5977	20	442
1900 - 1917	119	8940	70	1543

SWEDISH

Time slice	*ism*	*close*	*cluster*	*select*
1820 - 1839	3	724	3	49
1840 - 1859	17	1845	12	211
1860 - 1879	61	5229	31	669
1880 - 1899	120	12233	54	1320
1900 - 1917	137	11858	56	1387

Table 2: Number of distinct words used on various steps of the to obtain enriched clusters: **isms** is a number of distinct words with suffix *-ism*, ***close*** is a number of words, which cosine similarity to at least one ism is higher than 0.5, ***cluster*** is a number of clusters that contain at least one ism, ***select*** is a number of words in these clusters.

lications in Sweden because of the language connection and thus had a sort of mediating function with regard to new political vocabulary.

2. The *-ismi* was not a productive suffix in the Finnish language but used through cognate loans and through analogous derivation of foreign words.[4] Consequently, isms are in general less common in Finnish than in Swedish. Nonetheless they were used in both languages especially as Finnish political language developed through an interplay with Swedish. In the particular case of adopting isms as key terminology in Finnish, the latter half of the century was a crucial turning point.
3. The political outlook of the two languages was slightly different. From the 1880s onward the Finnish and Swedish newspapers were printed in nearly equal amounts. At this time the language spheres also started specializing. Swedish speakers lived mostly in larger towns and around the coast, whereas Finnish speakers inhabited most of the country [Marjanen et al., 2019]. In Lapland, Sami languages also had a strong presence, but they were not at this time published in print. At this point, Finnish-language papers were more likely to have a rural or working-class background and Swedish-language papers were more likely to be more urban, liberal and bourgeois, which also shows in the use of isms. This is typically visible in the proportionately big role the cluster around socialism manifests in Finnish compared to Swedish. The clusters clearly show that Finnish-language ism vocabulary was more politically oriented in the early twentieth century. Cultural, philosophical and scientific isms were less present.

The distinction between Swedish and Finnish is also visible from the analysis of the enriched clusters. The number of words used on various steps of analysis is presented in Table 2, which shows that the number isms in the Finnish data is much smaller than for the Swedish data. The table also shows that though 0.5 is an arbitrary threshold, up to 90% of words selected using this threshold are filtered out after the clustering. This is an indirect justification that the threshold

[4] As such the ism is not strictly speaking a suffix in Finnish, but a rather a sublexical suffix-like unit as often the whole words are cognate loans in which the root itself is not a word in Finnish. We thank Antti Kanner for pointing this out.

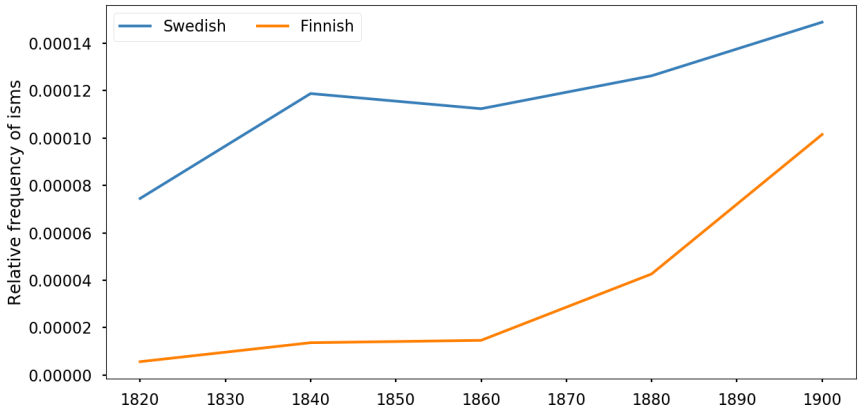


Figure 1: Relative frequency of all ism words found in the Finnish and Swedish corpora by time slice.

is sufficient and most of the relevant words are present in the output. The number of selected clusters is generally smaller than the number of words with the suffix ism since they tend to cluster together.

4.2 Expansion of the language of isms

By looking at the relative frequency of different isms over time we see an expansion of isms in the nineteenth century (see Figure 1). This is partly the function of a growth in data size over time, but mostly because new isms were introduced and often also lexicalized to the extent that they became nodal points in newspaper discourse. Isms like socialism and communism entered the lexicon in the 1830s and 1840s in many European languages and are almost simultaneous visible in the Finnish materials. A similar pattern is visible with other part of human activity with words such as spiritism or modernism being introduced in the latter half of the nineteenth century. New political, social and cultural phenomena were categorized through new isms and the notion of isms itself expanded.[Kurunmäki and Marjanen, 2018a]

While some individual isms became very common and grew in frequency, this is not the case for all of them. Some stagnated and others were simply short lived coinages. What matters is the overall productivity of isms that is visible in the unique number of isms used in the newspapers per year (see Figure 2). The overall growing trend in relative frequency corresponds with similar developments in in English as evidenced in the Google Books data set. [Kurunmäki and Marjanen, 2018a]

One feature of the suffix is that it is rather easy to deploy in *ad hoc* inventions of new words, so many isms were introduced, but never resonated in public use. These are as such interesting instances of linguistic innovation, but are excluded in this study as we use a frequency threshold for training our embeddings. The threshold also effectively excludes many false variants caused by noisy optical character recognition.

Aligning the clusters in the Sankey plots provides a possibility of visually exploring how the vocabulary of isms developed over the course of the century. As can be seen in Figure 3, there is quite a steady expansion of isms from the 1820s onward for Swedish. As the models for producing the clusters rely on enough datapoints for training, particular clusters appear with a delay compared to first uses of particular words. For instance, patriotism appears the first time in the corpus in 1791 and liberalism 1820, but the clusters in which they are part of (but not

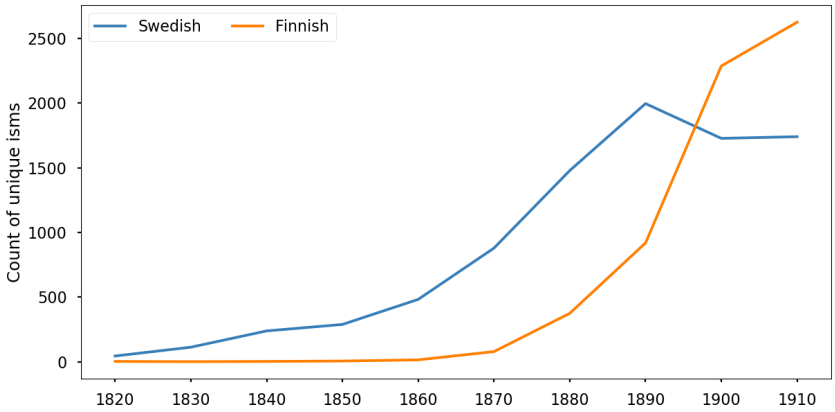


Figure 2: Counts of distinct ism words in the Finnish and Swedish corpora by time slice. This includes words with OCR issues and thus don't appear frequently in the corpora.

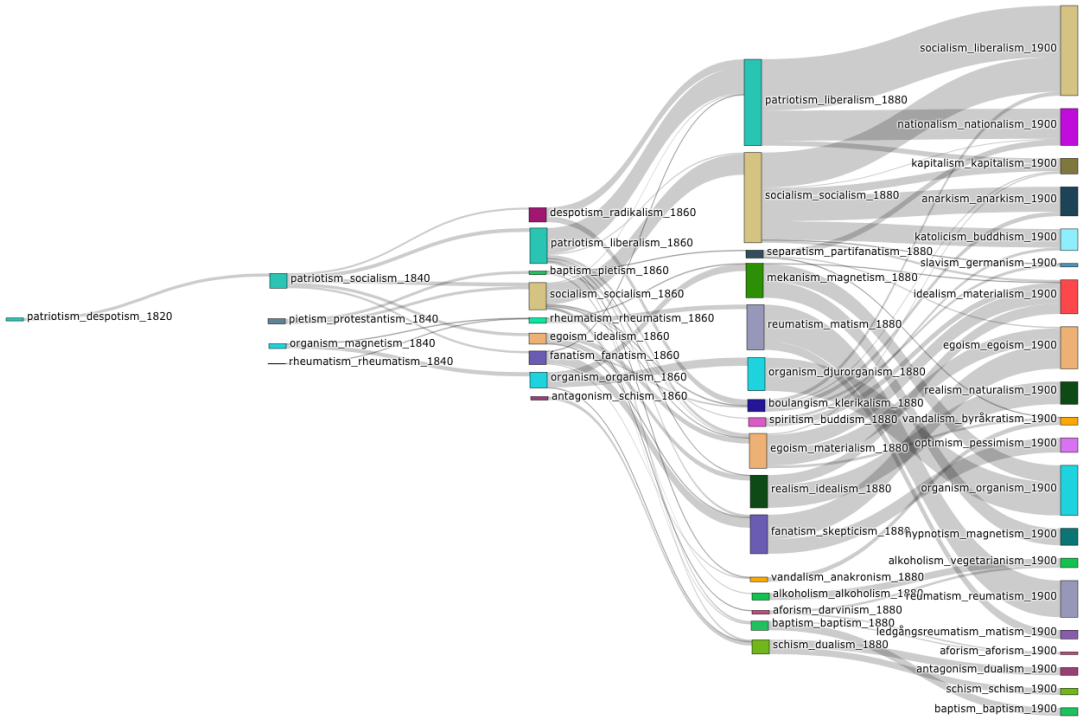


Figure 3: Sankey diagram of isms clusters from the Swedish data set covering five double decades from 1820 to 1917. A cluster name is the most frequent ism word for that cluster followed by the cluster representative and the double decade. A cluster size is a sum of the cluster word frequencies. A band width shows weighted proportion of common words.

necessarily cluster representatives or most frequent ones) appear in 1820–1839 and 1840–1859 respectively, as can be seen in Swedish clusters (Table 8). The word *socialism* appears the first time in 1840 and is also included in the cluster for 1840–1859, since it immediately became popular and the amount of newspapers in Swedish had already grown.

The visualization of Finnish-language clusters provides a much shorter story, but the expansion

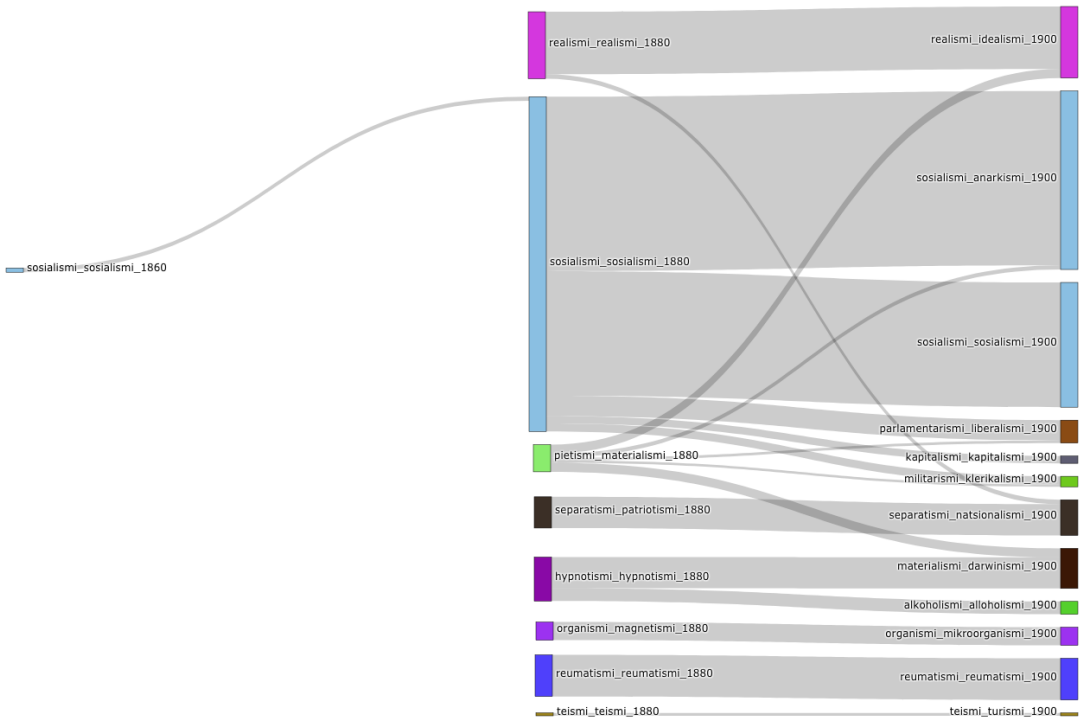


Figure 4: Sankey diagram of isms clusters from the Finnish data set covering three double decades from 1860 to 1917. The cluster name is the most frequent ism word for that cluster followed by the cluster representative in the double decade.

of isms into new domains is also visible in this data. A peculiarity of the Finnish data is that although the number of isms grew also for Finnish, the clusters show much stronger continuities in the sense that the clusters fluctuate much less than for the Swedish data. In this case the emergence of clusters that can be described as political or ideological are the ones that change the landscape of isms most significantly, whereas medical, cultural and scholarly isms only play a minor role.

4.3 Politics and ideology as distinct clusters

Previous interpretations by Kurunmäki and Marjanen [2018a], have suggested that the early nineteenth century meant the breakthrough of isms that we today associate with major political ideologies, whereas the end of the century saw the rise of plenty of new isms in the sciences (including medicine) and the arts. Again, looking at first appearances of particular isms in the Swedish-language data set suggests this holds also for Finland. However, the clusters allow for a stronger claim that suggest that the political and ideological isms form a quite distinct category after they have been introduced.

The clustering results, presented in Figure 3 and Table 8, allow us to trace more political and ideological clusters. A cluster size in the Sankey diagram corresponds to the sum of the word frequencies in a given double decade, while a width of a band connecting two clusters shows a proportion of cluster words (weighted by frequency) shared between these clusters. A table contains a complete list of cluster words and their frequencies for all periods.

As can be seen from Figure 3 and Table 8, there is a clear continuity in the politically laden

isms which start from a cluster with *patriotism*, *fanatism* (Eng. fanaticism) and *despotism* in one cluster in 1820–1839 and continue with an expansion over the consecutive double decades. Most frequent isms in the political clusters are *patriotism*, *socialism* and *despotism* up to 1859, and then *boulangism*, *fanatism*, *anarkism* (Eng. anarchism), *nationalism* and *kapitalism* (Eng. capitalism) up to 1917. There is some fluctuation between the political clusters, like *liberalism* and *patriotism* being quite tightly associated with one another until the last time slice of the investigated period, and some unsurprising continuities, like *konservatism* (Eng. conservatism) and *liberalism* being in the same clusters throughout. Still, it seems that there is less fluctuation between the distinctly political clusters and the other clusters. Also religious isms (starting from *pietism*), and medical isms (e.g. *rheumatism*) come across as fairly stable. The philosophical, artistic and scientific isms are also distinguishable, albeit they do cluster more freely. The case of rheumatism is very specific as it has a high frequency and appears often in health-related advertisements, which means it does not co-occur very often with other isms, but is rather an isolated marketing term in marketing pills and ointments.

For Finnish-language, the data is too scarce to produce meaningful clusters for more than three time slices as is clear from Figure 4. Even though the Finnish corpus for the 1880–1899 double decade is comparable in size with the Swedish corpus, the number of *distinct isms* in Finnish is smaller than in Swedish: 44 for Finnish and 125 for Swedish.

With scarcer data the distinctness of the clusters is even clearer. Clusters with *socialism* as the most frequent ism are rather dominant both for Swedish and Finnish, but the role of *socialism* as a pivotal ism is even more pronounced for the latter as is also indicated by Marzec and Turunen [2018]. Further work is needed to explain this in more detail, but apart from above mentioned demographic and political background factors for Finnish-language press, it also seems that the discourse on socialism may have been less confined in Finnish than in Swedish.

4.4 Socialism as a pivotal ism

While the two data sets are different, they both show that a many isms pivot around the discourse of socialism especially toward the end of the century. *Socialism* does not fluctuate between clusters, but really seems to be one of the terms that organized the debate. We get supplementary perspective on this phenomenon by looking at the relative frequency of a selection of most frequent isms in our data (Figure 5). Like the clusters, the relative frequencies indicate a growing proportion of isms over time and also demonstrate some difference between the data sets. For the Swedish data set we see a change in the overall landscape of the vocabulary with terms such as *patriotism* being dominant at first but then surpassed in frequency by *socialism*. In Swedish, we also find a broader selection of isms from political to religious and medical topics, present for the second half of the nineteenth century.

In Finnish, the landscape is different as it appears that the whole vocabulary relating to isms was dominated by *socialism* from the 1860s onward. It seems that the word *socialism* in a way invited other isms to be lexicalized in the Finnish language. Once socialism became inevitable in Finnish-language political discourse, other isms well-known from Swedish and other Germanic languages were easier to introduce also to Finnish. This does not mean that isms did not at all feature in Finnish, only that they were infrequent and not a normal part of the lexicon. We must also note that most authors who produced texts in Finnish, also operated in Swedish, so while they did not write about isms in Finnish, they still held notions of isms through the other main language of the country.

Figure 5 also shows that *capitalism* was an ism that became more commonly used in the early

Table 3: Enriched clusters for Finnish and Swedish that contain word *socialism*(*i*). Cluster *representatives* are marked with italic, **isms** are highlighted with bold.

1880–1889			
FINNISH		SWEDISH	
sosialismi 'socialism'	5115	**socialism 'socialism'**	5560
***anarkismi* 'anarchism'**	1120	*reaktion* 'reaction'	6991
***nihilismi* 'nihilism'**	602	*socialdemokrati* 'social democracy'	2303
***militarismi* 'militarism'**	328	***anarkism* 'anarchism'**	1975
***kommunismi* 'communism'**	316	*frigörelse* 'liberation'	1823
***radikalismi* 'radicalism'**	171	*proletariat* 'proletariat'	1548
sosiaalidemokratia 'social democracy'	386	*emancipation* 'emancipation'	1225
sosialidemokratia 'social democracy'	339	***nihilism* 'nihilism'**	1181
villitys 'craze'	337	*socialdemokratien* 'social democracy'	1023
luokkataistelu 'class struggle'	177	*utopi* 'utopia'	1016
reaktio 'reaction'	136	***antisemitism* 'antisemitism'**	911
pappis-malta 'clericalism'$_{ocr}$	130	*bourgeoisie* 'bourgeoisie'	772
		anti 'anti-'$_{ocr}$	747
		elementerna 'elements'	703
		***absolutism* 'absolutism'**	641
		***klerikalism* 'clericalism'**	569
		***statssocialism* 'state socialism'**	485
		***kommunism* 'communism'**	459
		***ateism* 'atheism'**	455
		kvinnoemancipation 'women's emancipation'	445
		***panslavism* 'panslavsim'**	341
		reaktionen 'reaction'	335
		kvinnorörelse 'women's movement'	332
		framtidsstat 'future state'	242
		***kapitalism* 'capitalism'**	226
		***jesuitism* 'jesuitism'**	206
		***individualism* 'individualism'**	196
		socia 'social'$_{ocr}$	174
		ateistisk 'atheistic'	173
		fredsidé 'idea of peace'$_{ocr}$	155
		***ultramontanism* 'ultramontanism'**	129
		***utilitarism* 'utilitarianism'**	124
		kollektivistisk 'collectivistic'	122
		***kollektivism* 'collectivism'**	121
		***cesarism* 'cesarism'**	110
		frihetsidé 'idea of liberty'	108

twentieth century. This follows international trends, but in this case it is perhaps most interesting to note that the use of *capitalism* is dominant in socialist newspapers – even more so than for the word socialism.[5] Here, it seems that, the increasing levels of discourse around capitalism are related to the rise of socialist newspapers and their political rhetoric. It was not uncommon to read about the "shackles of capitalism" or other very negatively laden statements in this discourse.[6]

Albeit a comparison with China may come across as far fetched, the introduction of isms in

[5] This observation is made based random concordance samples from http://korp.csc.fi and counting the individual occurrences according to newspaper titles.

[6] See e.g. *Kansan Lehti*, 24 October 1903, p. 2

Table 4: Enriched clusters for Finnish and Swedish that contain word *socialism*(*i*). Continuation.

1900–1917			
FINNISH		SWEDISH	
***sosialismi* ‘socialism’**	75117	**socialism ‘socialism’**	15080
kristitty ‘christian’	72175	*socialdemokrati* ‘social democracy’	11030
kristinusko ‘christianity’	32542	*klasskamp* ‘class struggle’	2998
kristillisyys ‘christian’	18566	***anarkism* ‘anarchism’**	1709
rauhanaate ‘pacifism’	1598	*socialdemokratien* ‘social democracy’	993
***kommunismi* ‘communism’**	1548	***absolutism* ‘absolutism’**	879
pakanakansa ‘pagan people’	760	*framtidsstat* ‘future state’	533
buddhalaisuus ‘buddhism’	456	***individualism* ‘individualism’**	512
lristinuslo ‘christianity’$_{ocr}$	428	*demokratien* ‘democracy’	496
tinusko ‘christianity’$_{ocr}$	383	***skandinavism* ‘skandinavism’**	440
käännytys ‘conversion’	256	***syndikalism* ‘syndicalism’**	387
tristi ‘?’$_{ocr}$	252	*fredstank* ‘pacifism’	342
adventisti ‘adventist’	243	***antisemitism* ‘antisemitism’**	341
alliansi ‘alliance’	164	***marxism* ‘marxism’**	286
kristinuslo ‘christianity’$_{ocr}$	161	***internationalism* ‘internationalism’**	285
tinuslo ‘christianity’$_{ocr}$	147	***antimilitarism* ‘antimilitarism’**	267
buddalaisuu ‘buddhism’$_{ocr}$	144	***kommunism* ‘communism’**	256
tristinusko ‘christianity’$_{ocr}$	128	*historieuppfattning* ‘understanding of history’	236
jumalausko ‘faith’	127	*studentrörelse* ‘student movement’	170
islami ‘islam’	123	***aktivism* ‘activism’**	168
buddalaisuusi ‘buddhism’$_{ocr}$	119	***revisionism* ‘revisionism’**	166
konfusius ‘confucius’	118	*brandfackla* ‘bombshell’	142
lristinusko ‘christianity’$_{ocr}$	114	*kulturrörelse* ‘cultural movement’	134
järkeisoppi ‘philosophy’	111	*förbudsrörelse* ‘prohibition movement’	122
tristinuslo ‘christianity’	109	***försvarsnihilism* ‘defence nihilism’**	117
alkukristillisyys ‘early christianity’	103	***nykterism* ‘prohibition movement’**	112
		***ungsocialism* ‘ungsocialism’**	112
		***kollektivism* ‘collectivism’**	110
		***modernism* ‘modernism’**	109
		samhällsrörelse ‘social movement’	102
		finskhetsrörelsen ‘finnish movement’	101

central categories for political thinking in China provides a dramatic instance that can be contrasted to the Finnish case. As Ivo Spira has shown, the discussion on modernization in China in the early 1900s prompted comparisons with Western ideological discourse through a discussion of different isms. At this time, a sign corresponding to ism was introduced (*zhǔyì* 主義) and it quickly became a way of translating Western isms into Chinese, but also a way to conceptualize locally embedded isms [Spira, 2018]. The isms may be seen as a way of synchronizing Chinese and Western political thought, so that they were used to translate and compare ideological positions [Jordheim, 2014, 2017]. The process was rather similar in Finnish, as Swedish-language expressions provided a channel for producing Finnish-language political expressions that tied Finnish developments to the rest of Europe.

Turning back to the issue of *socialism* as a pivotal ism in both Swedish- and Finnish-language discourse in Finland, our findings harmonize with Marzec and Turunen [2018] who emphasize the role of *socialism* based on frequency and textual analysis, but we further note that looking at *socialism* in the context of all isms shows that it also had a synchronizing function between Finnish and Swedish. The breakthrough of socialism as a buzz word in the second half of the

nineteenth century helped produce political and ideological isms also in Finnish that could be compared with counterparts in Swedish and other languages.

A careful analysis of text would provide more reliable interpretations to why socialism gained such a dominant role in Finnish-language discourse, but our enriched clustering with a cosine similarity to any word does also provide more information about the linguistic contexts of each ism. Tables 3 and 4 show how Finnish-language clusters with words associated with socialism include more religious (and to certain extent also scientific) terminology than the more political discourse visible in the Swedish-language clusters. Why socialist discourse was more prone to tap into a reservoir of religious rhetoric in Finnish than in Swedish requires further study. One possible explanation to this may lie in the fact that socialism was in Finnish to a higher degree than in Swedish related to the so-called social question, that is the political problematization of class, poverty and labor issues. These issues also dovetailed with Finnish-language religious discourse around the turn of the century 1900.[Alapuro et al., 1987]

4.5 Separatism and its different domains

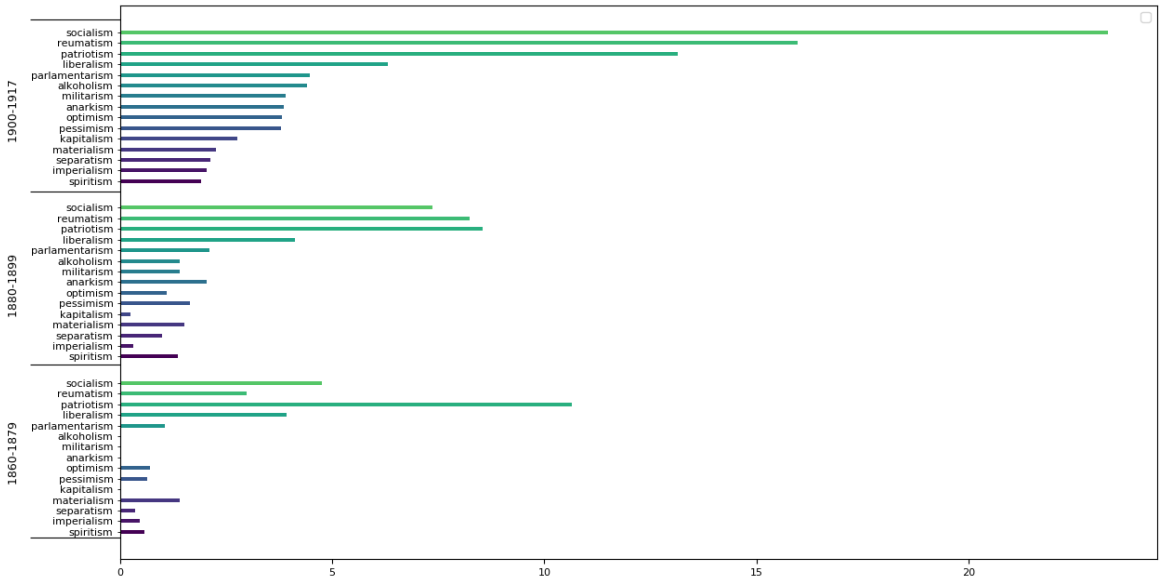
If words like *socialism* and *rheumatism* show remarkable continuity through clusters, other isms seem to be less tied to their clusters. A surprising and illuminating example of this is *separatism* in both Swedish and Finnish. In Table 5, we present the enhanced clusters for it in the Swedish data set.

Most of the words similar to *separatism* in the 1860–1879 cluster are religious, philosophical or scientific notions, such as mysticism, Darwinism, human nature, negation or idealistic. By analyzing the clusters and reading sample texts from the period, we conclude that the cluster derives much from debates about religion and the historical experience of Lutheranism being threatened. The paper *Vasabladet* for instance wrote about Evangelical movements as embodiments of "secterian character and separatism from the church".[7] In the period new scientific and philosophical strands of thought as well as contemporary religious revival movements seriously challenged the status of the dominant state church in Finland, and the notion of separatism seems to have been used often in the ensuing debates.

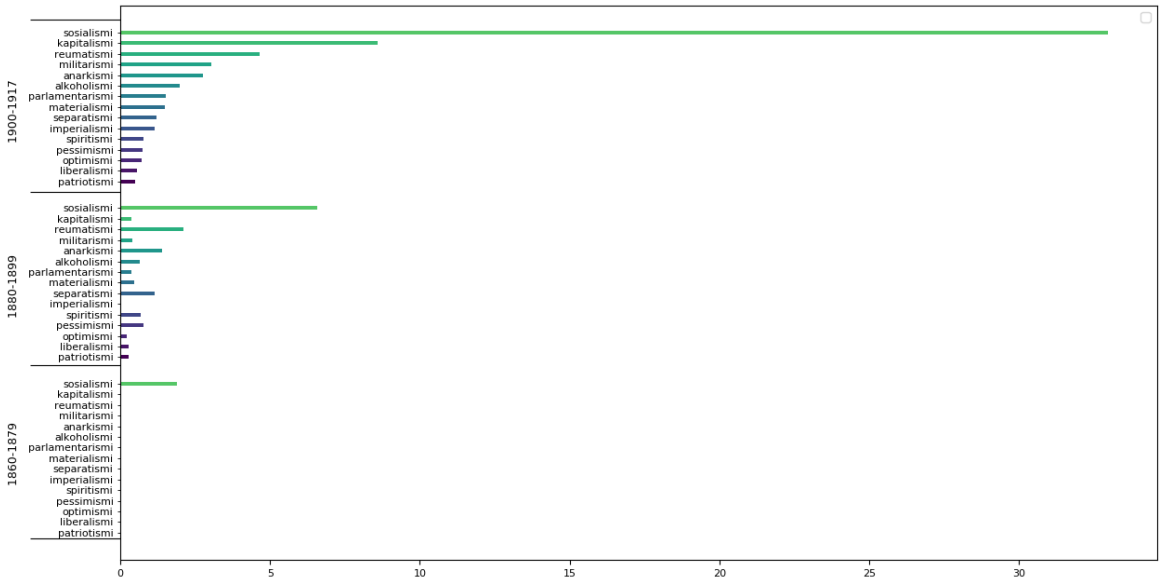
The 1880–1899 cluster contains a completely different set of words, including reference to ethnicity and language policy in the country, such as Finnishness, Fennomans and language policy, and contains rather emotional expressions, such as *agitation* and *fanaticism*. The outlier of *photophobia* also belongs to a similar discourse as the term was used metaphorically at the time to discuss things that could not be brought to the fore because of political tensions. Again with selected reading of texts we note that *separatism* is clearly clustered with words that are related to a contemporary discussion about national identity and national language in Finland, but also more broadly within the Russian Empire. Many of the texts are actually reporting on news in Russian newspapers as is the case with the paper *Finland* that wrote how the "Slavophile Russian press is in a continuous state of nervousness, in which it everywhere sees opponents to the Russian idea of state. First one corner of the country, then another, is accused of separatism."[8]

The 1900–1917 cluster is again different from the previous two and contains more general political lexis. Again, it seems that the notion of separatism had been included in a new discoursive domain. Now, the word clusters with words that relate to state structures and even the context of the Russian empire. Separatism had become embedded in discussions about independence,

[7] *Vasabladet*, 26 September 1877, p. 1
[8] *Finland*, 5 Feburary 1885, p. 3.



SWEDISH



FINNISH

Figure 5: A selection of the most frequent words ending with suffix *-ism*/*ismi*. The x-axis presents relative frequency in items per million.

the role of Finland and as a nation. There is some logical continuation from the previous double decade, especially with regard to Finland's position in the Russian empire, but still it seems that the discourse on separatism shifted focus. For instance, the paper *Wiborgs Nyheter* wrote in 1913 about how "revolutionary separatism in Finland had not reached all layers of society".[9]

All in all, in three consecutive double decades *separatism* at first had a mostly religious context, but was soon adopted into a discourse relating to ethnicity and the language question, which

[9] *Wiborgs Nyheter*, 20 November 1913, p. 3

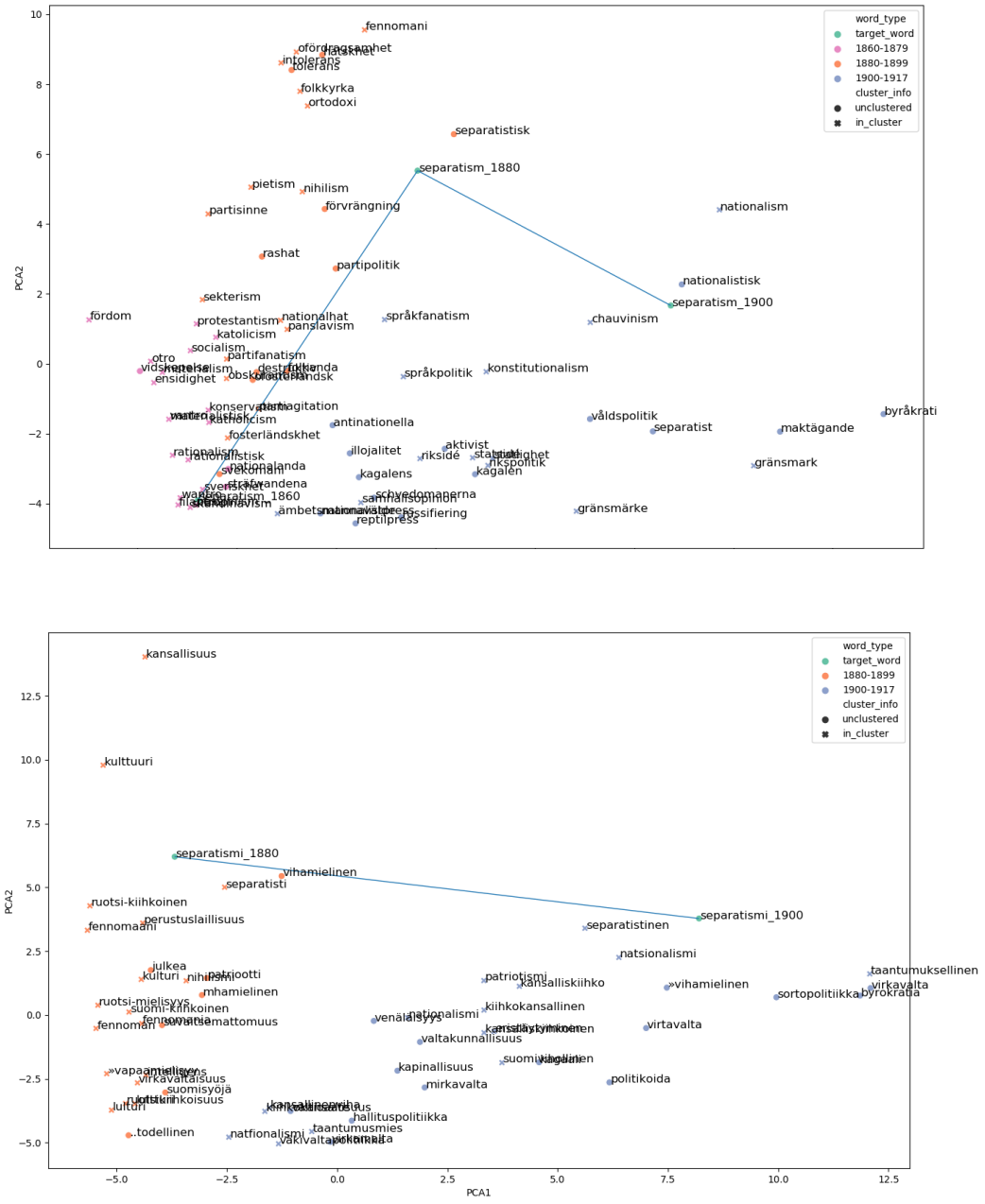
was central to the period, and finally it spread into a more general political discourse in which separatism was more abstract. There is a certain continuity throughout the time periods, and the latter two phases are clearly related to one another. Here, the reading of individual articles and analysing the changing enriched clusters complement one another. The former highlight the continuities, whereas the latter point at the differences by bringing out the dominant words that cluster with separatism in the different time slices.

The Finnish-language clusters for *separatismi*, presented in Table 6, suggest a similar development, but given the language divide in the country, the perspective is slightly different. The Finnish data set does not include a cluster for the period 1860–1879 as the word occurs less than a hundred times and as a consequence is excluded from our models. The periods for 1880–1899 and 1900–1917 point at separatism that is first dominated by the language question and then in the early twentieth century being dominated by the issue of Finland's status in the empire and nationalism in general. Interestingly, however, the Finnish-language cluster for 1880–1899 contains more words that relates to the Svekomans, that is the Swedish-language movement, and the Swedish-language cluster includes more words relating to Fennomans, that is the Finnish-language movement. Together with a reading of a selection of the sources, we see how the discourse on separatism is quite similar in both languages, but is directed toward the "opposing" side. (Obviously, the language question was interwoven with issues of class and the urban-rural divide as well, so it is not as simple as talking about only two sides, but the general pattern is clear.)

The Finnish-language cluster for the period 1900–1917 is also similar to the Swedish-language counterpart in emphasizing the imperial context. It also seems that the different languages seem to converge in their outlook as the question of language identity within Finland was no longer as topical in this particular discourse.

The change in the distribution of *separatism* seems to be related to a change in the dominant context in which it was discussed (from a religious context to a political context). The shift in cluster entails some degree of semantic change, but it is also clear that *separatism* as a highly abstract term could lend itself to many different themes or topics, and thus it seems that the change in dominant themes themselves is more important for the changing clusters than the changes in meaning of the word. An alternative interpretation would be that separatism was a polysemous word in which the different separatisms (those relating to religion, the language issue or the national question) coincided and that different senses dominated in different time slices, but a reading of sample sentences does not support this interpretation.

The distributional shift of *separatism* is to some extent visible from changes in the nearest neighbours of the word presented in Figure 6. They visualize a shift from the time slice 1880–1899 to 1900–1917 in both languages. The outlook can be interpreted in a similar way as the clusters produced by Affinity Propagation, but have a slightly different selection of words. This can be explained by the nature of the procedure used to produce the visualization. PCA is a dimensionality reduction technique and does not explicitly do any clustering therefore each word can be among the nearest neighbours for any number of other words while Affinity Propagation assigns a word to exactly one cluster so that, for instance, *socialism* and *katolicism* are separated in clusters of their own. The difference between outputs demonstrates an added value of the clustering, which selects only one word split among many possibilities provided by embeddings. At the same time, this also means loss of information, especially for polysemous words.



FINNISH

Figure 6: PCA plots of *separatism(i)* and its nearest neighbours across time slices. Words marked by $\times$ are part of the separatism cluster in their respective time slice.

1860-1879	1880-1899	1900-1917
separatism ‘ separatism’	*separatism* ‘ separatism’ *rent* ‘?’	*separatism* ‘ separatism’ *riksidé* ‘ national idea’$_{ocr}$
mysticism ‘ mysticism’ *naturalism* ‘ naturalism’	*finskhet* ‘ Finnishness’ *fennomanins* ‘ Fennomania’	*statsidé* ‘ state idea’$_{ocr}$ *rikspolitik* ‘ national policy’
darwinism ‘ darwinism’ *moral* ‘ morality’	*fennomani* ‘ Fennomania’ *svenskhet* ‘ Swedishness’	*bourgeoisins* ‘ bourgeoisie’ *byråkratien* ‘ bureaucracy’
tidsanda ‘ zeitgeist’ *krass* ‘ crass’ *utopi* ‘ utopia’	*fennomanin* ‘ Fennomania’ *vikingaparti* ‘ Viking party’	*samhällsopinion* ‘ societal opinion’
materialistisk ‘ materialistic’ *otro* ‘ incredible’	*partiagitation* ‘ party agitation’ *partiyra* ‘party delirium’	*sträfvandenas* ‘aspirations’ *rikskomplex* ‘ national complex’
rationalistisk ‘ rationalistic’ *wantro* ‘misbelief’	*partifanatism* ‘ party fanaticism’	*nationalitet-* ‘ nationality’$_{ocr}$ *santryska* ‘ true Russian’$_{ocr}$
menniskonaturen ‘ human nature’ *tidehvarfvets* ‘the age (genitive)’	*språkgräl* ‘ language quarrel’	*ämbetsmannavälde* ‘ officialdom’
materialism ‘ materialism’ *materialist* ‘ materialistic’	*språkfanatism* ‘ language fanaticism’	*gränsmärke* ‘ borderline’ *gränsmark* ‘ borderline’$_{ocr}$
konservatism ‘ conservatism’	*språkfråga* ‘ language question’	*riksenhet* ‘ national assembly’
idealism ‘ idealism’ *rationalism* ‘ rationalism’	*språkfrågan* ‘language question’	*samhällskraft* ‘ social force’ *statlighet* ‘ statehood’
negation ‘ negation’ *abstraktion* ‘ abstraction’	*ljusskygghet* ‘ photophobia’	*frihetssträvande* ‘freedom-aspiring’ *wäldets* ‘domination/empire’
idealistisk ‘idealistic’		*riksmakt* ‘ national power’ *självhärskarmakten* ‘autocratic power’

Table 5: Swedish clusters containing word *separatism*

1880-1899	1900-1917
separatismi 'separatism' *ruotsi-kiihkoinen* 'Svekoman' *ruotsinmielinen* 'Swedish-minded'	*separatismi* 'separatism'
ruotsalaisuus 'Swedishness' *viikinki* 'Viking' *ruotsi-mielinen* 'Swedish-minded'	*nationalismi* 'nationalism' *natsionalismi* 'nationalism'
fennomaani 'Fennoman' *epäkansallinen* 'anti-national' *viikingit* 'Vikings'	*opportunismi* 'opportunism' *natfionalismi* 'nationalism'$_{ocr}$
separatisti 'separatist' *ruotsikko* 'Swedish-minded'(person) *miikinki* 'Viking'$_{ocr}$ *pöppö* '?'	*eristäytyminen* 'isolation' *kansalliskiihko* 'nationalism'
miikingit 'Vikings'$_{ocr}$ *suomimielinen* 'Finnish-minded' *ruotsi-mielisyys* 'Swedish-mindedness'	*intelligens* 'intelligence' *länsieurooppalainen* 'Western-European'
wiitinki 'Viking'$_{ocr}$ *wiilinki* 'Viking'$_{ocr}$ *miitinki* 'Viking'$_{ocr}$ *ruotsimielinen* 'Swedish-minded'	*rotutaistelu* 'race struggle' *vapaamielisyy* 'liberalism'$_{ocr}$
suomi-kiihkoinen 'Fennoman' *fennoman* 'Fennoman' *henkiheimolainen* 'like minded'	*sanomalehdistö!* 'press' *antipatia* 'antipathy'
dagbladilainen 'member of the Dagblad circle' *miiking* 'Viking'$_{ocr}$ *fennomani* 'Fennoman'	*kansallinenviha* 'national anger' *kiihkokansallisuus* 'national fervour'
wiiking 'Viking'$_{ocr}$ *fennomaaninen* 'Fennoman' *ruotsikiihkoisuus* 'Svekomania'	*eristäytyä* 'self-isolate' *liittolaisuus* 'alliance'
wiilinli 'Viking'$_{ocr}$ *miikinkilehti* 'Vikings' newspaper'$_{ocr}$ *suomenmielinen* 'Finnish-minded'$_{ocr}$	*vihamieli-syy* 'hostility'$_{ocr}$ *kansallinenylpeys* 'national pride'
miikinkiläinen 'Viking (adjective)'$_{ocr}$ *ruolsinmielinen* 'Swedish-minded' *ruotsiliihloinen* 'Svekoman'$_{ocr}$	*kielipolitiikka* 'language policy'
herranenluokka 'class of the lords' *miikingilehti* 'Vikings' newspaper'$_{ocr}$ *epälansallinen* 'anti-national'$_{ocr}$	*kansallinenliike* 'national movement'

Table 6: Finnish clusters containing word *separatismi*

V DISCUSSION AND FUTURE WORK

5.1 Embeddings and semantics

As we have shown in this paper, the comparison of word embeddings trained on various time periods is a fruitful method for analysis of historical newspapers. Diachronic analysis using vector models is a rapidly growing research field in computational linguistics (see, for example, recent surveys of this topic [Kutuzov et al., 2018, Tahmasebi et al., 2018]).

One research direction is aimed at continuous time representation [Dubossarsky et al., 2019, Gillani and Levy, 2019, Rosenfeld and Erk, 2018, Yao et al., 2018]. These methods reveal gradual semantic changes over time and do not require dividing the data into discrete time slices.

The most recent approach involves contextual word embeddings, which outputs a separate vector for each word mentioned based on its context. Contextualized embeddings are reviewed in [Ethayarajh, 2019] and exemplified by BERT [Devlin et al., 2019] and ELMo [Peters et al., 2018]. These models make possible tracing differences in word usage across time, though as far as we are aware these models were applied to trace an evolution of a single word—e.g., [Martinc et al., 2020a,b]—rather than detecting evolution of groups of semantically related words.

Finally, there has been a lot of effort towards the development of cross-lingual embeddings [Ruder et al., 2019], which put words from two or more languages into the same vector space and thus enable direct comparison of data from various languages. We suggest that using any of these approaches—namely, contextual, continuous and cross-lingual embeddings—or their combination might be a productive next step, which would allow for a deeper understanding of the historical development of complex political notions, but using these methods requires statistical evaluation of the output for historical data.

5.2 Digital humanities and the study of political vocabularies

The analysis of the history of political thought is not tied to the newest advances in natural language processing, but analyses drawing on them often create space for new interpretations in studying the political imaginaries of past people. In this study on isms as nodes of everyday political thinking in nineteenth-century newspapers from Finland, we have produced new and reliable ways of charting and visualizing the expansion of the vocabulary of isms. Especially noteworthy in our method is that it can grasp developments in word use that relate both to growth in frequency and change in the distribution of the word. This way our findings regarding the importance of socialism as a political keyword are not surprising to someone with good knowledge of the political vocabulary in Finland, but our method shows the sheer amounts and pivotal role of socialism in a way that has not been possible before. Nor has there been any attempts to compare the discourse of socialism across the language divide in Finland. The

findings relating to separatism are different in the sense that we were not expecting to find anything out of ordinary relating to that word. We were rather surprised that it emerged as a interesting case based on a semi data-driven perspective.

Our cases relating to socialism and separatism also indicate that the relationship between distribution and meaning as pointed out in the so-called distributional hypothesis, which is usually attributed to Zellig Harris [Harris, 1970, Sahlgren, 2008], is not as straightforward as sometimes believed.[10] While there is a link between the change in distribution and semantic change, this link seems to be easier to capture in clear cases of polysemy than in rather vague and flexible terms such as the isms under study here. Isms are often also in hierarchical relations to one another, especially when being qualified in some way. For instance, the words state socialism (*statssocialism*) and municipal socialism (*kommunalsocialism*) are found in Table 8. The former clusters together with socialism but not the latter. This suggests that the clustering is rather being related to social meaning than to strict semantic meaning.

While word embeddings and other methods analysing the distribution of terminology are increasingly looking for new avenues in studying multilingual corpora, we further want to point out that the case of isms may be a fruitful avenue for developing multilingual approaches. Dealing with Finnish and Swedish in one country showed that the historical translatability between the language (even if Finnish is less prone to introduce new isms) can be very useful in studying political vocabularies and thinking in different linguistic contexts when combined with good contextual knowledge that takes into account linguistic an political specificities relating to the languages at stake.

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[10] We thank Antti Kanner for pointing this interpretation out to us.

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A ANNEX 1: ISM CLUSTERS FOR FINNISH DATA

Table 7: Clustering obtained for Finnish words ending with ism suffix. We show cluster words and their frequencies in the respective time slice, sorted by frequency. Cluster *representatives* are marked with italic.

1860-1879

sosialismi	172

1880-1899

sosialismi	5115
anarkismi	1120
nihilismi	602
militarismi	328
kommunismi	316
parlamentarismi	312
kapitalismi	301
liberalismi	236
radikalismi	171
boulangismi	163
kosmopolitismi	128
protestantismi	115
baptismi	108

realismi	1029
pessimismi	614
idealismi	351
symbolismi	291
naturalismi	279
optimismi	182

separatismi	924
patriotismi	231
fanatismi	126

organismi	415
magnetismi	328

pietismi	370
materialismi	367
ateismi	167
metodismi	147
dualismi	105
despotismi	101

hypnotismi	733
spiritismi	542
alkoholismi	527

reumatismi	1706

teismi	119

1900-1917

realismi	2097
pessimismi	1192
idealismi	591
naturalismi	794
pietismi	476
impressionismi	342
aforismi	262
humanismi	242
symbolismi	231
panteismi	230
egoismi	201
kubismi	169
asketismi	154
fatalismi	152
altruismi	150
mystisismi	141
klassisismi	123
ratsionalismi	119

materialismi	3232
spiritismi	1327
hypnotismi	623
monismi	449
darwinismi	435
modernismi	174
marxismi	148
pragmatismi	113

organismi	1009
magnetismi	433
mikro-organismi	130

mekanismi	564

sosialismi	75117
anarkismi	5630
terrorismi	2063
kommunismi	1548
sialismi	910
syndikalismi	524
individualismi	398
nihilismi	397
ateismi	341
antimilitarismi	306
revisionismi	288
sofalismi	178
remisionismi	139
indimidualismi	127
rialismi	117
darvinismi	111
antisemitismi	102

>sosialismi	832
..sosialismi	316
sionismi	221
vegetarismi	196
”sosialismi	170
.sosialismi	163
sosialismi	133
’sosialismi	126
sosialismi	108

reumatismi	9629
matismi	180
nivelreumatismi	158

militarismi	7062
imperialismi	2796
despotismi	661
absolutismi	350
tsarismi	318
huliganismi	270
panslavismi	202
vandalismi	194
bolshevismi	194
hellenismi	187
klerikalismi	147
klerkalismi	146
germanismi	104

separatismi	2008
natsionalismi	1852
optimismi	1580
patriotismi	993
nationalismi	657
fanatismi	589
nalismi	134
anakronismi	129
natfionalismi	120

fotsialismi	203
fofalismi	151
anarfismi	126
fofialismi	123

onnismi	517
onanismi	265

kapitalismi	20681
talismi	388
industrialismi	346
suurkapitalismi	302
barbarismi	225
tpitalismi	178
lpitalismi	166
tapitalismi	155
pitalismi	137
lapitalismi	113
kapitalismi	104

parlamentarismi	3413
liberalismi	1156
radikalismi	645
feodalismi	438
opportunismi	420
dualismi	293
valtiososialismi	235
protestantismi	213
gmerkantilismi	140

alkoholismi	4312
kunnallinensosialismi	1085
alloholismi	105
holismi	158

teismi	598
tarismi	175
turismi	126

reumatismi	212
.reumatismi	122

B ANNEX 2

Table 8: Clustering obtained for Swedish words ending with ism suffix. We show cluster words and their frequencies, sorted by frequency. Cluster *representatives* are marked with italic.

1820-1839

patriotism	232
fanatism	165
despotism	153

1840-1859

patriotism	581
egoism	560
fanatism	431
socialism	294
pauperism	290
despotism	254
kommunism	160
liberalism	136
radikalism	105

organism	410
mekanism	217
magnetism	170
galvanism	124

rheumatism	101

pietism	505
protestantism	342
katholicism	155

1860-1879

patriotism	2664
liberalism	1148
materialism	461
konservatism	446
dualism	347
parlamentarism	341
absolutism	265
optimism	228
pessimism	209
rationalism	158
konstitutionalism	139
anakronism	137
protektionism	135
sofism	100

rheumatism	571
reumatism	305
galvanism	151

socialism	1263
katolicism	988
protestantism	846
kommunism	363
nihilism	282
katholicism	272
mormonism	240
pauperism	211
skandinavism	211
jesuitism	207
spiritism	188
panslavism	163
darwinism	112
ateism	102

baptism	360
pietism	205
separatism	118

despotism	923
radikalism	585
ultramontanism	458
bonapartism	337
klerikalism	177
imperialism	150
carlism	141
federalism	136
republikanism	115

fanatism	1710
terrorism	325
vandalism	233
cynism	190
chauvinism	115

antagonism	336
schism	323

egoism	1024
realism	388
idealism	183
heroism	153
mysticism	142
naturalism	115
dilettantism	106

organism	1575
mekanism	992
magnetism	328
statsorganism	120

Table 8: Clustering obtained for Swedish words ending with ism suffix: continuation

1880-1899

socialism	5560
katolicism	2154
anarkism	1975
protestantism	1408
militarism	1366
nihilism	1181
antisemitism	911
absolutism	641
statssocialism	485
kommunism	459
journalism	244
bimetallism	212
jesuitism	206
nationalism	198
individualism	196
utilitarism	124
germanism	115

baptism	641
mormonism	503
sekterism	366
metodism	259
finlandism	223
laestadianism	132
fennicism	106

separatism	829
partifanatism	278
språkfanatism	273
nepotism	121

vandalism	572
anakronism	298

patriotism	4792
liberalism	2705
konservatism	1806
parlamentarism	1688
radikalism	1455
protektionism	1222
chauvinism	950
despotism	868
opportunism	344
skandinavism	311
konstitutionalism	259
republikanism	203
feodalism	101

mekanism	3237
hypnotism	1811
magnetism	932
idiotism	287
jordmagnetism	175
galvanism	169
somnambulism	138
bypnotism	132
atavism	106

schism	1263
antagonism	863
dualism	467
statsorganism	146

aforism	283
darwinism	276
darvinism	165
vegetarianism	154

egoism	3057
materialism	1003
pietism	547
formalism	482
ateism	455
rationalism	276
obskurantism	221
positivism	221
indifferentism	213
industrialism	136
asketism	131
barbarism	123

realism	2295
naturalism	1134
idealism	834
symbolism	561
mysticism	422
dilettantism	309
sofism	309
humanism	216
kosmopolitism	171

spiritism	1123
kannibalism	383
buddism	175
muhamedanism	166
buddhaism	151
spiritualism	103

alkoholism	1364
pauperism	231
morfinism	129

boulangism	1128
terrorism	707
klerikalism	569
panslavism	341
kapitalism	226
hellenism	206
partikularism	180
imperialism	151
bonapartism	143
ultramontanism	129
kollektivism	121
cesarism	110

fanatism	3086
pessimism	1382
cynism	846
optimism	839
skepticism	548
heroism	320
fatalism	310
lokalpatriotism	112

reumatism	5735
ledgångsreumatism	1381
rheumatism	1262
matism	274
ledgångsrheumatism	188
ledgängsrheumatism	126

organism	5713
mikroorganism	621
djurorganism	110

amerikanism	161

Table 8: Clustering obtained for Swedish words ending with ism suffix: continuation

1900-1917

socialism	15080
parlamentarism	2231
liberalism	2034
konservatism	2034
imperialism	1637
radikalism	1438
absolutism	879
klerikalism	818
konstitutionalism	695
protektionism	650
skandinavism	440
opportunism	288
marxism	286
internationalism	285
proportionalism	245
demokratism	234
statssocialism	204
aktivism	168
oktobrism	136
försvarsnihilism	117
monarkism	112
modernism	109

alkoholism	2829
vegetarism	245
darwinism	193
kommunalsocialism	145
vegetarianism	130
nykterism	112

antagonism	943
dualism	415
statsorganism	177
parallellism	105

schism	3237
skism	167

turism	448

idealism	1113
materialism	694
individualism	512
spiritism	506
pietism	415
mysticism	266
sofism	260
journalism	189
humanism	179
indifferentism	178
kosmopolitism	167
rationalism	158
obskurantism	156
ateism	146
asketism	138
atavism	129
dogmatism	121
monism	114

realism	1785
naturalism	560
impressionism	319
symbolism	247
dilettantism	245
kubism	225
klassicism	183

slavism	317
germanism	240
panslavism	211
hellenism	141
pangermanism	130

reumatism	6423
rheumatism	820
muskelreumatism	142

ledgångsreumatism	1811
matism	470

anarkism	1709
terrorism	1600
syndikalism	387
antisemitism	341
antimilitarism	267
kommunism	256
feminism	242
jesuitism	180
revisionism	166
nihilism	125
ungsocialism	112
kollektivism	110

nationalism	5398
patriotism	4254
separatism	1079
chauvinism	1002
språkfanatism	373
suometarianism	363
fariseism	134

katolicism	1363
protestantism	726
kannibalism	338
buddism	261
buddhism	154
muhammedanism	150

organism	6627
mekanism	2332
mikroorganism	453
samhällsorganism	125

optimism	2565
pessimism	2023
skepticism	563

aforism	396
finlandism	221

egoism	2942
fanatism	2496
cynism	900
heroism	482
fatalism	252
partifanatism	219
lokalpatriotism	172
altruism	145
klassegoism	106
knutpatriotism	102

kapitalism	2399
militarism	2346
despotism	917
industrialism	732
tsarism	568
barbarism	169
utilitarism	142
feodalism	132
storkapitalism	128

vandalism	703
byråkratism	426
formalism	496
anakronism	423
nepotism	117
servilism	106

hypnotism	528
magnetism	362
idiotism	133
jordmagnetism	116

baptism	207
mormonism	125
sekterism	121

polism	182