Appendix to: 'When Correlation Is Not Enough: Validating Populism Scores from Supervised Machine-Learning Models'

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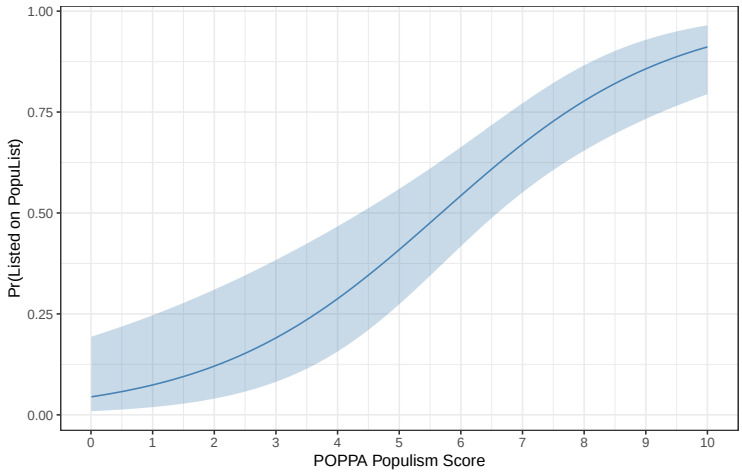
A1 Correlation of POPPA and the PopuList

To demonstrate that the PopuList actually strongly correlates with other expert surveys on populism, we use the established POPPA data set (Meijers and Zaslove 2020). We run a logistic regression with the classification of the PopuList as dependent variable. The independent variable is POPPA's populism score. We plot the results in Figure A1 as predicted probabilities. They clearly show that the PopuList and POPPA's populism score are highly correlated.

Figure A1. Probability of a party being classified as populist conditional on POPPA's populism score



A2 Convergent validity over time: Correlation with V-Party data

As we argued in Section 2 of the main paper, correlating the populism scores with external measures of populism is insufficient because the observed correlations reflect the correlation of POPPA with the PopuList. In addition to this issue, the validation strategy is also insufficient because DCM only assess the convergent validity *between* parties. Despite addressing a clear research gap of how populism varies *over time*, i.e. how the degree of populism changes *within* parties, there is no validation of whether the temporal variation of DCM's scores is meaningful.

Assessing the validity of populism scores over time is challenging because most datasets on parties' degree of populism are cross-sectional and offer no information about temporal variation.[1] The only exception is the V-Party data which contains a measure of how populist a party was in each election (Lührmann *et al.* 2020). Admittedly, this data can also be criticized because it is generated by asking experts to evaluate how populist a party was several years ago. Moreover, the variation in populism scores of V-Party are relatively small, which might reflect biases of the retrospective expert judgment. Thus, V-Party data is not a 'gold standard' for assessing the temporal correlations. However, given that it is currently the only source for temporal populism scores, it is still interesting to assess within-party correlation between V-Party's and DCM's populism scores.

In Table A1, we display the results of a fixed-effect regression in which the populism score of DCM is regressed on the V-Party populism score. Because we are interested in the correlation of the two scores *within* parties, we use party fixed-effects. Moreover, we only analyze parties which participated in at least four elections.[2] The results of Table A1 demonstrate that there is no meaningful *within party* correlation between the V-Party populism scores and the scores derived by DCM. In other words, changes in the level of populism in the V-Party data are not predictive for changes of populism scores in the DCM data. The point estimate is negative. When we exclude Austria from the analysis, because it contains quite severe coding errors which we discuss in more detail in the main text, the effect does not change. These results do not indicate that the movement of parties over time in the DCM data is consistent with the patterns of the V-Party data. Due to the problems of the V-Party data which we discussed above – such as the low level of variation in populism scores over time – we do not claim that this analysis alone provides sufficient evidence for the lack of validity of DCM's approach. However, the null finding is consistent with our critique that the over-time variation in DCM's scores is not reflective of changes in a party's level of populism.

Table A1. Party Fixed-Effect Regression: Effect of V-Dem Populism Score on Populism Score of DCM

	Incl. AUT	Excl. AUT
Intercept	0.05	0.04
	(0.06)	(0.06)
V-Dem Populism Score	−0.12	−0.02
	(0.37)	(0.50)
Num. obs.	84	65

Note: Standard errors in parentheses.

1. Moreover, as shown by Adams *et al.* (2019), analyzing shifts in parties' policy positions is particularly challenging, even when addressing more established concepts such as left-right ideology or positions on European Integration.

2. This reduces the analysis to 15 parties and it excludes all parties from Italy and France. For France only three elections were analyzed and for Italy no party participated in all four elections. Also note that some V-Party values are missing when a party was not represented in the national parliament in the previous legislative period. However, even when we change the criterion for inclusion to three elections, the substantive results do not change. The point estimate is positive but still statistically insignificant.

A3 Feature Importance based on SHAP Values

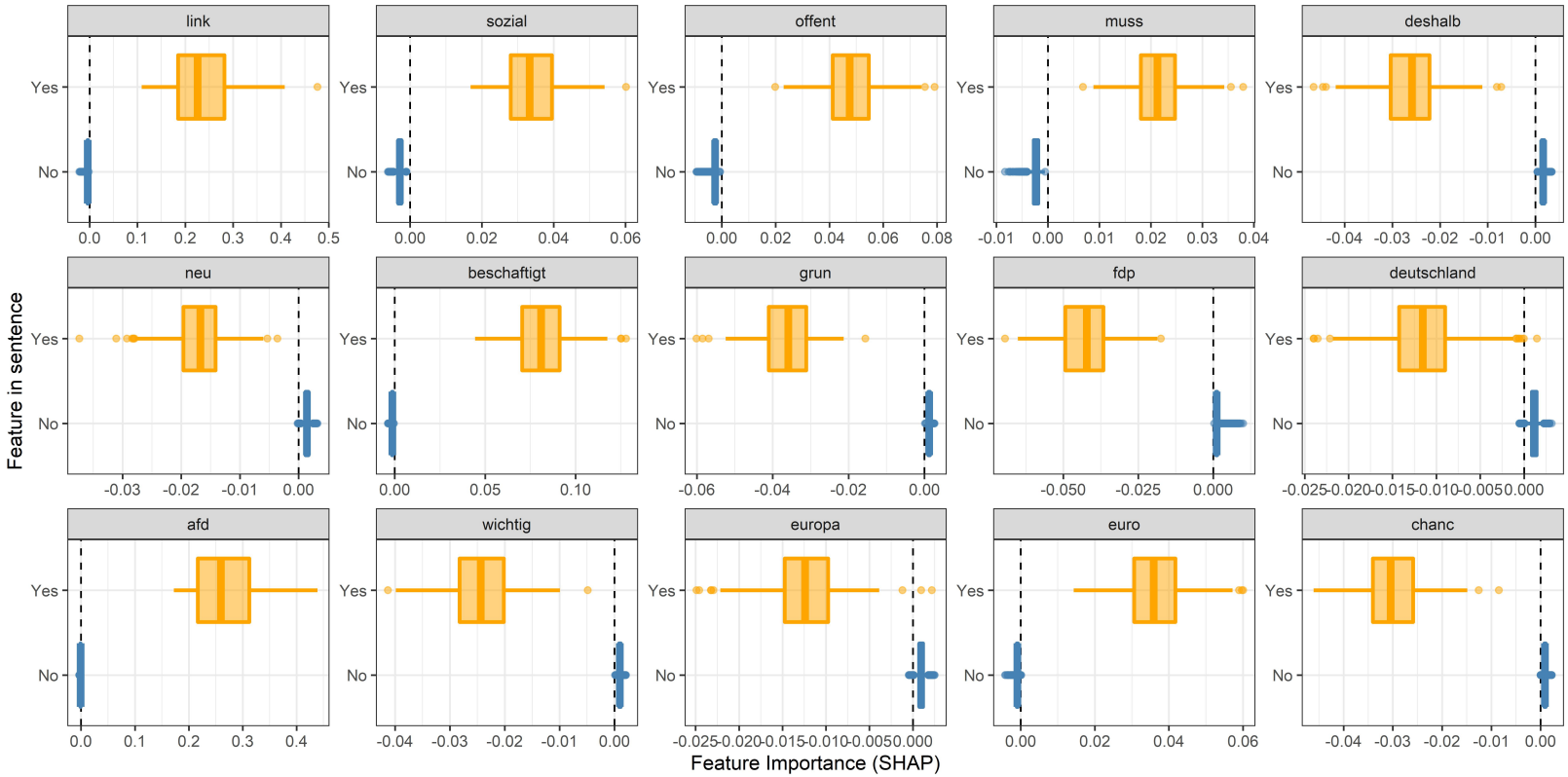
In the main text, we report the five most important features of DCM's models for predicting 'populism'. Feature importance was estimated using the mean impurity approach, which is the default in the `SciKit` package and already included in the model output. However, the mean impurity approach can be biased and it also provides no information on whether a feature has a positive or negative effect on predicting a value of 1, i.e. whether a sentence is populist or not. As an alternative, SHAP values have been proposed as a more robust and informative alternative for assessing feature importance. SHAP values provide a value that indicates which effect the feature had for each observation. A drawback of SHAP values is, however, that they are computationally demanding as they are based on feature permutations. As document-feature-matrices have thousands of features, not all permutations can be estimated. We therefore use an approximation method for estimating the SHAP values. These approximation SHAP values might have some bias, but as we are interested in the general pattern, they should still be informative and they allow to understand whether a feature is indicative of 'populism' or 'non-populism'.

In the following, we summarize the feature importance based on SHAP summary plots. They can be interpreted as follows. First, we plot the overall fifteen most important features in facets. Second, for each feature two boxplots are shown. One for sentences in which the feature is included (orange) and one for sentences in which the feature was not present (blue). For each of the sentences the x-axis displays the importance of the feature in that case. As can be seen in all cases, the presence of a feature usually has a much larger impact on classifying a text as 0 or 1 compared to the absence of a feature. Third, a positive value indicates that the feature had a positive effect on the probability of classifying a sentence as 'populist' and a negative value means that a feature increased the probability of a sentence as being classified as 'non-populist'. Notice that the effect of a feature is estimated for each sentence so that a feature could have a strong or weak effect and also different effect signs depending on the specific sentence. However, in most cases the effect sign is identical.

To provide a specific example, Figure A2 displays the SHAP values for the fifteen most important features for Germany. The most important feature is 'link' (Linke). As can be seen, when this feature is present in a sentence (orange boxplot) it has a large and positive effect on the probability of being classified 'populist'. When a sentence does not include this feature (blue boxplots), this feature has no effect on the classification. Thus, when a sentence includes the word 'link' the probability of classifying the sentence as 'populist' strongly increases but the absence of the feature is not informative for classifying sentences.

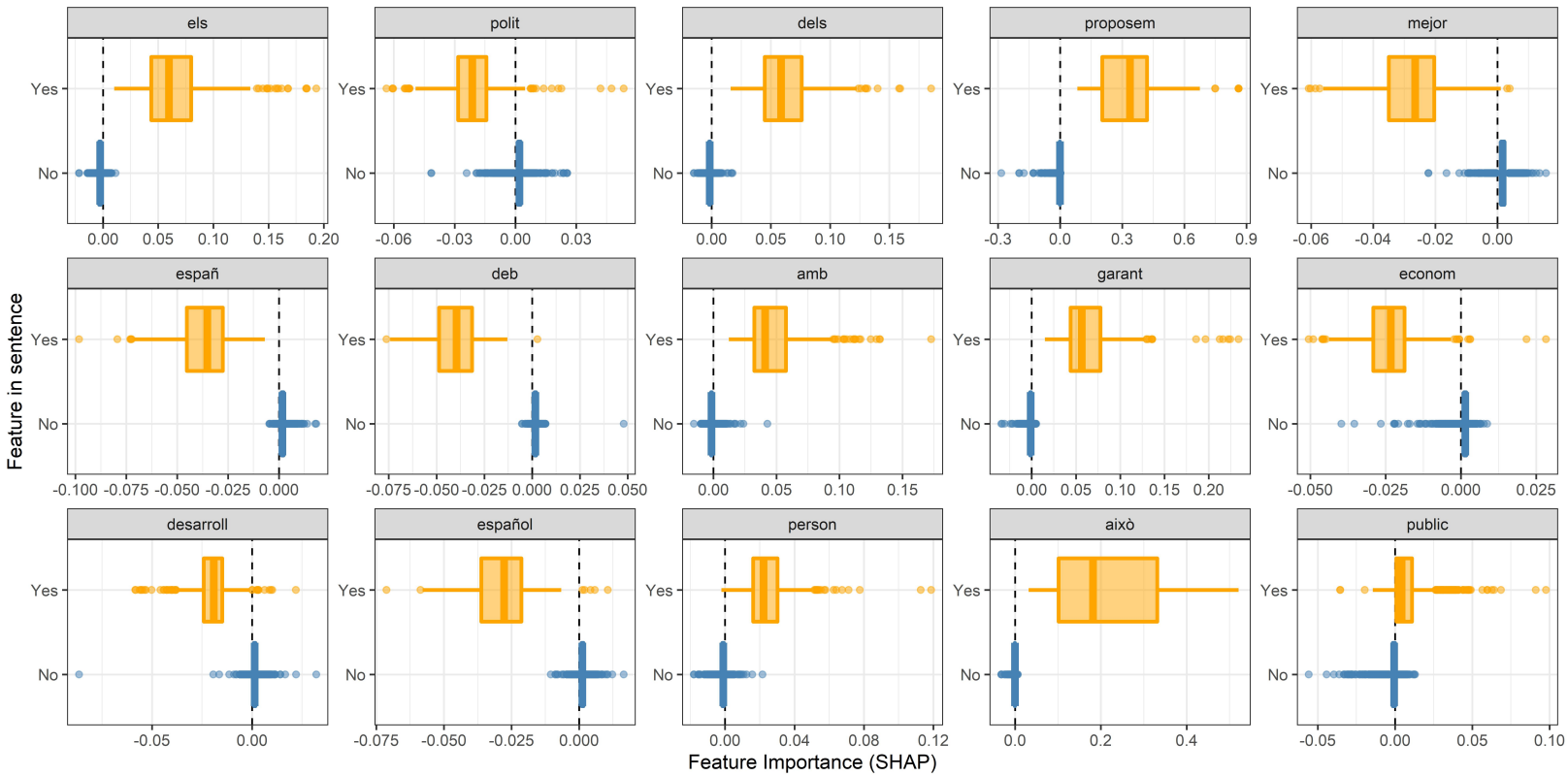
A3.1 Germany

Figure A2. SHAP summary plot for Germany



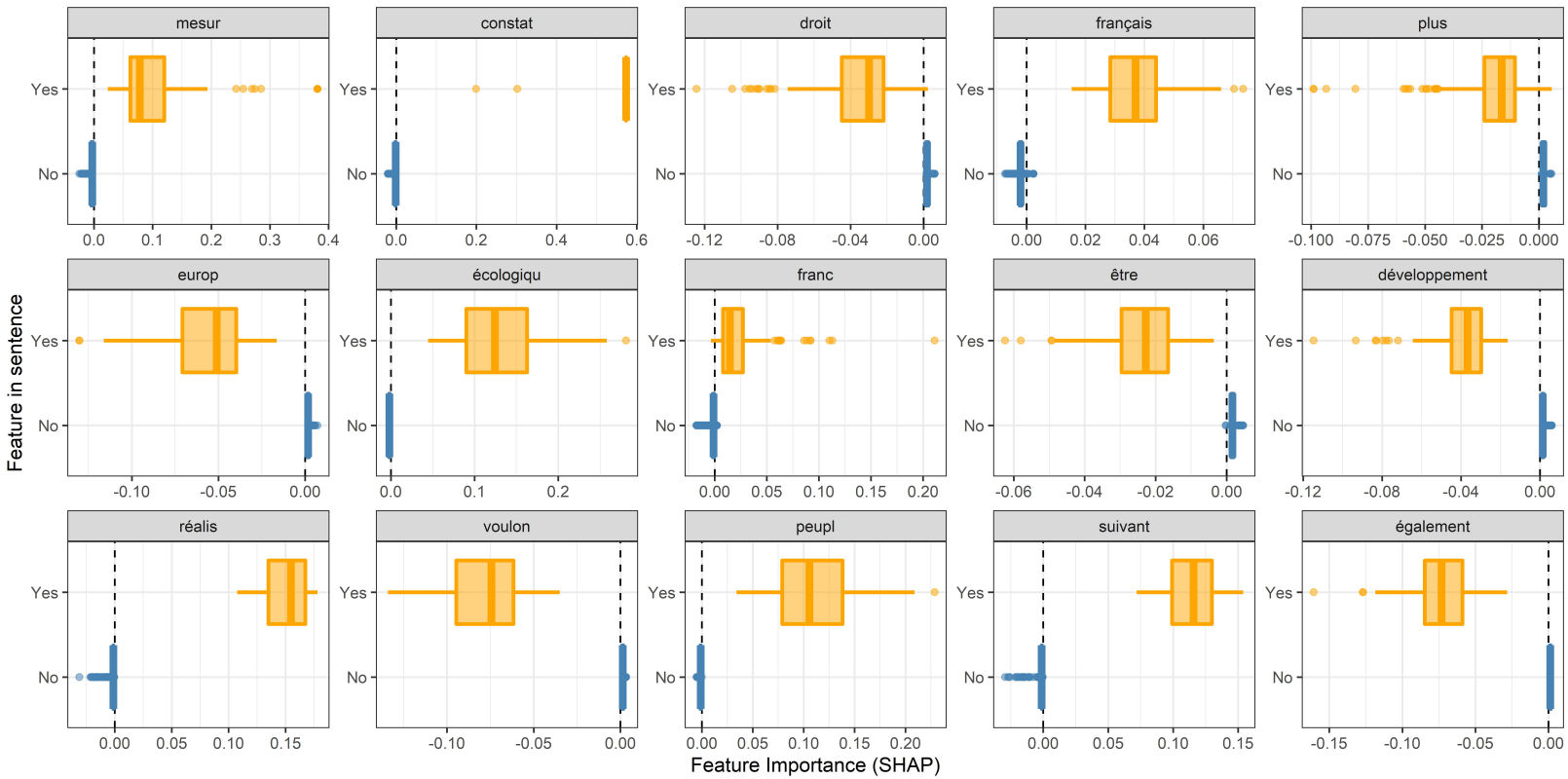
A3.2 Spain

Figure A3. SHAP summary plot for Spain



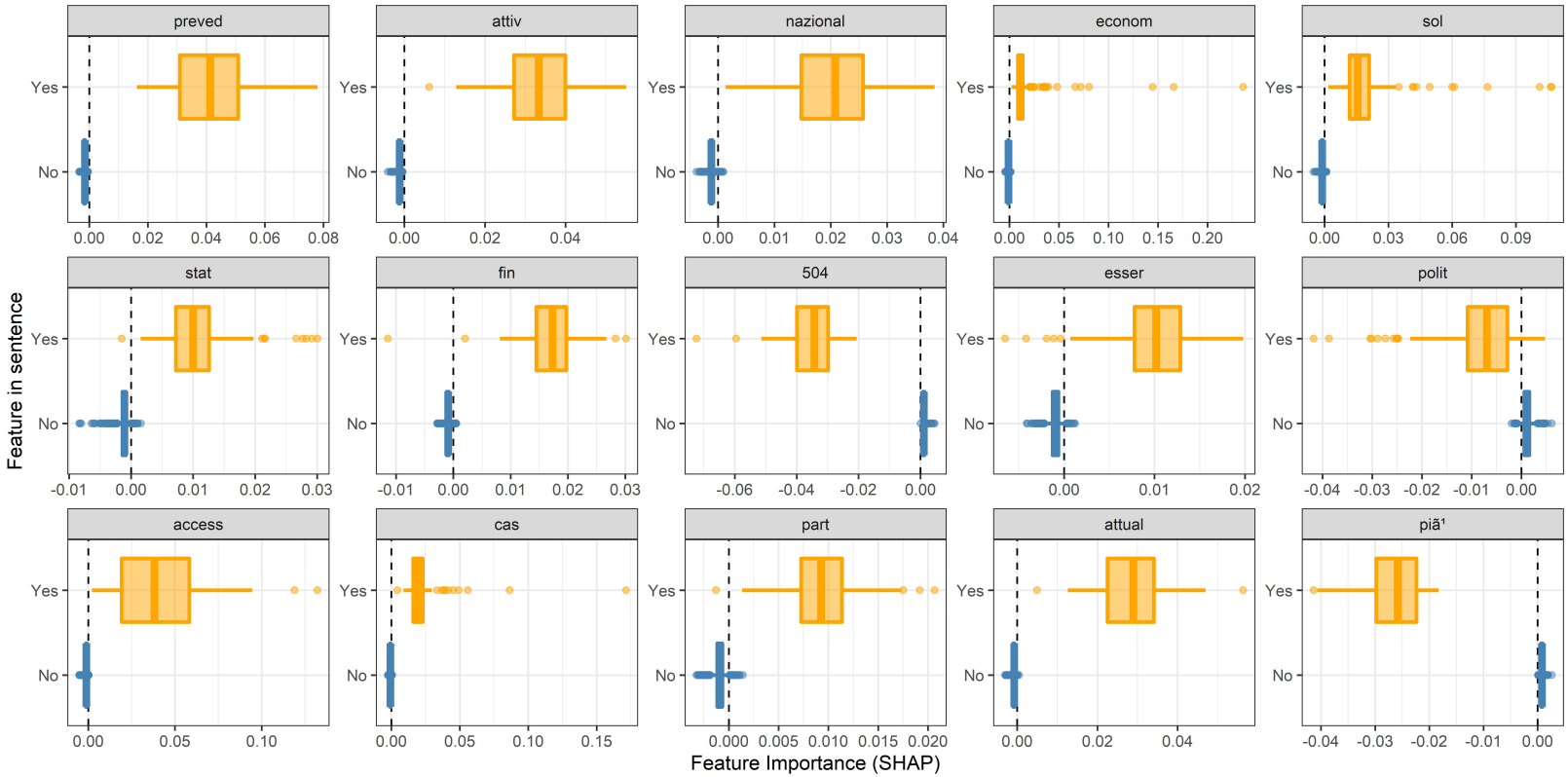
A3.3 France

Figure A4. SHAP summary plot for France



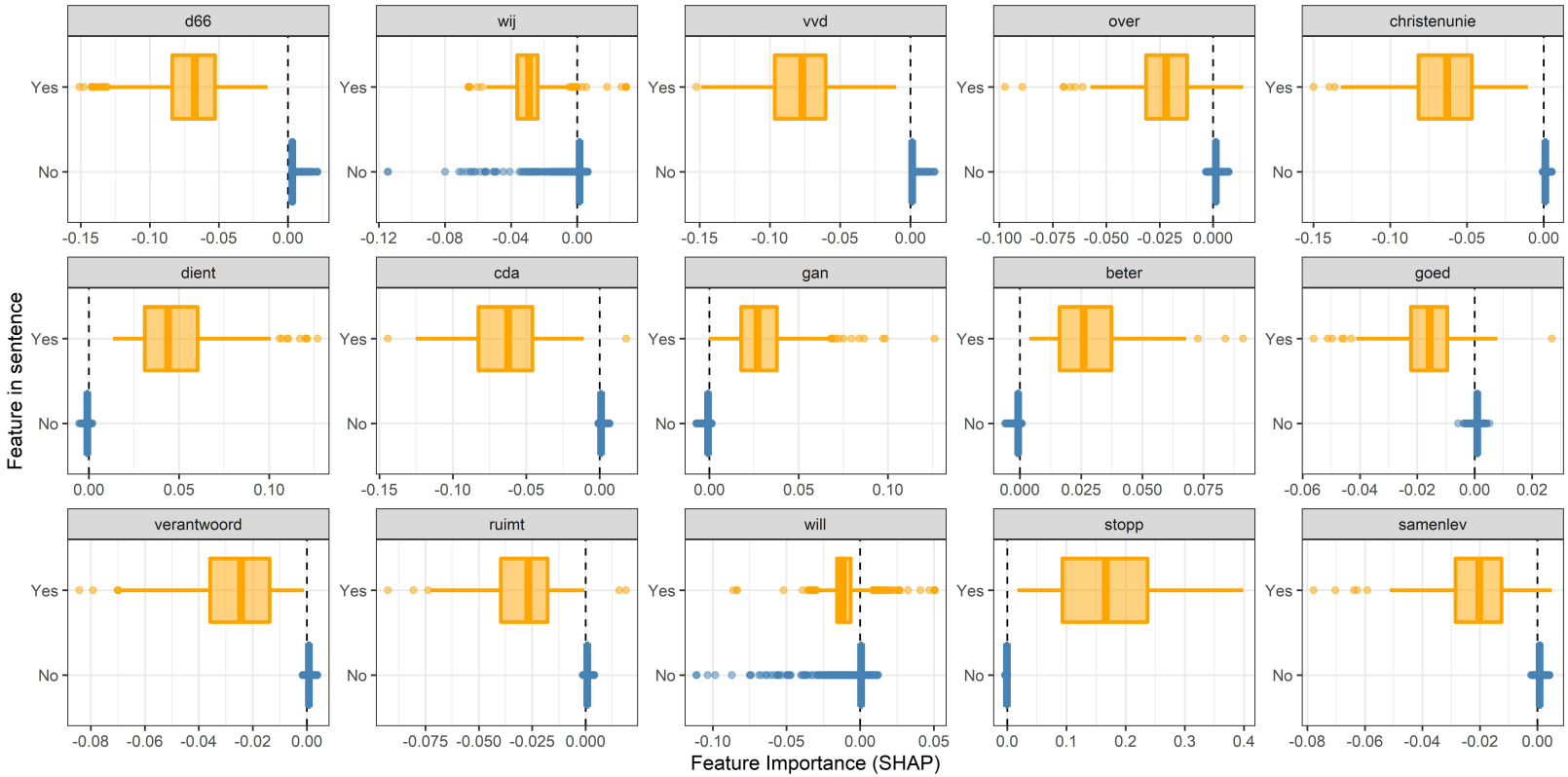
A3.4 Italy

Figure A5. SHAP summary plot for Italy



A3.5 Netherlands

Figure A6. SHAP summary plot for Netherlands



A4 Correlation between Host Ideologies and Populism in the Six Countries

Despite being theorized as a 'thin-centered' ideology (Mudde 2004) that could *potentially* be adopted by any party, existing research demonstrates that populism clusters at the fringes of the political left-right spectrum. For example, Meijers and Zaslove (2020) show how radical left-right positions are correlated with different levels of populism. Hence, populist parties have different 'thick' ideological profiles compared to non-populist parties. DCM's machine-learning models, thus, might also capture these ideological differences between populist and non-populist parties as thick and thin ideologies are not fully independent. This is, of course, a more general problem of using supervised machine-learning for identifying populism. The more often two distinct concepts appear together, the more challenging it becomes for a machine-learning model to separate between both concepts. Specifically with regard to the conflation of thick and thin ideologies, the bias is more likely to occur in countries with ideologically homogeneous populist supply, i.e. when all populist parties in a country are left- or right-wing. The stronger populism and ideological positions correlate the more likely the machine-learning algorithm fails to distinguish between both concepts.

While this problem potentially applies to all applications of using supervised machine-learning for measuring populism, it should be noted that this bias is much more severe in DCM's approach compared to an approach in which populism is (manually) coded at the sentence level. This is so, because DCM code *all sentences* of a populist party as 'populist' and, thus, also sentences which contain *only* thick ideology. Based on previous work on populism in party manifestos, sentences that contain only thick ideological statements are the vast majority even in manifestos of populist parties (see, e.g., the study by Rooduijn and Pauwels 2011 which demonstrates that only 15% of the paragraphs in the most populist manifesto contain actually populist language). Thus, there is an important difference between DCM's approach and manually coded (supervised machine-learning) measures of populism. When using manual coding, one can be sure that each coded sentence contains populism and the supervised machine-learning model might be slightly biased because these sentences *also* contain references to thick ideologies. In contrast, DCM's approach includes a large number of sentences which contain no populist language at all and, thus, the coding of populism is already strongly biased.

To evaluate how severe the correlation of populism and host-ideology is in the six countries analyzed by DCM, we look at the composition of ideological positions among the populist parties. DCM classify each party's ideology as either 'left-wing', 'right-wing' or 'other'. Moreover, their data contains the number of sentences for each manifesto. Table A2 summarizes this information. In Austria, Germany, and Spain, populist manifestos are clearly connected to one host-ideology as either *all* (Austria and Spain) or the vast majority (Germany) of populist sentences is connected to one ideological leaning.[3] In France, Italy, and the Netherlands, the pattern is more balanced. Overall, these patterns suggest that DCM's approach may bias the measurement by failing to correctly capture the core concept – populism. In many cases, they run at risk of conflating populism with certain host ideologies of parties and contrasts with the conception of populism as a thin-centered ideology that is independent of thick ideologies.[4]

3. We are aware of a small coding error for Germany in the data of DCM. For the election of 2005 the manifesto of the Left Party is included twice in the data once with the old party label 'Party of Democratic Socialism' and once with the new party label 'The Left'. Table A2 includes the uncorrected distribution of sentences and parties on which the analysis by DCM is conducted. See section A6 in this appendix for details.

4. While we highlight imbalance in terms of the ideological composition of parties, other imbalances may also occur. For example, the number of populist parties which participated in elections may have increased over time. This may induce 'agenda effects' in which words used only in specific elections may be highly predictive of populism overall (Proksch and Slapin 2009).

Table A2. Ideological Composition of Populist Parties in the Six Countries Analyzed by DCM

	Number of Populist Manifestos			% Sentences		
Country	Right-wing	Left-wing	Other	Right-wing	Left-wing	Other
Austria	8	0	0	100	0	0
France	3	1	0	59	41	0
Germany	2	4	0	13	87	0
Italy	3	1	2	50	2	49
Netherlands	6	6	0	32	68	0
Spain	0	5	0	0	100	0

A5 Coding Errors in Austria

DCM's data for Austria contain coding errors which we summarize in Table A3. The labels used for identifying and training the models do not contain the correct manifestos. For example, the manifesto which is labeled as 'SPÖ 2002' actually contains the manifestos of the Greens from 2006 (see row 1 in Table A3). In only four cases (the Greens in 2002 and 2008; the ÖVP in 2006; the BZÖ in 2008) the labels are correct. Notice that no party label or manifesto occurs twice. The manifestos are only randomly assigned to certain labels. We also provide the feature importance (Table A4) and SHAP values (Figure A7). They are clearly biased based on the coding errors. For example, 'ÖVP' is the most important feature and the party name of a non-populist party. Nonetheless, Figure A7 would suggest that it is highly predictive of populism.

Table A3. Coding Errors for Austrian Election Manifestos

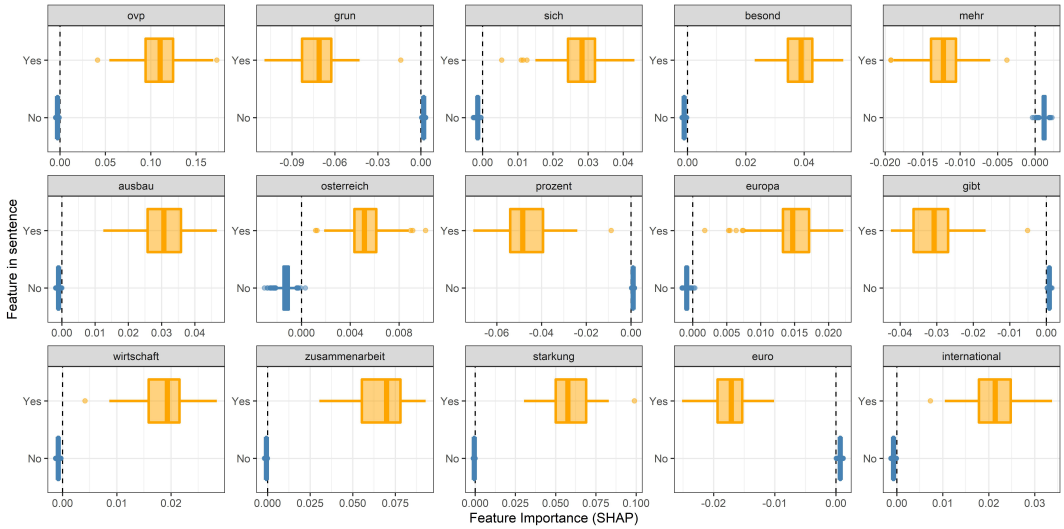
DCM's Manifesto *labels*		Manifesto *content*	
Party	Year	Party	Year
SPÖ	2002	Greens	2006
SPÖ	2006	FPÖ	2006
SPÖ	2008	KPÖ	2008
SPÖ	2013	NEOS	2013
SPÖ	2017	NEOS	2017
Greens	2002	Greens	2002
Greens	2006	FPÖ	2002
Greens	2008	Greens	2008
Greens	2013	FPÖ	2013
Greens	2017	SPÖ	2017
FPÖ	2002	SPÖ	2002
FPÖ	2006	ÖVP	2002
FPÖ	2008	SPÖ	2008
FPÖ	2013	ÖVP	2008
FPÖ	2017	ÖVP	2013
ÖVP	2002	SPÖ	2006
ÖVP	2006	ÖVP	2006
ÖVP	2008	SPÖ	2013
ÖVP	2013	Greens	2017
ÖVP	2017	Team Stronach	2013
BZÖ	2006	BZÖ	2006
BZÖ	2008	FPÖ	2008
NEOS	2013	BZÖ	2008
NEOS	2017	ÖVP	2017
Peter Pilz	2017	FPÖ	2017
KPÖ	2008	Greens	2013
Team Stronach	2013	Peter Pilz	2017

Table A4. Top five most important features of the Random Forest model for Austria

Country	Feature		Feature Importance
	Original	Translation†	
Austria	ovp	övp•	0.0189
Austria	grun	green•	0.0143
Austria	schussel	schüssel•	0.0074
Austria	prozent	percent	0.0046
Austria	zusammenarbeit	collaboration	0.0038

Note: † = Translations are based on non-stemmed versions, while the column 'Original' reports the stemmed version of the feature. • = These features are party or candidate names.

Figure A7. SHAP summary plot for Austria



A6 Coding Error in Germany

DCM's data for Germany contain two manifestos for the party 'The Left' in the election of 2005. The one manifesto is labeled as 'The Left', the other as 'Party of Democratic Socialism' which is the name of predecessor of The Left party. Both manifestos contain the same content which is due to the fact that only The Left party participated in 2005.[5] However, while the two manifestos have the same content, the manifestos used by DCM are *not identical*. The manifesto labeled as 'The Left' contains longer paragraphs and not just single sentences. This is different for the manifesto labeled as 'Party of Democratic Socialism' which has the paragraphs split in different sentences and thus more observations. The following example demonstrates these differences (we use colors for highlighting the same sentences). The manifesto labeled as 'The Left' contains the paragraph:

> "hartz iv steht armut demut gesetz agenda 2010 steht wahlbetrug entsolidarisier spd sozial demokrat grundsatz verabschiedet regierungspartei ungerecht gescheitert polit agenda 2010 fortsetz darub plakativ sozial klingend aussag wahlprogramm hinweg tausch"

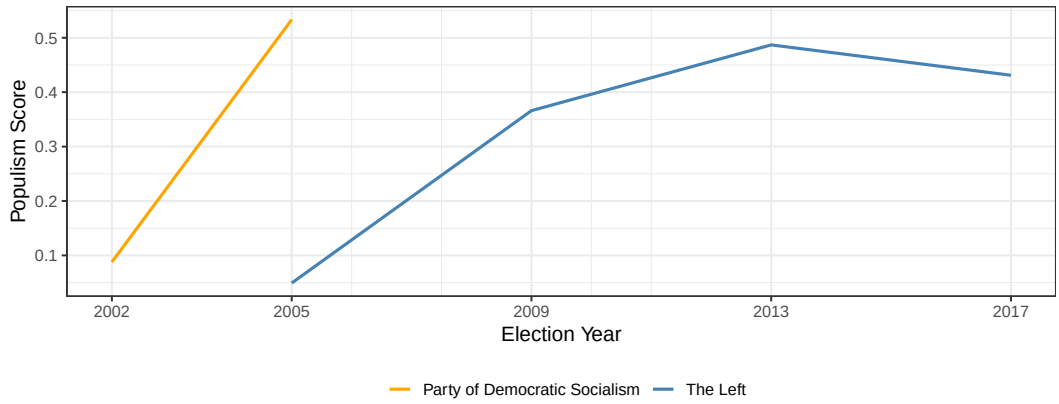
In contrast, the other manifesto has split this paragraph in multiple sentences:

> "hartz iv steht armut demut gesetz agenda 2010 steht wahlbetrug entsolidarisier"
>
> "spd sozialdemokrat grundsatz verabschiedet regierungspartei ungerecht gescheitert polit agenda 2010 fortsetz"
>
> "darub plakativ sozial klingend aussag wahlprogramm hinwegtausch spd grun cdu csu fdp biet moglich verschied polit richtung wahl"

This is the same content but the structure of the data is different. There are some additional differences between the two manifestos which become clear from the example. First, some words are treated differently. For example, the term 'sozialdemokrat' (social democrats) is not split in the second manifesto. In the first manifesto, however, it is included as 'sozial demokrat'. Second, the third sentence of the second manifesto includes text which is not part of the long paragraph of the first manifesto. Thus, the texts seems to be split differently.

We report these difference, because they appear to have quite severe consequences for the derived 'populism' scores. As can be seen from Figure A8, the manifesto with the long paragraphs (The Left in 2005) has a very low populism score. The same manifesto, only with a different split of sentences, has a high populism score ('Party of Democratic Socialism' in 2005). This finding is puzzling and questions the validity of the score, because the same manifesto receives strongly different scores depending on how the sentences are split. It also suggests that one should not conclude from the data that the Left Party became more populist over time.

Figure A8. Populism Scores of the Left Party in Germany



5. Formally, the Left Party was founded in 2007 and the 'Party of Democratic Socialism' existed until 2007. In the election of 2005 the party participated under label of "Left Party.PDS".

A7 Effect of Removing Party Names on Model Performance in Germany

Based on the Feature Importance analysis in the main paper (see also Section A3 and A10 in this Appendix), we showed that DCM's models strongly rely on party names when predicting whether a sentence is populist or not. In this section, we systematical investigate how the models react to removing party names. One may anticipate that the predictive power of the models either substantially decreases or that other plausible features show higher predictive performance because they appear more frequently in sentences with party names. In this section we demonstrate that both is actually the case. Empirically, we focus on Germany as exemplary case because party labels play a particularly important role in this case. To do so, we run two models. First, we run the model without removing any features by using Gradient Boosting as classifier. We then remove the following seven features from the document-feature-matrix (dfm): `cdu`, `csu`, `spd`, `grun`, `fdp`, `link`, `afd`. These are the abbreviations of the seven most prominent parties in Germany. We only remove these seven features to modify the document-feature-matrix (dfm) as little as necessary. The full matrix has 8,342 features and, thus, we remove 0.08% of the total number of features – a tiny fraction of the complete data. In the following, we first scrutinize the model performance via F1 scores. We then discuss the changes in feature importance of central features. Third, we discuss several exemplary sentences which highlight the the model pick up thick ideology rather than populism, once party names have been removed. We then investigate the change in the predicted probability of a sentence to be populist and the subsequent changes in the populism score before concluding.

A7.1 F1 Scores

We first assess the effect of removing party names from the dfm on the model performance. Specifically, we analyze how the F1 scores change between the model with and without the party names. DCM estimate F1-scores for the (1) training, (2) validation, and (3) test set. Note that Table 1 in DCM only reports the validation and test set F1 scores and that the F1 score for the training set is not reported in DCM's paper; thus we extracted them from the replication materials. We report each of these F1 scores in Table A5. As can be seen, removing the seven party names results in a decrease of 0.035 to 0.045 in the F1 scores. For the validation set, the decrease is around 25%. For the training and testing sets, the decrease is around 7-8%. Overall, these results indicate that removing party names affects the model performance and given that only a tiny fraction of the dfm was removed, we consider this a considerable decrease in model performance.

Table A5. F1-scores for Germany conditional on the inclusion or exclusion of party names in the document-feature-matrix

	Incl. Party Names	Excl. Party Names	Difference	Percentage change
Validation	0.180	0.135	0.045	25.0%
Training	0.533	0.487	0.046	8.6%
Testing	0.485	0.449	0.036	7.4%

A7.2 Feature Importance

Having analyzed the model performance, we now look at how the feature importance of the remaining features is affected by removing party names. To do so, we estimate SHAP values for both models and compare which features become more important when party names are excluded. We display the 20 features with the strongest increase in SHAP values when party names are excluded in Table A6. An inspection of these features does not suggest that populist language increased its relevance in feature importance. Rather, Table A6 indicates that the model now relies more strongly on thick ideologies to distinguish between the manifestos and parties. Particularly, as outlined above in Table A2, the sentences coded as populist overwhelmingly stem from the left-wing populist Left party. Not surprisingly, Table A6 extensively relies on left-wing features focusing on the economy. Terms such as 'employment', 'social', but also 'market economy' and 'fair' indicate that the models pick up the thick ideology of the Left Party.

Table A6. The 20 features with the strongest increase in SHAP values when party names are excluded

Features		SHAP Values		
German	English	w/o party names	w/ party names	Increase
beschaftigt	employed	0.029	0.011	0.018
sozial	social	0.074	0.060	0.014
neu	new	0.031	0.019	0.012
uns	us	0.022	0.009	0.012
wichtig	important	0.022	0.010	0.012
inn	?†	0.017	0.008	0.009
marktwirtschaft	market economy	0.013	0.006	0.007
fair	fair	0.010	0.005	0.005
jung	young	0.007	0.002	0.004
recht	law	0.018	0.014	0.004
bedeut	imply	0.006	0.002	0.004
stark	strong	0.004	0.000	0.004
monat	month	0.005	0.002	0.004
sofort	immediately	0.007	0.003	0.003
herausforder	challenge	0.003	0.000	0.003
bess	better	0.007	0.003	0.003
demokrat	democrat	0.003	0.000	0.003
muss	must	0.047	0.044	0.003
krieg	war	0.009	0.007	0.003
beend	stop	0.005	0.003	0.002

Note: † = The meaning of this feature is unclear.

A7.3 Representative Sentences

The impression that the models rely more strongly on thick ideologies after removing the party names is further corroborated by an analysis of the sentences with the highest probability of being classified as 'populist' when party names are removed from the analysis. We display the ten most 'populist' sentences in Table A7 (Table A8 provides english translations of the German sentences). None of these sentences expresses a particular populist sentiment. Instead, they are all reflective of a thick left-wing ideology. Unsurprisingly, all of these sentences come from the Left Party. Again, these findings suggest that removing party names leads the model to focus more strongly on thick ideologies than on party names.

Table A7. Sentences with highest probability of being classified as 'populist' after removing party features from the analysis

Sentence	Party	Year	Probability
gleichzeit massenerwerbslos verfestigt funktioniert zusamm hartz iv drohkuliss disziplinier beschaftigt erwerbslos bekampf personalmangel offent daseinsvorsorg ausgleich	The Left	2013	0.992
privatisiert krankenhaus pflegeeinricht kommerziell offent gemeinnutz genossenschaft tragerschaft uberfuhr vgl iv solidar gesundheitsversicher	The Left	2017	0.955
gut arbeit erwerbslos abbau ford zukunftsprogramm solidar mindestrent von1 050 euro netto darunt droht armut	The Left	2013	0.944
beschaftigt rechtsanspruch arbeitszeit mindest 22 stund woch angebot erwerbslos freiwill mindestsicher sanktion statt hartz iv	The Left	2017	0.903
link unterstutzt beschaftigt kindertagesstatt forder anerkenn arbeit angemess bezahl gut arbeitsrecht beding vgl kapitel xiii Â»gut bildung alleÂ«	The Left	2017	0.903
wer erwerbslos darf armut gedrangt hartz iv offent beschaftigungssektor mensch schaff derzeit regular beschaft nachgeh	The Left	2017	0.898
anspruch bundesrepubl lebend mensch ausreich einkomm vermog verfug mindestbedarf deck link unterstutzt kampf gewerkschaft sozialverband â€žbundnis sozial deutschland sofort anheb regelsatz hartz iv empfangerinn empfang	The Left	2009	0.896
endlich ursach fluchtbeweg bekampf waffenexport verbiet friedlich konfliktlos unterstutz gerecht weltwirtschaft schaff vgl kapitel xv nein krieg	The Left	2017	0.893
einfuhr mindestsicher hoh 050 euro vgl kapitel iii Â»sozial sicherheitÂ« muss angemessenheitsgrenz Â»kost unterkunftÂ« deutlich angehob tatsach bedarf deck	The Left	2017	0.892
zusatz ford solidar wiss technologietransf energiew land sud klimafinanztransf deutschland soll 2020 sieb milliard euro jahrlich ansteig grossteil zusatz entwicklungszusammenarbeit bereitgestellt vgl kapitel xiv Â»mensch natur profiteÂ«	The Left	2017	0.880

Note: Special characters – such as 'Â»' – are included like this in the original data.

Table A8. Translated sentences with highest probability of being classified as 'populist' after removing party features from the analysis

Sentence	Party	Year	Probability
at the same time solidified masses unemployed works together hartz iv threatening backdrop disciplined employed unemployed fight staff shortage open public services compensation	The Left	2013	0.992
privatized hospital nursing facility commercial open non-profit cooperative sponsorship transfer see iv solidar health insurance	The Left	2017	0.955
good work unemployed reduction ford future program solidarity minimum pension of 1,050 euros net including poverty	The Left	2013	0.944
employed legal entitlement working hours at least 22 hours week offer unemployed voluntary minimum security sanction instead of Hartz iv	The Left	2017	0.903
left supports busy day care center forder recognize work pay well labor law condition cf. chapter xiii Â»everyone has a good education«	The Left	2017	0.903
who is unemployed may poverty pushed hartz iv opens employment sector people currently create regular employment pursuing	The Left	2017	0.898
entitlement federal republic living human being sufficient income able available minimum requirement deck link supports fight union social association "alliance social germany immediately raise standard rate hartz iv recipient reception	The Left	2009	0.896
finally cause escape movement fight arms export ban peaceful conflict-free support fair global economy create cf. chapter xv no war	The Left	2017	0.893
import minimum security hoh 050 euros cf. chapter iii "social security" must adequacy limit "food accommodation" significantly increased fact needs deck	The Left	2017	0.892
Supplement ford solidar wiss technologietransf energiew land sud klimafinanztransf germany is to increase by 2020 seven billion euros annually large part of the supplement provided for development cooperation cf. chapter xiv Â»human nature profitsÂ«	The Left	2017	0.880

Note: Special characters – such as 'Â»' – are included like this in the original data. All words translated using google translate.

A7.4 Change in predicted probability at the sentence level

We can also look at the change in the probability of each sentence between the model in which party names are included and the model in which we excluded the party names. Both models were run on identical test sets. Thus, for each sentence we have two predicted values: the probability of the sentence when the model was trained including party names or not. We take the difference between both probabilities for each sentence and then analyze how the probability of a sentence changed conditional on including a party name or not. Figure A9 displays the change in probability for sentences which include the feature 'afd' or 'left'. As can be seen, there is a drastic decrease in the probability. In most cases, the decrease in probability is around -0.2, but it can go up to -0.4. Again, this finding shows the strong effect of party names on the model's predictions. We discuss why party features are powerful, yet meaningless, predictors of populism in the main text. Likewise, we can also look at the change in probabilities when a sentence includes the name of a non-populist party. The results are displayed in Figure A10. In this case, there are only smaller differences, but again they confirm that party names are influential for making predictions. When a party name of a non-populist party was removed, sentences including these names *increase* their probability of being classified as being populist. This makes sense, as non-populist parties use their own party names more frequently and, thus, the models can rely on this information for classifying a sentence as non-populist.

Figure A9. Change in probability of a sentence being classified as 'populist' conditional on including afd or link

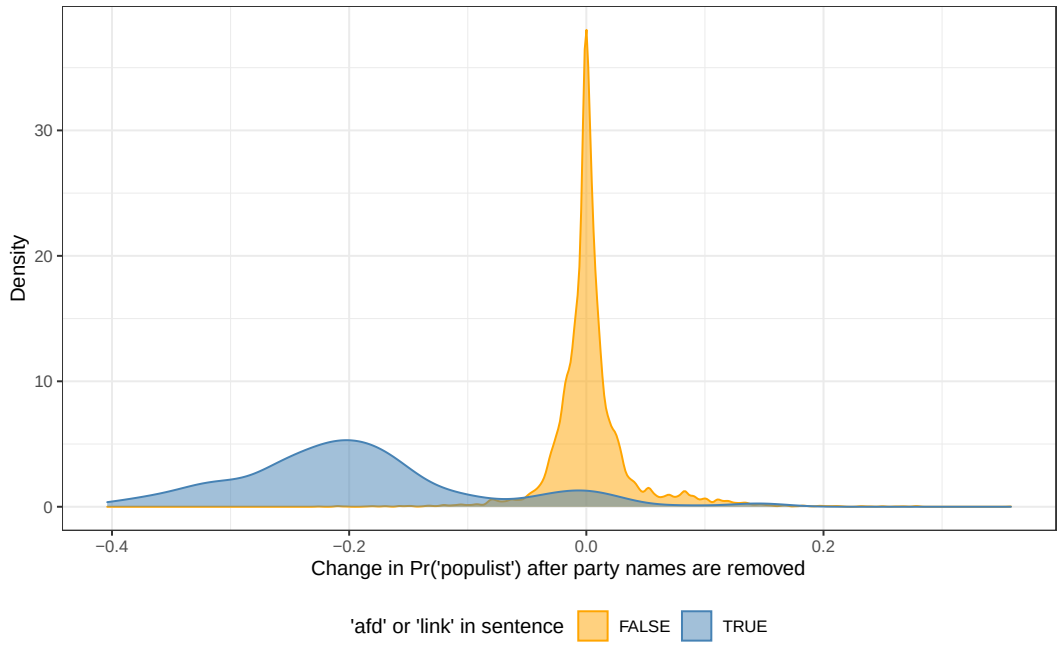
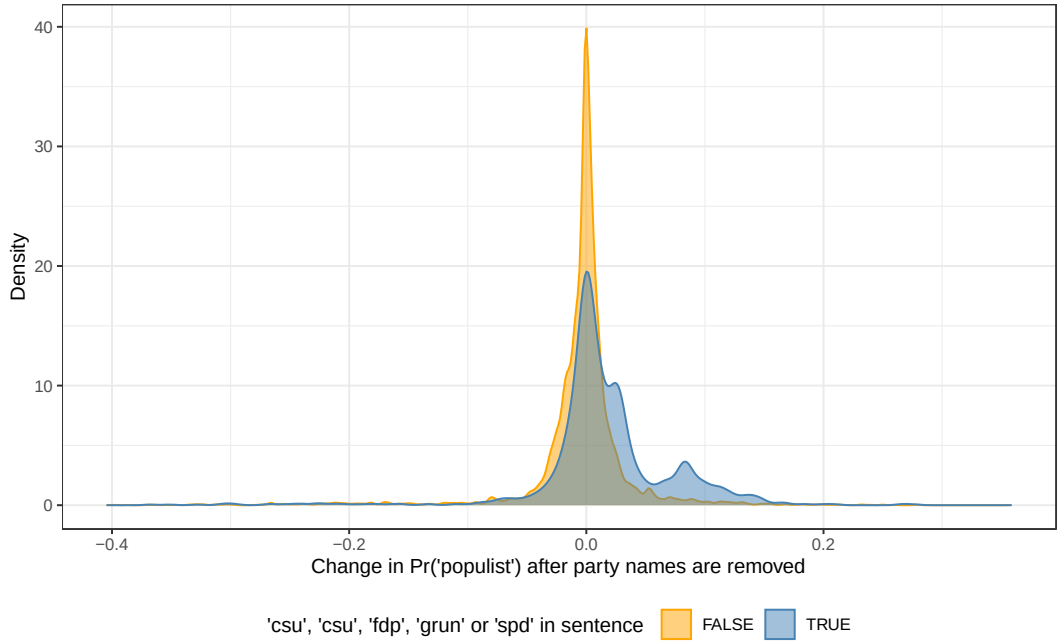


Figure A10. Change in probability of a sentence being classified as 'populist' conditional on including cdu, csu, fdp, grun, or spd



A7.5 Impact of excluding party names on populism scores

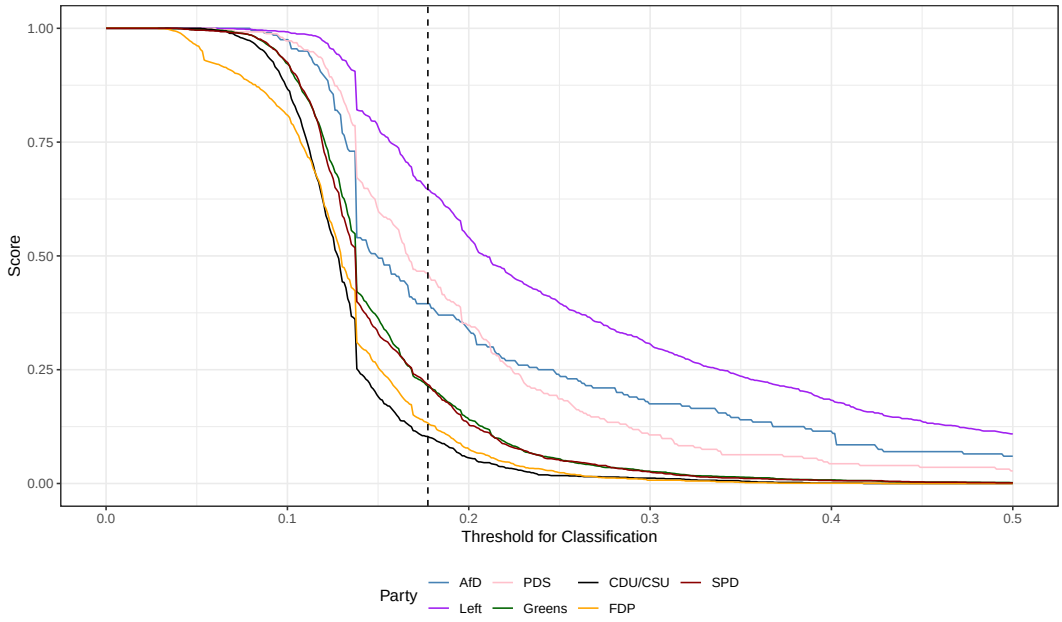
Finally, we investigate how the estimated populism scores change due to the removal of party names. One could anticipate that the right-wing populist AfD has a lower chance of being recognized as populist, since the left-wing ideology of the Left Party is more dominant in the features when party names are removed (see Section A7.2 and A7.3). The findings confirm this intuition. The removal of party names substantially decreases the chances that the model identifies sentences of the AfD, the main (right-wing) populist party in Germany, as populist. While DCM's models always overestimate the degree of populism of The Left party and underestimate the AfD's degree of populism, this pattern is further increased when excluding party names. We provide evidence for this claim based on the following analysis. In Figure A11 and Figure A12 we display how the populism score for each party depends on the cut-off chosen for classifying sentences as populist or non-populist. The threshold estimated by the Youden-Index, as done by DCM, is highlighted by dashed vertical lines.[6] Based on our knowledge of the literature, the use of the Youden-Index is not very common in political science research. We acknowledge that methods for using a different classification threshold than 0.5 when data is imbalanced are discussed in the field of supervised machine-learning research (e.g. Provost 2000; Krawczyk 2016). However, the Youden-Index is only one of many suggested approaches to address the imbalance problem. Therefore, we think it is reasonable to assess the robustness of the results when the classification threshold is varied. Just like one would not expect the results of a supervised machine-learning model to change drastically when the classification threshold is changed from the standard threshold of 0.5 to, for example, 0.52, one would not expect that the populism scores by DCM depend on the specific value of the Youden-Index. As a consequence, we think that showing the stability of the results along different thresholds is relevant.

In Figure A11 we display the scores for each party from the model in which party features were included. Here we can see that it depends on the chosen cut-off how strongly the AfD is seen as populist. It also demonstrates that the AfD is classified as more populist than the PDS when a higher threshold is used. This implies that the AfD has a larger share of sentences with a high predicted probability of populism than the PDS. In Figure A12, which shows the same plot for the model in which the party names were excluded, we see that

6. Note that lowering the threshold from the standard 0.5 to the value suggested by the Youden-Index is necessary for DCM's method because almost no sentence reaches a probability of more than 0.5. When using the standard cut-off of 0.5 for classification, almost all parties would receive a populism score of 0.

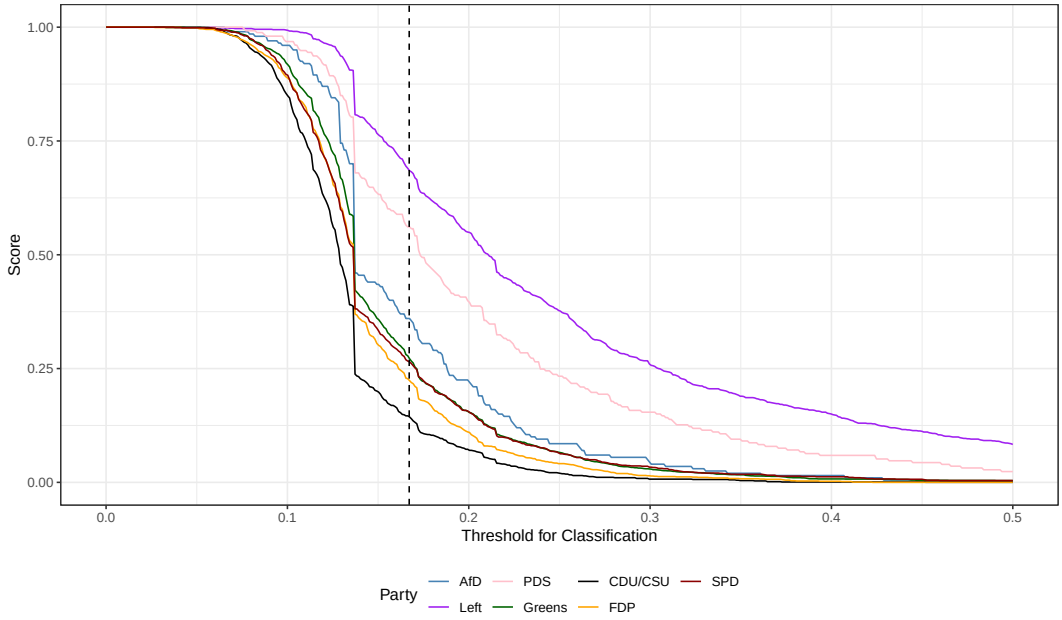
this pattern has vanished. This indicates that the share of 'highly populist' sentences for the AfD has strongly decreased. In fact, Figure A12 clearly demonstrates that the AfD is only slightly more populist than the non-populist parties in Germany (CDU, SPD, Greens, FDP) for almost all cut-offs. This indicates that the AfD can hardly be identified by the models as populist. This pattern is consistent with the assumption that the models rely more strongly on thick left-wing ideology for classifying parties when party names are removed. With regard to the observation that the AfD is identified better as populist by the model when party names are included, we can further provide evidence that the share of sentences which include party names among the sentences classified as 'populist' increases the higher the threshold is set. We show this pattern in Figure A13 for the AfD and the Left Party. As can be seen, a predicted probability of more than 0.4 is only achieved for sentences which include the party name AfD. For the Left Party this pattern differs: While the share of party name sentences increases, their share makes only up to 50% of all populist sentences when the threshold is set higher.

Figure A11. Populism scores for all German parties conditional on the threshold selected for classifying sentences as 'populist' or 'non-populist' – Party names included in the analysis



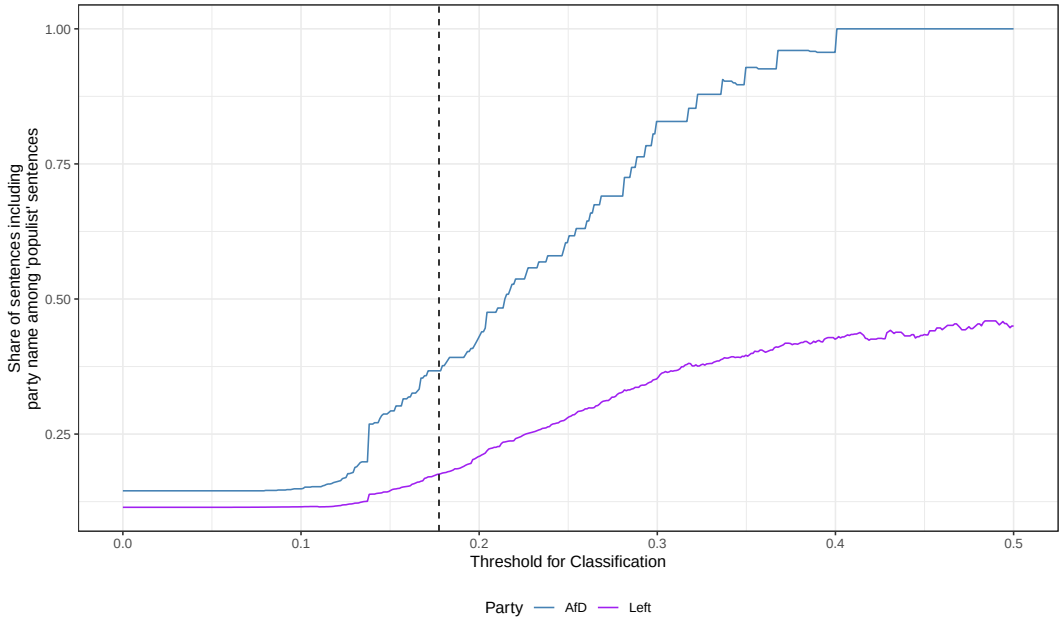
Note: Dashed vertical line is cut-off suggested by Youden-Index.

Figure A12. Populism scores for all German parties conditional on the threshold selected for classifying sentences as 'populist' or 'non-populist' – Party names excluded from the analysis



Note: Dashed vertical line is cut-off suggested by Youden-Index

Figure A13. Share of sentences with feature 'afd' or 'link' among all sentences classified as populist conditional on different thresholds for classification



Note: Dashed vertical line is cut-off suggested by Youden-Index.

A7.6 Summary

To summarize, removing only seven features from the document-feature-matrix and re-estimating the model of DCM has the following effects on the results: First, the model fit, measured by the F1 score, decreases. Second, the new feature importance analysis suggests that the model now relies more strongly on thick left-wing ideologies to identify 'populism'. There is no evidence that populist language becomes more relevant for the classifications. We discuss in the main text of the paper that identifying thick ideology is somewhat more informative than party names to predict populism; however, it is only a superfluous proxy for parties degree of populism. Third, an inspection of the most populist sentences corroborates the impression that left-wing ideology is predictive for populism in Germany. This is plausible since the Left Party accounts for more than 80% of populist sentences (see Table A2). Fourth, the sentences which include party names of populist parties ('afd' and 'link') see massive decreases in the predicted probabilities, indicating that the high predicted probabilities for the sentences relied on a single feature, the party name. Likewise, sentences including party names of non-populist parties see an increase in the probability of being classified as more populist. Fifth, when party names are excluded, the AfD is only slightly more 'populist' than the established, non-populist parties in Germany. This holds true regardless of the specific threshold used for classification. Again, this is consistent with the interpretation that the model, in absence of party names, relies on left-wing content for making classifications. Six, when party names are included, the degree of populism for the AfD strongly depends on sentences which include the feature 'afd'. All sentences with a considerable high predicted probability are sentences which include the term 'afd'. Taken all these results together, it seems reasonable to conclude that removing party names from the analysis affects model performance, but it does not suggest that the models now identify populist content in the manifestos.

A8 Effect of Removing Party Names on Model Performance in the Netherlands

Similar to the analysis for Germany in the previous section, we also removed the party names from the document-feature-matrix (dfm) in the Netherlands to assess the effect on model performance. As demonstrated in the main text, party names have large feature importance values in the Netherlands. The following features were removed: `d66`, `vvd`, `christenunie`, `cda`, `pvv`, `pvda`, `lpf`, `lijst`, `pim`, and `fortuyn`. As with the case of Germany, we only remove few features to modify the document-feature-matrix (dfm) as little as necessary. The full matrix in the Netherlands has 8,396 features and, thus, we remove 0.12% of the total number of features – a tiny fraction of the complete data. In the following, we first scrutinize the model performance via F1 scores. We then discuss the changes in feature importance of central features. Third, we discuss several exemplary sentences which highlight the the model pick up thick ideology rather than populism, once party names have been removed. We then investigate the change in the predicted probability of a sentence to be populist and the subsequent changes in the populism score before concluding.

A8.1 F1 Scores

Comparable to the analysis for Germany, Table A9 reports F1-scores for the model with and without the party names. In contrast to the German model, the decrease in model performance is weaker. However, we still observe a decrease in model performance on the training and testing set when party names are excluded.

Table A9. F1-scores for Netherlands conditional on the inclusion or exclusion of party names in the document-feature-matrix

	Incl. Party Names	Excl. Party Names	Difference	Percentage change
Validation	0.074	0.074	0.000	0.0%
Training	0.409	0.395	0.014	3.4%
Testing	0.371	0.351	0.020	5.4%

A8.2 Feature Importance

Table A10 reports the 20 features with the strongest increase in SHAP values when party names are excluded. Similar to the case of Germany, the feature importance based on SHAP values does not indicate that the models identify populism after removing party names.

Table A10. The 20 features with the strongest increase in SHAP values when party names are excluded in the Netherlands

Features		SHAP Values		
Dutch	English	w/o party names	w/ party names	Increase
dient	served	0.023	0.007	0.017
dien	serve	0.014	0.008	0.006
vindt	find	0.005	0.001	0.004
jar	year	0.004	0.000	0.004
ontwikkel	develop	0.003	0.000	0.003
goed	good	0.007	0.005	0.002
procent	percent	0.009	0.007	0.002
innovatie	innovation	0.003	0.001	0.002
verschill	difference	0.002	0.000	0.002
stat	stand	0.003	0.001	0.002
onz	our	0.002	0.000	0.002
binn	inside	0.005	0.003	0.002
belang	interest	0.002	0.000	0.002
partij	party	0.005	0.004	0.002
personel	personal	0.002	0.001	0.002
reger	rule	0.004	0.003	0.002
kom	come	0.003	0.002	0.001
gebruik	use	0.001	0.000	0.001
kans	chance	0.003	0.001	0.001
maatschapp	companies	0.001	0.000	0.001

Note: All words translated using google translate or after consultation with a native speaker.

A8.3 Representative Sentences

Table A11 displays the 10 sentences with the highest probability of being classified as 'populist' when party names are removed for the Netherlands. Table A12 provides the English translations (computer translations from Google Translate). Overall, there is again no evidence that the most popular sentences reflect particularly populist content. First, all sentences come from the Socialist Party, indicating that the model associates populism especially with content from the Socialist Party, which is the only left-wing populist party in the Netherlands. This finding is quite comparable to the case of Germany where the Left Party dominated the identified content of the models in contrast to the far more populist AfD. Second, while some of the sentences indicate critique international organizations (such as the WTO or EU), most of these sentences also have clear left-wing ideological content. Again, the impression is that the model also relies on thick ideologies for classifying sentences as populist or non-populist. Third, there are some 'sentences' included with little substantial meaning, such as the table of content from the Socialist Party manifesto in 2017. Overall, there is no clear evidence that the models identify populism in the Netherlands when party names are removed.

Table A11. Sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
bevriez overdracht bevoegd europes unie overdracht bevoegd europes unie bevror totdat geweld democratisch gat bestat gedicht bevolk dergelijk overdracht daadwerk steunt toe onz soevereiniteit hand gegev ondemocratisch supranational organ europes unie verword neoliberal project richt vergrot macht grot ondernem verklein zeggenschap democratisch publiek bestur twijfel bevolk lidstat erg grot verder federaliser europes unie opbouw europes superstat schadelijk onz democratie onaanvaard belangrijk ingrijp besluit zoal goedkeur nieuw europes verdrag uitbreid europes unie nieuw lidstat zoud referenda gehoud moet zodat volk europa besliss eig toekomst voordat richtlijn europes unie geldig zoud eerst nederland parlement moet goedgekeurd europes politiek beter controler dient nederland parlement voortan vrij beschik notul ministerrad europes unie twed kamer betrok moet europes regelgev	Socialist Party	2003	0.987
actieprogramma sp 2002 2006 hoofdstuk 10 won ruimtelijk orden begrip â€˜social volkshuisvest lijkt politiek besmet verklaard draait voortan bedien koopkracht consument behoeft ruim lux woning aanwez tweedel tuss rijk arm wijk hierdor verder versterkt daarin verander kom over hoort verantwoord wer nem volkshuisvest wetgev belang economisch zwak groep woningzoek beter gan bescherm ruimtelijk orden hand gegev particulier bedrijv geld macht bepal inricht land algemen belang behoeft bevolk ontwikkel stopp dient over regie wer hand nem ervor zorg aantal goed betal woning verder toeneemt	Socialist Party	2002	0.977
economisch aanslag natur milieu tolerer noordzee wad biesbosch veluw verdien extra bescherm ijzer rijn mag limburg meinweg steun national natur offensief uitstot broeikasgass gat omlag overeenkomst kyoto verdrag grootverbruiker energie gan voortan â€˜ecotak betal kernenergie buitenland verbod luchtvaartprivileges afgeschaft ruim ban gegev bevorder duurzam energie indamm afvalstrom beperk opgelegd gebruik milieuschad stoff kiez voedselveil â€˜van boer bord gev voorrang duurzam boer bov grootschal landbouw bio industrie reken eerlijk kostendek prijz boerenproduct 2006 dient ten minst 10 landbouwproduct biologisch	Socialist Party	2003	0.961
actieprogramma sp 2002 2006 hoofdstuk 12 recht rechtsbescherm wet zoud elk vorm achterstell moet uitsluit praktijk juist wettelijk regel ongelijk partij vastgelegd huurder minder recht verhuurder werknemer minder recht werkgever consument trek conflict verkoper vaker kortst eind gat milieuregel vak sprak structurel ongelijk betrok partij rechtsstat hoort iederen toegang rechter gegarandeerd praktijk rechtshulp sted kwestie geld hoger inkom beter beschik rechtshulp mens lag inkom zien vak procedures advocat betal risico proceskost grot vind tweedel dient eind kom	Socialist Party	2002	0.927

Table A11. Sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
inhoudvoorwoord macht marktwerk samenwerk zorg 13 invester lon werk ondernem 15 eerlijk del eerlijk betal 17 klein klassenstrijd beter onderwijs 19 betal won leefbar buurt 23 lang elkar hen sam lev 25 veilig agent wijk 27 toegank recht klassenjustitie 31 10 onz jeugd onz toekomst 33 11 kunst cultur iederen 37 12 vrij veilig internet 39 13 hel nederland 41 14 meeprofiter duurzam energie 43 15 bio industrie duurzam landbouw 47 16 schon milieu gezond omgev 49 17 bereik land betal vervoer 51 18 brussel dwang samenwerk europa 53 19 mens nod help migratiestrom voorkom 57 20 interventiepolitiek vredeshandhav 59	Socialist Party	2017	0.883
navo navo achterhaald daardor gevar militair institut dient ontmanteld plat uitgebreid nederland doet wijs overleefd verdragsorganisatie tred geeft zeggenschap terug buitenland beleid zak oorlog vred wer bas onz krijgsmacht nederland deelnem europes veilig defensie initiatief evdi oftewel euroleger immer ongewenst onnod nieuw militair structur extra militair ambities activiteit daarmee verbond groter risico kost nederland krijgsmacht dusdan hervormd dien bijdraagt verbeter international capaciteit conflictpreventie vreedzam conflictoploss verenigd naties europes veiligheidsorganisatie ovs hierin belangrijk rol spel	Socialist Party	2002	0.876
nee dictat wereldhandelsorganisatie lidmaatschap wereldhandelsorganisatie verplicht vrijhandel lat gan belang voedselveil gezondheidszorg milieu cultur ontwikkel derd wereld wto verdrag uitsprak wto geschillenorgan stan bov nederland wetgev daarmee onz democratie ondergeschikt schimmig handelsbelang international bedrijfslev binn wto dient nederland ieder geval hard mak acceptatie voorzorgbeginsel regel bescherm voedselveil zoal europes verbod hormoonvles beperk genetisch gemanipuleerd product milieuregel uitvoer multilateral milieuovereenkomst zoud langer onderwerp mog klacht wto geschillenorgan hetzelfd geldt culturel wet regelgev arm land moet wto langer belemmerd eig industrie tijdelijk bescherm wester concurrentie kan gev ontwikkel goedkop producer medicijn derd wereld bijvoorbeeld aid mogelijk gemaakt royalty vergoed heff kader dwanglicentie trim akkoord wto ontwikkelingsland verbiedt eis stell investeerder buit werking gesteld akkoord zoal 1998 mislukt multilateral agreement investment welk verband nederland verworp bestred nederland verzet verder uitbreid general agreement trad services gat waarmee land verbind concurrentie privatiser dienstensector vergader wto geschillenorgan moet open belangenverstrengel led voorkom macht officieuz international economisch gerechtshof beperkt international gebruik regel toe pass uitsprak allen bindend wanner partij daarin toestemm	Socialist Party	2003	0.863

Table A11. Sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
nee dictat wereldhandelsorganisatie lidmaatschap wereldhandelsorganisatie verplicht vrijhandel lat gan belang voedselveil gezondheidszorg milieu cultur ontwikkel derd wereld wto verdrag uitsprak wto geschillenorgan stan bov nederland wetgev daarmee onz democratie ondergeschikt schimmig handelsbelang international bedrijfslev binn wto dient nederland ieder geval hard mak acceptatie voorzorgbeginsel regel bescherm voedselveil zoal europes verbod hormoonvles beperk genetisch gemanipuleerd product milieuregel uitvoer multilateral milieuovereenkomst zoud langer onderwerp mog klacht wto geschillenorgan hetzelfd geldt culturel wet regelgev arm land moet wto langer belemmerd eig industrie tijdelijk bescherm wester concurrentie kan gev ontwikkel goedkop producer medicijn derd wereld bijvoorbeeld aid mogelijk gemaakt royalty vergoed heff kader dwanglicentie trim akkoord wto ontwikkelingsland verbiedt eis stell investeerder moet buit werking gesteld akkoord zoal 1998 mislukt multilateral agreement investment welk verband nederland verworp bestred nederland verzet verder uitbreid general agreement trad services gat waarmee land verbind concurrentie privatiser dienstensector vergader wto geschillenorgan moet open belangenverstrengel led voorkom macht officieuz international economisch gerechtshof beperkt international gebruik regel toe pass uitsprak allen bindend wanner partij daarin toestemm wanner bemoeieniss wereldhandel eerlijker mak doodlop dient nederland lidmaatschap wto heroverweg	Socialist Party	2002	0.863
effectiever straff straff vooral resocialiser doel moet herhal strafbar asociaal gedrag voorkom kortzicht maatregel zoal plaats gedetineerd een werk averecht verslechter veilig gevangenbewaarder gevangen zull langer dur schad berokken voordel oplever hoewel aantal alternatiev straff zoal taakstraff toeneemt sted mens langdur opgeslot gedetineerd dien beter voorbereid terugker samenlev daarna eerlijk kan krijg opnieuw onderdel maatschappij houdt resocialiser voorzien maatregel eerder begonn krijgt bijvoorbeeld slecht klein del gedetineerd passend opleid begeleid ex gedetineerd dient verbeterd vel vall gevangenisstraf herhal	Socialist Party	2003	0.858

Table A11. Sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
ggz nod help aantal mens beroep â€˜geestelijk gezondheidszorg neemt toe overheidsbeleid maatschapp verker 24 uur economie flexibiliser werk hog werkdruk dient gekek reken gehoud gevolg â€˜geestelijk volksgezond daarnaast onderzoek kom effect psychiatrisch behandel psychisch hulp zovel mogelijk gegev eerst lijn hulp daarom versterkt waarbij huisarts ondersteund moet psychiatrisch verpleegkund eerstelijn psycholog wijz grot aantal geneesmiddel huisarts terrein voorschrijv teruggebracht mens zorg hulp nodig moet snel geholp zeker kinder lang wachttijd funest crisisopvang 24 uur dag voldoend beschik asielfunctie psychiatrisch ziekenhuiz dient gehandhaafd voorkom mens zorg strat terechtkom thuis verkommer psychiatrisch patient ziekt inzicht lot overgelat moet indien nodig opgenom behandeld voorkom geisoleerd rak patient hulp zoek hoort uitgegan zorgplicht mogelijk opvang evenal middel hen actief preventief zoek moet uitgebreid	Socialist Party	2003	0.842

Table A12. Translated sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
freeze transfer authorized european union transfer authorized european union froze until violence democratic hole exist poem populate such transfer act supports our sovereignty hand given undemocratic supranational organ european union transform neoliberal project aims increase power cave enterprise reduce control democratic public administration doubt populate member state very large continue federaliser european union building european superstat damaging our democracy unacceptable important intervention decision as approved new european treaty expand european union new member state referendums should be held so that people of europe decide their future before the european union directive would be valid first the netherlands parliament must approve european politics better controller serves the netherlands parliament now freely available minutes ministerrad european union twed chamber involved must european regulations	Socialist Party	2003	0.987
action program sp 2002 2006 chapter 10 won spatial planning concept â€˜social housing seems politically contaminated declared runs ahead of serving purchasing power consumer needs spacious lux home present second part between rich poor neighborhood heredor further strengthened therein change come over hear responsible work public housing lawgev interest economically weak group housing seek better go protect spatial planning hand given private business money power determine furnishings country general interest needs population development stopp serve over direction work hand nem ervor care number of well paying home further increasing	Socialist Party	2002	0.977
economic attack natur environment tolerant north sea wad biesbosch veluw earn extra protect iron rhine mag limburg meinweg support national natur offensive greenhouse gas emission hole omlag agreement kyoto treaty large consumer energy ganvoortan 'ecotak pay nuclear energy abroad ban aviation privileges abolished wide ban given promote sustainable energy indamm waste stream limit imposed use environmental substances choose food safety 'from farm to fork' priority sustainable harmful farmer large scale agriculture bio industry calculate fair cost price 2006 at least 10 agricultural product organic	Socialist Party	2003	0.961
action program sp 2002 2006 chapter 12 legal protection law should exclude any form of backsliding should exclude practice correct legal rule on unequal party fixed tenant less right landlder employee less right employer pull conflict seller more often shortest end gap environmental gel spoke structurally unequal involved party rule of law hears everyone access judge guaranteed practice legal aid sted issue money higher income better disposal legal aid people lay inside see box procedures lawyerat pay risk process cost cave find two parts serve end come	Socialist Party	2002	0.927

Table A12. Translated sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
contentpreface power market work cooperation care 13 investor lon work company 15 fair share fair pay 17 small class struggle better education 19 pay won livable neighborhood 23 long each other hen sam lev 25 safe officer district 27 access law class justice 31 10 our youth our future 33 11 art culture everyone 37 12 fairly safe internet 39 13 hell netherlands 41 14 co-profit sustainable energy 43 15 bio-industry sustainable agriculture 47 16 clean environment healthy environment 49 17 reach land pay transport 51 18 brussels forced cooperation europe 53 19 people need help prevent migration flow 57 20 intervention policy peacekeeping 59	Socialist Party	2017	0.883
nato nato obsolete therefore danger military institute needs dismantled flat expanded netherlands wisely survived treaty organization step returns control foreign policy bag war peace wer bas our armed forces netherlands participate in european safe defense initiative evdi or euro army always unwanted unnecessarily new military structure extra military ambitions activity associated with it greater risk costs the netherlands armed forces reformed contribute improve international capacity conflict prevention peaceful conflict solution united nations european security organization ovs play an important role in this	Socialist Party	2002	0.876
no dictat world trade organization membership of the world trade organization compulsory free trade lat gan interest food security health care environment culture developed third world wto treaty pronounced wto disputes organ stan bov the netherlands legislation with it our democracy subordinate shadowy trade interest international business within wto serve the netherlands in any case hard mak acceptance precautionary principle rule protect food security such as european ban hormone meat limit genetically manipulated product environmental rule export multilateral environmental agreement could be subject to longer complaint wto dispute body the same applies cultural law rules poor country must be hindered wto longer own industry temporarily protect western competition can develop cheap producer medicine third world for example aid made possible royalty reimbursed levy framework compulsory license trim agreement wto developing country bans demand stell investor spoiled agreement like 1998 failed multilateral agreement inv estment which connection the netherlands rejected contested the netherlands resistance further expand general agreement entered services gap with which country connect competition privatiser service sector meeting wto disputes body must open conflict of interest led prevent power unofficial international economic court limited international use rule pass pronounced all binding when party consents	Socialist Party	2003	0.863

Table A12. Translated sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
no dictat world trade organization membership of the world trade organization compulsory free trade lat gan interest food security health care environment culture developed third world wto treaty pronounced wto disputes organ stan bov the netherlands legislation with it our democracy subordinate shadowy trade interest international business within wto serve the netherlands in any case hard mak acceptance precautionary principle rule protect food security such as european ban hormone meat limit genetically manipulated product environmental rule export multilateral environmental agreement could be subject to longer complaint wto dispute body the same applies cultural law rules poor country must be hindered wto longer own industry temporarily protect western competition can develop cheap producer medicine third world for example aid made possible royalty reimbursed levy framework compulsory license trim agreement wto developing country bans demand from stell investor must be looted agreement as 1998 failed multilateral agreement t investment which connection the netherlands rejected contested the netherlands resistance further expand general agreement entered services gap with which country connect competition privatizer service sector meeting wto disputes body must open conflict of interest led prevent power unofficial international economic court limited international use rule apply pass pronounced all binding when party consents when interference world trade fairer mak doodlop should the netherlands reconsider WTO membership	Socialist Party	2002	0.863
more effective punishment punishment especially rehabilitation goal must repeat punishable antisocial behavior prevent short-sighted measure as place detained a work purl deteriorate safe prison guard prisoner will be longer dur cause harm benefit although number of alternative punishment such as community service increases city human long term locked up detainee better prepared return live together afterwards fair can get again part of society keeps resocialiser provided measure started earlier gets for example bad small part detained appropriate training supervised ex detainee needs improved skin fall prison sentence repeat	Socialist Party	2003	0.858

Table A12. Translated sentences with highest probability of being classified as 'populist' after removing party features from the analysis in the Netherlands

Sentence	Party	Year	Probability
mental health care nod help number of people profession â€˜mental health care is increasing government policy social worker 24 hour economy more flexible work high workload needs to be kept in mind due â€˜mental health in addition research come effect psychiatric treatment psychological help as much information as possible first line help therefore reinforced whereby GP supported must be psychiatric nurse first-line psychologist change large number of medicine GP site prescription brought back human care need help must be helped quickly certain children long waiting time disastrous crisis care 24 hours a day sufficient availability asylum function psychiatric hospital must be maintained prevent human care strat end up at home cripple psychiatric patient illness insight fate left should be treated if necessary prevent isolated rak patient seek help heard assumed duty of care possible shelter as well as means them active preventive search must be extensive	Socialist Party	2003	0.842

A8.4 Change in predicted probability at the sentence level

We can also look at the change in the probability of each sentence between the model in which party names are included and the model in which we excluded the party names. Both models were run on identical test sets. Thus, for each sentence we have two predicted values: the probability of the sentence when the model was trained including party names or not. We take the difference between both probabilities for each sentence and then analyze how the probability of a sentence changed conditional on including a party name or not. Figure A14 displays the change in probability for sentences which include the features 'pvv', 'lpf', 'pim', or 'fortuyn'. As can be seen, there is a drastic decrease in the probability. In most cases, the decrease in probability is between -0.2 and -0.4. Again, this finding shows the strong effect of party names on the model's predictions. Likewise, we can also look at the change in probabilities when a sentence includes the name of a non-populist party. The results are displayed in Figure A15. In this case, there are only smaller differences, but again they confirm that party names are influential for making predictions. When a party name of a non-populist party was removed, sentences including these names *increase* their probability of being classified as being populist. This makes sense, as non-populist parties use their own party names more frequently and, thus, the models can rely on this information for classifying a sentence as non-populist.

Figure A14. Change in probability of a sentence being classified as 'populist' conditional on including 'pvv', 'lpf', 'pim' or 'fortuyn'

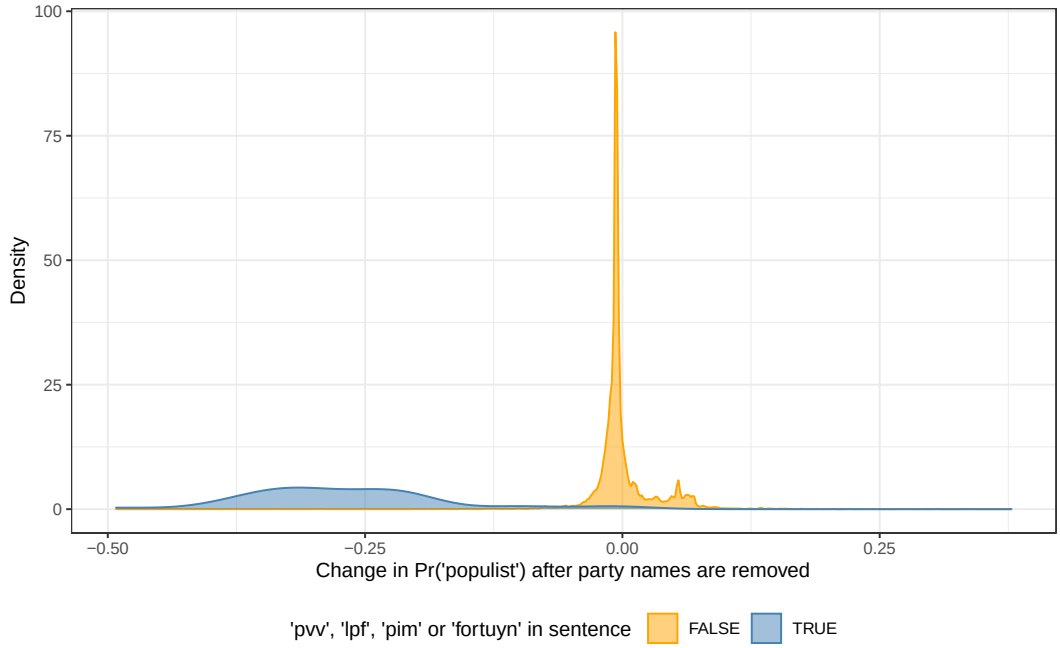
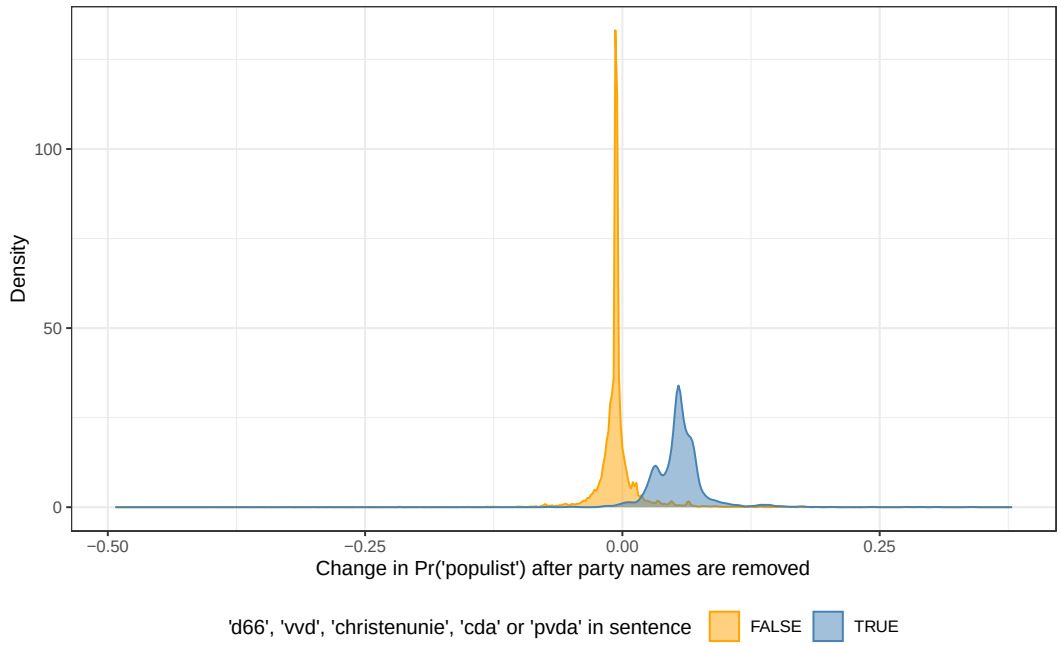


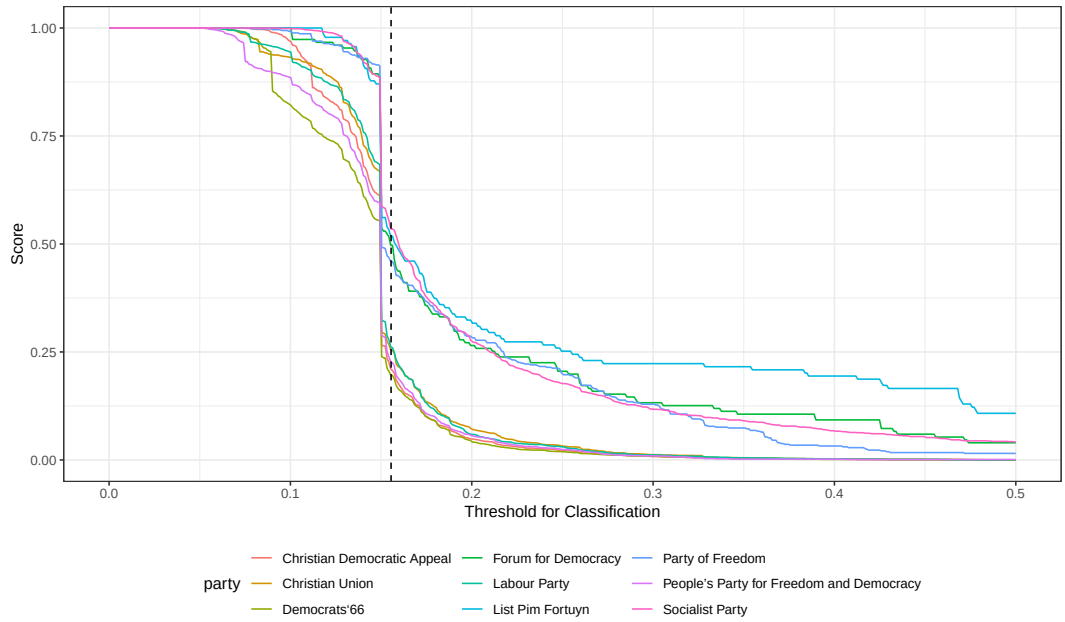
Figure A15. Change in probability of a sentence being classified as 'populist' conditional on including d66, vvd, christenunie, cda or pvda



A8.5 Impact of excluding party names on populism scores

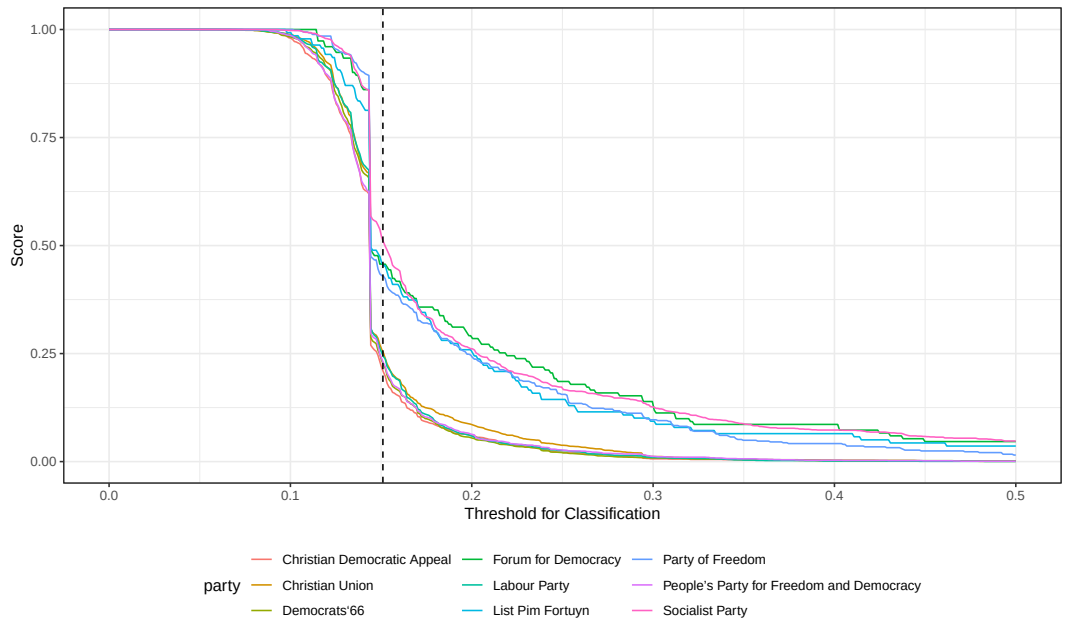
Finally, we look at the change in populism scores, when party names are excluded. As demonstrated in Figures A16 and A17, in both cases the models identify a clear gap between the parties labeled as populist and non-populist by the PopuList. However, the order of the parties strongly depends on the chosen cut-off values (which DCM estimate using the Youden-Index). For example, when party names are included, List Pim Fortuyn has a high populism score for most classification thresholds, but the same party has the lowest populism score among the populist parties when the party names are excluded from the analysis. In other words, the exclusion of party names does not substantially change the relative order of the populist parties. Finally, Figure A18 demonstrates for the case of the PVV that among the 'populist sentences' the share of sentences with a particularly high populism score are those that include the 'pvv'-party name. Again, strengthening the impression that highly populist sentences are those with the respective party name included.

Figure A16. Populism scores for all Dutch parties conditional on the threshold selected for classifying sentences as 'populist' or 'non-populist' – Party names included in the analysis



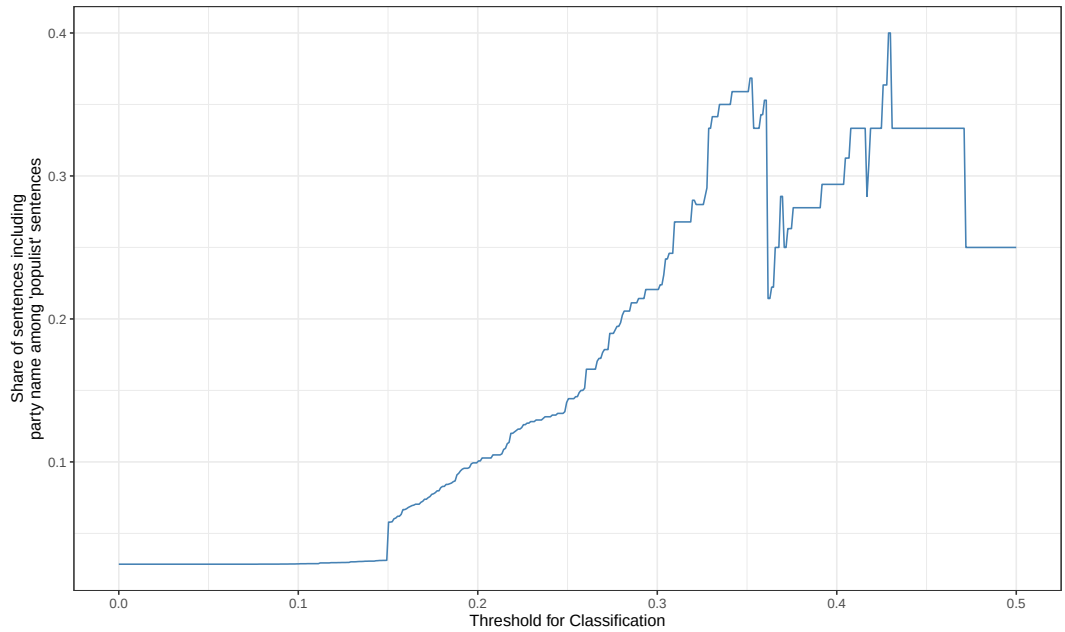
Note: Dashed vertical line is cut-off suggested by Youden-Index.

Figure A17. Populism scores for all Dutch parties conditional on the threshold selected for classifying sentences as 'populist' or 'non-populist' – Party names excluded from the analysis



Note: Dashed vertical line is cut-off suggested by Youden-Index

Figure A18. Share of sentences with feature 'pvv' among all sentences classified as populist conditional on different thresholds for classification in the Netherlands



Note: Dashed vertical line is cut-off suggested by Youden-Index.

A8.6 Summary

Comparable to the case of Germany, the analysis of Netherlands does not indicate that removing party names from the document-feature-matrix leads to the identification of populist content in the Dutch party manifestos.

A9 Reshuffling Results for all Countries

In this section, we present the results of the reshuffling analyses for all countries. As discussed in the main-text, we randomly reshuffle the labels of manifestos and rerun the models. We then compare the manifestos' populism scores when they receive a populist label with their scores when not receiving a populist label. We would anticipate that the label does not matter if the content is of relevance in the approach by DCM. Our results generally demonstrate that this is not the case. Manifestos, regardless of content, receive higher populism scores when labeled populist. We discuss this in more detail in the main-text and show the results for Germany. This section provides the corresponding figures for all countries. The first figure of each subsection shows the distribution of populism scores for each manifesto. Colors indicate whether the manifesto received a populist label (yellow) or not (blue). The number at the top of each facet provides the difference in mean of the two distributions as well as the confidence intervals. Overall, we observe that the distribution for populist labels receive substantially higher scores than manifestos which receive non-populist labels, despite the same manifesto content. The second set of figures shows the distribution of populism scores by party label. Yellow boxes indicate that the party is considered populist. Despite the random content, we observe that that populist labels receive higher scores.

A9.1 Austria

Figure A19. Populism score of each manifesto conditional on being labeled as populist or non-populist

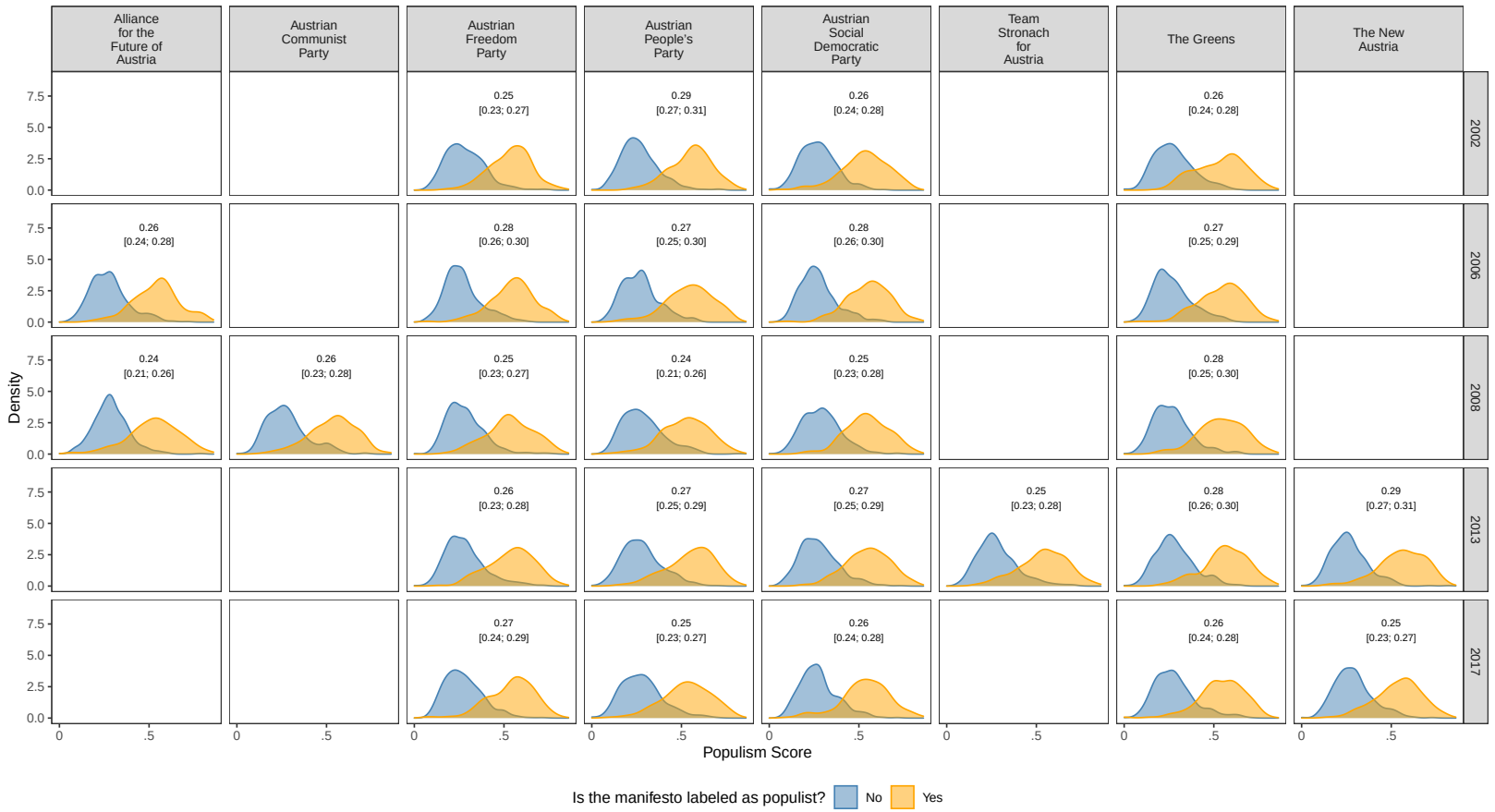
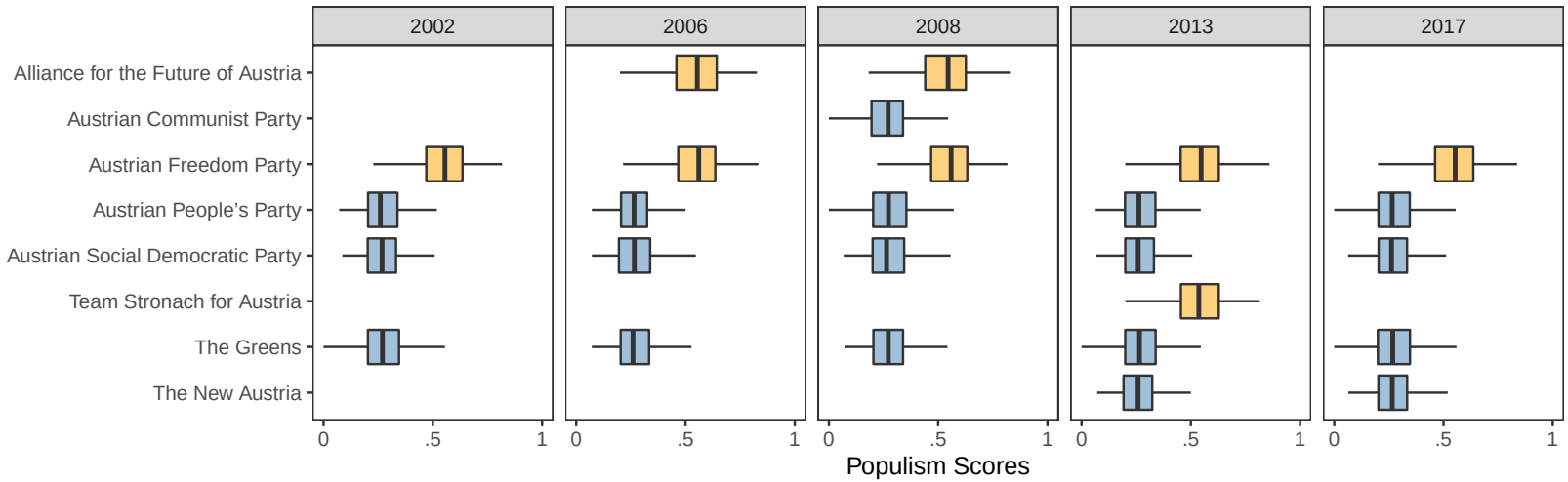


Figure A20. Populism scores of each manifesto label



A9.2 Netherlands

Figure A21. Populism score of each manifesto conditional on being labeled as populist or non-populist

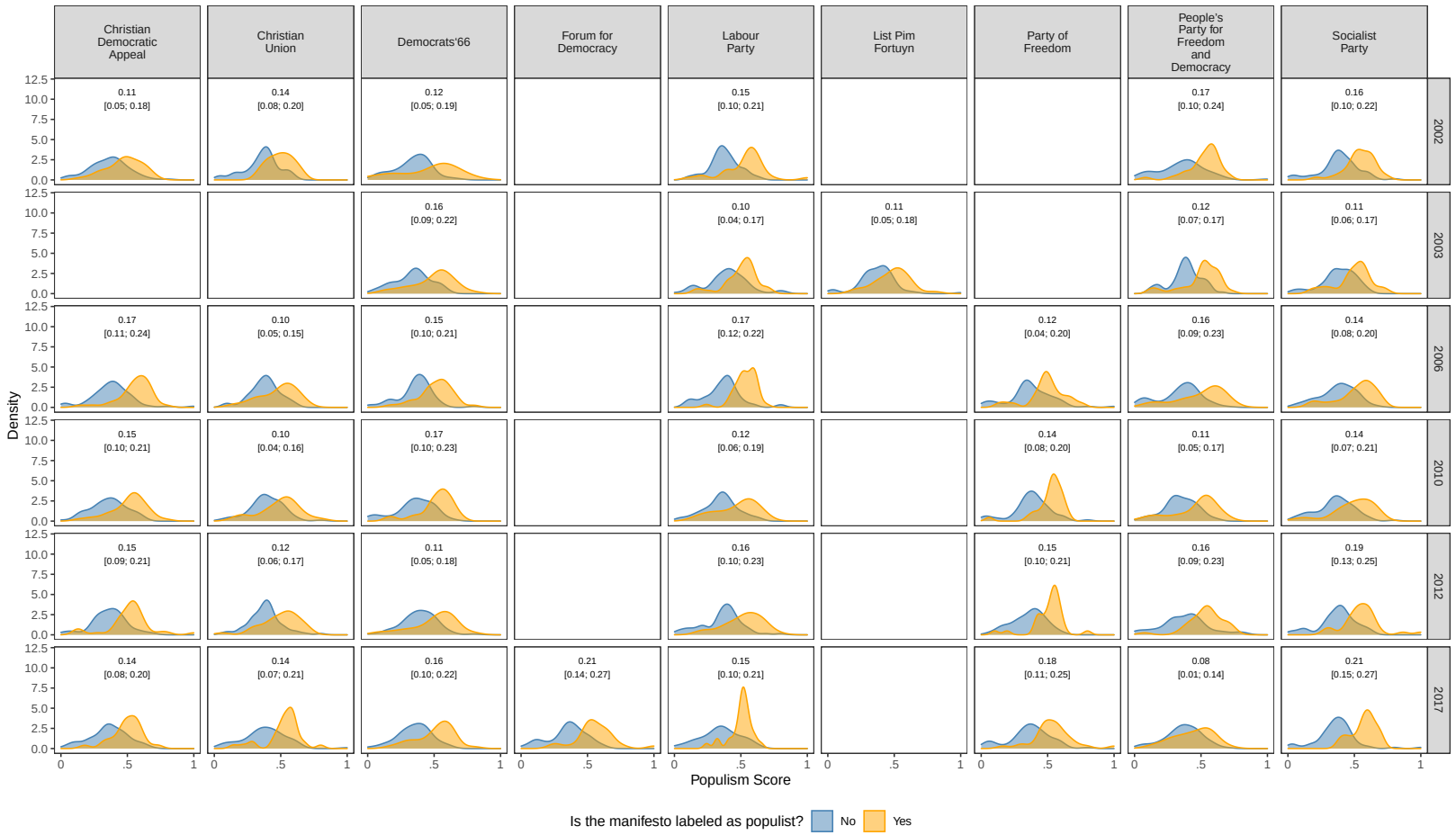
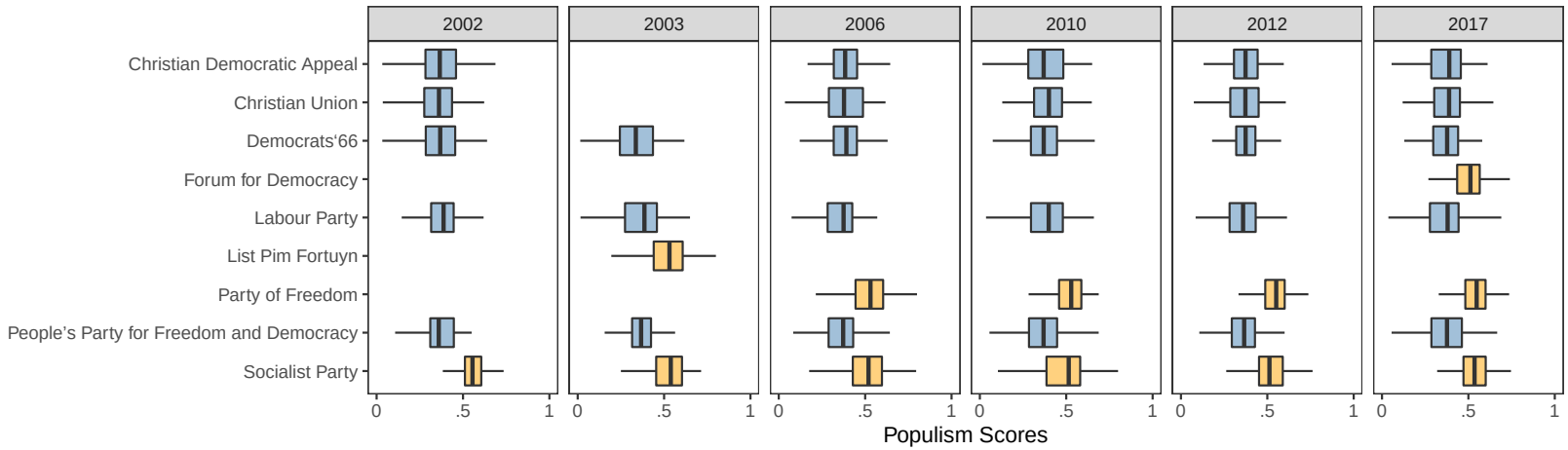


Figure A22. Populism scores of each manifesto label



A9.3 Spain

Figure A23. Populism score of each manifesto conditional on being labeled as populist or non-populist

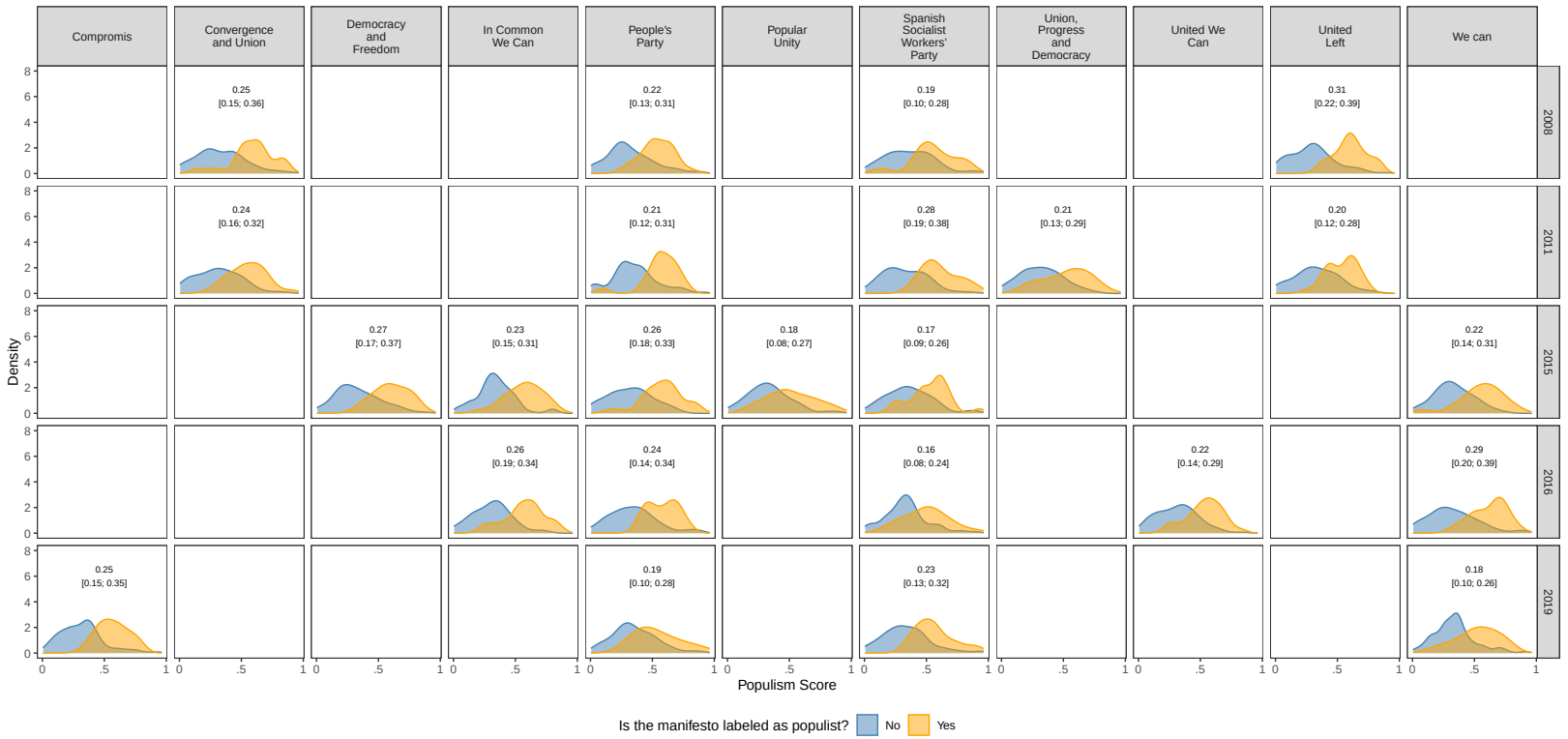
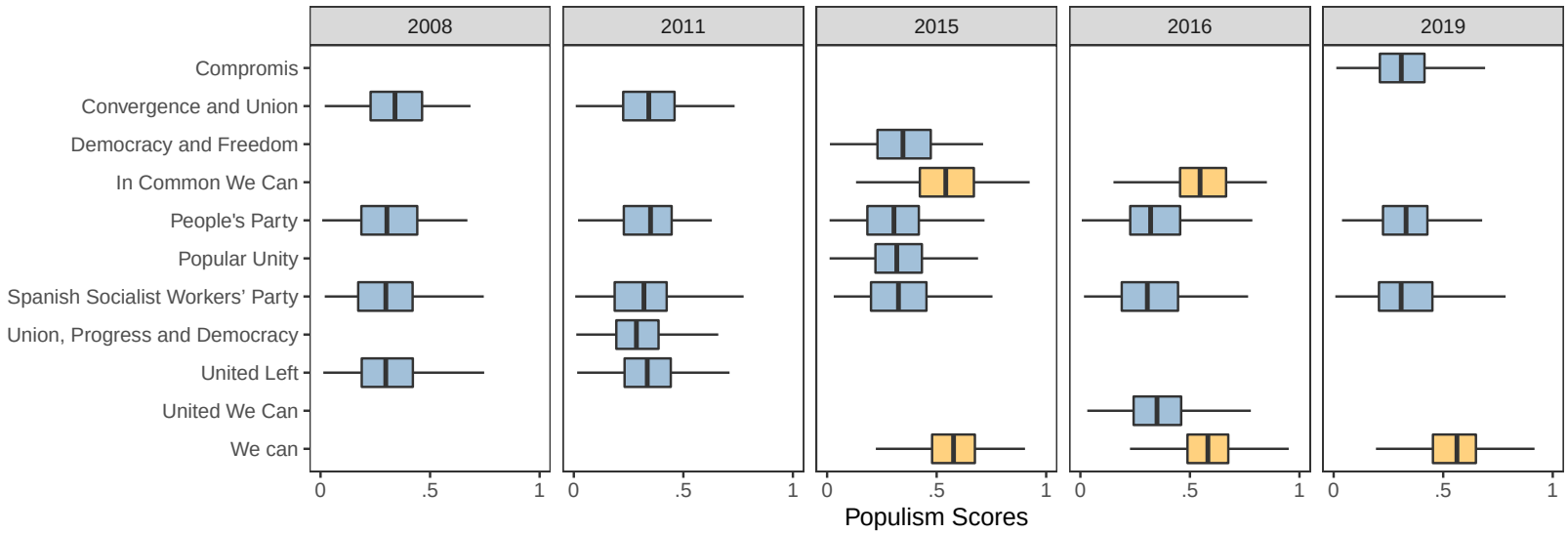


Figure A24. Populism scores of each manifesto label



A9.4 Italy

Figure A25. Populism score of each manifesto conditional on being labeled as populist or non-populist

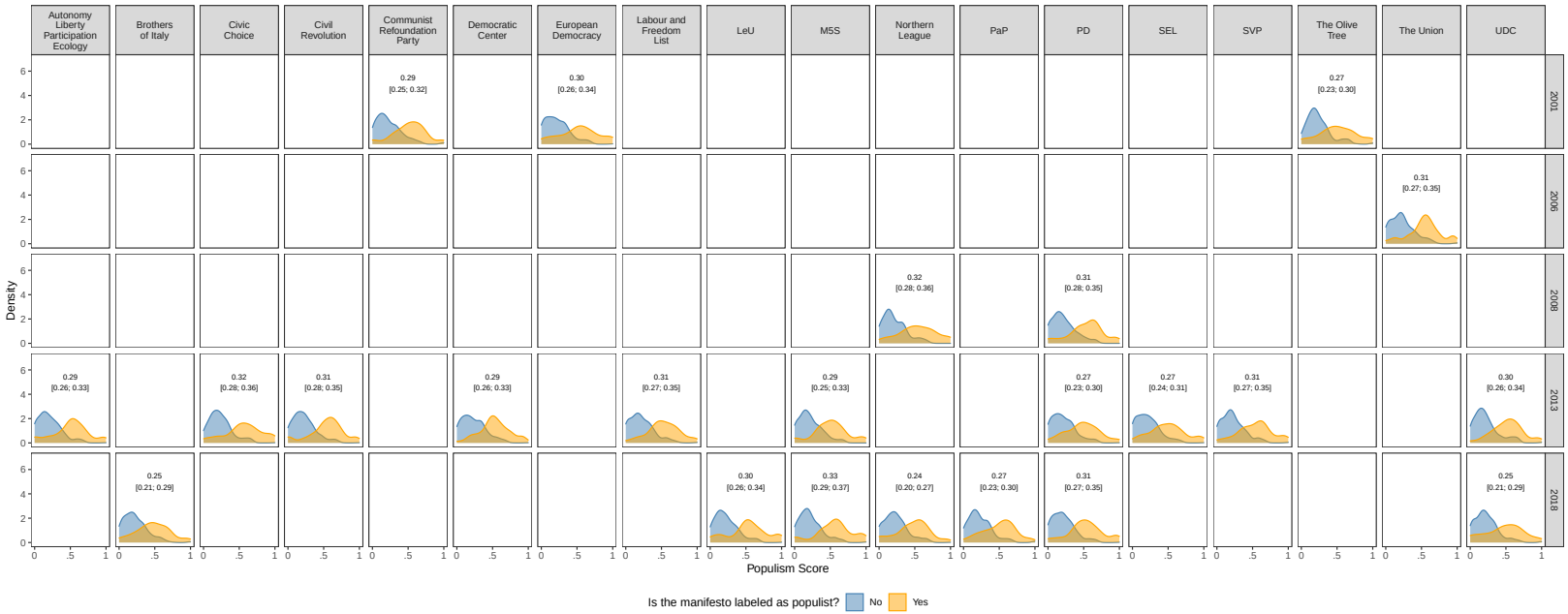
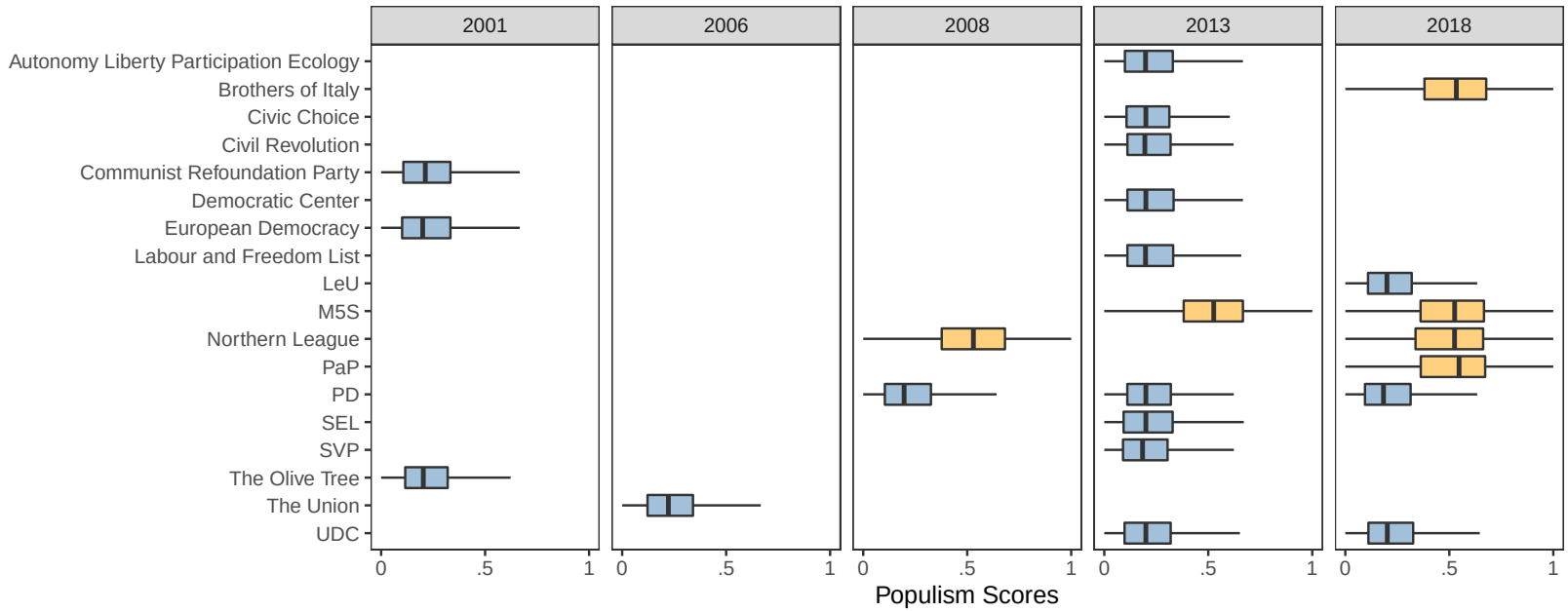


Figure A26. Populism scores of each manifesto label



A9.5 France

Figure A27. Populism score of each manifesto conditional on being labeled as populist or non-populist

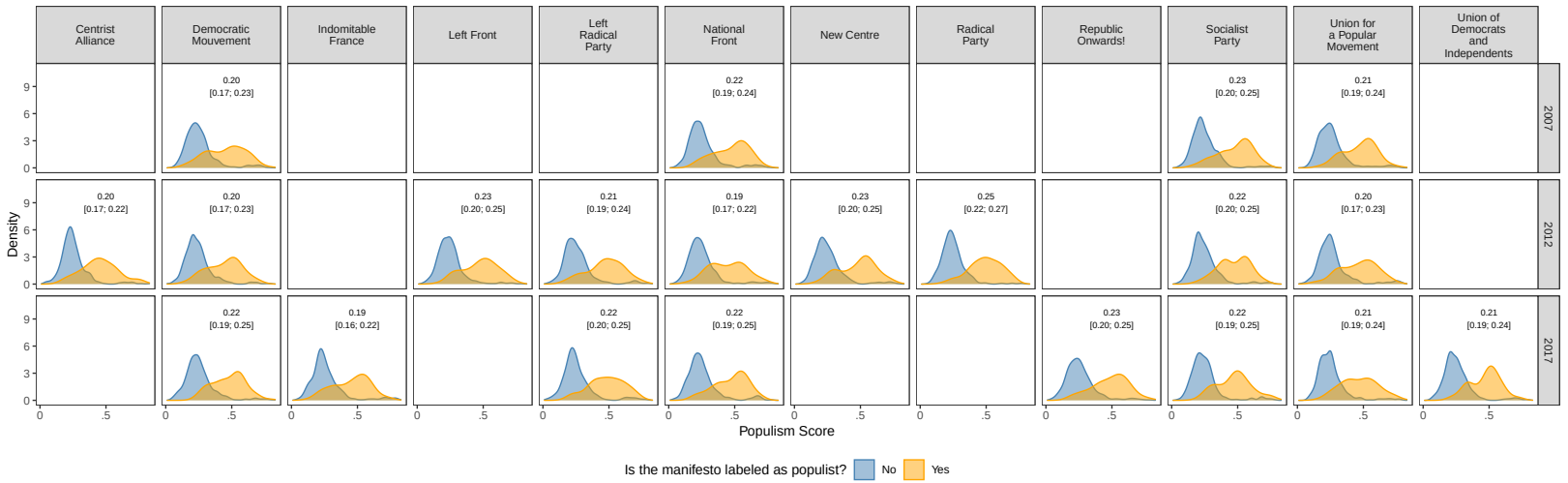
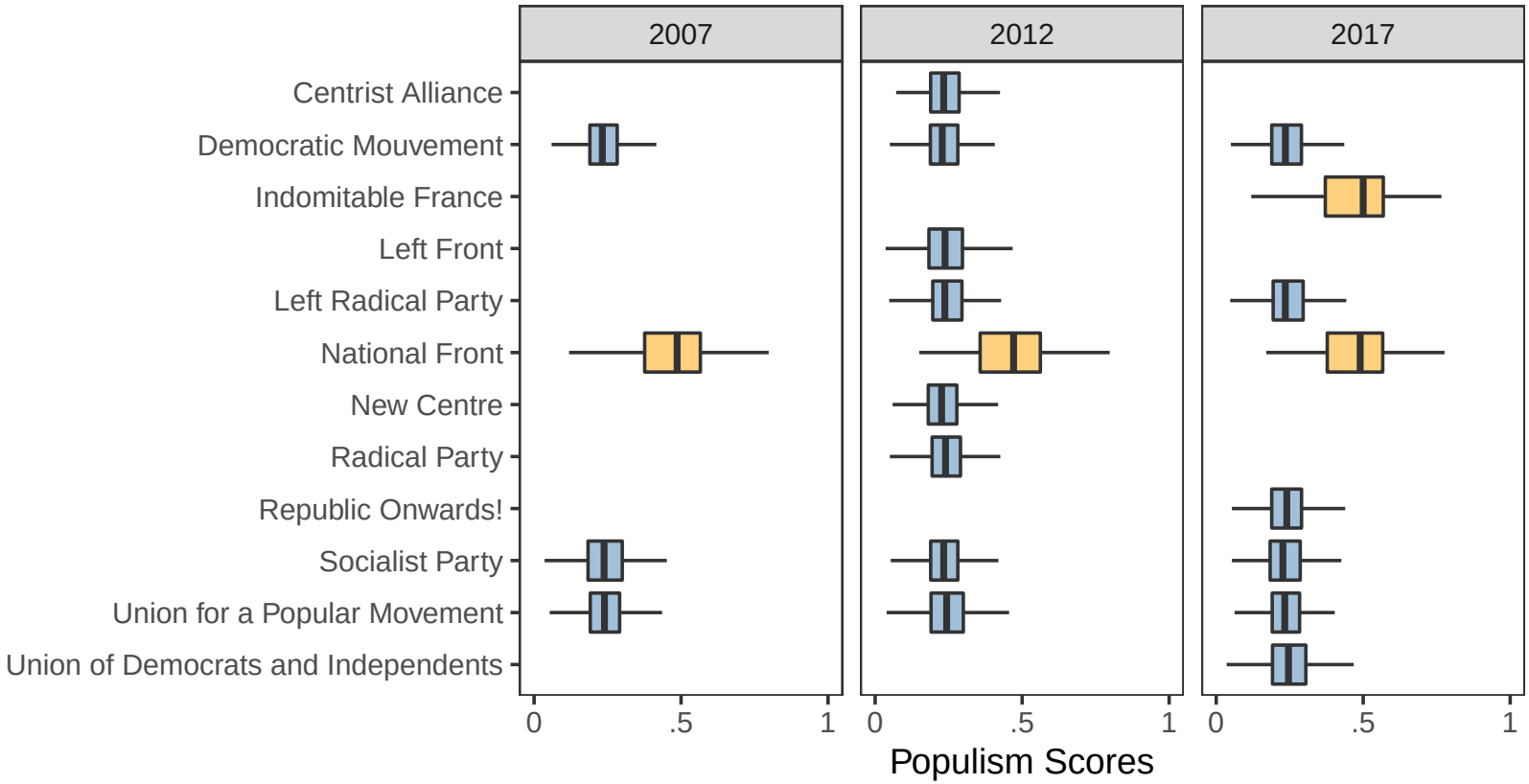


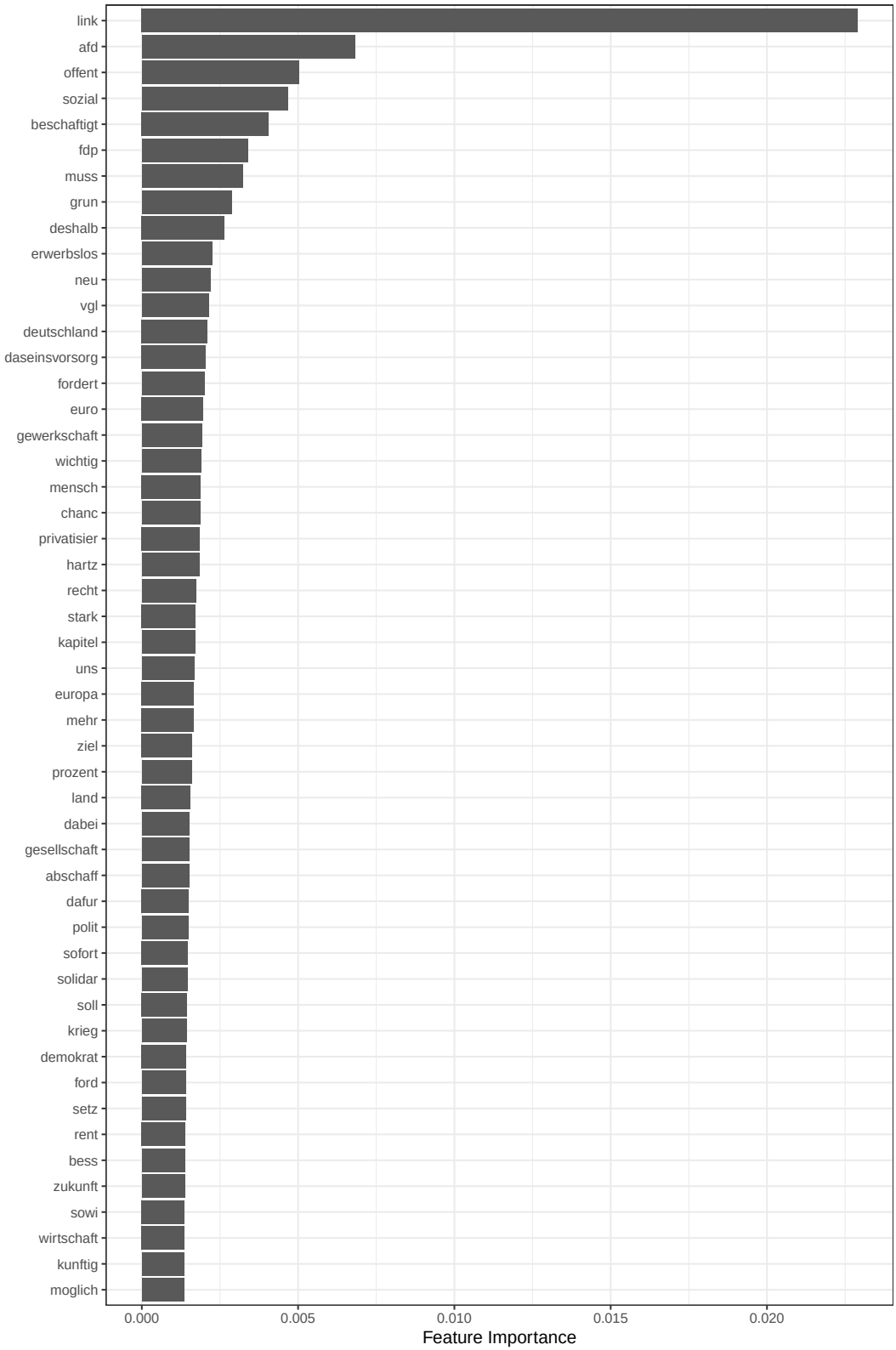
Figure A28. Populism scores of each manifesto label



A10 Feature Importance based on Mean Impurity Approach (Top 50 Features)

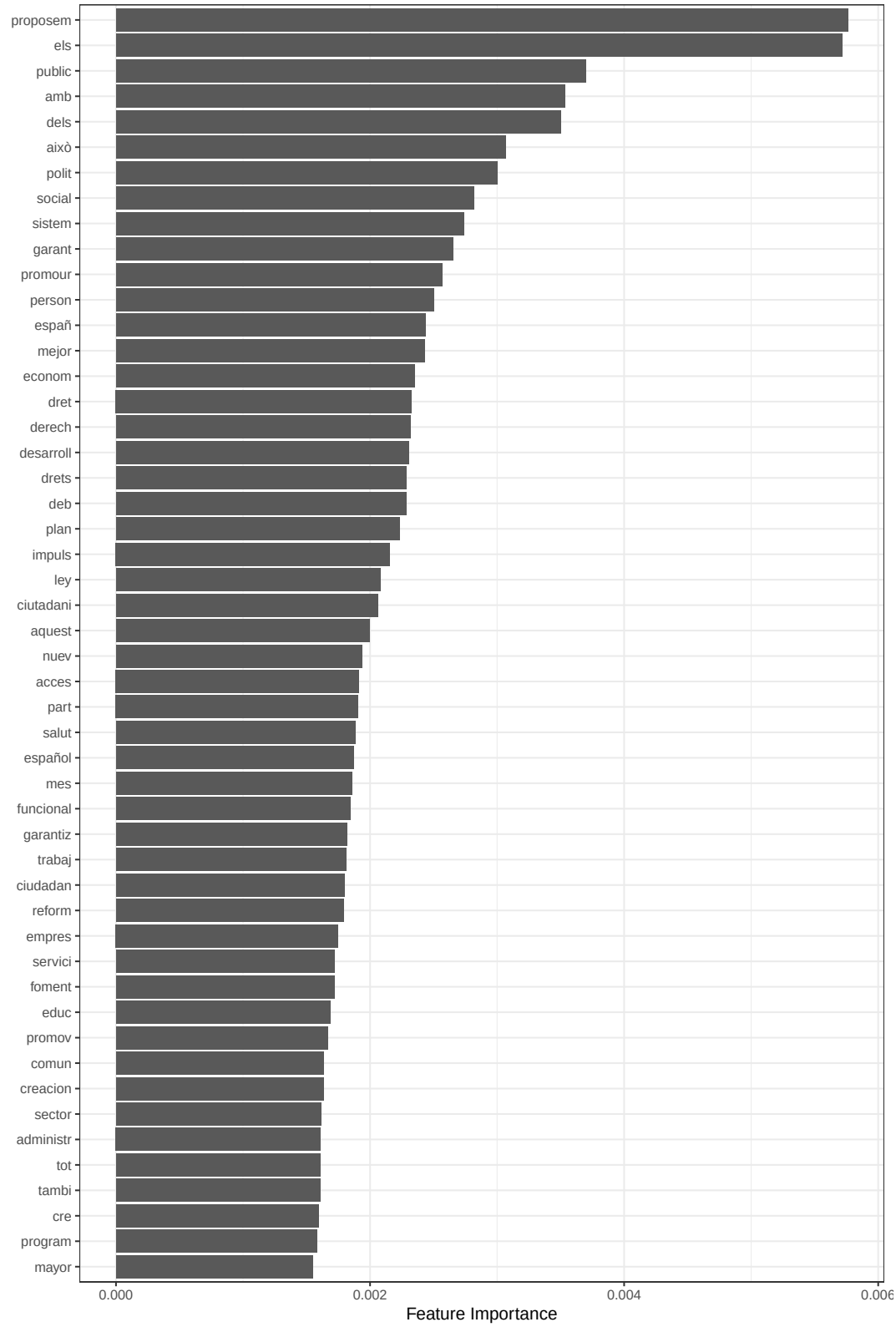
A10.1 Germany

Figure A29. Top 50 Most Important Features for Germany



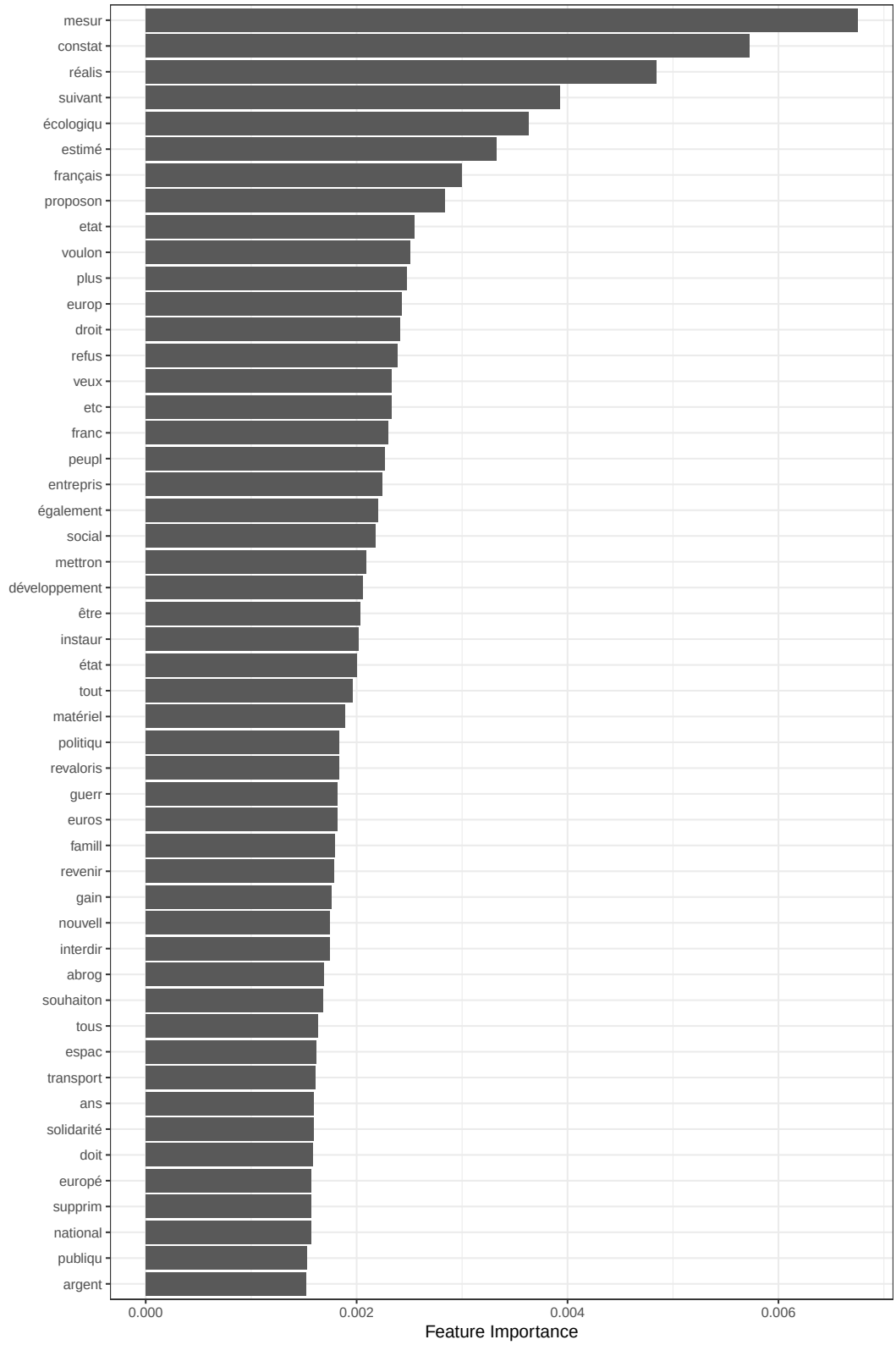
A10.2 Spain

Figure A30. Top 50 Most Important Features for Spain



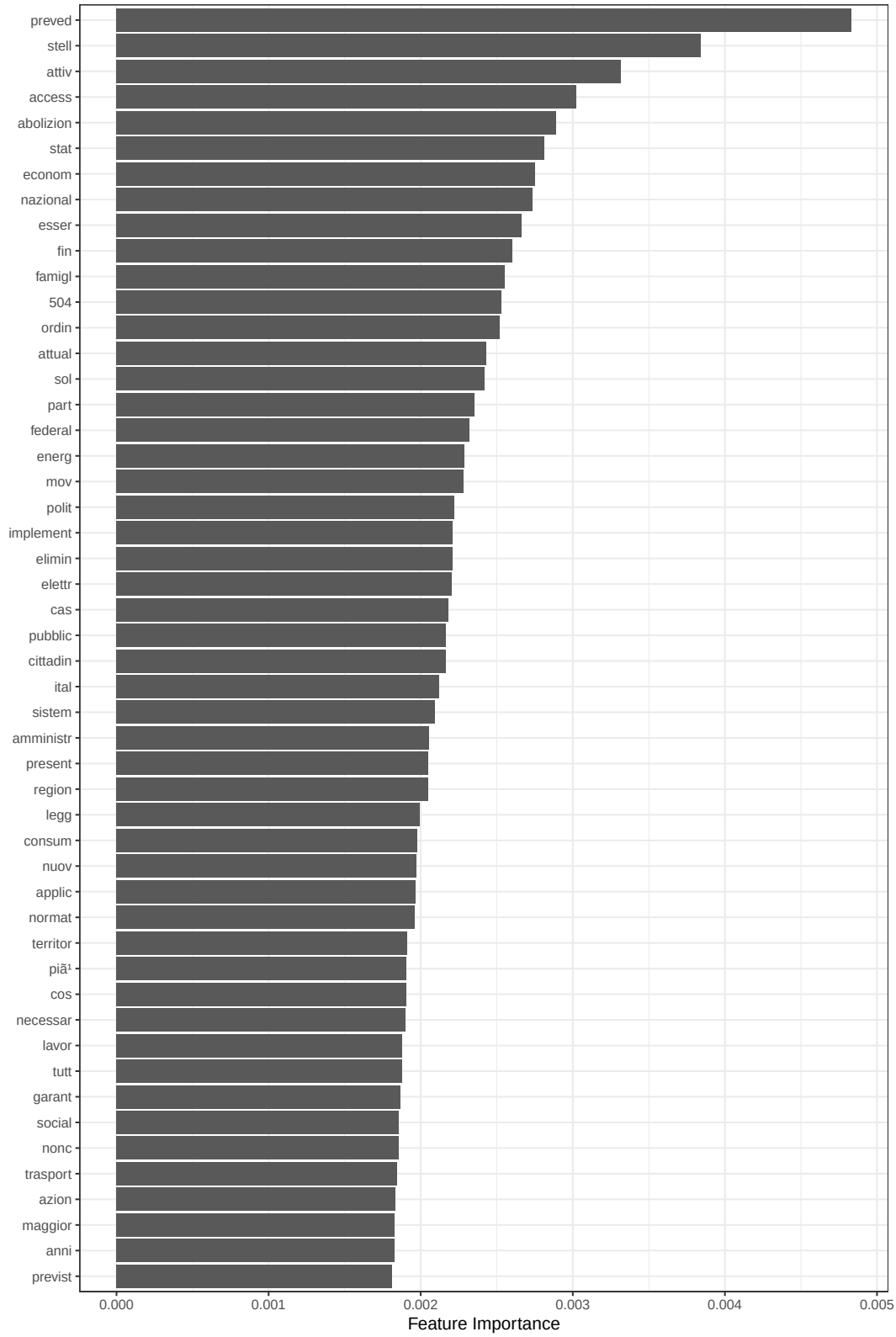
A10.3 France

Figure A31. Top 50 Most Important Features for France



A10.4 Italy

Figure A32. Top 50 Most Important Features for Italy



A10.5 Netherlands

Figure A33. Top 50 Most Important Features for Netherlands

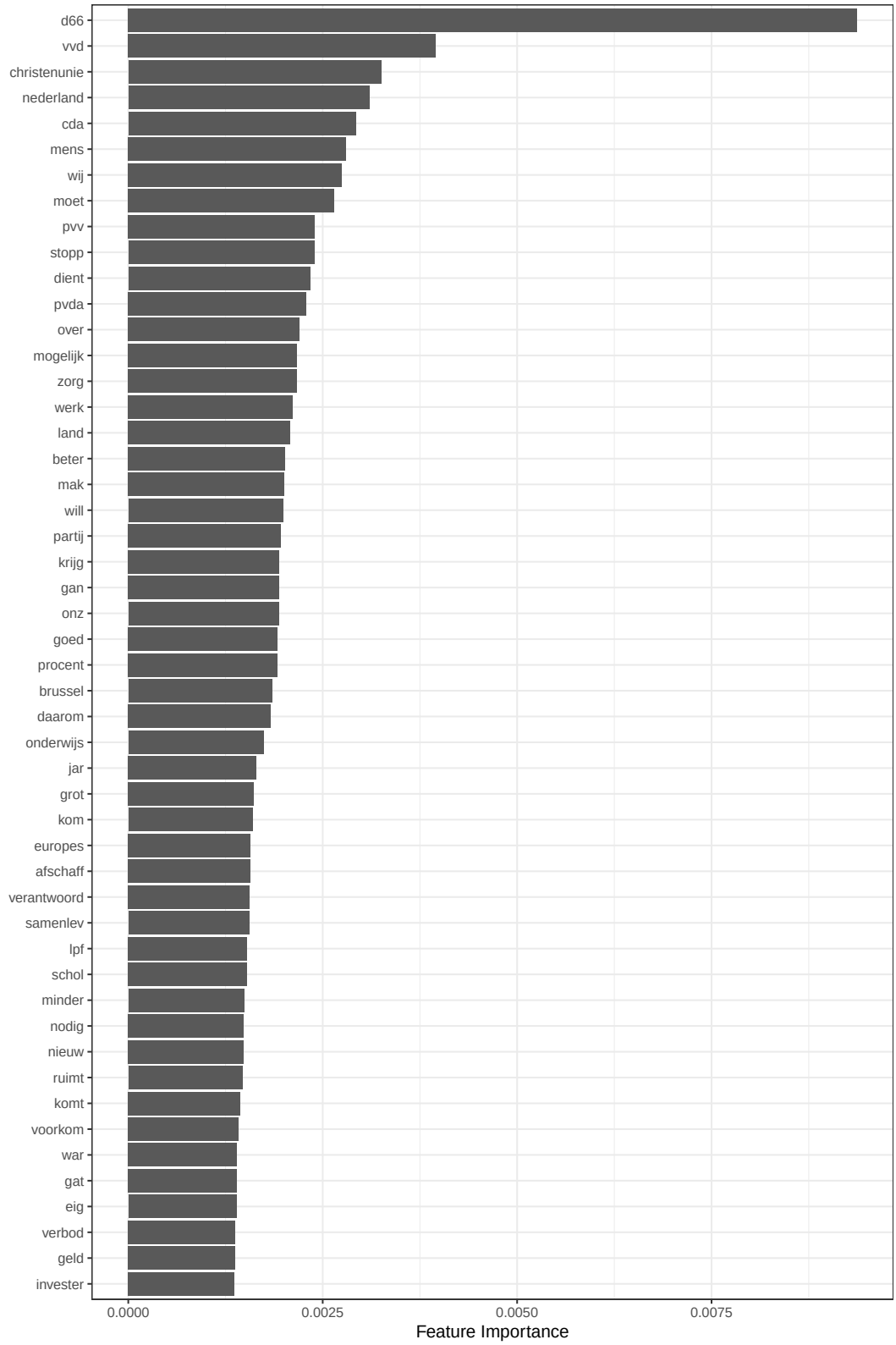
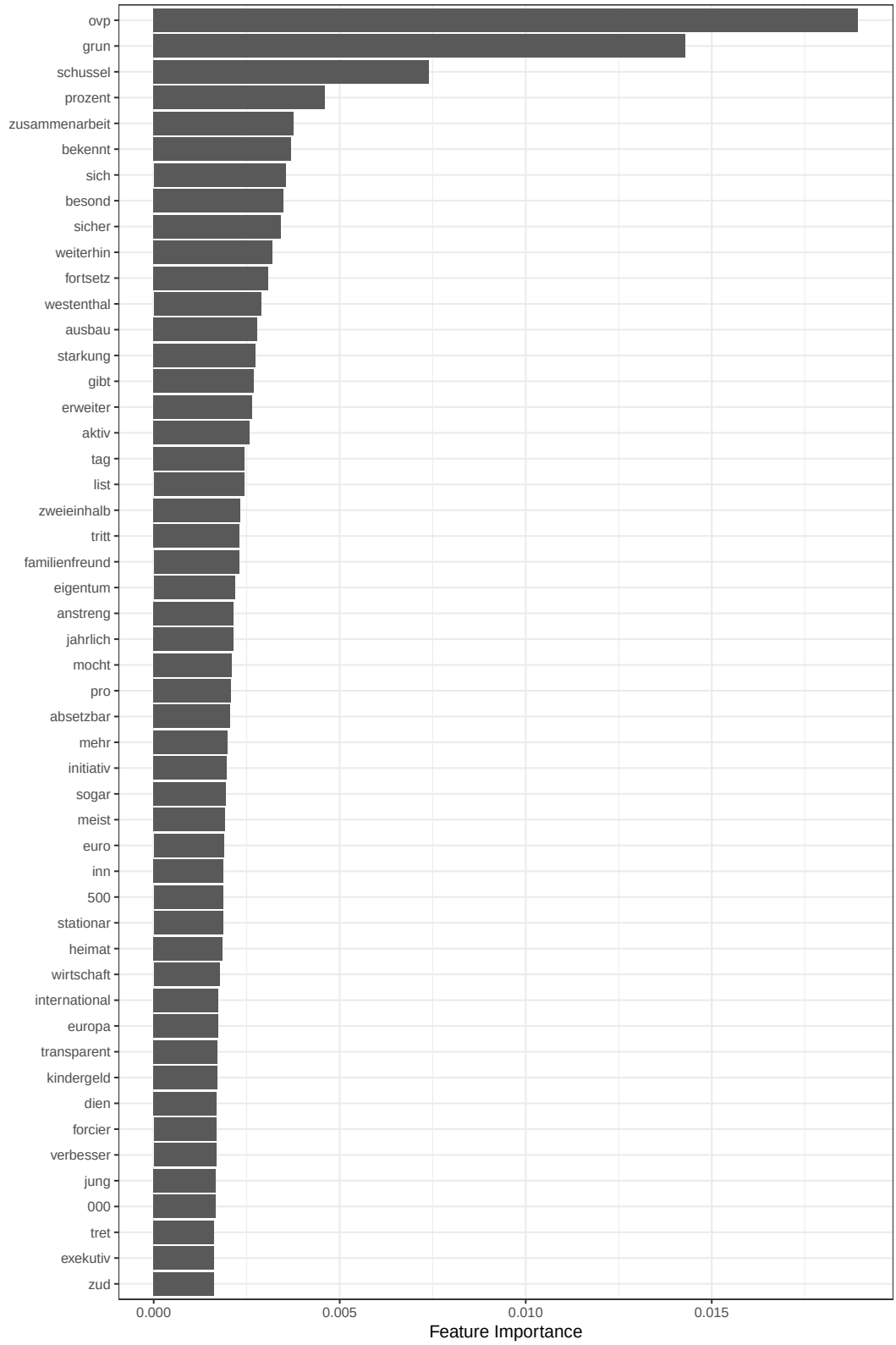


Figure A34. Top 50 Most Important Features for Austria



Supplementary Material

(This is dummy text) For supplementary material accompanying this paper, please visit https://doi.org/10.1017/pan.xxxx.xx.

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