VDem Indices Analysis

November 25, 2018

1 Major Indices Created Using VDem data

I restricted the analysis to post 1980 period for three reasons. First, this ensures that we will not have many missing data. Second, I believe that data quality should be better for this period as VDem relies on experts' knowledge and they are not historian most of the time. Lastly, democratic backsliding is a recent phenomenon that became an issue after 1990s. VDem data has hierarchial structure, meaning that most of the indices consist of other sub-indices. I firstly focus on the major indices. Then, I will switch to sub-indices (which consist of some variables directly coded by the experts) and some variables that compose these major indices. The following indices seem relevant for our purposes and the questions they try to answer are as follows:[1]

Electoral component index: To what extent is the electoral principle of democracy achieved? (`v2x_EDcomp_thick`)

Corruption index: (`v2x_corr`)

Freedom of expression index and **Alternative sources of information index**: To what extent does government respect press and media freedom, the freedom of ordinary people to discuss political matters at home and in the public sphere, as well as the freedom of academic and cultural expression? (`v2x_freexp` and `v2xme_altinf`)

Civil liberties index: To what extent is civil liberty respected? (`v2x_civlib`)

Accountability index: To what extent is the ideal of government accountability achieved? (`v2x_accountability`)

Party institutionalization index: To what extent are political parties institutionalized? Party institutionalization refers to various attributes of the political parties in a country, e.g., level and depth of organization, links to civil society, cadres of party activists, party supporters within the electorate, coherence of party platforms and ideologies, party-line voting among representatives within the legislature. A high score on these attributes generally indicates a more institutionalized party system. (`v2xps_party`)

[1] These are directly taken from VDem codebook.

Core civil society index: How robust is civil society? The sphere of civil society lies in the public space between the private sphere and the state. Here, citizens organize in groups to pursue their collective interests and ideals. We call these groups civil society organizations CSOs. CSOs include, but are by no means limited to, interest groups, labor unions, spiritual organizations if they are engaged in civic or political activities, social movements, professional associations, charities, and other non-governmental organizations. The core civil society index CCSI is designed to provide a measure of a robust civil society, understood as one that enjoys autonomy from the state and in which citizens freely and actively pursue their political and civic goals, however conceived. (`v2xcs_ccsi`)

Division of power index: Are there elected local and regional governments, and if so to what extent can they operate without interference from unelected bodies at the local level? (`v2x_feduni`)

Rule of law index: To what extent are laws transparently, independently, predictably, impartially, and equally enforced, and to what extent do the actions of government officials comply with the law? (`v2x_rule`)

The descriptive statistics for these major indices is as follows:

Table 1

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Corruption	5,598	0.527	0.292	0.005	0.255	0.790	0.977
Electoral component	5,598	0.558	0.269	0.003	0.316	0.830	0.950
Freedom of expression	5,598	0.635	0.301	0.011	0.384	0.893	0.991
Civil liberties	5,598	0.652	0.268	0.011	0.447	0.896	0.976
Accountability	5,598	0.554	0.934	−1.626	−0.191	1.360	2.191
Party institutionalization	5,598	0.593	0.262	0.003	0.409	0.822	1.000
Core civil society	5,598	0.643	0.292	0.011	0.413	0.899	0.979
Alternative sources of information	5,598	0.619	0.306	0.014	0.362	0.884	0.987
Division of power	5,598	0.441	0.356	0	0.1	0.8	1
Rule of law	5,598	0.535	0.306	0.018	0.263	0.825	0.998

All indices except for accountability index ranges from 0 to 1. Apparently, there was a problem with accountability index. Although, in the codebook it says that the index should be between 0 and 1, there are some negative values as seen in the desriptive statistics. I think that they did not rescale it since they put a cautionary note for this index. I paste this note here (from the codebook):

"While estimates of the latent variable Vertical Accountability ($v2x\_veracc$) converged according to standard V-Dem criteria, some parameters involved in the estimation process for this variable did not. As a result, this variable should be used with caution. All other Accountability indices –the overall Accountability index ($v2x_accountability$), Diagonal Accountability index ($v2x\_diagacc$), Vertical Accountability index ($v2x\_vertacc$), and Horizontal Accountability index ($v2x\_horacc$)–met V-Dem criteria for convergence."

The correlation matrix for these 10 indices are as follows:

	Corruption	Electoral comp.	Freedom of exp.	Civil lib.	Accountability	Party inst.	Core CS	Alt. sources of inf.	Div. of power	Rule of law
Corruption	1.00	-0.59	-0.50	-0.54	-0.60	-0.57	-0.45	-0.41	-0.46	-0.89
Electoral comp.	-0.59	1.00	0.87	0.88	0.93	0.70	0.85	0.83	0.70	0.78
Freedom of exp.	-0.50	0.87	1.00	0.95	0.95	0.56	0.94	0.93	0.68	0.75
Civil lib.	-0.54	0.88	0.95	1.00	0.94	0.58	0.93	0.87	0.67	0.78
Accountability	-0.60	0.93	0.95	0.94	1.00	0.64	0.93	0.93	0.71	0.83
Party inst.	-0.57	0.70	0.56	0.58	0.64	1.00	0.53	0.52	0.55	0.62
Core CS	-0.45	0.85	0.94	0.93	0.93	0.53	1.00	0.91	0.64	0.70
Alt. sources of inf.	-0.41	0.83	0.93	0.87	0.93	0.52	0.91	1.00	0.63	0.66
Div. of power	-0.46	0.70	0.68	0.67	0.71	0.55	0.64	0.63	1.00	0.59
Rule of law	-0.89	0.78	0.75	0.78	0.83	0.62	0.70	0.66	0.59	1.00

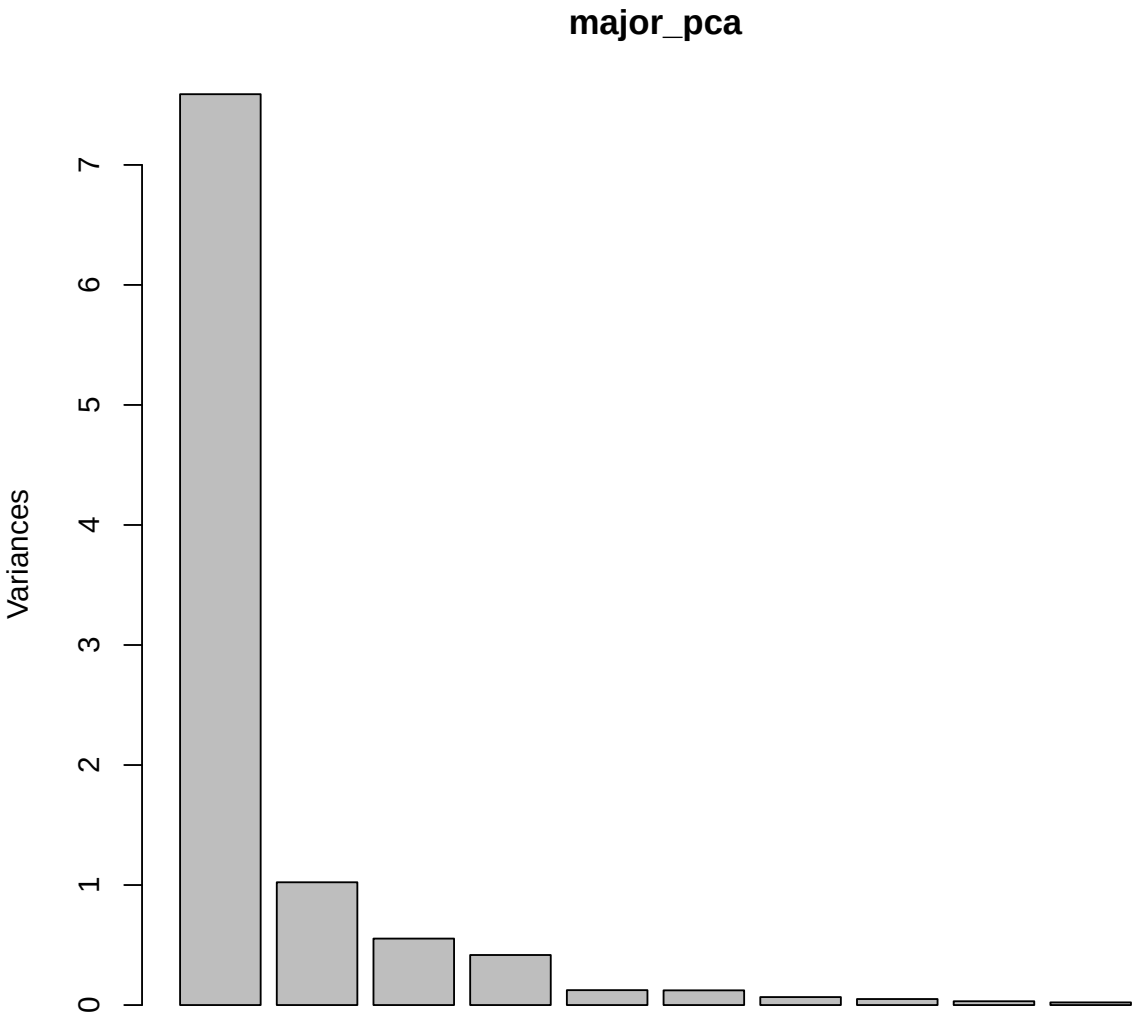
When we look at the correlation matrix, most of the variables are highly correlated. For instance, the correlation coefficient of our key index (Core CS index) are 0.85, 0.94, 0.93, 0.93, 0.91 with electoral component, freedom of expression, civil liberties, accountability, and alternative sources of information indices respectively. The correlation is weaker for party institutionalization index (0.53), division of power index (0.64), and rule of law index (0.70) though they are also pretty high.

To reduce dimension, I did the PCA and the results are as follows:

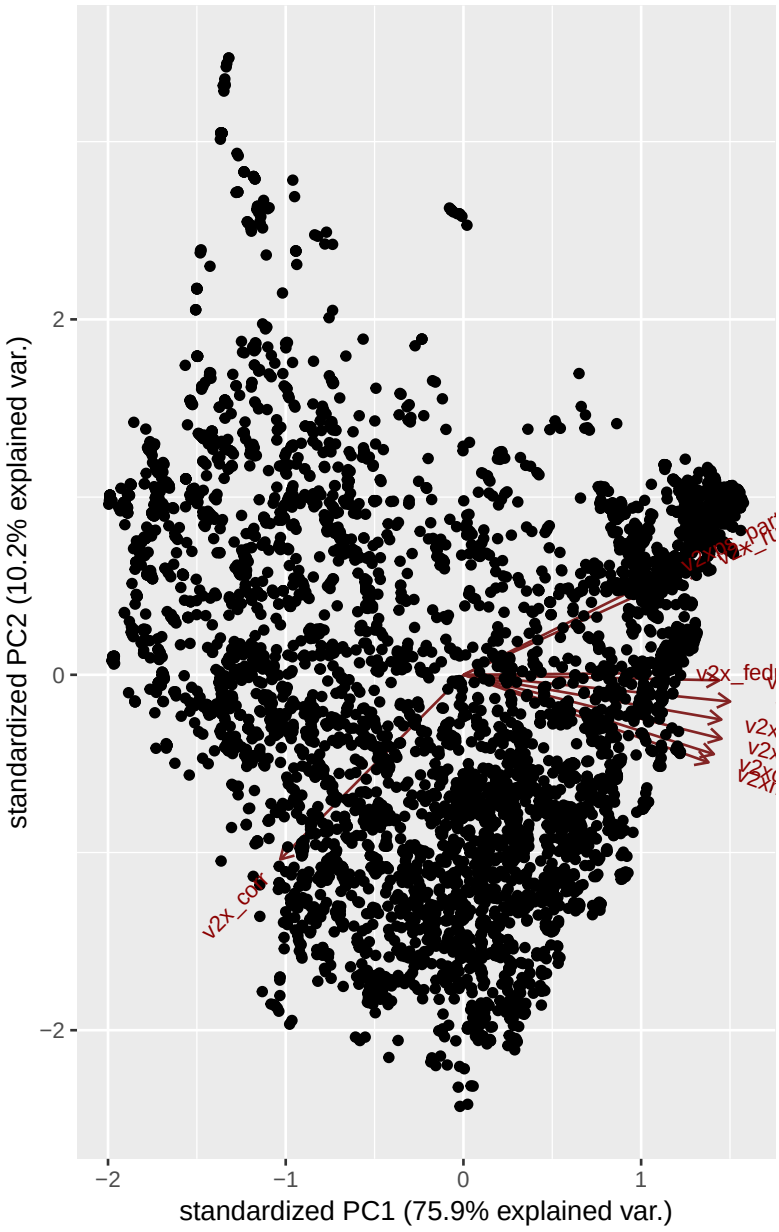
```
#Summary of the PCA using all major indices
summary(major_pca)

## Importance of components:
##                           PC1    PC2     PC3    PC4     PC5     PC6
## Standard deviation     2.7549 1.0114 0.74414 0.6457 0.35241 0.35021
## Proportion of Variance 0.7589 0.1023 0.05537 0.0417 0.01242 0.01226
## Cumulative Proportion  0.7589 0.8612 0.91660 0.9583 0.97072 0.98298
##                            PC7     PC8     PC9   PC10
## Standard deviation     0.25783 0.22387 0.17775 0.1483
## Proportion of Variance 0.00665 0.00501 0.00316 0.0022
## Cumulative Proportion  0.98963 0.99464 0.99780 1.0000
```

The results show that PC1 explains the 76% of the total variance. When we add PC2, they explain 86% of the total variance. The screeplot for this PCA is as follows:

```
screeplot(major_pca)
```



When we look at the biplot, we see that corruption index contributes to the second component. The rest all contributes to the first component.



2 Sub-Components of Major Indices

Each major index above either composes of sub-indices or of variables directly coded by the experts. This means that sub-indices also compose of some variables which are coded by the experts. Major indices analyzed above consist of the following components:

Electoral component index: Freedom of association index, Clean election index, Elected officials index.[2]

[2]Percent of population with suffrage is the fourth component of this index. But, I excluded this since there would be no variance at all for this variable as this will be 100% for all observations.

Corruption index: Public sector corruption index, Executive corruption index, legislature corrupt activities, judicial corruption decision

Civil liberties index: Private civil liberties index, physical violence index, political civil liberties index

Accountability index: Vertical accountability index, horizontal accountability index, diagonal accountability index

Party institutionalization index: Party organizations, party branches, party linkages, distinct party platforms, legislative party cohesion

Core civil society index: CSO participatory environment, CSO entry and exit, CSO repression

Alternative sources of information index: Media bias, Print/broadcast media critical, print/broadcast media perspective

Division of power index: Local government exists[3], regional government exists[4], local government elected, regional government elected, local offices relative power, regional offices relative power

Rule of law index: Compliance with the high court, compliance with judiciary, high court independence, lower court independence, executive respects constitution, rigorous and impartial public administration, transparent laws with predictable enforcement, access to justice for men, access to justice for women, judicial accountability, judicial corruption decision, public sector corrupt exchanges, public sector theft, executive bribery and corrupt exchanges, executive embezzlement and theft

Since there are many sub-indices and variables, I directly jump to PCA. When we do PCA using all sub-indices and variables that make up major indices analyzed in previous section, first component explains 64.4% of total variation. The second component explains 9.9% of total variation and they together explain 74.3%. The results for all components can be seen below.

```
summary(minor_pca)

## Importance of components:
##                           PC1     PC2     PC3     PC4     PC5     PC6
```

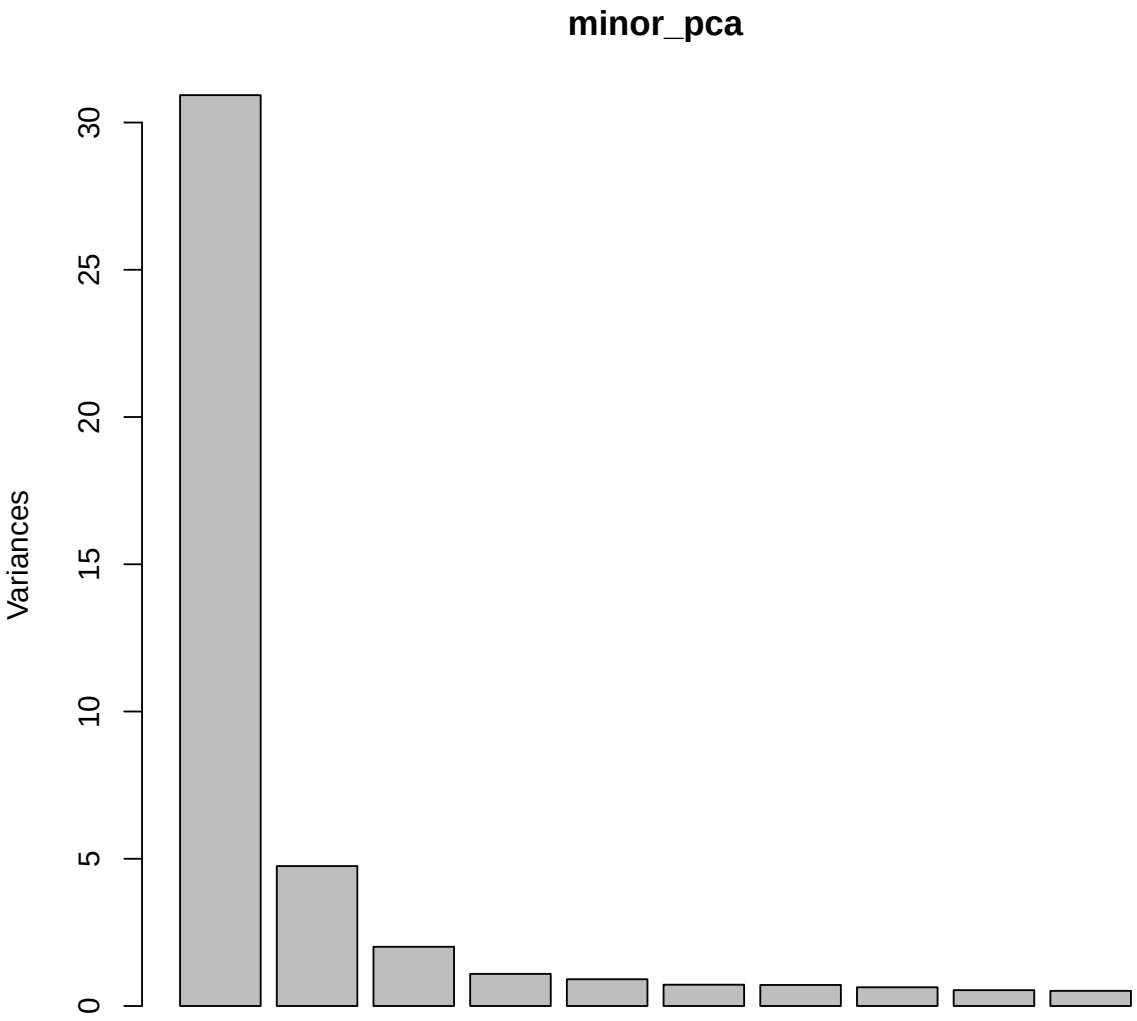
[3]There was no variation at all in this variable, so it was removed during the PCA
[4]There was no variation at all in this variable, so it was removed during the PCA

```
## Standard deviation     5.5615 2.17984 1.4182 1.04422 0.95345 0.85059
## Proportion of Variance 0.6444 0.09899 0.0419 0.02272 0.01894 0.01507
## Cumulative Proportion  0.6444 0.74337 0.7853 0.80798 0.82692 0.84200
##                            PC7     PC8     PC9    PC10    PC11    PC12
## Standard deviation     0.84493 0.79795 0.73355 0.71749 0.66694 0.62087
## Proportion of Variance 0.01487 0.01327 0.01121 0.01072 0.00927 0.00803
## Cumulative Proportion  0.85687 0.87013 0.88135 0.89207 0.90134 0.90937
##                           PC13    PC14    PC15    PC16    PC17    PC18
## Standard deviation     0.58232 0.55178 0.53338 0.50941 0.49922 0.48960
## Proportion of Variance 0.00706 0.00634 0.00593 0.00541 0.00519 0.00499
## Cumulative Proportion  0.91643 0.92278 0.92870 0.93411 0.93930 0.94429
##                           PC19   PC20    PC21    PC22   PC23    PC24
## Standard deviation     0.4802 0.4491 0.43437 0.40660 0.3978 0.39268
## Proportion of Variance 0.0048 0.0042 0.00393 0.00344 0.0033 0.00321
## Cumulative Proportion  0.9491 0.9533 0.95723 0.96068 0.9640 0.96718
##                           PC25    PC26    PC27    PC28    PC29    PC30
## Standard deviation     0.36303 0.34367 0.33789 0.32442 0.32154 0.30897
## Proportion of Variance 0.00275 0.00246 0.00238 0.00219 0.00215 0.00199
## Cumulative Proportion  0.96993 0.97239 0.97477 0.97696 0.97912 0.98110
##                           PC31    PC32    PC33    PC34    PC35    PC36
## Standard deviation     0.30157 0.29545 0.28804 0.27930 0.26932 0.26604
## Proportion of Variance 0.00189 0.00182 0.00173 0.00163 0.00151 0.00147
## Cumulative Proportion  0.98300 0.98482 0.98655 0.98817 0.98968 0.99116
##                           PC37    PC38    PC39    PC40    PC41    PC42
## Standard deviation     0.25737 0.25234 0.24288 0.23697 0.22077 0.20394
## Proportion of Variance 0.00138 0.00133 0.00123 0.00117 0.00102 0.00087
## Cumulative Proportion  0.99254 0.99386 0.99509 0.99626 0.99728 0.99814
##                           PC43    PC44    PC45    PC46    PC47    PC48
## Standard deviation     0.17613 0.15980 0.13616 0.09359 0.05963 0.04078
## Proportion of Variance 0.00065 0.00053 0.00039 0.00018 0.00007 0.00003
## Cumulative Proportion  0.99879 0.99932 0.99971 0.99989 0.99997 1.00000
```

Since it was corruption index that contributed the second component in previous analysis, I repeated the

analysis excluding sub-indices and variables that compose the corruption index. That is, I excluded public sector corruption index,executive corruption index, legislature corrupt activities, and judicial corruption decision. When we do it, the results do not change much. The first and second components explain 66% and 7.8% of total variation respectively. That is why, I continue the analysis by including the corruption indices as well. The screeplot for this PCA is as below. As expected, the biplot shows that it is corruption indices that contribute to PC2 mostly (see below).

```
screeplot(minor_pca)
```



```
ggbiplot(minor_pca)
```