Party Heterogeneity: Variation in the Variance Across Space and Time

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Start the introduction here...

A Heading

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A Sub-Heading

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See R Markdown at Work

I can build the analysis directly into the R Markdown document and leave the code and/or output either seen or unseen. I leave it seen below, but we can hide either if we want.

Tidy

First, let's tidy the raw data a bit:

```
# load packages
library(tidyverse)
```

```
## -- Attaching packages ------------------------------------------------------------------------ tidyv
```

```
## v ggplot2 3.2.1     v purrr   0.3.2
## v tibble  2.1.3     v dplyr   0.8.3
## v tidyr   0.8.3     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.4.0
```

```
## -- Conflicts --------------------------------------------------------------------------- tidyverse_c
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(haven)

# load raw data
leg_df_raw <- read_dta("shor_mccarty_1993-2016_individual_legislator_data_May_2018_release_(Updated_Jul

# clean data
leg_df <- leg_df_raw %>%
  # convert chamber-year indicator variables into a single variable
  gather(chamber_year, observation, senate1993:house2016) %>%
  # drop legislators who don't appear if they don't appear in a champter-year
  filter(!is.na(observation)) %>%
```

```
  # separate the chamber-year colum into separate chamber and year
  # variables, see https://stackoverflow.com/questions/45591387/tidyr-separate-column-values-into-chara
  separate(chamber_year,
           into = c("chamber", "year"),
           sep = "(?<=[a-z])(?=[0-9])") %>%
  # keep only needed variables
  select(state = st, chamber, year, party, name, ideology = np_score) %>%
  # convert year from character to numeric
  mutate(year = as.numeric(year)) %>%
  # keep only house
  filter(chamber == "house") %>%
  # keep only Ds and Rs
  filter(party != "X") %>%
  # quick check
  glimpse()
```

```
## Observations: 112,597
## Variables: 6
## $ state    <chr> "AR", "AR", "AR", "AR", "AR", "AR", "AR", "AR", "AR",...
## $ chamber  <chr> "house", "house", "house", "house", "house", "house",...
## $ year     <dbl> 1993, 1993, 1993, 1993, 1993, 1993, 1993, 1993, 1993,...
## $ party    <chr> "D", "R", "D", "D", "D", "D", "D", "D", "D", "D", "D"...
## $ name     <chr> "Argue, James Jr.", "Bisbee, David", "Brown, Irma", "...
## $ ideology <dbl> -0.072, 0.315, -0.273, 0.143, 0.154, 0.200, -0.173, 0...
```

Summarize

Now let's find the standard deviation for the legislators' ideologies in each party-state-year.

```
# find standard deviation for each party in each party-state-year
sum_df <- leg_df %>%
  group_by(state, party, year) %>%  # set groups at state-party-year
  summarize(sd = sd(ideology, na.rm = TRUE)) %>%  # calculate sd by group
  glimpse()  # quick look
```

```
## Observations: 2,056
## Variables: 4
## Groups: state, party [100]
## $ state <chr> "AK", "AK", "AK", "AK", "AK", "AK", "AK", "AK", "AK", "A...
## $ party <chr> "D", "D", "D", "D", "D", "D", "D", "D", "D", "D", "D", "...
## $ year  <dbl> 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 20...
## $ sd    <dbl> 0.55117233, 0.55117233, 0.47878152, 0.47878152, 0.407789...
```

Plot

Unfortunately, R Markdown doesn't easily number figures and tables.

```
# plot the SD for each party across time in each state
ggplot(sum_df, aes(x = year, y = sd, color = party)) +
  facet_wrap(~ state) +
  geom_line()
```

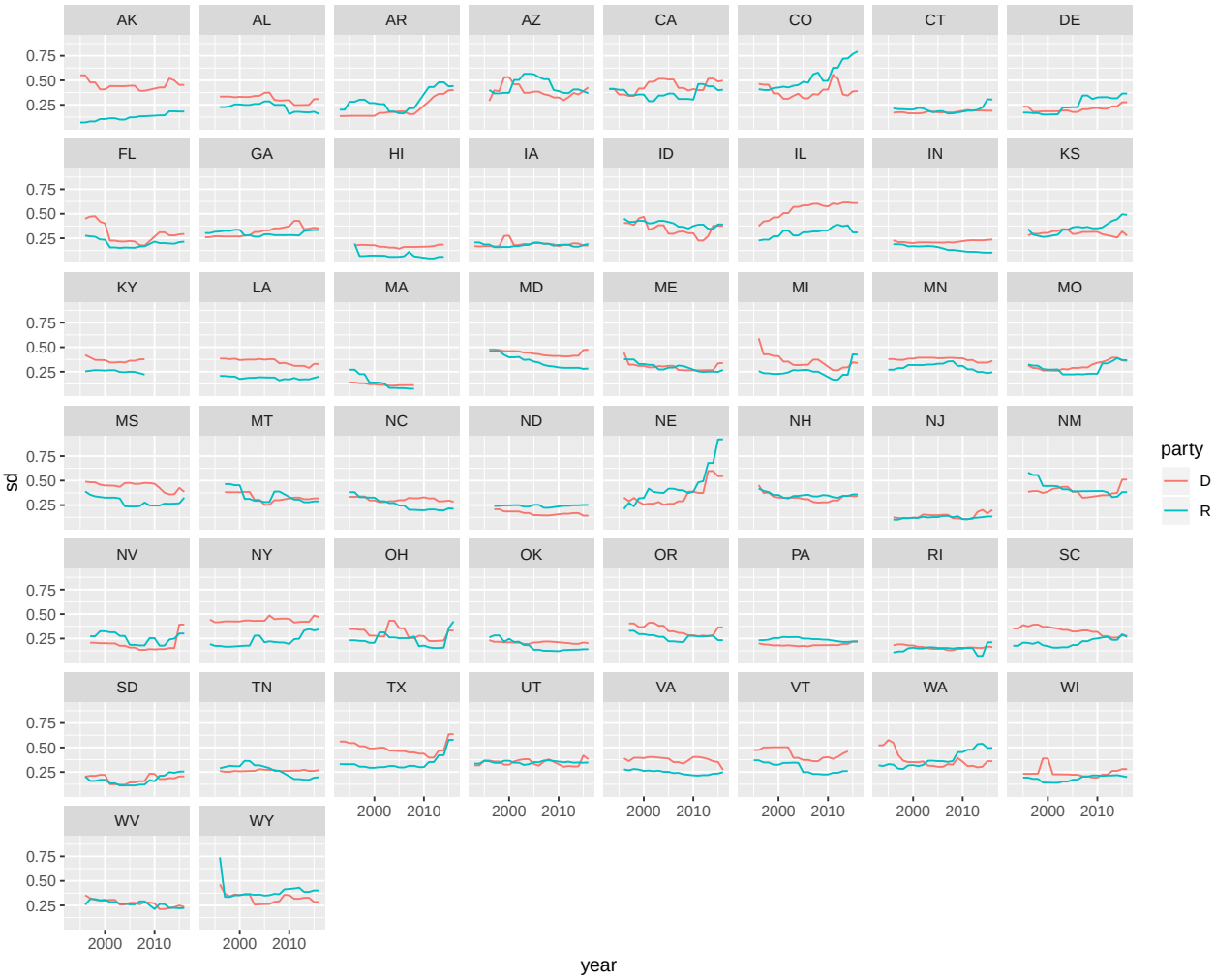

Figure 1: This figure shows the standard deviations for each state-party-year over time.

Tables

The html tables possible in R Markdown are cool. See here for more.

```
# load packages
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     group_rows
```

```
# display NAs as empty
options(knitr.kable.NA = '')
sum_df %>%
  # reduce the data a bit for space
  filter(year > 2000) %>%
  # give table columns nice names
  rename(State = state, Party = party, Year = year, SD = sd) %>%
  # put years in the columns to save a bit of space
  spread(Year, SD) %>%
  # make table
  kable(escape = FALSE, align = "c") %>%
  kable_styling(c("striped", "condensed"), full_width = FALSE)
```

State	Party	2001	2002	2003	2004	2005	2006	2007	2008	200
AK	D	0.4412331	0.4412331	0.4403821	0.4403821	0.4449977	0.4449977	0.3933141	0.3933141	
AK	R	0.1129800	0.1129800	0.0991785	0.0991785	0.1222598	0.1222598	0.1325543	0.1335514	
AL	D	0.3304735	0.3304735	0.3405543	0.3422903	0.3726972	0.3756235	0.3009131	0.2936324	0.295
AL	R	0.2489261	0.2489261	0.2592670	0.2592670	0.2855928	0.2855928	0.2492939	0.2492939	0.249
AR	D	0.1675703	0.1675703	0.1766220	0.1766220	0.1829264	0.1829264	0.1556176	0.1556176	
AR	R	0.2573359	0.2573359	0.1821770	0.1821770	0.1630410	0.1630410	0.2151546	0.2151546	
AZ	D	0.4597019	0.4597019	0.3729548	0.3726275	0.3848875	0.3848875	0.3587680	0.3486589	0.325
AZ	R	0.5043601	0.5033456	0.5664589	0.5664589	0.5623863	0.5337376	0.5116886	0.5116886	0.401
CA	D	0.4851217	0.4851217	0.5157041	0.5157041	0.5093621	0.5093621	0.4226454	0.4226454	0.396
CA	R	0.2872904	0.2872904	0.3449198	0.3449198	0.3652190	0.3652190	0.3103087	0.3103087	0.310
CO	D	0.3123917	0.3123917	0.3410056	0.3638844	0.3182315	0.3160877	0.3598510	0.3538585	0.405
CO	R	0.4352627	0.4272659	0.4446253	0.4520622	0.4852994	0.4759876	0.5617900	0.5787309	0.494
CT	D	0.1625737	0.1673005	0.1834204	0.1797606	0.1737399	0.1729795	0.1719459	0.1719459	
CT	R	0.2190777	0.2139338	0.1921182	0.1747851	0.1855744	0.1855744	0.1611873	0.1629971	
DE	D	0.1844006	0.1844006	0.1920409	0.1920409	0.1768821	0.1768821	0.2053055	0.2053055	0.215
DE	R	0.1523310	0.1523310	0.2224459	0.2224459	0.2259844	0.2259844	0.3453198	0.3453198	0.309
FL	D	0.2257366	0.2257366	0.2167416	0.2167416	0.2221015	0.2170682	0.1802704	0.1756011	
FL	R	0.1566002	0.1567244	0.1514059	0.1558989	0.1540696	0.1530941	0.1658419	0.1680218	
GA	D	0.2793496	0.2803254	0.3146209	0.3146209	0.3306930	0.3306930	0.3510225	0.3510225	0.362
GA	R	0.2764544	0.2827478	0.2657994	0.2657994	0.2909405	0.2909405	0.2818666	0.2818666	0.281
HI	D	0.1634326	0.1634326	0.1553183	0.1553183	0.1436621	0.1622289	0.1615797	0.1615797	
HI	R	0.0721235	0.0721235	0.0599339	0.0599339	0.0606864	0.0669290	0.1117586	0.0659740	
IA	D	0.1772470	0.1821318	0.1914720	0.1899589	0.1999487	0.2020646	0.1954324	0.1935811	0.187
IA	R	0.1698150	0.1711694	0.1804616	0.1821561	0.2067909	0.2067909	0.1937084	0.1937084	0.173
ID	D	0.3376322	0.3530712	0.3830534	0.3827440	0.2953014	0.2953014	0.3156198	0.3202704	0.301
ID	R	0.4018858	0.4062150	0.4270146	0.4278504	0.4155974	0.4024399	0.3686246	0.3666663	0.349
IL	D	0.5065619	0.5065619	0.5705147	0.5705147	0.5856302	0.5856302	0.6017278	0.6017278	0.581
IL	R	0.3280703	0.3280703	0.2781544	0.2781544	0.3113982	0.3113982	0.3194694	0.3194694	0.330
IN	D	0.2076142	0.2082682	0.2081324	0.2063380	0.2066106	0.2046073	0.2097228	0.2061576	
IN	R	0.1664177	0.1674953	0.1710220	0.1677407	0.1600307	0.1471966	0.1305978	0.1312303	
KS	D	0.3226255	0.3246742	0.3430036	0.3404162	0.2935995	0.2976426	0.3142306	0.3142306	0.315
KS	R	0.2786434	0.2855183	0.3372745	0.3365703	0.3617064	0.3674718	0.3598648	0.3656286	0.351
KY	D	0.3435667	0.3430596	0.3483157	0.3433073	0.3626348	0.3616886	0.3753721	0.3772455	
KY	R	0.2650212	0.2650212	0.2471052	0.2447470	0.2500349	0.2475158	0.2345226	0.2210176	
LA	D	0.3715987	0.3738135	0.3728628	0.3795104	0.3727010	0.3779445	0.3767090	0.3352505	0.339
LA	R	0.1823642	0.1878086	0.1882135	0.1935376	0.1922428	0.1903702	0.1908120	0.1614026	0.174
MA	D	0.1158628	0.1154526	0.1077323	0.1077361	0.1125598	0.1129917	0.1132333	0.1132333	
MA	R	0.1391050	0.1301454	0.0843229	0.0843229	0.0821299	0.0821299	0.0762920	0.0762920	
MD	D	0.4607405	0.4577731	0.4440586	0.4437657	0.4337177	0.4293876	0.4174324	0.4136541	0.410
MD	R	0.3969425	0.4004800	0.3698291	0.3741622	0.3529573	0.3431639	0.3186597	0.3079958	0.302
ME	D	0.2945637	0.2945637	0.3066805	0.3026936	0.3099234	0.3099234	0.2680277	0.2646884	
ME	R	0.3195300	0.3195300	0.2729884	0.2729884	0.2918273	0.2918273	0.3130741	0.3077256	
MI	D	0.3528560	0.3529225	0.3188893	0.3167084	0.3202860	0.3209563	0.3732652	0.3732652	
MI	R	0.2320682	0.2439776	0.2667721	0.2631561	0.2680555	0.2680555	0.2503288	0.2503288	
MN	D	0.3927291	0.3927291	0.3924749	0.3924749	0.3880111	0.3880111	0.3915409	0.3915409	0.387
MN	R	0.3173840	0.3173840	0.3229283	0.3229283	0.3313983	0.3313983	0.3540566	0.3572934	0.308
MO	D	0.2605861	0.2604213	0.2778720	0.2729951	0.2893189	0.2876008	0.2943717	0.2928443	0.324
MO	R	0.2715448	0.2733730	0.2228992	0.2228992	0.2223634	0.2254595	0.2228313	0.2280904	0.230
MS	D	0.4496070	0.4474388	0.4358047	0.4750252	0.4769839	0.4660267	0.4672800	0.4762112	0.474
MS	R	0.3266912	0.3266912	0.3178649	0.2375973	0.2352630	0.2352630	0.2390476	0.2771922	0.247
MT	D	0.3850552	0.3850552	0.3051357	0.3051357	0.2535573	0.2535573	0.3007653	0.3007653	
MT	R	0.3140786	0.3140786	0.2943970	0.2943970	0.2815368	0.2815368	0.3890739	0.3890739	
NC	D	0.2808166	0.2808166	0.2903112	0.2903112	0.3008993	0.3008993	0.3244429	0.3198125	0.321
NC	R	0.2903022	0.2903022	0.2707865	0.2707865	0.2457393	0.2457393	0.2017387	0.2019644	0.198
ND	D	0.1846134	0.1846134	0.1690401	0.1690401	0.1469969	0.1469969	0.1441357	0.1441357	
ND	R	0.2496482	0.2496482	0.2337937	0.2337937	0.2529836	0.2529836	0.2226429	0.2226429	
NE	D	0.2649980	0.2650247	0.2824699	0.2530040	0.2635110	0.2635110	0.2895918	0.2895918	0.388

Below, I use R Markdown syntax to automatically include references, create mathematical equations, incude and refence the figure.

Shor and McCarty (2011) and Shor, Berry, and McCarty (2010) develop the statistical theory to estimate the ideology of state legislators along a single left-right dimmension. Using data from Shor (2018), I calculate the standard deviation of the legislators' ideologies for each state-party-year. Figure REF shows these standard deviations, calculated as $\sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2}$, where i indexes the legislators in each state-party-year and N represents the total number of legislators in the state-party-year.

References

Shor, Boris. 2018. "Individual State Legislator Shor-Mccarty Ideology Data, May 2018 Update." Harvard Dataverse: https://doi.org/10.7910/DVN/6QWX7Q.

Shor, Boris, Christopher Berry, and Nolan McCarty. 2010. "A Bridge to Somewhere: Mapping State and Congressional Ideology on a Cross-Institutional Common Space." *Legislative Studies Quarterly* 35(3): 417–48.

Shor, Boris, and Nolan McCarty. 2011. "The Ideological Mapping of American Legislatures." *American Political Science Review* 105(3): 530–51.