Analytical Politics II: Political Institutions (31610), taught by Luis Martinez & Adam Zelizer

Problem Set 2

1

PSet 2

Agent:

Q1 $e \in \{\frac{1}{3}, \frac{2}{3}\}$

$u(w,e) = 2w^{0.5} - e$

$r = 1$ (const.)

Principal:

$y \in$ {success, failure}

success = 4: $p = \frac{1}{3}$ if e_L & $p = \frac{2}{3}$ if e_H

failure = 0: $p = \frac{2}{3}$ if e_L & $p = \frac{1}{3}$ if e_H

logical conclusion

a) effort observable: I assume 2 values.

- High effort $e_H = \frac{2}{3}$: 1. $2w^{0.5} - \frac{2}{3} = 1$

$w^* = \frac{25}{36} \approx 0.69$ (full info wage if e_H at 69 ct's)

2. $\frac{2}{3}(4) + \frac{1}{3}(0) - 0.69 \approx 1.98$

- Low effort $e_L = \frac{1}{3}$: 1. $2w^{0.5} - \frac{1}{3} = 1$

$w^* = \frac{4}{9} \approx 0.44$ (full info wage if e_L at 44 ct's)

2. $\frac{1}{3}(4) + \frac{2}{3}(0) - 0.44 \approx 0.89$

⇒ Expected payoff under e_H higher than under e_L: $1.98 > 0.89

that's why principle prefers high effort at $\frac{2}{3}$ (Π-maximizing)

b) effort unobservable → output-dependent wages because effort no longer observable but since e_H makes high output more likely, high effort is being incentivized by conditioning pay

1 Participation constraint: work for principle or no?

$EU = \frac{2}{3}(2w_H^{0.5} - \frac{2}{3}) + \frac{1}{3}(2w_L^{0.5} - \frac{2}{3}) \geq 1$

$\Leftrightarrow 4w_H^{0.5} + 2w_L^{0.5} \geq 5$

Solved for w_H: $16w_H \geq 25 - 4w_L$

$w_H \geq \frac{25}{16} - \frac{1}{4}w_L$

Solved for w_L: $w_L \geq \frac{400}{16} - w_H$

2 incentive-compatibility constraint

$$\frac{2}{3}(2w_H^{0.5}) + \frac{1}{3}(2w_L^{0.5}) - \frac{2}{3} \geq \frac{1}{3}(2w_H^{0.5}) + \frac{2}{3}(2w_L^{0.5}) - \frac{1}{3}$$

$$\Leftrightarrow \quad .2\, w_H^{0.5} \geq 2\, w_L^{0.5} + 1$$

Solved for w_H: $w_H \geq w_L + \frac{1}{4}$

Solved for w_L: $w_L \geq w_H + \frac{1}{4}$

⇒ now solve to find output-dependent wages

Solve for w_H: $w_H + \frac{1}{4} = \frac{100}{16} - w_H$

$w_H = 3$

Solve for w_L: $w_L + \frac{1}{4} = \frac{25}{16} - \frac{1}{4} w_L$

$w_L = 1.05$

A wage of \$3 induces high effort and a wage of \$1.05 low effort. (I assumed these are dollar values).

c) for e_H: $\frac{2}{3}(4) + \frac{1}{3}(10) - 3 = -0.\overline{3}$

for e_L: $\frac{1}{3}(4) + \frac{2}{3}(10) - 1.05 = 0.28$

Expected payoffs under e_L higher than under e_H: \$0.28 > -\$0.$\overline{3}$.

that's why principle prefers low wage schedule (P-maximizing).

(which induces low effort)

2

a) in favor of decentralization

In general, decentralization means that local governments instead of a central government lead away with authority ("whatever isn't prescribed to the central government or not prohibited on sub-national level"). Germany is an example of a country with a decentralized, federal system. In class, we used the Oates model to decide on how to best allocate authority, which shows that decentralization is not a panacea per se and that there's a trade-off instead that needs to be taken into account – and that's the trade-off between differences in preferences vs. externalities/ spill-overs across regions. The model suggests that having **heterogeneous preferences** – the lambas in the model are (more) unequal – [or/ and having small externalities/ spill-overs, small k] is what makes decentralization more attractive. That applies to Bardhan's example of conflict and separatism, in which case decentralization promises to diffuse (at least some of the) social and political tensions resulting in more cultural and political autonomy. That relates to the example from Bosnia-Herzegovina (Croats and Bosniaks vs. Serbs) where a decentralized government was preferred because it better responded to local/ ethnic demands and needs. In addition to that, it is often argued that decentralization increases **accountability** because politicians are closer to their constituency instead of governing from a far-away. In that case, they need to justify themselves more frequently and directly before their constituency (disciplining effect) and in doing so also attempt more often to work harder and provide immediate benefits to them in particular ("pork barreling"). This results in welfare surpluses for citizens in their respective regions and is probably what Bardhan has in mind when he says governments become more responsive/ efficient. Lastly, the Uganda paper seems to support Bardhan's final claim on efficiency in that transactional cost and/ or corruption can lead to a hefty loss of money, e.g. in Uganda, out of $1 that the fed sent out, by the time the money reached their recipients in the states, only 13 ct. were left. This may lead to **"fiscal laziness"** and suggests that raising money on a local level might be more efficient.

b) against decentralization

The counter piece to decentralization is centralization. Centralization means that the central state rather than sub-national governments leads away with authority and only delegates when found appropriate. France is an example of a country with a more centralized, unitary system, which is when the delegation of authority to lower levels of governments is called devolution. The Oates model suggests that the presence of **spatial externalities/ spill-overs** (resulting from differences across districts) is what makes centralization more attractive (referring to a high value for parameter k in the model, i. e. closer to 0.5).[1] With regards to the benefits of centralization in the presence of spill-overs, the example is lecture was a study of optimal regulation of air pollution in the US electricity sector. It shows how a uniform policy results in few financial losses (0.2 per cent) compared to a set of decentralized policies (where each states can decide) resulting in overall losses of 31.5 per cent relative to Oates' first-best. Unlike under decentralization, a centralized solution appears to better capture welfare surpluses for citizens of the country as a whole because it allows a society to internalize externalities rather than deflecting them off to the neighbors. While decentralization makes governments more accountable and thus responsive, it can also

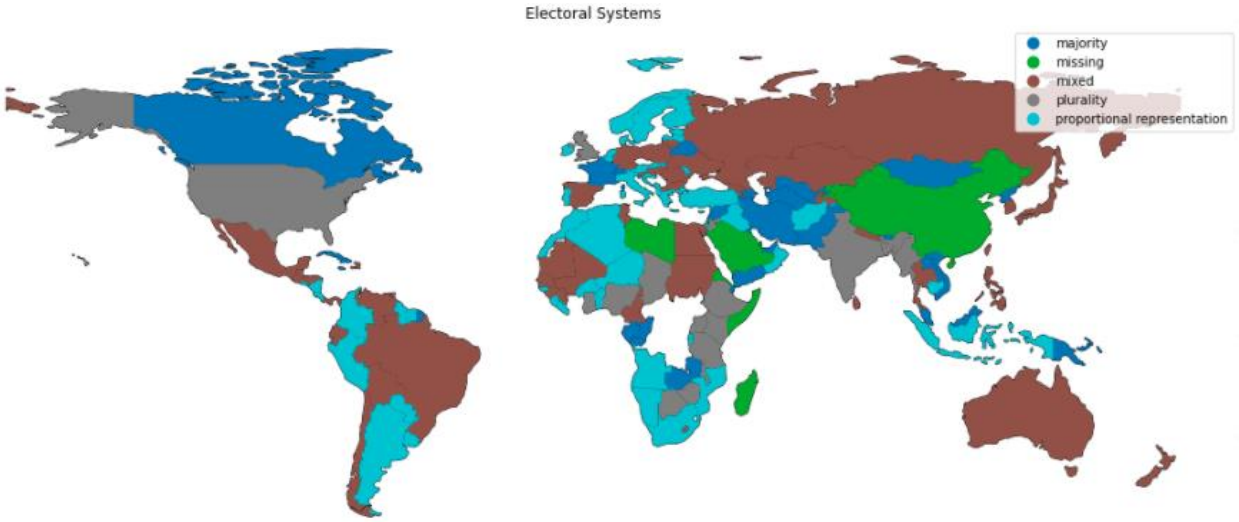
[1] Technically, however, centralization doesn't respond to k (flat line), however, it makes decentralization much less beneficial (g^{dec} downward slopping as k increases). [In addition, centralization is also the preferred option should districts have identical preferences.]

make them **more corrupt** as the evidence from China suggests. People in leadership positions, especially in developing countries, can get either captured by local elites or as they originate from the region, they may possess more information than a central bureaucrat has and thus make financial investments (stock market) as they set policies at the same time, which all reflects and leads to a rise in local corruption. In the paper from China, this is what happened: decentralization made collusion more likely (especially when costs were low) which in return had a deteriorating effect on workplace safety. Lastly, in terms of efficiency, we talked about so-called **special purpose jurisdictions** in lecture, many of which overlap and are governed by questionable democratic processes, at best. To me, this seems like a rather costly and intransparent way to produce revenue. Also, **decentralization must be "real"** in that rules are not predetermined by the national government and actually allow local governments to realize their preferences.

3

For more figures, tables, data, and code, please visit https://github.com/Wasil-UChi/Machine-Learning. The file for this assignment is a Jupyter Notebook file called "Electoral Systems".

a) Check out my map that I'm very proud of!



In case I haven't mentioned it, I'm very proud of my map! ☺ It does resemble the one showed to us in lecture (see: https://en.wikipedia.org/wiki/Electoral_system). I see how mixed systems (brown) are being used somehow equally across all the different continents (exclusively in Oceania, by the way) while proportional systems (baby blue) appear to be more prevalent in Europe, Africa, and Latin America. Majority systems (dark blue) and plurality systems (grey) are not very common in the Americas (exception: Canada and the US, respectively), and instead, we find them most densely concentrated across the Middle East, Central Asia and Africa. Given the instructions and because I did not want to lose data, I coded countries with no (elected) legislature as missing. That explains why China, Saudi-Arabia and Egypt appear in green. Interestingly, data are missing – like actually missing and not (just) coded as missing – for the DRC in the data frame I was given (that's the white hole in the heart of Africa) – however, that's not too uncommon given issues of data collection in the DRC.

Data frame that I created after reading in the .csv and merging geospatial data onto it:

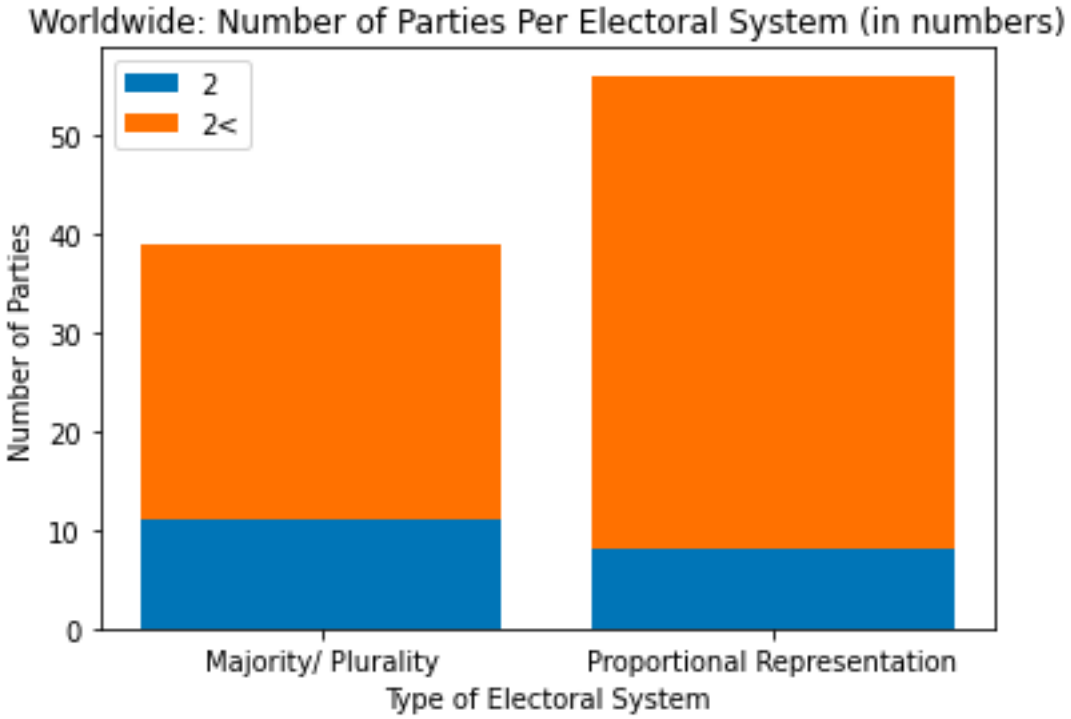
	iso_a3	cname	geometry	cabr	year	lelecsystem
0	TZA	Tanzania	POLYGON ((33.90371 -0.95000, 34.07262 -1.05982...	TAZ	2011	plurality
1	CAN	Canada	MULTIPOLYGON (((-122.84000 49.00000, -122.9742...	CAN	2011	majority
2	USA	United States of America	MULTIPOLYGON (((-122.84000 49.00000, -120.0000...	USA	2011	plurality
3	KAZ	Kazakhstan	POLYGON ((87.35997 49.21498, 86.59878 48.54918...	KZK	2011	mixed
4	UZB	Uzbekistan	POLYGON ((55.96819 41.30864, 55.92892 44.99586...	UZB	2011	majority
...	...	...	...	...	...	...
142	UGA	Uganda	POLYGON ((33.90371 -0.95000, 31.86617 -1.02736...	UGA	2011	plurality
143	RWA	Rwanda	POLYGON ((30.41910 -1.13466, 30.81613 -1.69891...	RWA	2011	proportional representation
144	MKD	Macedonia	POLYGON ((22.38053 42.32026, 22.88137 41.99930...	MAC	2011	mixed
145	MNE	Montenegro	POLYGON ((20.07070 42.58863, 19.80161 42.50009...	MNG	2011	proportional representation
146	TTO	Trinidad and Tobago	POLYGON ((-61.68000 10.76000, -61.10500 10.890...	TRI	2011	plurality

Code:

```
## 3

df_1 = pd.read_csv(labels_path)

pd.set_option('max_columns', None) # displays all columns
df_1.head()

# df_2 = pd.read_csv(numbers_path)

# pd.set_option('max_columns', None) # displays all columns
# df_2.head()
# Since I don't want to go through the code notebook, I'll use the classified version of the df, which I named df_1



# a

# Find unique values for lelecsystem, which classifies electoral systems

df_1["lelecsystem"].unique()

# Renaming column values according to instructions

df_1["lelecsystem"] = df_1['lelecsystem'].replace({'Plurality (FPP)': 'plurality', 'Majority': 'majority', 'Proportional representation': 'proportional representation', 'Mixed systems': 'mixed', 'N/A - no legislature': 'missing', 'N/A - no elected legislature': 'missing', 'Missing information': 'missing'})
```

```
df_1["lelecsystem"].unique()

# Reducing df_1 to essential columns needed for this assignment: df_1_red

df_1_red = df_1[["cabr", "cname", "year", "lelecsystem", "parties"]]
df_1_red.head()

df_1_red_2011 = df_1_red[df_1_red["year"] == 2011]
# df_1_red_2011["year"].unique() # check that it works -> Yes, 2011 is the unique value
df_1_red_2011.head() # 163 rows that means we have data for 163 countries here

# Plot world map showing the varying electoral systems across the world

## Prepare

# First, merge geopandas data with our data: 'naturalearth_lowres' is geopandas datasets so I can use it directly
world = geopandas.read_file(geopandas.datasets.get_path('naturalearth_lowres'))
# Reduce size to essential columns
world = world[["iso_a3", "name", "geometry"]]
world # 177 rows
# Rename the columns in world dataframe so that I can merge
world.columns=['iso_a3', 'cname', 'geometry']
merged = pd.merge(world, df_1_red_2011, on='cname')
merged.head() # 147 rows: yields more matches than when merging on cabr

## Plot

fig, ax = plt.subplots(figsize=(20,20))
merged.plot(ax=ax, color='white', edgecolor='black')
from mpl_toolkits.axes_grid1 import make_axes_locatable
divider = make_axes_locatable(ax)
cax = divider.append_axes('right', size='5%', pad=0.1)
ax = merged.plot(ax=ax, column='lelecsystem', legend=True, cax=cax)
ax.axis('off')
ax.set_title('Electoral Systems');
```

b) I used a stacked bar in matplotlib to create to display number of parties per type of electoral system as requested:

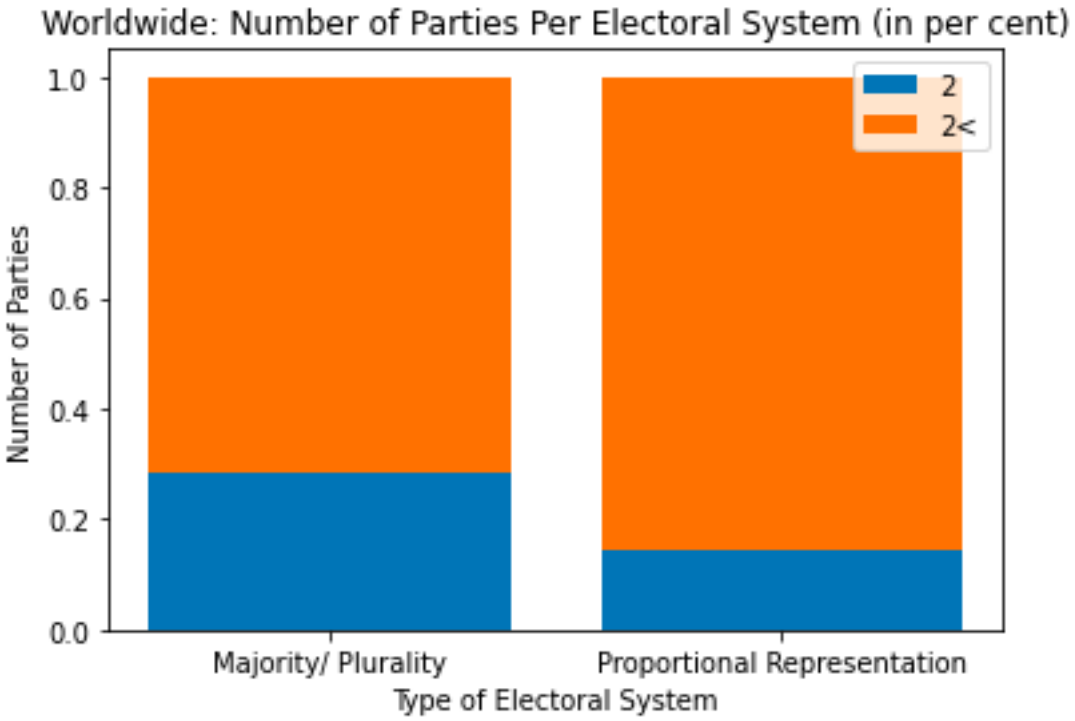


Duverger's Law refers to the implications of different electoral systems for political representation as illustrated by the number of political parties, for example. The French scholar compared majoritarian or plurality systems (e.g. US or UK, respectively) to systems of proportional representation (e.g. Spain, Brazil) and argued that the former will display a strong preference for a two-party system while the latter will have more parties in its political system because of its inherent preference for multi-partyism (district magnitude, electoral formula, ballot structure, etc.).

Using the stacked bar plot to compare bars majority and plurality to proportional systems, I manipulated the data as follows:

- For lelecsystem, I excluded "Mixed" and "Missing" because Duverger's Law focuses on majority/ plurality v. proportional. I also summed majority and plurality displaying it in one column as to make a direct comparison with proportional.
- For parties, I excluded "N/A" and "One" to prove Duverger's Law that focuses on two vs. more than two parties.

The stacked bar above shows the two bins for the two electoral systems relevant in Duverger's Law along the x-axis, with each one being disintegrated by whether it has two or more than two parties. First, it appears on a global scale that more countries have proportional systems than majority/ plurality systems. To prove Duverger's Law, the difference in absolute numbers makes interpretability harder and possibly misguiding, which is why I chose to standardize the values and show them as percentages (scaling for percentages allows for better comparison):



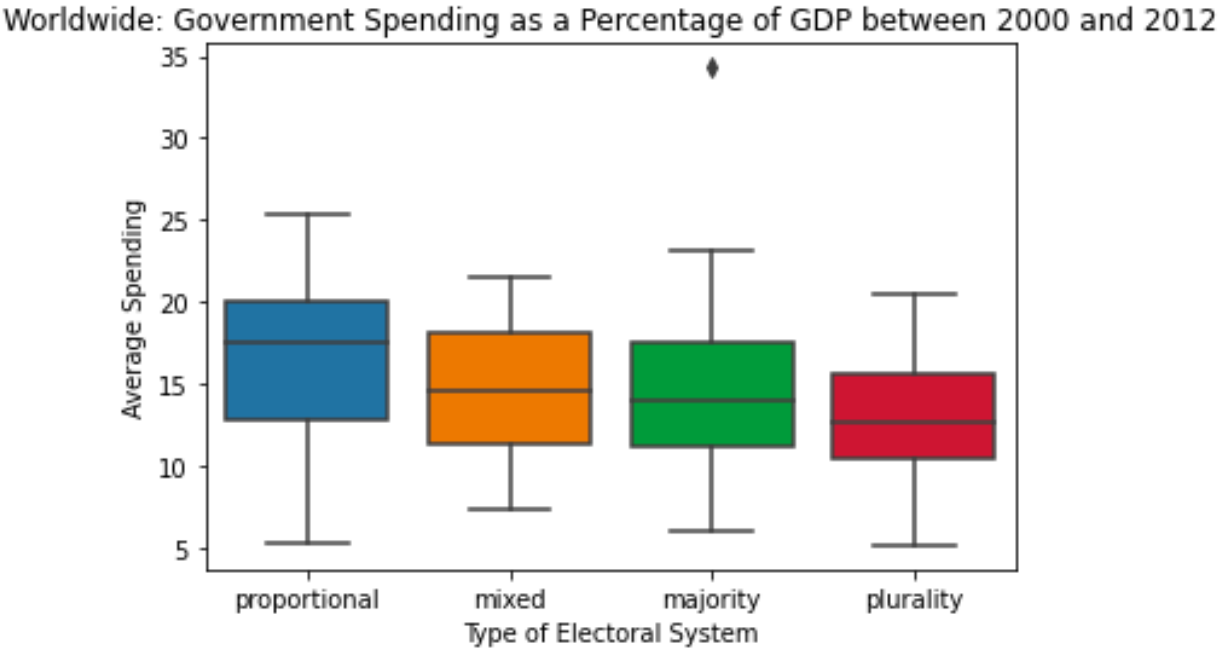
Standardizing the values facilitates interpretation. I see that most countries across the world have more than two parties (orange): in majority/ plurality systems, approx. 70 per cent of the countries have more than two parties while for proportional systems, it is approx. 80 per cent – and the difference is now exactly where Duverge would speak up! It shows how majority/ plurality systems are ten per cent more likely to have only two parties relative to proportional systems while proportional systems are ten per cent more likely to have more than two parties relative to majority/ plurality systems. That's exactly the point Duverge made!

Code:

```
# b

# Refer back to df_1_red_2011
# Focus on and identify unique values of "parties" column that captures
# the number of parties with more than 5% of seats in the legislature

df_1_red_2011

df_1_red_2011["parties"].unique()

# Rename in order to have shorter legend
df_1_red_2011["parties"] = df_1['parties'].replace({'Two': "2", 'More than two': "2<", 'One': "1",
'Missing information': "N/A"})
df_1_red_2011

# Count occurences of parties per electoral system
```

```
stacked = df_1_red_2011.groupby(['lelecsystem',
"parties"])["cabr"].count().reset_index(name="count")
stacked

# Draw a figure showing the relationship between parties and lelecsystem
# I want to display the number of parties (Y) per lelecsystem (X) using a stacked bar
# For lelecsystem, I excluded "Mixed" and "Missing" to prove Duverger's Law that focuses on
majority/ plurality v. proportional
# I also summed majority and plurality displaying it in one column as to make a direct
comparison with proportional
# For parties, I excluded "N/A" and "1" to prove Duverger's Law that focuses on two vs. more
than two parties

labels = ['Majority/ Plurality', 'Proportional Representation']
two = [7+4, 8]
twoplus = [19+9, 48]
# Drawing the numbers from the previous table

fig, ax = plt.subplots()

plt.bar(labels, two, label = "2")
plt.bar(labels, twoplus, bottom = two, label = "2<")

ax.set_ylabel('Number of Parties')
ax.set_xlabel('Type of Electoral System')
ax.set_title('Worldwide: Number of Parties Per Electoral System (in numbers)')
ax.legend()

plt.show()

labels = ['Majority/ Plurality', 'Proportional Representation']
two = [11/39, 8/56]
twoplus = [28/39, 48/56]
# Standardizing numbers to percentages

fig, ax = plt.subplots()

plt.bar(labels, two, label = "2")
plt.bar(labels, twoplus, bottom = two, label = "2<")

ax.set_ylabel('Number of Parties')
ax.set_xlabel('Type of Electoral System')
ax.set_title('Worldwide: Number of Parties Per Electoral System (in per cent)')
ax.legend()

plt.show()
```

c) I am using a boxplot from the package seaborn to visualize the relationship between Type of Electoral System v. Government Spending as a Percentage of GDP between 2000 and 2012 (like in b) above, I filtered out missing values in lelecsystem):



I really like what I see – and I'll explain why! The average government spending decreases as we move from a proportional to a mixed to a majority to a plurality system – and this finding is very much in line with what we talked about and learned in class (note how the standard errors of my boxplots are smallest with mixed systems which is indicative of that we have most observations in that category and less n's in categories with smaller standard errors; however, regardless, the general tendency of a decreasing government spending holds as we move along the x-axis).

Given that electoral systems differ (district magnitude, electoral formula, ballot structure, etc.), they have different implications. In b) above, I already talked about one, namely, Duverger's Law. Here, I'm going to address another phenomenon that has got much attention among political scientists, and that is that majority systems, and even more so plurality systems, tend to govern more efficiently/ prioritize government effectiveness. I am illustrating this here by showing how the average government spending as a percentage of GDP is lowest for plurality systems suggesting these are the most effective systems and highest for proportional systems suggesting these are the most ineffective systems (the other commonly referred to benefit of a majoritarian system lies in that it is considered to be more accountable, which is something I already addressed and elaborated on in question 1).

The underlying association could well be causal because unlike in proportional systems, majoritarian systems (that is plurality and majority systems) do not need to form costly coalitions and bargain and compromise less in order to translate their ideas into policy actions. This allows them to target their spendings better which in return saves money, however, as seen above in b), comes at the expense of diversity and social representation. However, critics have emerged calling the general efficiency benefits into question, e.g. Roger Myerson who argues that voters can more

easily be held hostage in a majoritarian system because of shared ideology and limited outside options.

Code:

```
# c

df_2 = pd.read_csv(wb_path,
                   header=2)
# Download in Safari because Chrome not working

df_2.head()

df_2.columns

df_2_red = df_2[['Country Name', 'Country Code', '2000', '2001', '2002', '2003', '2004',
       '2005', '2006', '2007', '2008', '2009', '2010', '2011', '2012']] # 264 rows
df_2_red = df_2_red.dropna() # 200 rows
df_2_red.head()

# Calculate average of government spending for each country between 2000 and 2012

gdp = df_2_red.loc[: , '2000':'2012'] # select all columns with years: 2000 to 2012
df_2_red['mean'] = gdp.mean(axis=1) # calculate mean and create new column "mean"
df_2_red.head()

# df_2_red.columns

# Merge (first renaming merging column: Country Name)

df_2_red.columns=['cname', 'Country Code', '2000', '2001', '2002', '2003', '2004',
       '2005', '2006', '2007', '2008', '2009', '2010', '2011', '2012', 'mean']
merged_2 = pd.merge(df_2_red, df_1_red_2011, on='cname')
merged_2.head() # 123 rows: yields more matches than when merging on cabr, still sufficiently large

# Show relationship using seaborn to show boxplot: lelecsystem v. mean

merged_2 = merged_2[merged_2["lelecsystem"] != "missing"]
# Filtering out missing values in lelecsystem: 119 rows

merged_2["lelecsystem"] = merged_2['lelecsystem'].replace({'proportional representation': 'proportional'})
# Renaming just to have prettier plot

ax = sns.boxplot("lelecsystem", "mean", data=merged_2)
ax.set_ylabel('Average Spending')
ax.set_xlabel('Type of Electoral System')
ax.set_title('Worldwide: Government Spending as a Percentage of GDP between 2000 and 2012')
```