Political Methodology Comprehensive Examination, May 2019
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Instructions: *Read all questions before answering any of them. When you use substantive examples in your answers, we strongly prefer to see examples from political science. Answer all questions in part I. Answer 3 questions in part II. If you are completing the exam at GW, feel free to hand-write answers or parts of answers in a blue book, but carefully label them and note that you are using the blue book in your typed document. If you are completing the exam at home, you can similarly include photos/scans of hand-written material. Good luck!*

Part I

1. Say you have two variables X and Y. If you compute Z scores for both variables, Z_X and Z_Y, then compute the product of the Z scores Z_X*Z_Y, what common statistic will be approximated by the mean of Z_X*Z_Y? Explain why this makes sense.

2. The main analysis in a recent paper on political representation in municipal governments in the United States used a cross-sectional multilevel model of the association between public opinion (**policy conservatism**) and a set of municipal policies (e.g., **expenditures per capita**). The multilevel regressions controlled for the **median income**, **population**, **percent black**, and average **housing value** in each city. The multilevel regressions also included random effects for each state. Table 1 below shows the descriptive statistics for the main variables used in this paper's analysis, while Table 2 shows the main results.
    a. Imagine that you're a reviewer at the APSR, please evaluate this research design. What sorts of confounders does it account for? What sorts of confounders could bias its results? What assumptions are necessary in order to interpret the results in a causal fashion?
    b. Discuss possible improvements in this research design.
    c. How should we interpret the substantive strength of the association between public opinion (**policy conservatism**) and **per capita expenditures** in columns 3 and 4 of Table 2? Please discuss the results in <u>both</u> columns 3 and 4.
    d. Looking across all the columns in Table 2, which policy shows the strongest substantive relationship with public opinion (**policy conservatism**)?

TABLE 1. Summary Statistics of Key Variables

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max
Policy Conservatism	−1.019	−0.208	−0.025	−0.053	0.123	0.669
Median Income ($100,000)	0.15	0.3408	0.42	0.46	0.56	1.40
City Population (100,000)	0.20	0.26	0.39	0.81	0.67	80.08
Percent Black	0.001	0.016	0.043	0.115	0.146	0.977
Housing Value	0.36	0.85	1.17	1.45	1.70	9.94
Policy Scale	−2.39	−0.63	−0.04	−0.02	0.61	3.73
Expenditures Per Capita	15	943	1,234	1,541	1,770	14,053
Taxes Per Capita	49	461	609	759	854	8,629
Share of Taxes from Sales Tax	0.00	0.12	0.25	0.28	0.40	0.92

TABLE 2. Association Between City Liberalism and Policy Outcomes

	Dependent variable							
	Scaled Policy		Per Capita Expend.		Per Capita Taxes		Sales Tax Share	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Intercept)	0.13*	0.18	1,838.85**	1,780.02**	898.88**	589.41**	0.35**	0.45**
	(0.07)	(0.15)	(207.31)	(217.62)	(144.72)	(147.65)	(0.05)	(0.05)
Policy Conservatism	1.19**	1.04**	−760.75**	−347.42**	−365.93**	−132.47**	0.08**	0.09**
	(0.18)	(0.19)	(97.42)	(116.80)	(47.63)	(51.96)	(0.02)	(0.02)
Median Income		0.29		−720.01**		77.32		−0.22**
		(0.35)		(204.90)		(92.21)		(0.04)
City Population		−0.01		54.41**		35.72**		−0.00
		(0.01)		(7.77)		(3.42)		(0.00)
Percent Black		0.15		330.05*		328.28**		−0.13**
		(0.39)		(177.82)		(79.32)		(0.04)
Med. Housing Value		−0.15**		238.69**		183.87**		0.01*
		(0.06)		(39.24)		(17.42)		(0.01)
Observations	437	436	1,619	1,618	1,575	1,574	968	967
Log Likelihood	−546.35	−547.24	−13,218.37	−13,146.86	−11,729.34	−11,524.30	635.54	651.17
Akaike Inf. Crit.	1,100.71	1,110.48	26,444.74	26,309.71	23,466.68	23,064.59	−1,263.08	−1,286.34
Bayesian Inf. Crit.	1,117.03	1,143.10	26,466.30	26,352.82	23,488.13	23,107.48	−1,243.58	−1,247.34

**$p < 0.05$; *$p < 0.1$.

3. Suppose you are interested in whether political institutions explain the prevalence of smoking. Your main outcome of interest is **smoking** (% of adults who regularly smoke). Your main explanatory variable is **democracy**, a binary indicator of democracy. You also consider the following controls: **loggdp** (logged GDP per capita), **infant** (the infant mortality rate per 1,000 live births), **gdp_grow** (% growth rate of GDP per capita), and the **year**. You first run a simple cross-sectional OLS regression for the year 2010, testing only the democracy indicator and get the following:

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      Source |       SS       df       MS              Number of obs =     119
-------------+------------------------------           F(  1,   117) =   15.93
       Model |  1701.25382     1  1701.25382            Prob > F      =  0.0001
    Residual |  12494.9369   117  106.794332            R-squared     =  0.1198
-------------+------------------------------           Adj R-squared =  0.1123
       Total |  14196.1907   118  120.306701            Root MSE      =  10.334

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     smoking |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  democracy |   7.660348   1.919279     3.99   0.000     3.859317    11.46138
      _cons |     17.594   1.461467    12.04   0.000     14.69964    20.48836
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   a. List all of the statistics in the above table that you believe indicate (in some way) the strength of association between **democracy** and **smoking**. Which do you believe is the best indicator of this and why?
   b. What is the likelihood that the effect of **democracy** is above 3.859 according to this model?
   c. Suppose that you're not sure if **democracy** is the correct way to test the effect of political institutions. Therefore, you add a second, continuous measure of democracy to the above model. Surprisingly, you find that neither **democracy** nor this new variable is significant. Why might this be? How would you go about deciding the best way to test democracy?

Source	SS	df	MS	Number of obs =	1175
				F(5, 1169) =	183.66
Model	61666.6188	5	12333.3238	Prob > F =	0.0000
Residual	78502.6511	1169	67.1536793	R-squared =	0.4399
				Adj R-squared =	0.4375
Total	140169.27	1174	119.394608	Root MSE =	8.1947

smoking	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
democracy	2.799847	.5351306	5.23	0.000	1.749923	3.849771
loggdp	.4223093	.3881059	1.09	0.277	-.3391527	1.183771
infant	-.2189451	.0165618	-13.22	0.000	-.2514393	-.1864509
gdp_grow	.3142303	.0513596	6.12	0.000	.213463	.4149976
year	-.1855518	.0844312	-2.20	0.028	-.3512054	-.0198981
_cons	394.4147	169.6498	2.32	0.020	61.56257	727.2668

As a next step, you run the above model with additional controls using all years from 2001 to 2010.

d. What is the estimated difference in smoking rates between a democracy with a robust 5% growth rate and an autocracy contracting at 5% per year?
e. The F statistic and R^2 of this model are greater than the simpler model you first considered. Does this mean this is a "better" model? Why or why not? What else should you consider to decide this?
f. When you present this at a conference, someone objects that there might be omitted variables explaining both democracy and smoking rates. You respond, "I made sure there weren't. I took the residuals from this regression, which capture all the unexplained variation in **smoking**, then confirmed these are not correlated with **democracy**." Is this a good response?
g. At the same conference, someone objects that most of the variation in smoking remains unexplained, so your work on democracy is questionable. Why might they be saying this? Is this a good critique?
h. Still later at the conference, someone says that the only reason **democracy** is positive is that democracy leads to freer trade, which drives down the cost of cigarettes and encourages people to smoke. Therefore, you need to control for free trade and see whether **democracy** remains predictive. What is this objection an example of and is the recommendation valid?

Part II

1. Public opinion surveys are increasingly challenged by non-response. In this question, first distinguish between unit and item non-response. Then summarize how much of a threat unit non-response poses to the representativeness of estimates from surveys, taking care to distinguish among different kinds of attributes that surveys might seek to measure. Finally, assess whether non-probability sampling methods should replace probability samples in an era of high non-response.

2. It is increasingly common practice for researchers to estimate linear models on dependent variables that are dichotomous or ordinal. Why is this the case? How are those modeling choices justified? When is that strategy likely to be a bad idea?

3. It's frequently said there's a methodological divide between qualitative and quantitative researchers. In terms of inference, how are these approaches different and how are they similar? For scholars using causal inference techniques, describe some of the ways that qualitative information can be helpful. Give illustrative examples where quantitative work was enriched by qualitative knowledge and vice-versa.

4. One of the most common criticisms of causal inference and experimental research is "external validity." First, explain what this means and contrast it with "internal validity." Second, why is external validity a special concern for causal and experimental work? Third, choose at least two causal inference techniques and describe some of the ways that researchers can address external validity concerns for each technique. Examples may be helpful.

5. The state of Alabama recently passed one of the most stringent anti-abortion laws in the country. Imagine that you wanted to estimate a multilevel regression and post-stratification (MRP) model of public opinion on abortion to evaluate public opinion on abortion in Alabama, and compare it to other states. What data would you need to gather in order to implement this model? How would you evaluate the validity of your estimates of state-level public opinion on abortion? What additional information would you need in order to estimate the opinion of Democrats and Republicans on abortion in each state?

6. Regression discontinuity (RD) designs are an increasingly common research design in political science. What is an RD design? Discuss the key assumption(s) that must be necessary for an RD design to generate a causal estimate (be precise). How would you evaluate the validity of the RD design? Provide at least one example of how an RD design has been used to evaluate an important research question in political science.

7. Imagine that over a 20 year period (1990-2010), about half of the state governments in the United States pass laws requiring children between the ages of 4-6 years old to use a car seat. In the other half of states, there is no requirement for children in this age group to use a car seat. You want to evaluate the causal effect of these laws on fatality rates of children in this age group. We have data on fatality rates from 1980-2015. Discuss <u>three</u> possible research designs you could use to estimate this quantity. What are the strengths and weaknesses of each design? Discuss the assumptions that would have to be met for each design to provide a causal estimate of the effect of car seat laws on fatality rates among children. Finally, imagine someone tells you that you should add a control variable to your regression for how many vehicle miles people in each state drive with children in the car. Why might someone give you this advice? Is it sound advice?