Outlined Solutions Final Exam 2020

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Exercise 1 (60 points)

In their paper "Mining and Local Corruption in Africa." published in the American Journal of Political Science in 2017, Knutsen et al. study whether natural resources have adverse effects on political institutions by increasing corruption. This question is partly inspired by their paper.

The authors write: several cross-country studies indicate that dependence on natural resources is related to less democratic regime forms and worse governance institutions and outcomes. (for a recent survey, see Deacon, 2011). In particular, there seems to be a correlation between natural resources and corruption (e.g., Busse and Gröning, 2013). This posited relationship may, for example, stem from natural resource revenues being relatively easy to control and monopolize for political elites (Boix, 2003; Bueno de Mesquita and Smith, 2009), in turn reducing incentives for politicians to provide accountability and transparency. Moreover, high-rent activities such as natural resource production increase the amount of resources available for patronage and unofficial transactions. Hence, one may expect that resource-abundant countries engender a political state that is factional or predatory and distorts the economy in the pursuit of rents" (Auty, 2001, 839).

(a) "Despite these plausible arguments, scholars increasingly question whether the cross-country correlations undergirding the political resource curse thesis reflect *causal* effects. This growing skepticism is related to an increased awareness of the limitations of traditional cross-country designs for drawing inferences." Referring to the relevant models learned in class, discuss why cross-country studies might fail at pinning down the causal effect of resouces on corruption.

Solution. A cross-country model takes the form:

$$corrupt_i = \beta_0 + \beta_1 resourceextraction_i + u_i. \tag{1}$$

In this framework, causal effects are difficult to be uncovered as the model might likely suffer from: 1) OVB: many variables are omitted; 2) simultaneity: corrupt countries might be less able to extract their natural resources; 3) measurement error in the resource extractions. Now let's assume that all these factors could be explained by country-specific heterogeneity (e.g. geography) or time-specific shocks (e.g. recessions). Then, while cross-country studies are unable to identify causal effects, longitudinal studies making use of fixed effect estimators could solve all the issues, under the assumption that α_c and α_t below fully account for 1-3.

(b) The authors adopt a different approach. They combine a novel, longitudinal data set on large-scale mines, roughly for the period 1984 to 2013 with the data from Afrobarometer, a pan-

African, independent, non-partisan research network that measures public attitudes on economic, political, and social matters, over the same time period. They so obtain a panel of 33 countries. Suppose the dependent variable is the log of bribes paid by the respondent i living in neighborhood n at time t, and the independent variable is whether in the neighborhood n of the respondent i is located a mine at time t. They then estimate version of the model:

$$\log(bribe)_{int} = \beta_0 + \beta_1 mine_{nt} + \alpha_c + \alpha_t + \boldsymbol{x'\gamma} + u_{int}, \tag{2}$$

where *bribe* is measured in dollars, *mine* is a dummy variable that takes value of one if in in the neighborhood n of the respondent i there is a mine at time t, α_c are country fixed effects and α_t are time fixed effects and $\boldsymbol{x}$ a vector of other control variables. Explain what α_c and α_t are, and what they capture.

Solution. They are dummy variables that capture in the case of α_c all country-level time-invariant characteristics that might be correlated with *mine* and corruption (e.g. overall quality of institutions), while in the case of α_t they capture yearly shocks across all countries (e.g. Ebola outbreak, global recession...).

(c) Table 1 shows results from this analysis. Interpret the results in all three columns.

Solution. Bribes increase by 24% when country and time f.e. are not controlled for. The results are greatly reduced with the inclusion of these variables, to an expected change of 2.4% and 1.5%.

(d) A commentator suggests that during the period of interest the global economy did not incur in global crisis that could have affected the mining or the bribing activity. Evaluate this statement with an appropriate test.

Solutions. Standard F-test on time f.e. This is done by:

$H_0 : \alpha_1 = \ldots = \alpha_n = 0$

$H_1 :$ not H_0

The F-statistic takes the form:

$$F - stat = \frac{R_u^2 - R_r^2}{1 - R_u^2} \times \frac{n - k - 1}{q} = \frac{0.096 - 0.077}{1 - 0.096} \times \frac{92762 - (29 + 32 + 1 - unknown)}{29} \approx 67.10$$

Note that we do not know exactly what k is, as additional controls are mentioned in the text, but never spelled out. But the F-stat is large enough to draw definite conclusions anyway.

With $n = 92,762$, $k \geq 62$ and and $q = 29$, the critical values are 2.32 at 1%, 1.83 at 5% and 1.60 at 10%and the rejection region is $F - stat > c$. We reject H_0 at all significance levels, so we can conclude that time fixed effects are jointly significant. Therefore, time fixed effects should enter the model

(e) A commentator is worried that neighborhoods within countries where mines are present are substantially different than neighborhoods where mining activity is absent. In addition, these neighborhoods might be subject to very specific developments over time. Does the model in equation 2 account for such differences? If not, how could it be modified to do that?

Solutions. The model does not account for such differences. The model would need neighborhood fixed effects to account for permanent differences across neighborhoods (call it α_n) and neighborhood-time fixed effects to account for neighborhood-specific developments over time (call it α_{nt}) . The latter are dummy variables for each neighborhood and year. However, they cannot be estimated because they would be perfectly collinear with the mine indicator. Including α_n will be a good idea, as long as we have enough mines that open over time in different neighborhoods (enough variation across n-t), and as long as $Cov(mine_{nt}, \alpha_n) \neq 0$, so that these unobserved factors are currently biasing our estimator. Including α_{nt}, on the other hand, is impossible.

(f) A commentator is worried that people might misreport the amount of bribes paid, either due to social stigma or to so called recall bias. Would you be concerned about this?

Solutions. Measurement error in the y inflates the standard errors. Students should derive this result, but might also recognize that in this case the bias will work against the main hypothesis of the work.

Table 1: The effect of resources on corruption

	OLS	OLS	OLS
	$\log(bribe_{int})$	$\log(bribe_{int})$	$\log(bribe_{int})$
	(1)	(2)	(3)
$mine_{nt}$	0.24	0.024	0.015
	(0.06)	(0.008)	(0.001)
Country f.e.	No	Yes	Yes
Time f.e.	No	No	Yes
R-squared	0.01	0.077	0.096
N	92,762	92,762	92,762

$\log(bribe_{int})$ indicates the log of the bribes paid, in dollars; $mine_{int}$ is a dummy variable that equals one if in neighrbohood n at time t there is a mine. Time f.e. and country f.e. are time and country fixed effects.

Question 2 (40 points)

One of the stylized facts in the field of political economy is that central bank independence causes comparatively lower inflation than central bank dependence. However, why that occurs is less well

understood. One claim is that, when central banks are not insulated from political pressures, prime ministers and their parties manipulate monetary policy in response to changes in public opinion, especially in response to the public's evaluations of party leaders and of their expression of vote intentions. If this claim is true, then monetary variables should have no relationship with public opinion when central banks are independent. Britain is a good case in which to test this claim because the Bank of England became independent when Labor took power in mid-1997, the country's form of democracy is known for its clarity of responsibility, and it was not constrained by the European monetary system. The analysis is here performed on monthly data of two key variables for the period 1997-2006.

Imagine you estimate the following model:

$i_t = \beta_0 + \beta_1 PM_t + \beta_2 PM_{t-1} + \beta_3 \log(GDP)_t + t + u_t$, where the variable PM_t measures the percent of respondents in the Gallup Opinion Survey who are satisfied with the performance of the prime minister; i_t is the monthly average short-term interest rate used for domestic monetary policy, $\log(GDP)_t$ is the (log) gross domestic product, and t represents a time trend. Table 2 shows the results.

(a) Interpret all the coefficients in column (1).

Solution. As the percentage of people being satisfied with the prime minister increases by 1% the interest rate decreases by 0.0339%, all else equal. The effect of the lagged prime minister satisfaction is that if percentage of people satisfied by the prime minister in the previous month increases by 1%, the interest rate drops by 0.0097% ceteris paribus. A 1% increase in GDP corresponds to a 0.0057% increase in interest rates, all else equal. Finally, the time trend says that all else equal the interest rate increases by 0.0234% each month.

(b) Compute the long-run elasticity of the interest rate to public opinions. Next, explain how you would test whether it is statistically significant or not and, if possible, perform the test.

Solution. This is LRP=-0.0339-0.0097=-0.0436. To test for significance one would need to perform:

$H_0 : \beta_1 + \beta_2 = 0$ $H_1 : \beta_1 + \beta_2 \neq 0$

This is a standard t-test that would take the form:

$$t - stat = \frac{\hat{\beta}_1 + \hat{\beta}_2}{se(\hat{\beta}_1 + \hat{\beta}_2)} \sim T_{n-k-1}$$

The problem is that $se(\hat{\beta}_1 + \hat{\beta}_2) = \sqrt{V(\hat{\beta}_1) + V(\hat{\beta}_2) + 2Cov(\hat{\beta}_1, \hat{\beta}_2)}$, while the individual variances can be derived from the standard errors reported in the table, the covariance is unknown. One would either need to re-parametrize the model or use a specific command in Stata (e.g. lincom) to find the correct standard error of the linear combination of coefficients.

(c) Explain the consequences of having serially correlated errors and test whether this problem is present in the data.

Solution. Serial correlation invalidates the calculation of the variance of the estimator. The problem is present in the data. Using column (2), letting $u_t = \rho u_{t-1} + v_t$, one can test:

$H_0 : \rho = 0$

$H_1 : \rho \neq 0$

This is a standard t-test and the statistic is 61.13

(d) Using the information available in the table and any other arguments you think is appropriate, discuss whether you believe that the Bank of England makes independent decisions. Propose alternative or additional

Solution. Note, one sentence was incomplete. Students who only answered the first part were not penalized.

The points worth making here are three. First, in column (1) we find no statistically significant effect of public opinion on the interest rate. This would lead us to believe that the BoE is acting independently. However, in column (2) we found out that the standard errors have a problem, so we cannot be sure that the inference we have made using them is valid. More importantly, using the results in column (3) one could perform a DF test on i_t. This would show that the interest rate has a unit root. Violating stationarity, this analysis is therefore completely incorrect and nothing can be said on this relationship.

The second part was suggesting to explain what one would have done alternatively. The key here would have been to point out to a model in first differences, testing for unit roots for all variables and eventually testing for serial correlation in this new model. Only a first difference model and, eventually, a FGLS estimation in case of serial correlation could give us a correct answer as to wether the BoE is independent. Finally, all other assumptions (zero conditional mean especially) need to be satisfied.

Table 2: The effect of public opinions on monetary policy

	OLS	OLS	OLS
	i_t	$\hat{u}_t$	Δi_t
	(1)	(2)	(3)
PM_t	-0.0339	-	-
	(0.0491)		
PM_{t-1}	-0.0097	-	-
	(0.0553)	-	-
$\log(GDP)_t$	0.5732	-	-
	(0.0631)	-	-
t	0.0234	-	-
	(0.6198)	-	-
$\hat{u}_{t-1}$	-	0.489	-
	-	(0.008)	-
$\hat{i}_{t-1}$	-	-	0.2129
	-	-	(0.4567)
R-squared	0.01	0.077	0.096
N	109	108	108

i_t is the interest rate, PM_t is the percent of respondents in the Gallup Opinion Survey who are satisfied with the performance of the prime minister; $\log(GDP)_t$ is the (log) gross domestic product, and t represents a time trend.
$\hat{u}_t$ is the residual from column (1).