

ECON 4918: ECONOMICS OF CONFLICT  
EXAM 2013

**QUESTION 1.** (40 points)

Consider the basic model in the article “Conflict and Distribution (JET 1999)” by Joan Esteban and Debraj Ray (a brief description of the model introducing notation follows).

Recall that in this model, society is composed of a unit measure of individuals, situated in  $G$  groups. Note  $n_i$  is the number of individuals in group  $i$ , so that  $\sum_{i=1}^G n_i = 1$ . Each group exerts effort/contributes resources (per-capita effort for group  $i$  is denoted by  $r_i$ ) so as to win the contest and have its most preferred outcome implemented. Recall the utility group  $i$  gets from outcome  $j$  is  $u_{ij}$  for every  $i, j \in \{1, \dots, G\}$  where by construction  $u_{ii} > u_{ij}$  for  $i \neq j$ . Also, let  $v_{ij} \equiv u_{ii} - u_{ij}$ . This term is a measure of inter-group antagonism (divergence in preferences).

Resources are acquired at a cost to each individual. Denote by  $c(r)$  the individual cost of supplying  $r$ . Assume that  $c'(r) > 0$ ,  $c''(r) > 0$  and  $c'''(r) \geq 0$  for all  $r > 0$ . Thus, the structure is a general version of a contest.

The total resources devoted to lobbying by society is  $R \equiv \sum_{i=1}^G n_i r_i$ . So  $R$  as a measure of societal conflict in this context.

For simplicity, consider the case of *two* groups, i.e.,  $G = 2$ . The following first order condition characterizes the optimal choice of effort for each of the two groups ( $i, j = 1, 2$  and  $i \neq j$ ):

$$n_i n_j r_j v_{ij} = c'(r_i) R^2$$

Further assume  $v_{12} = v_{21}$  (symmetric inter-group antagonism).

- (i) Using all the information above, what can we say about the relative sizes of  $r_1$  and  $r_2$  in equilibrium? Which is larger? How does this depend upon the sizes of the two groups ( $n_1$  and  $n_2$ )?
- (ii) Show that conflict (represented by  $R$ ) is maximized when the groups are of equal size.
- (iii) Describe (in a few words only) the notion of polarization and what it is supposed to capture. Does the result in part (ii) fit with the notion of polarization you have described (answer how it does or does not)?

Take a society in which incomes take all values in \$100 increments between \$100 and \$1000. Assume that an equal proportion (1/10) occupies each of these classes. Show this income distribution on a diagram with incomes on the horizontal axis and population proportions on the vertical axis. Call this society A.

Draw another diagram with half the population at \$300 and the other at \$800. Call this society B.

- (iv) Show that the distribution in society B can be obtained by a sequence of *progressive* Dalton transfers from the one in society A. What can you say about inequality across the two societies? Which society seems more conflictual (answer in reference to part (iii))?

**QUESTION 2.** (30 points)

This problem is based on the article titled “Economic Shocks and Civil Conflict: An Instrumental Variables Approach” by Miguel et al (JPE 2004).

- (i) What is the main empirical question that the authors try to answer? Will using OLS provide consistent and unbiased estimates? What are the endogeneity concerns, if any? How do the authors attempt to overcome this problem?
- (ii) Look at Table 4 (attached). Compare the regressions in columns (1) – (4) with those in columns (5) and (6). Which ones are more reliable? Provide one reasonable argument to explain the huge difference between the OLS estimates and the 2SLS ones.
- (iii) Look at Table 5 (attached). Provide an interpretation of the interaction terms in all the columns. What do you conclude from the sign and significance of these (interaction term) coefficients?

**QUESTION 3.** (30 points)

This problem is based on the article “INSTITUTIONS AND THE RESOURCE CURSE” by Mehlum et al (EJ 2006).

- (i) What is the main finding in the paper?
- (ii) Having positive profits from modern production is critical for the main results: Yes or No? Discuss in the context of the different type of equilibria: Production versus Grabber.

Consider a grabber equilibrium. Recall the following notation:

$\pi_P$  denotes the payoff to a modern producer.  $\pi_G$  denotes the payoff to a grabber.  $\lambda \geq 0$  is a measure of institutional quality.  $n_P$  is the number of modern producers (determined in equilibrium).  $\pi(n_P)$  is the profits from modern production when there are  $n_P$  such producers.  $R$  denotes resource rents,  $N$  is the total number of entrepreneurs and  $\alpha \equiv n_P/N$ .

- (iii) Start from  $\pi_P = \pi(n_P) + \lambda\pi_G$  and use  $\pi_G = \frac{R}{N(1-\alpha+\lambda\alpha)}$  to show that in a grabber equilibrium, the *long-run* relationship between  $R$  and  $n_P$  is given by:

$$R = \frac{\bar{N}}{1 - \lambda} \pi(n_P) - n_P \pi(n_P)$$

where  $\bar{N}$  is the long-run steady state number of entrepreneurs.

TABLE 4  
ECONOMIC GROWTH AND CIVIL CONFLICT

EXPLANATORY VARIABLE	DEPENDENT VARIABLE: Civil Conflict $\geq 25$ Deaths						DEPENDENT VARIABLE: Civil Conflict $\geq 1,000$ Deaths
	Probit (1)	OLS (2)	OLS (3)	OLS (4)	IV-2SLS (5)	IV-2SLS (6)	IV-2SLS (7)
Economic growth rate, $t$	-.37 (.26)	-.33 (.26)	-.21 (.20)	-.21 (.16)	-.41 (1.48)	-1.13 (1.40)	-1.48* (.82)
Economic growth rate, $t-1$	-.14 (.23)	-.08 (.24)	.01 (.20)	.07 (.16)	-2.25** (1.07)	-2.55** (1.10)	-.77 (.70)
Log(GDP per capita), 1979	-.067 (.061)	-.041 (.050)	.085 (.084)		.053 (.098)		
Democracy (Polity IV), $t-1$	.001 (.005)	.001 (.005)	.003 (.006)		.004 (.006)		
Ethnolinguistic fractionalization	.24 (.26)	.23 (.27)	.51 (.40)		.51 (.39)		
Religious fractionalization	-.29 (.26)	-.24 (.24)	.10 (.42)		.22 (.44)		
Oil-exporting country	.02 (.21)	.05 (.21)	-.16 (.20)		-.10 (.22)		
Log(mountainous)	.077** (.041)	.076* (.039)	.057 (.060)		.060 (.058)		
Log(national population), $t-1$	.080 (.051)	.068 (.051)	.182* (.086)		.159* (.093)		
Country fixed effects	no	no	no	yes	no	yes	yes
Country-specific time trends	no	no	yes	yes	yes	yes	yes
$R^2$	...	.13	.53	.71	...	...	...
Root mean square error	...	.42	.31	.25	.36	.32	.24
Observations	743	743	743	743	743	743	743

NOTE.—Huber robust standard errors are in parentheses. Regression disturbance terms are clustered at the country level. Regression 1 presents marginal probit effects, evaluated at explanatory variable mean values. The instrumental variables for economic growth in regressions 5–7 are growth in rainfall,  $t$  and growth in rainfall,  $t-1$ . A country-specific year time trend is included in all specifications (coefficient estimates not reported), except for regressions 1 and 2, where a single linear time trend is included.

- \* Significantly different from zero at 90 percent confidence.
- \*\* Significantly different from zero at 95 percent confidence.
- \*\*\* Significantly different from zero at 99 percent confidence.

TABLE 5  
 INTERACTIONS BETWEEN ECONOMIC GROWTH AND COUNTRY CHARACTERISTICS  
 Dependent Variable: Civil Conflict  $\geq 25$  Deaths

EXPLANATORY VARIABLE	IV-2SLS				
	(1)	(2)	(3)	(4)	(5)
Economic growth rate, $t$	-1.20 (1.43)	.92 (2.62)	-9.9 (22.9)	-.99 (1.26)	-1.85 (1.81)
Economic growth rate, $t-1$	-2.86* (1.46)	-3.01* (1.70)	-6.4 (6.1)	-2.37** (1.04)	-2.97** (1.39)
Economic growth rate, $t \times$ democracy (Polity IV), $t-1$	.01 (.21)				
Economic growth rate, $t-1 \times$ democracy (Polity IV), $t-1$	-.10 (.16)				
Economic growth rate, $t \times$ log(per capita income, 1979)		-1.98 (2.70)			
Economic growth rate, $t-1 \times$ log(per capita income, 1979)		.58 (1.09)			
Economic growth rate, $t \times$ ethnolinguistic fractionalization			12.1 (30.1)		
Economic growth rate, $t-1 \times$ ethnolin- guistic fractionalization			5.1 (8.1)		
Economic growth rate, $t \times$ oil-exporting country				-2.8 (6.9)	
Economic growth rate, $t-1 \times$ oil-export- ing country				3.2 (3.1)	
Economic growth rate, $t \times$ log(mountainous)					.39 (.83)
Economic growth rate, $t-1 \times$ log(mountainous)					.23 (.62)
Country fixed effects	yes	yes	yes	yes	yes
Country-specific time trends	yes	yes	yes	yes	yes
Root mean square error	.33	.34	.41	.32	.32
Observations	743	743	743	743	743

NOTE.—Huber robust standard errors are in parentheses. Regression disturbance terms are clustered at the country level. The instrumental variables are growth in rainfall,  $t$  and growth in rainfall,  $t-1$  and these two terms interacted with the appropriate explanatory variable. A country-specific year time trend is included in all specifications (coefficient estimates not reported). Similar interaction patterns hold when civil conflict  $\geq 1,000$  deaths is the dependent variable and in most OLS specifications (results not shown).

\* Significantly different from zero at 90 percent confidence.

\*\* Significantly different from zero at 95 percent confidence.

\*\*\* Significantly different from zero at 99 percent confidence.