

AREC 345: Global Poverty and Economic Development

Problem Set 4

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Problem Set 4 is due at the start of section on October 14.

1. Calculate the level of ethnolinguistic fractionalization in a country with 4 equally-sized ethnic (or ethnolinguistic) groups.
2. You and the other 7 members of your immediate family operate a small farm growing rice which you sell to earn your income. You have a fixed amount of land: only one hectare (just under 2.5 acres). When one family member works the farm on his or her own, the farm produces 16 shekels worth of rice. Adding a second family member working on the farm increases total rice output by 8 shekels, a third increases output by 4 shekels, a fourth by 2 shekels, and so on. To state this slightly more formally, the marginal product of the labor of the n^{th} family member working on the farm is always half as large as the marginal product of the labor of the $(n - 1)^{\text{th}}$ family member.
 - (a) Given this setup, what will total farm output be if 5 family members work on the farm?
 - (b) Your family wants to maximize your income, which is equivalent to maximizing the value of total rice output from your farm because no other jobs are available in your village. After the harvest, you will divide this income between you equally. Given this, how many family members will work on the farm, and how much income will each of you receive?
 - (c) A factory opens in your village; it begins hiring workers at a wage of 3 shekels per day. Now everyone in your family can choose between working on the farm or working on the factory. You are a family, so you still plan to pool all of your income and divide it equally. If you wish to maximize your family's income, how many family members will work on the farm and how many will work in the factory? How does your family's total income compare to what it was before the opening of the factory?
 - (d) In 3 or 4 sentences, discuss the relationship between this example and the concept of disguised unemployment that we discussed in class.
3. In the country of Domaritania, the relationship between physical capital in year t and output in year t is characterized by the equation:

$$Y_t = 2K_t \tag{1}$$

The citizens of Domaritania consume 95 percent of their output and invest the rest. Capital depreciates at a rate of 8 percent per year.

- (a) Use the Harrod-Domar model to calculate Domaritia's growth rate in the absence of foreign aid.
- (b) If Domaritia wishes to achieve a rate of GDP growth of 6 percent per year, how large is the financing gap?
4. Answer the following questions based on the table below (which is taken from the paper "Colonialism and Modern Income: Islands as Natural Experiments" by James Feyrer and Bruce Sacerdote).

TABLE 2.—OUTCOMES REGRESSED ON YEARS OF COLONIZATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log GDP per Capita	Log GDP per Capita	Log GDP per Capita—IV	Log GDP per Capita	Log GDP per Capita—IV	Log GDP per Capita	Log GDP per Capita—IV	Infant Mortality per 1,000	Infant Mortality per 1,000—IV
Number of centuries a colony	0.42 (0.076)***	0.491 (0.110)***	0.712 (0.253)***					-3.885 (1.472)**	-13.47 (5.434)**
First year a colony				-0.456 (0.112)***	-0.883 (0.354)**	-0.342 (0.108)***	-0.626 (0.304)**		
Final year a colony						0.409 (0.755)	0.527 (0.874)		
Remained a colony in 2000						0.954 (0.311)***	0.81 (0.373)**		
Abs (latitude)		0.053 (0.012)***	0.054 (0.011)***	0.06 (0.012)***	0.068 (0.016)***	0.038 (0.012)***	0.046 (0.015)***	-0.797 (0.207)***	-0.841 (0.225)***
Area in millions of sq km		-20.374 (3.894)***	-21.738 (3.970)***	-26.34 (5.142)***	-34.764 (8.252)***	-15.071 (5.383)***	-20.769 (7.148)***	266.288 (147.186)*	325.479 (138.716)**
Island is in Pacific		0.752 (0.464)	1.018 (0.559)*	0.782 (0.510)	1.364 (0.762)*	0.664 (0.491)	1.043 (0.641)	-8.476 (9.329)	-20.036 (14.379)
Island is in Atlantic		0.425 (0.395)	0.188 (0.477)	0.471 (0.396)	0.019 (0.568)	0.319 (0.383)	0.043 (0.481)	-5.161 (8.540)	5.14 (8.501)
Constant	7.472 (0.205)***	6.033 (0.552)***	5.484 (0.834)***	15.026 (1.872)***	22.302 (5.894)***	4.879 (15.218)	7.406 (17.308)	44.914 (11.085)***	68.754 (21.610)***
Observations	81	81	81	81	81	81	81	81	81
R-squared	0.273	0.527	0.498	0.488	0.396	0.655	0.616	0.371	0.063

We regress Log GDP per capita and infant mortality on the number of years the island spent as a colony of a European power. Columns 1, 2, 4, 6, and 8 are OLS. Columns 3, 5, 7, and 9 are two-stage least squares where we instrument for centuries of colonial rule or the first year as a colony using the twelve-month average and standard deviation of the east-west wind speed for each island. In the IV columns, we do not instrument for final year a colony or "remained a colony" in 2000. We obtain similar IV results when we use LIML rather than two-stage least squares.

Robust standard errors in parentheses. We cluster at the island group level since several of the islands (such as the Cook Islands and the Federated States of Micronesia) are used as separate observations from a cluster of politically related yet geographically distinct islands.

*significant at 10%; **significant at 5%; ***significant at 1%.

- (a) How many different regressions are included in the table?
- (b) What is the equation describing the regression reported in Column 1?
- (c) Based on the results reported in Column 1, what is the predicted level of log GDP per capita for a country that spent 0 years as a colony?
- (d) Based on the results reported in Column 1, what is the predicted level of log GDP per capita for a country that spent 100 years as a colony?
- (e) In the regression presented in Column 4, which independent variables are statistically significant?
- (f) Based on the results reported in Column 8, what is the predicted infant mortality rate in a country that spent 200 years as a colony, has an absolute latitude of 10 degrees, has an area of 1 million square km, and is located in the Pacific Ocean.