计量经济学第一题

Nunn (2008)发现，长达 400 多年的奴隶贸易对非洲国家的长期经济发展产生了显著的负面影响。尽管这篇文章确认了奴隶贸易与非洲国家现代的经济增长之间的负因果关系，但该分析无法确定其背后的因果机制。

Nunn 和 Wantchekon（2011）研究了奴隶贸易可能影响当今非洲国家经济发展的渠道之一：奴隶贸易导致了非洲国家的不信任文化的发展，这种不信任文化可能会持续到今天。

文章使用的信任数据是对每个国家/地区的 1,200 或 2,400 名具有投票年龄的人的调查，调查询问了受访者对政府的信任程度，对同一国家其他族群人的信任程度，以及对同一国家相同族群人的信任程度。奴隶贸易数据是 Nunn(2008)统计的奴隶贸易数据，其中统计了每个奴隶的种族，80,656 名已知种族身份的奴隶的样本包括 229 个不同的种族名称。

回归方程如下：

$$trust_{i,e,d,c} = \alpha_c + \beta\ slave\ exports_e + \mathbf{X}'_{i,e,d,c}\mathbf{\Gamma} + \mathbf{X}'_{d,c}\Omega + \mathbf{X}'_e\Phi + \varepsilon_{i,e,d,c} \quad (1)$$

其中 i 表示每个受访者个体，e 表示族群，d 表示地区，c 表示国家。$trust_{i,e,d,c}$表示某一个信任指标，α_c表示国家固定效应，$slave\ exports_e$表示每个族群奴隶贸易的数量，$\mathbf{X}'_{i,e,d,c}$表示受访者个人特征变量，$\mathbf{X}'_{d,c}$表示受访者所在国家和地区的特征变量，$\mathbf{X}'_e$表示受访者所属族群的特征变量。

（1）Table 1 展示了基准回归的结果，观察 Table 1 的第（1）列，请回答：

①（1 分）这一列的被解释变量是什么，关键解释变量是什么？

②（1 分）估计模型（1）的样本有多少个观测？这些观测所属的族群有多少个？所在的地区有多少个？

（2）观察Table 1的第（1）列可以发现，估计系数-0.00068的下方有三个括号。根据文中作者解释，这三个括号中的数分别展示了不同聚类层级的标准误。其中方括号里面展示的是在族群层面上聚类的稳健标准误，圆括号里面展示的是在族群和地区层面上聚类的稳健标准误（two-way clustering within ethnic groups and within districts）。请回答：

①（2分）作者报告聚类稳健标准误的目的是什么？

②（2分）为什么在族群和地区层面上聚类的稳健标准误比在族群层面上聚类的稳健标准误更大？

③（1分）在谨慎原则下，研究者应倾向于采信哪一种稳健标准误？

TABLE 1—OLS ESTIMATES OF THE DETERMINANTS OF TRUST IN NEIGHBORS

Dependent variable: Trust of neighbors	Slave exports (thousands) (1)	Exports/ area (2)	Exports/ historical pop (3)	ln (1 + exports) (4)	ln (1 + exports/ area) (5)	ln (1 + exports/ historical pop) (6)
Estimated coefficient	−0.00068	−0.019	−0.531	−0.037	−0.159	−0.743
	[0.00014]	[0.005]	[0.147]	[0.014]	[0.034]	[0.187]
	(0.00015)	(0.005)	(0.147)	(0.014)	(0.034)	(0.187)
	{0.00013}	{0.005}	{0.165}	{0.015}	{0.034}	{0.212}
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
District controls	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	20,027	20,027	17,644	20,027	20,027	17,644
Number of ethnicities	185	185	157	185	185	157
Number of districts	1,257	1,257	1,214	1,257	1,257	1,214
R^2	0.16	0.16	0.15	0.15	0.16	0.15

Notes: The table reports OLS estimates. The unit of observation is an individual. Below each coefficient three standard errors are reported. The first, reported in square brackets, is standard errors adjusted for clustering within ethnic groups. The second, reported in parentheses, is standard errors adjusted for two-way clustering within ethnic groups and within districts. The third, reported in curly brackets, is T. G. Conley (1999) standard errors adjusted for two-dimensional spatial autocorrelation. The standard errors are constructed assuming a window with weights equal to one for observations less than five degrees apart and zero for observations further apart. The individual controls are for age, age squared, a gender indicator variable, five living conditions fixed effects, ten education fixed effects, 18 religion fixed effects, 25 occupation fixed effects, and an indicator for whether the respondent lives in an urban location. The district controls include ethnic fractionalization of each district and the share of the district's population that is the same ethnicity as the respondent.

（3）这篇文章采用的工具变量是奴隶贸易期间每个种族与海岸的距离。Table 5展示了工具变量的回归结果。观察Table 5回答以下问题：

①（3分）基准回归模型（1）在因果识别上的主要威胁是什么？这篇文章采用的工具变量为什么能够帮助减轻这一威胁？

②（1分）Table 5 第（1）列的被解释变量是什么，解释变量是什么，工具变量是什么？

③（2分）一个“好”的工具变量应该满足哪些条件？

④（2分）Table 5 第（1）列的哪些结果能够佐证这一工具变量是一个“好”的工具变量？佐证的是“好”的工具变量的哪一个条件？

⑤（2分）Table 5 第（1）列第一阶段回归的R^2是多少？如果这一R^2很小，会造成什么问题？

⑥（3分）作者在Table 7展示了非洲受访者对当地政府的信任与受访者族群离海岸线的距离之间的关系，以及亚洲受访者对当地政府的信任与受访者族群离海岸线的距离之间的关系。请简述作者展示Table 7结果的目的。

参考文献：

Nunn, N., & Wantchekon, L. (2011). The slave trade and the origins of mistrust in Africa. American Economic Review, 101(7), 3221-52.

TABLE 5—IV ESTIMATES OF THE EFFECT OF THE SLAVE TRADE ON TRUST

	Trust of relatives (1)	Trust of neighbors (2)	Trust of local council (3)	Intragroup trust (4)	Intergroup trust (5)
Second stage: Dependent variable is an individual's trust					
ln (1 + exports/area)	−0.190***	−0.245***	−0.221***	−0.251***	−0.174**
	(0.067)	(0.070)	(0.060)	(0.088)	(0.080)
Hausman test (p-value)	0.88	0.53	0.09	0.44	0.41
R^2	0.13	0.16	0.20	0.15	0.12
First stage: Dependent variable is ln (1 + exports/area)					
Historical distance of ethnic group from coast	−0.0014***	−0.0014***	−0.0014***	−0.0014***	−0.0014***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Colonial population density	Yes	Yes	Yes	Yes	Yes
Ethnicity-level colonial controls	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes
District controls	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	16,709	16,679	15,905	16,636	16,473
Number of clusters	147 / 1,187	147 / 1,187	146 / 1,194	147 / 1,186	147 / 1,184
F-stat of excl. instrument	26.9	26.8	27.4	27.1	27.0
R^2	0.81	0.81	0.81	0.81	0.81

Notes: The table reports IV estimates. The top panel reports the second-stage estimates, and the bottom panel reports first-stage estimates. Standard errors are adjusted for two-way clustering at the ethnicity and district levels. The individual controls, district controls, ethnicity-level colonial controls, and colonial population density measures are described in Table 3. The null hypothesis of the Hausman test is that the OLS estimates are consistent.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

TABLE 7—REDUCED FORM RELATIONSHIP BETWEEN THE DISTANCE FROM THE COAST AND TRUST WITHIN AFRICA AND ASIA

	Trust of local government council			
	Afrobarometer sample		Asiabarometer sample	
	(1)	(2)	(3)	(4)
Distance from the coast	0.00039***	0.00031***	−0.00001	0.00001
	(0.00009)	(0.00008)	(0.00010)	(0.00009)
Country fixed effects	Yes	Yes	Yes	Yes
Individual controls	No	Yes	No	Yes
Number of observations	19,913	19,913	5,409	5,409
Number of clusters	185	185	62	62
R^2	0.16	0.18	0.19	0.22

Notes: The table reports OLS estimates. The unit of observation is an individual. The dependent variable in the Asiabarometer sample is the respondent's answer to the question: "How much do you trust your local government?" The categories for the answers are the same in the Asiabarometer as in the Afrobarometer. Standard errors are clustered at the ethnicity level in the Afrobarometer regressions and at the location (city) level in the Asiabarometer and the WVS samples. The individual controls are for age, age squared, a gender indicator, education fixed effects, and religion fixed effects.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

计量经济学第二题

在发展中国家，经济发展依赖制造业，但制造业带来的环境污染问题迟迟得不到根治。对发展中国家减少污染的经济成本还缺乏研究。

He 等（2020）的文章研究了中国的环境污染治理问题。在中国，中央政府利用强大的政治激励措施来执行环境监管，创造了一个独特的实验环境。为解决中国严重的水污染问题，中央政府在主要河干沿线安装了数百个国家控制的水监测站，并利用水质读数来帮助确定地方政府官员的晋升。然而，中央和地方政府之间的这种政治契约由于监督不完善而受到破坏。水监测站只能捕获上游的排放物，这给了地方官员在空间上不连续的激励措施，以对紧邻监测站上游的污染者实施更严格的监管。

He 等（2020）设计了空间断点回归计量模型用于识别环境污染监管对企业 TFP 的影响。

$$\begin{aligned} \text{TFP}_{ijk} = \alpha_1 \text{ Down}_{ijk} + \alpha_2 \text{ Dist}_{ijk} + \alpha_3 \text{ Down}_{ijk} \cdot \text{Dist}_{ijk} \\ + u_j + v_k + \varepsilon_{ijk} \quad \text{s.t. } -h\tilde{\text{N}} \text{ Dist}_{ijk} \tilde{\text{N}} h, \end{aligned} \tag{2}$$

其中 TFP_{ijk} 表示行业 j 在观测站 k 的企业 i 的 TFP。$Down_{ijk}$ 表示企业是否在观测站 k 的下游。$Dist_{ijk}$ 表示企业和观测站之间的距离，正数表示在下游，负数表示在上游。H 表示带宽。

（1） （2 分）在 He 等（2020）的研究中，驱动变量（running variable）是什么？它是如何工作的？

（2） （2 分）请简述断点回归方法的假设，并简述为什么 He 等（2020）设计的断点回归是有效的。

（3） （2 分）在使用断点回归方法进行估计之前，需要对样本进行什么检验？针对 He 等（2020）的研究，你认为应该如何进行这些检验？

（4） Figure 4 展示了 He 等（2020）的基本结果，请观察 Figure 4 并回答：

①（1 分）解释 He 等（2020）的主要结论。

②（2 分）Figure 4 每个方形点表示什么含义，位置如何确定？

③（2 分）请解释纵轴“residualized”的含义，并解释必须使用 residualized TFP 的原因。

本题参考资料：以下一段话是作者解释估计方程（2）的步骤：*The estimation*

of this nonparametric RD model with fixed effects is implemented using the two-step approach suggested by Lee and Lemieux (2010), where industry and station fixed effects (or industry-by-station fixed effects in a more saturated model) are absorbed by running an OLS regression of TFP on a set of industry and station-specific dummies and then applying the nonparametric estimations on the residualized TFP.

（5） Table 1 是 Figure 4 的量化结果，请观察 Table 1 并回答下列问题：

①（1 分）Panel B “Station FE + industry FE absorbed”和 Panel C“Station by industry FE absorbed”分别表示什么含义？

②（2 分）作者估计方程（2）的方法是“局部线性回归”（local linear regression），与之相对的 RD 模型估计方法还有“全局多项式回归”。请解释局部线性回归为什么通常比全局多项式回归的结果更加可信？

③（2 分）Table 1 最后一行 Triangle、Epanech.、Uniform 分别代表什么含义？在方程（2）的估计中有何作用？

④（2 分）为什么作者在 Table 1 同时报告污染行业和非污染行业的结果？

（6）（2 分）请根据 Table 1 Panel B 的结果回答：上游企业和下游企业的 TFP 相差大约____%-____%。

参考文献：

He, G., Wang, S., & Zhang, B. (2020). Watering down environmental regulation in China. The Quarterly Journal of Economics, 135(4), 2135-2185.

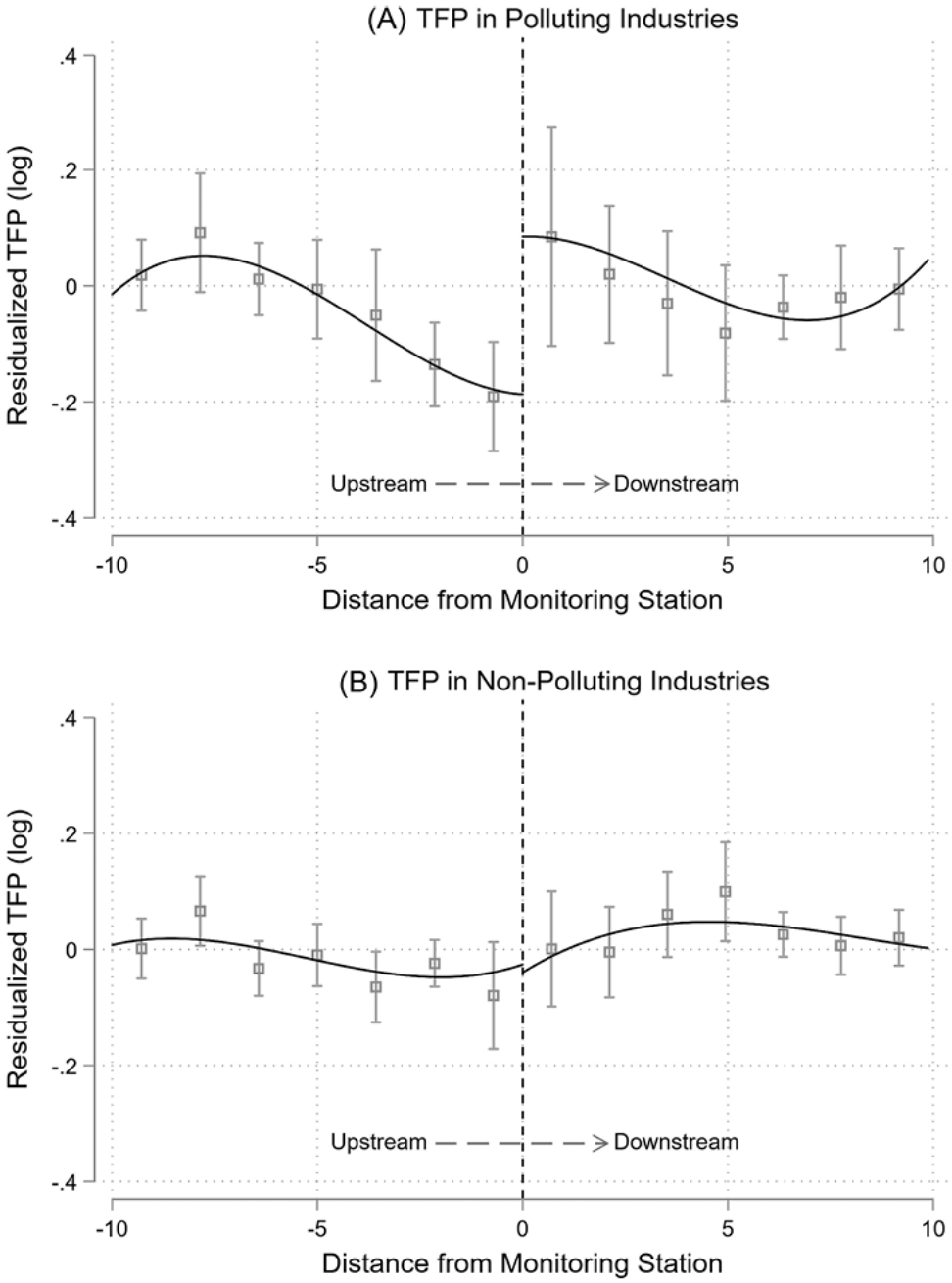

FIGURE IV

RD Plot: Effects of Water Quality Monitoring on TFP

Industry and monitoring station fixed effects are absorbed before plotting the regression discontinuities.

TABLE I

THE UPSTREAM–DOWNSTREAM TFP GAP

	Polluting industries			Nonpolluting industries		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: No control						
RD in TFP (log)	0.34	0.37	0.32	−0.03	0.04	0.01
(downstream − upstream)	(0.57)	(0.59)	(0.56)	(0.15)	(0.18)	(0.18)
Bandwidth (km)	4.203	3.889	3.622	5.887	5.168	4.522
Panel B: Station FE + industry FE absorbed						
RD in TFP (log)	0.36**	0.38**	0.34**	0.03	0.04	−0.02
(downstream − upstream)	(0.17)	(0.17)	(0.15)	(0.09)	(0.09)	(0.09)
Bandwidth (km)	5.723	5.523	5.144	5.890	5.479	6.091
Panel C: Station by industry FE absorbed						
RD in TFP (log)	0.27*	0.29**	0.29**	0.02	0.04	0.03
(downstream − upstream)	(0.15)	(0.15)	(0.14)	(0.06)	(0.06)	(0.07)
Bandwidth (km)	4.496	4.333	4.689	5.692	5.204	4.430
Obs.	6,224	6,224	6,224	11,502	11,502	11,502
Kernel	Triangle	Epanech.	Uniform	Triangle	Epanech.	Uniform

Notes. Each cell in the table represents a separate RD regression. The running variable is the distance between a firm and a monitoring station, where negative (positive) distance means firms are located to the upstream (downstream) of the monitoring stations. The positive coefficients indicate that downstream firms have higher TFP than upstream firms. TFP is estimated using the Olley and Pakes (1996) method, with "upstream polluting" added as an additional state variable. The discontinuities at monitoring stations are estimated using local linear regressions and MSE-optimal bandwidth proposed by Calonico, Cattaneo, and Titiunik (2014) for different kernel weighting methods. Standard errors clustered at the monitoring station level are reported below the estimates. * significant at 10%, ** significant at 5%, *** significant at 1%.