Kin-based institutions and economic development

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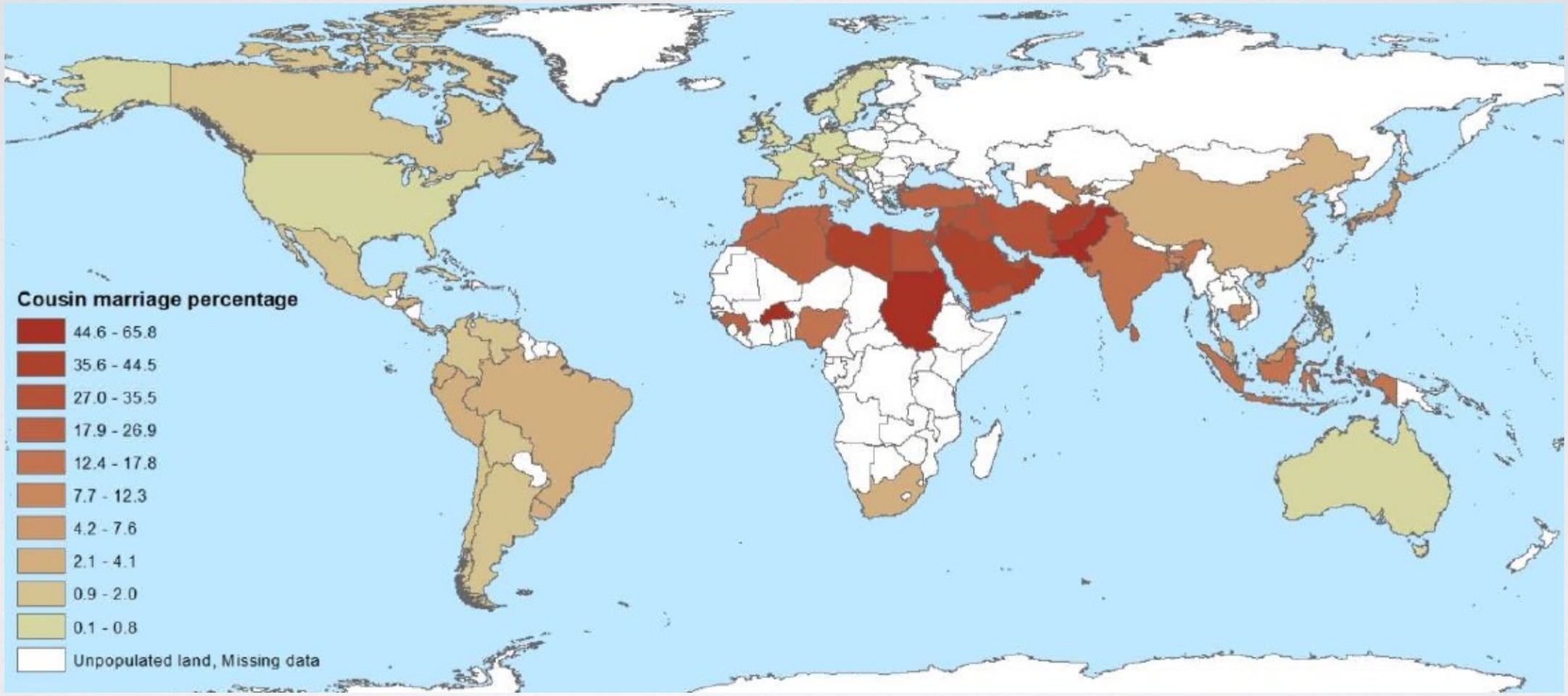
Kin-based institutions

- Kin-based institutions are the set of social norms governing descent, kinship, marriage, residence, etc, in different societies
  - Extensively studied by anthropologists
  - Among the oldest and most fundamental of human institutions

- For example, many societies:
  - Allow or require marriages to specific kin (e.g., 1st or 2nd cousins, uncles)
  - Have high levels of polygamy (and especially polygyny)
  - Are organized around unilineal lineages and/or clans

COUSIN MARRIAGE AROUND THE WORLD



Ethnographic examples

The Marri Baluch of Pakistan

- Hierarchy of patrilineages
- Arranged marriages, typically within patrilineage
- 72% of marriages among kin; 30% between patrilineal parallel cousins
- Up to 4 wives permitted (mostly for political elites)
- Patrilocal post-marital residence

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The English

- Descent traced through both mothers and fathers
- Love-based marriages
- Taboo, laws against cousin marriages
- Monogamous families
- New couples establish new residence, separate from parents/family

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We explore the link between the tightness and breadth of kin-based institutions — "*kinship intensity*" — and economic prosperity around the world

Why should low "kinship intensity" impact economic prosperity?

"Virtually every commercial transaction has within itself an element of trust… It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence." Arrow (1972)

- We know kinship intensity is negatively associated with:
  - An individualistic-impersonal psychology (Alesina & Giuliano, 2014; Schulz et al., 2019, Enke, 2019, Moscona et al. 2017)
  - Political participation & well-functioning political institutions (Alesina & Giuliano, 2011; Schulz, forthcoming; Akbari et al., 2019)

- We show further associations with key determinants of economic prosperity: innovation, division of labor

Kin-based institutions

- We use 2 measures of kinship intensity:

    1. The **Kinship Intensity Index (KII)**: an omnibus measure of the overall strength of kin-based institutions, based on anthropological data

    2. Each society's **average inbreeding coefficient** (***F***), computed with genetic data

OVERVIEW OF RESULTS

- We establish a **tight empirical relationship between kinship intensity and economic development**

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  - A **one-SD-increase in the KII** is associated with:
    - a ~**35% decrease in per capita luminosity and GDP**, worldwide
    - a ~**10% decrease** …, within-country
  - Robust to controlling for pop'n density, geographic and ethnocultural variables, country FEs, and to various adjustments to the SEs
  - Robust across analyses (light density at pixel level, regional GDP, spatial RD; with the KII, with *F*); estimated effect size remarkably consistent

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- Results consistent with a causal effect of kinship intensity on economic prosperity
  - Robust in spatial RD analysis, to controlling for Christianity or European ancestry, to controlling for early proxy for econ development, in subsample with very low population density

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- Likely mechanisms: division of labor and comparative advantage, cultural psychology, institutions, innovation

CONTENTS

1. **Economic prosperity and the KII**
2. Results: economic prosperity and *F*
3. Pathways

1st measure of kinship intensity

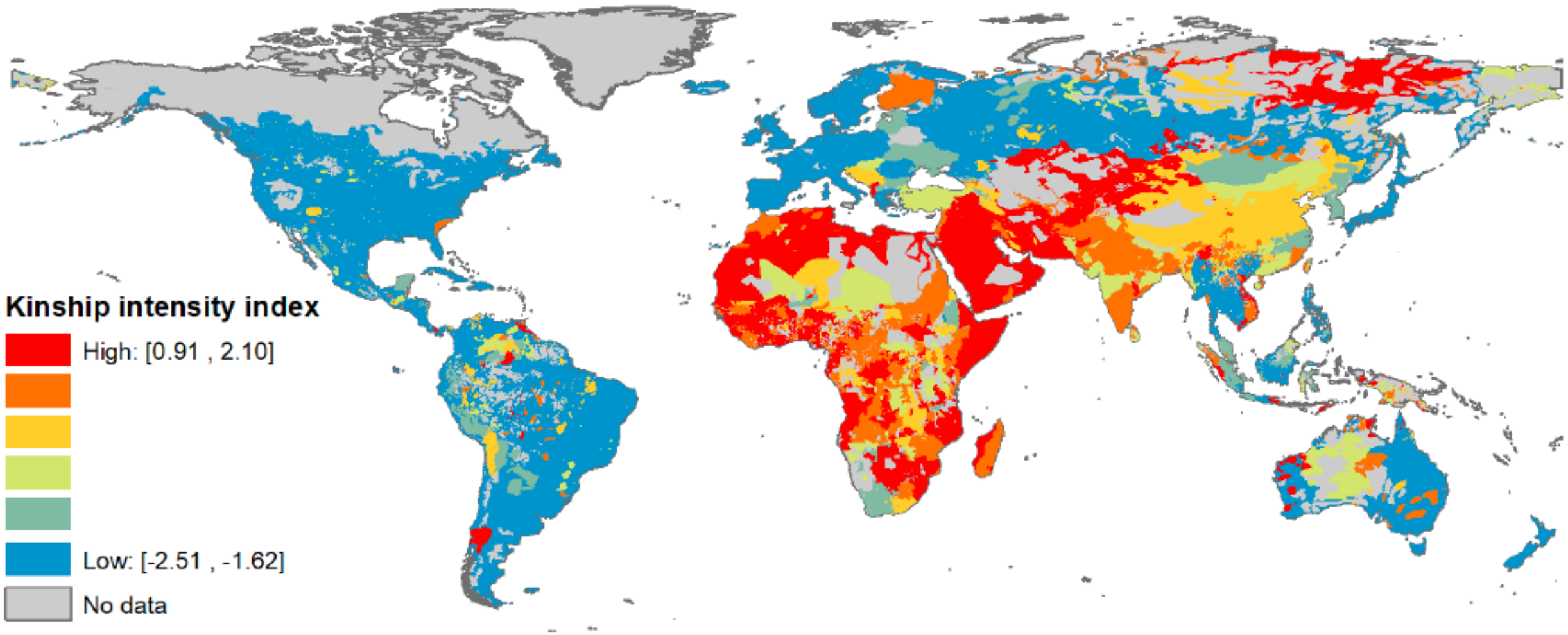
The Kinship intensity index (KII)

- Omnibus measure of the overall strength of kin-based institutions
  - Based on anthropological studies on 1,291 ethnicities prior to industrialization or European colonization from the *Ethnographic Atlas* (EA) (Murdock, 1967)

- For each *EA* society, the KII is the average of 5 measures:
  1. Preferences for cousin marriage
  2. Polygamy
  3. Co-residence of extended families
  4. Presence of unilineal descent
  5. Community organization

  - We standardized the KII (so SD = 1)

The KII around the world



Other data

- **Measures of economic prosperity:**

  1. Satellite nighttime luminosity (in 2010)
     - ➢ We control for population density
  2. Regional GDP per capita (1950-2010; Gennaioli et al. 2014)

- **Baseline geographic controls:**

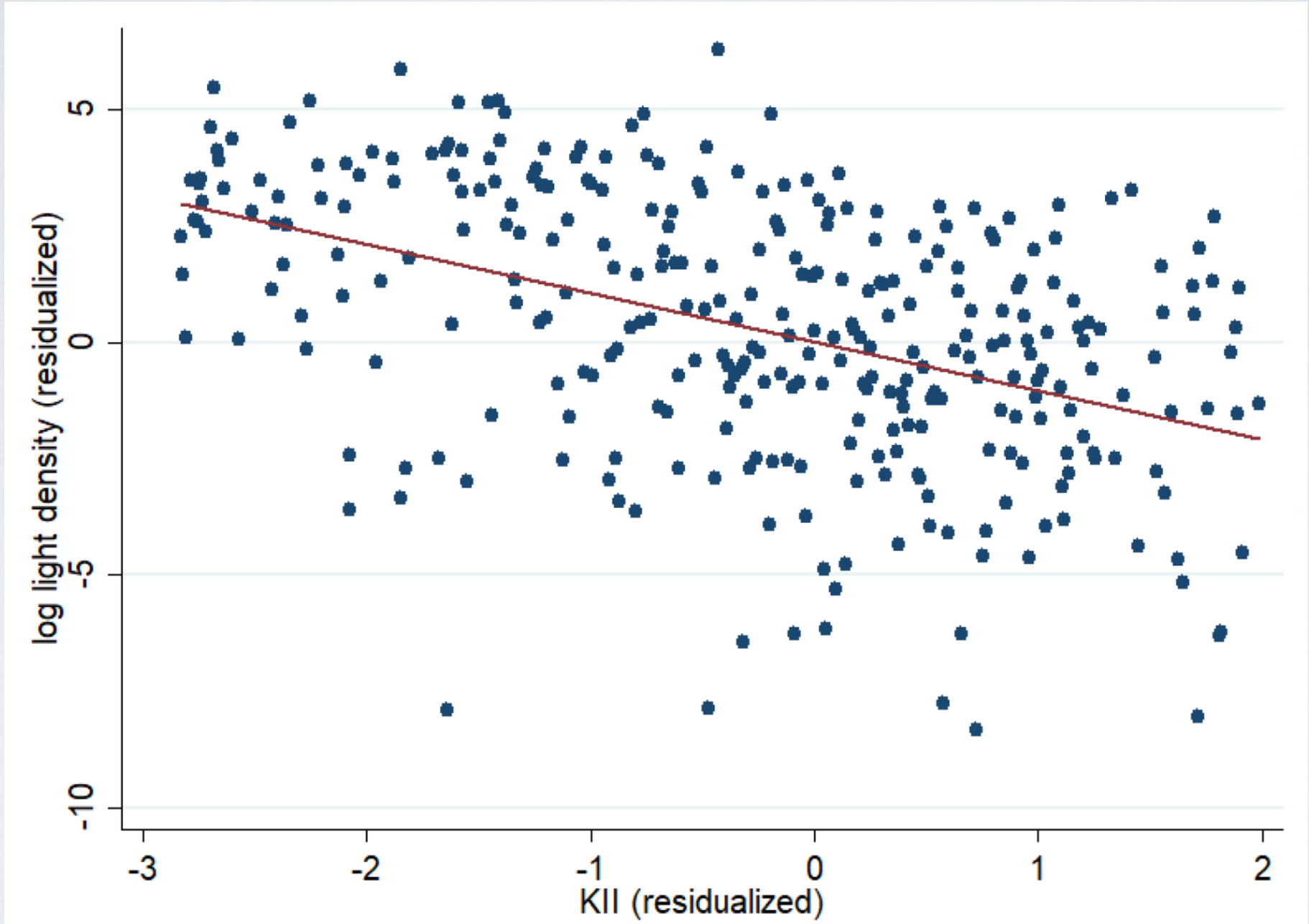
  Temperature, precipitation, agricultural suitability, elevation, absolute latitude, ruggedness, distance to coast, and distance to the nearest river or lake

- **Matching data:**

  Ethnographic Atlas (~1,200 societies) ↔ *Ethnologue* (~5,700 languages) ↔ geographic pixels (~400,000 pixels) [↔ regions/countries]

  Human Origins

Satellite luminosity vs. the KII across ethnicities (with population density partialled out)



The KII and nighttime luminosity: OLS

Baseline specification:

$$L_{i,e,c} = \alpha + \beta KII_e + \delta \log(P_{i,e,c}) + \gamma X_{i,e,c} + \lambda_c + \theta V_{(i),e} + \epsilon_{i,c},$$

- $L_{i,e,c}$: log nighttime density of pixel i in ethnicity e's homeland in country c.
- KII_e : KII of ethnicity e
- $P_{i,e,c}$: pixel's population density
- $X_{i,e,c}$: vector of geographic variables
- λ_c : country fixed effects
- $V_{(i),e}$: additional controls (at the pixel or ethnicity level)

The KII and nighttime luminosity: OLS

	Log nighttime luminosity			
	(1)	(2)	(3)	(4)
KII	-0.512***	-0.420***	-0.136***	-0.110***
	(0.143)	(0.129)	(0.046)	(0.024)
Log population density	0.985***	0.992***	1.084***	1.067***
	(0.064)	(0.051)	(0.071)	(0.061)
Subsistence variables				
Political hierarchies				
Malaria index				
Log population density	yes	yes	yes	yes
Geographic controls		yes	yes	yes
Continent FE			yes	
Country FE				yes
Observations	377,656	377,656	377,656	377,656
R-squared	0.488	0.537	0.582	0.660
Number of clusters	138	138	138	138

- In most specifications, coeff. on log population density ≈ 1
  $\Longrightarrow$ KII coeff. captures association btw KII and luminosity *per capita*

The KII and nighttime luminosity: OLS

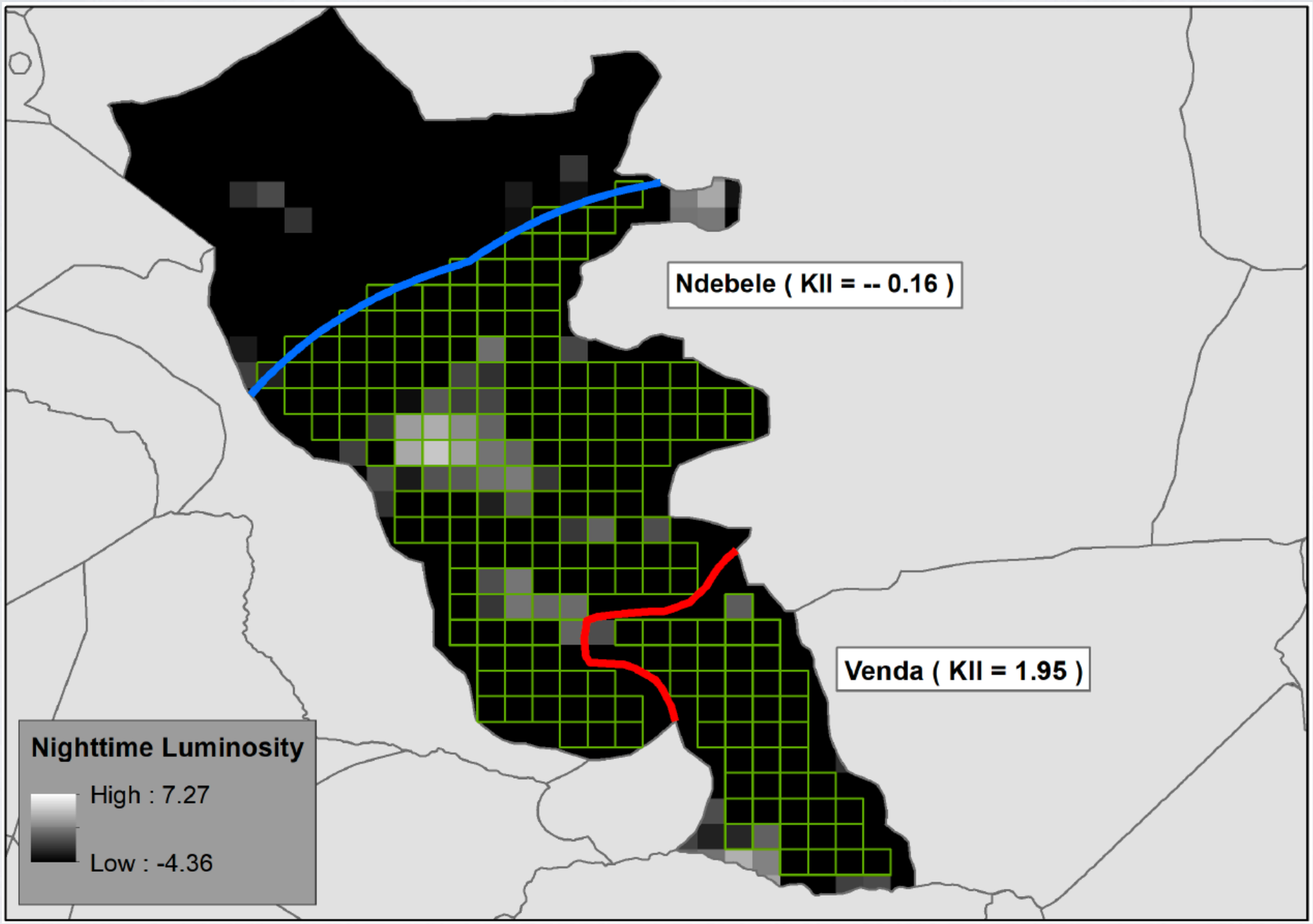
	Log nighttime luminosity								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
KII	-0.512***	-0.420***	-0.136***	-0.110***	-0.066	-0.085**	-0.101***	-0.110***	-0.110***
	(0.143)	(0.129)	(0.046)	(0.024)	(0.045)	(0.041)	(0.025)	(0.024)	(0.024)
Log population density	0.985***	0.992***	1.084***	1.067***	1.066***	1.066***	1.063***	1.067***	1.067***
	(0.064)	(0.051)	(0.071)	(0.061)	(0.063)	(0.063)	(0.061)	(0.104)	(0.106)
Subsistence variables					yes				
Political hierarchies						yes			
Malaria index							yes		
Log population density	yes	yes	yes	yes	yes	yes	yes	yes	yes
Geographic controls		yes	yes	yes	yes	yes	yes	yes	yes
Continent FE			yes						
Country FE				yes	yes	yes	yes	yes	yes
Observations	377,656	377,656	377,656	377,656	377,656	373,070	377,656	377,656	377,656
R-squared	0.488	0.537	0.582	0.660	0.660	0.661	0.660	0.660	0.660
Number of clusters	138	138	138	138	138	138	138	62	96 & 162

- In most specifications, coeff. on log population density ≈ 1
  $\Longrightarrow$ KII coeff. captures association btw KII and luminosity *per capita*

The KII and regional GDP per capita: OLS

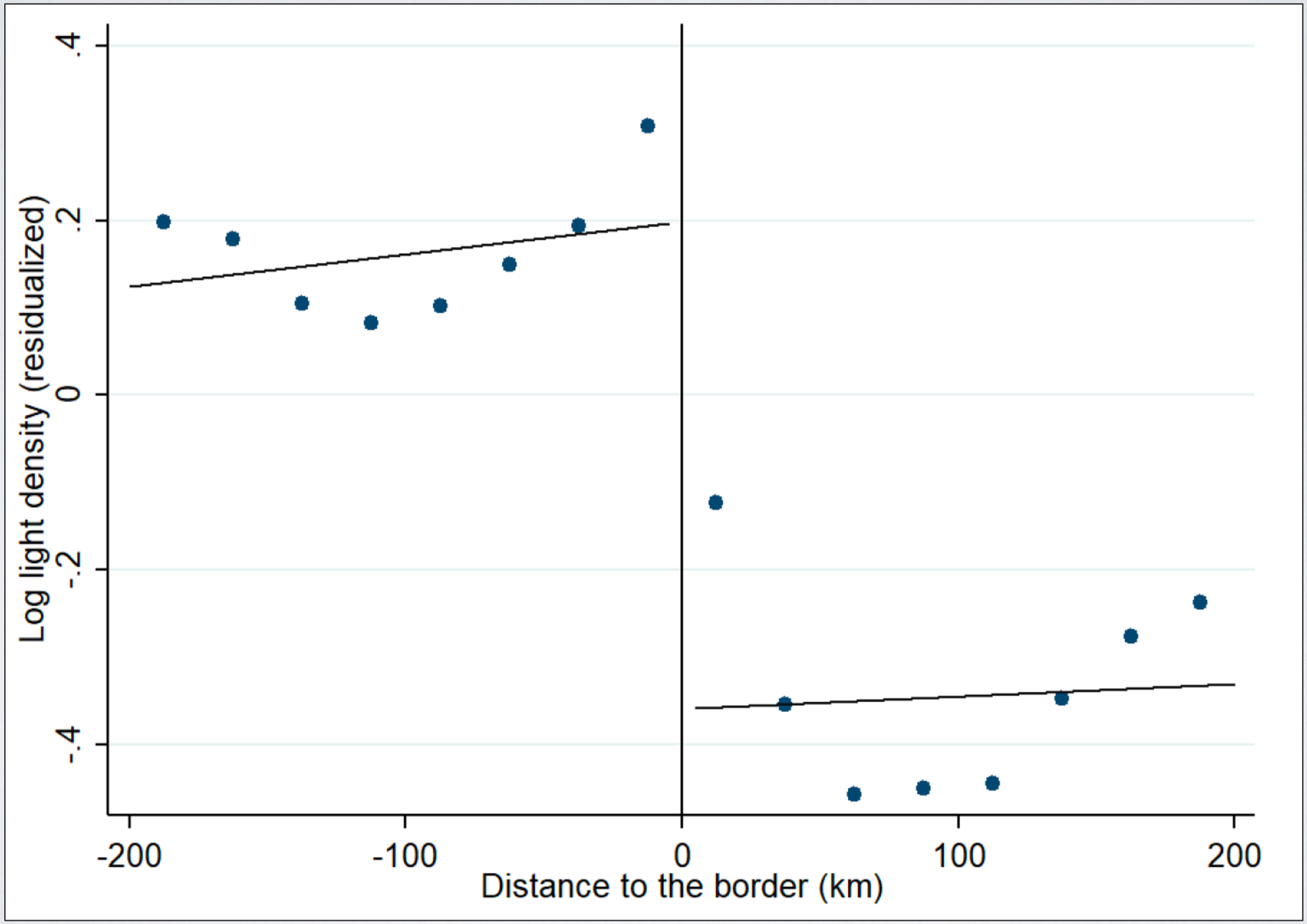
	Log regional GDP per capita							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
KII	-0.445***	-0.459***	-0.455***	-0.085**	-0.168***	-0.129***	-0.081**	-0.081**
	(0.105)	(0.092)	(0.094)	(0.034)	(0.039)	(0.046)	(0.034)	(0.038)
Subsistence variables					yes			
Political hierarchies						yes		
Malaria index							yes	
Oil and Gas production								yes
Capital is in Region								yes
Geographic controls		yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes						
Year × Continent FE			yes					
Year × Country FE				yes	yes	yes	yes	yes
Observations	5,514	5,514	5,514	5,514	5,514	5,514	5,514	5,514
R-squared	0.313	0.511	0.610	0.889	0.890	0.889	0.890	0.902
Number of clusters	61	61	61	61	61	61	61	61

The KII and nighttime luminosity : Spatial regression discontinuity (RD)



The KII and nighttime luminosity : Spatial RD

Binned scatterplot



The KII and nighttime luminosity : Spatial RD

Regression specification:

$$L_{i,e(e'),c} = \beta KII_e + \delta \log(P_{i,e,c}) + \gamma X_{i,e,c} + \theta V_{(i),e} + \lambda_{ee',c} + f(D_{i,e(e'),c}) + \epsilon_{i,e(e'),c}$$

- $L_{i,e(e'),c}$: log nighttime density of pixel i in ethnicity e that is adjacent to ethnicity e' in country c.
- $\lambda_{ee',c}$: ethnicity-pair fixed effects
- $f(D_{i,e(e'),c})$: local linear polynomial in distance from the boundary, with different coefficients on the right and left sides

The KII and nighttime luminosity : Spatial RD

	Log nighttime luminosity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
KII	-0.060***	-0.072***					
	(0.019)	(0.017)					
Log population density	1.088***	1.059***					
	(0.084)	(0.077)					
Subsistence variables							
Political hierarchies							
Malaria index							
Log population density	yes	yes					
Geographic controls		yes					
Distance-to-the-boundary polynomial	yes	yes					
Ethnicity pair FE	yes	yes					
Observations	290,669	290,669					
R-squared	0.600	0.613					
Number of clusters	70	70					

The KII and nighttime luminosity : Spatial RD

	Log nighttime luminosity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
KII	-0.060***	-0.072***	-0.085**	-0.078**	-0.071***	-0.072***	-0.072***
	(0.019)	(0.017)	(0.039)	(0.038)	(0.017)	(0.018)	(0.018)
Log population density	1.088***	1.059***	1.056***	1.061***	1.056***	1.059***	1.059***
	(0.084)	(0.077)	(0.079)	(0.076)	(0.077)	(0.112)	(0.115)
Subsistence variables			yes				
Political hierarchies				yes			
Malaria index					yes		
Log population density	yes	yes	yes	yes	yes	yes	yes
Geographic controls		yes	yes	yes	yes	yes	yes
Distance-to-the-boundary polynomial	yes	yes	yes	yes	yes	yes	yes
Ethnicity pair FE	yes	yes	yes	yes	yes	yes	yes
Observations	290,669	290,669	290,669	289,740	290,669	290,669	290,669
R-squared	0.600	0.613	0.613	0.614	0.614	0.613	0.613
Number of clusters	70	70	70	70	70	58	58 & 70

The KII and nighttime luminosity : Spatial RD

Selected additional robustness checks:

- ✓ Subsample of neighboring ethnicity pairs with KII diff. ≧ 1
- ✓ Including neighboring ethnicities in diff. countries (w. country FEs)
- ✓ Control for distance-to-boundary polynomial X ethnicity pair FE
- ✓ Control for latitude and longitude X ethnicity pair FE
- ✓ Subsamples of pixels at various distance to boundary (0-200 km, 0-150, 0-100, 25-200, …, 50-200, …)
- ✓ Placebo spatial RD analysis with geographic variables as the dep. variables instead of nighttime luminosity

The KII and nighttime luminosity : spatial RD —selected robustness check—

	Log nighttime luminosity								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Distance to border (in km)	0-200	0-150	0-100	25-200	25-150	25-100	50-200	50-150	50-100
KII	-0.072***	-0.065***	-0.046*	-0.096***	-0.093***	-0.079**	-0.118***	-0.121***	-0.115**
	(0.017)	(0.021)	(0.028)	(0.022)	(0.025)	(0.034)	(0.028)	(0.030)	(0.045)
Log population density	yes	yes	yes	yes	yes	yes	yes	yes	yes
Geographic controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Distance-to-the-boundary polynomial	yes	yes	yes	yes	yes	yes	yes	yes	yes
Ethnicity pair FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	290,669	219,874	146,438	268,628	197,833	124,397	227,620	156,825	83,389
R-squared	0.613	0.619	0.623	0.615	0.621	0.626	0.616	0.624	0.630
Number of clusters	70	70	70	70	70	70	70	70	70

The KII and nighttime luminosity : Spatial RD —Placebo regressions—

	(1) Temperature	(2) Precipitation	(3) Agricultural suitability	(4) Elevation	(5) Ruggedness	(6) Distance to coast	(7) Distance to river/lake	(8) Malaria index
KII	-0.377	0.064	0.005	-0.006	-0.005	-0.020*	0.003	-0.061
	(0.297)	(0.093)	(0.007)	(0.026)	(0.005)	(0.011)	(0.003)	(0.095)
Distance-to-the-boundary polynomial	yes	yes	yes	yes	yes	yes	yes	yes
Ethnicity pair FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	290,669	290,669	290,669	290,669	290,669	290,669	290,669	290,669
R-squared	0.981	0.907	0.638	0.664	0.370	0.809	0.714	0.883
Number of clusters	70	70	70	70	70	70	70	70

CONTENTS

1. Economic prosperity and the KII

2. Economic prosperity and *F*

3. Pathways

2nd measure of kinship intensity

The inbreeding coefficient (*F*)

- The Human Origins dataset (David Reich Lab, 2020)
  - ➢ Genetic data on 9,460 present-day individuals from populations around the world

2nd measure of kinship intensity

The inbreeding coefficient (*F*)

- Measures the expected fraction of one's genome where the maternal and paternal variants are "identical by descent" (IBD)
  - ➢ Expected value of *F* is one-half the **coefficient of relationship** between their two parents

- In practice, we estimate F_{ROH} (not *F)* for individuals in HO and compute each population's mean F_{ROH}
  - ➢ We include "genetic controls"

- Though *F* can be measured from the genome, the relevant variation in *F* for our analyses captures *cultural* practices

The inbreeding coefficient and kinship intensity: OLS estimates

	Cousin marriage preference				KII			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\overline{F_{ROH}}$	18.491***	45.744***	44.566***	37.557***				
	(5.346)	(5.653)	(5.772)	(8.379)				
Genetic controls		yes	yes	yes				
Continent FE			yes					
Country FE				yes				
Observations	398	397	397	397				
R-squared	0.077	0.433	0.453	0.683				
$\Delta R^2(\overline{F_{ROH}})$	0.0775	0.0951	0.115	0.0419				
Number of clusters	127	127	127	127				

The inbreeding coefficient and kinship intensity: OLS estimates

	Cousin marriage preference				KII			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\overline{F_{ROH}}$	18.491***	45.744***	44.566***	37.557***	11.641***	13.185***	13.319***	14.549***
	(5.346)	(5.653)	(5.772)	(8.379)	(3.067)	(2.714)	(2.761)	(4.033)
Genetic controls		yes	yes	yes		yes	yes	yes
Continent FE			yes				yes	
Country FE				yes				yes
Observations	398	397	397	397	396	395	395	395
R-squared	0.077	0.433	0.453	0.683	0.066	0.717	0.720	0.843
$\Delta R^2(\overline{F_{ROH}})$	0.0775	0.0951	0.115	0.0419	0.0665	0.0171	0.0200	0.0136
Number of clusters	127	127	127	127	127	127	127	127

The inbreeding coefficient and nighttime luminosity: OLS

	Log nighttime luminosity									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\overline{F_{ROH}}$	-41.297**	-27.265**	-25.841**	-27.094**	-21.026***	-18.235**	-15.943**	-20.923***	-21.026***	-21.026***
	(18.654)	(11.294)	(11.267)	(12.315)	(7.633)	(8.357)	(6.766)	(7.460)	(5.584)	(7.995)
Subsistence variables						yes				
Political hierarchies							yes			
Malaria index								yes		
Log population density	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Genetic controls		yes	yes	yes	yes	yes	yes	yes	yes	yes
Geographic controls			yes	yes	yes	yes	yes	yes	yes	yes
Continent FE				yes						
Country FE					yes	yes	yes	yes	yes	yes
Observations	281,177	281,177	281,177	281,177	281,177	281,177	281,100	281,177	281,177	281,177
R-squared	0.503	0.633	0.652	0.652	0.674	0.674	0.674	0.674	0.674	0.674
Number of clusters	98	98	98	98	98	98	98	98	30	95 & 157

CONTENTS

1. Economic prosperity and the KII

2. Economic prosperity and *F*

3. **Pathways**

Alternative pathways

- Results mostly robust to dropping **European-ancestry countries** and controlling for **Christianity**

- Reverse causality (econ dev → KI) unlikely to fully drive our results
  - Spatial RD results
  - KII based observations from before industrialization/colonization
  - Results robust to controlling for settlement complexity
  - Results robust to using subsample of pixels with very low or high population density (to test urbanization channel)

Mechanisms

1. The division of labor and comparative advantage
2. Cultural psychology (trust, impersonal cooperation, impartiality, individualism, conformity; Schulz *et al., Science* 2019)
3. Institutions
4. Innovation
5. Inbreeding depression

- Data consistent with a important roles for 1-4, but not 5

The KII, economic specialization, and market exchange

	(1) Specialization index	(2) Specialization index	(3) Specialization index	(4) Intercommunity food trade	(5) Market participation
KII	-0.141*	-0.144**	-0.150**	-0.003	-0.080**
	(0.075)	(0.068)	(0.069)	(0.050)	(0.031)
Geographic controls	yes	yes	yes	yes	yes
Subsistence dummies		yes	yes	yes	yes
Country FEs			yes		
Observations	651	651	639	170	93
R-squared	0.557	0.576	0.738	0.257	0.272
Number of clusters	125	125	125	74	49

Cross-country evidence on mechanisms

	(1) Openness to trade	(2) Trust	(3) Blood donations	(4) Expropriation Risk	(5) Institutional quality	(6) CPI	(7) Articles per m.	(8) Patents per m.
KII	-0.040*	-0.026**	-2.399***	-0.424***	-0.116***	-32.508***	-94.045***	-14.847
	(0.022)	(0.012)	(0.895)	(0.105)	(0.036)	(9.389)	(28.716)	(12.554)
Geographic controls	yes	yes	yes	yes	yes	yes	yes	yes
Observations	151	70	142	86	79	154	159	75
R-squared	0.261	0.383	0.560	0.634	0.272	0.506	0.559	0.177

CONCLUDING REMARKS

Concluding remarks

- We establish a **tight empirical relationship between kinship intensity and economic development**
  - A **one-SD-increase in the KII** is associated with:
    - a ~**35% decrease in per capita luminosity and GDP**, worldwide
    - a ~**10% decrease** …, within-country
  - Robust robust across wide array of analyses; estimated effect size remarkably consistent
  - Plausible mechanisms include effects of kinship intensity on the division of labor, cultural psychology, institutions, and innovation
- Policy implications are still unclear; more research is needed
  - Cannot conclude intensive kin-based institutions are less "desirable" and that policy should seek to dismantle them
    - In many places, intensive kin-based institutions play a critical role in providing a safety net and maintaining social order
    - Tight family network may also foster happiness and life satisfaction (Alesina Giuliano 2012)

Thank you

JOHN TEMPLETON FOUNDATION

Inspiring Awe & Wonder

More on the inbreeding coefficient

- The inbreeding coefficient, *F*, measures the probability that the maternal and paternal variants at a location in the genome are IBD
  - The expected value of *F* is the coefficient of kinship, or one-half the coefficient of relationship, between their two parents
  - Though *F* can be measured from the genome, the relevant variation in *F* for our analyses captures *cultural* practices

- Our measure of *F* is $F_{ROH} = \sum_i \frac{l_i}{3,000}$
  - The sum is over the individual's ROHs that are at least 1.5 Mb in length and l_i is the length of ROH i in Mb
  - We estimated F_{ROH} with the ROHgen consortium's ROHgen2 pipeline

- ROHs can arise in individuals for reasons unrelated to marital practices and kinship systems
  - We compute and control for expected heterozygosity and migratory distance from East Africa, the top 20 PCs, and mean regional pairwise F_{ST}

Robustness to:

1. excluding European-ancestry observations
2. controlling for deep Christianization

	Language-tree matches				Direct matches			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Regressions of log nighttime luminosity at the pixel level							
KII	-0.141*	-0.016	0.002	-0.059	-0.097	0.035	0.062	-0.062
	(0.085)	(0.065)	(0.088)	(0.052)	(0.101)	(0.079)	(0.137)	(0.065)
Log population density	yes	yes	yes	yes	yes	yes	yes	yes
Observations	201,391	201,391	488,558	488,558	129,168	129,168	377,656	377,656
R-Squared	0.515	0.601	0.546	0.653	0.558	0.642	0.551	0.660
Number of clusters	96	96	162	162	85	85	138	138
	Panel B. Regressions of log nighttime luminosity at the country-ethnicity level							
KII	-0.124*	0.023	-0.271***	0.031	-0.209**	-0.175***	-0.392***	-0.098
	(0.074)	(0.050)	(0.081)	(0.043)	(0.082)	(0.066)	(0.082)	(0.067)
Log population density	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,711	1,711	2,143	2,143	482	482	659	659
R-Squared	0.543	0.695	0.538	0.737	0.650	0.802	0.646	0.831
Number of clusters	95	95	161	161	85	85	135	135
	Panel C. Regressions of log regional GDP per capita at the region level							
KII	-0.360***	-0.103	-0.375***	-0.111**	-0.358***	-0.113	-0.367***	-0.115**
	(0.078)	(0.074)	(0.073)	(0.046)	(0.077)	(0.074)	(0.072)	(0.045)
Year FEs	yes		yes		yes		yes	
Observations	3,182	3,182	9,019	9,019	3,182	3,182	9,019	9,019
R-Squared	0.645	0.856	0.608	0.896	0.646	0.856	0.607	0.896
Number of clusters	30	30	83	83	30	30	83	83
	Panel D. Regressions of log nighttime luminosity (spatial RD analysis)							
KII	-0.083*		-0.068		-0.113*		-0.120	
	(0.043)		(0.048)		(0.060)		(0.091)	
Log population density	yes		yes		yes		yes	
Distance-to-the-boundary polynomial	yes		yes		yes		yes	
Ethnicity pair FE	yes		yes		yes		yes	
Observations	378,764		750,996		115,660		290,669	
R-Squared	0.634		0.623		0.659		0.613	
Number of clusters	71		104		48		70	
	Panel E. Regressions of log nighttime luminosity at the pixel level with $\overline{F_{ROH}}$							
$\overline{F_{ROH}}$					-29.364**	-35.593***	-26.052**	-20.328***
					(11.368)	(11.866)	(11.094)	(7.475)
Log population density					yes	yes	yes	yes
Genetic controls					yes	yes	yes	yes
Observations					63,142	63,142	281,177	281,177
R-Squared					0.621	0.641	0.652	0.674
Number of clusters					51	51	98	98
Subsamble, no Europeans	yes	yes			yes	yes		
Deep Christianization			yes	yes			yes	yes
Geographic controls	yes	yes	yes	yes	yes	yes	yes	yes
Country FE (Year × Country FE for Panel C)		yes		yes		yes		yes