

ECON 184

Economic Growth: the role of geography

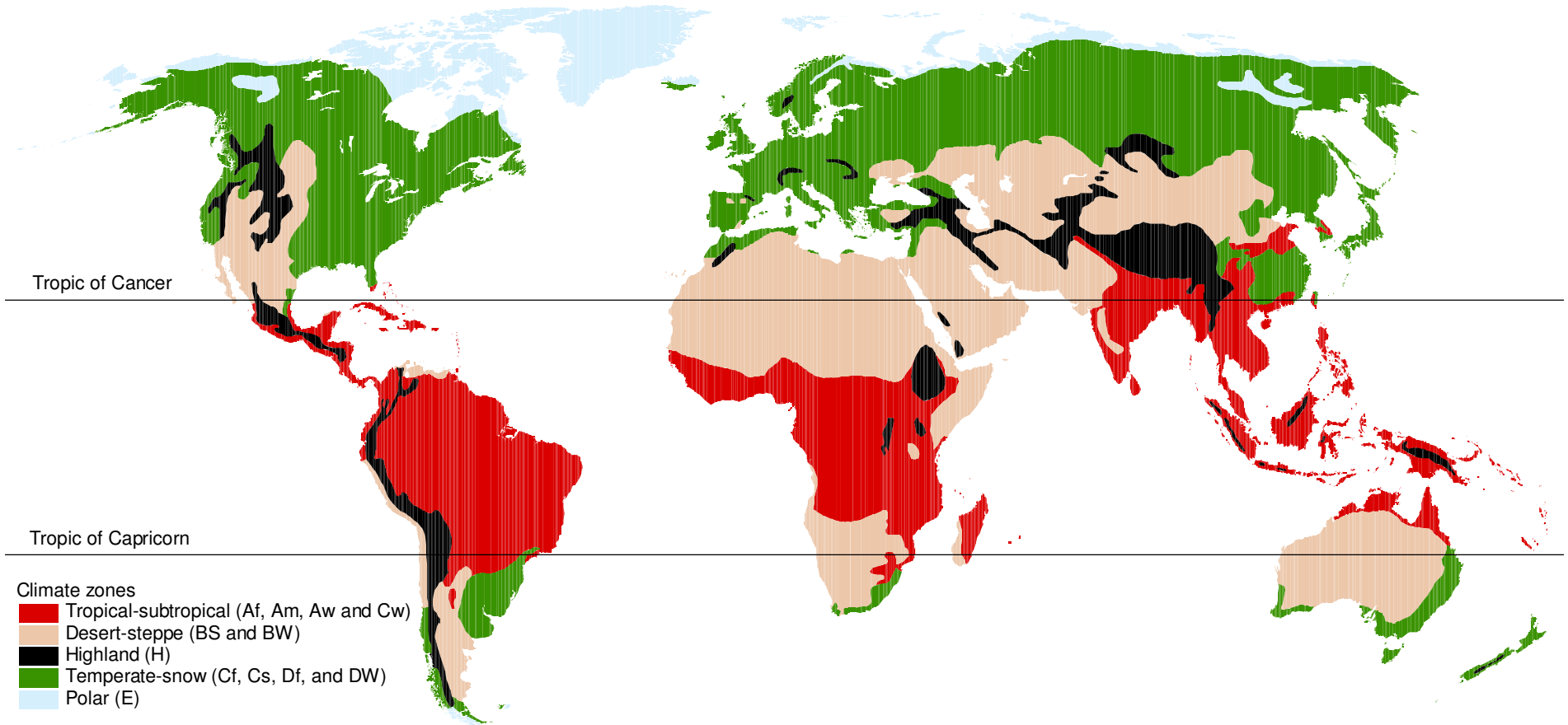
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1 Geography and growth: initial analysis

Climate zones

Figure 3. Koeppen-Geiger climate zones



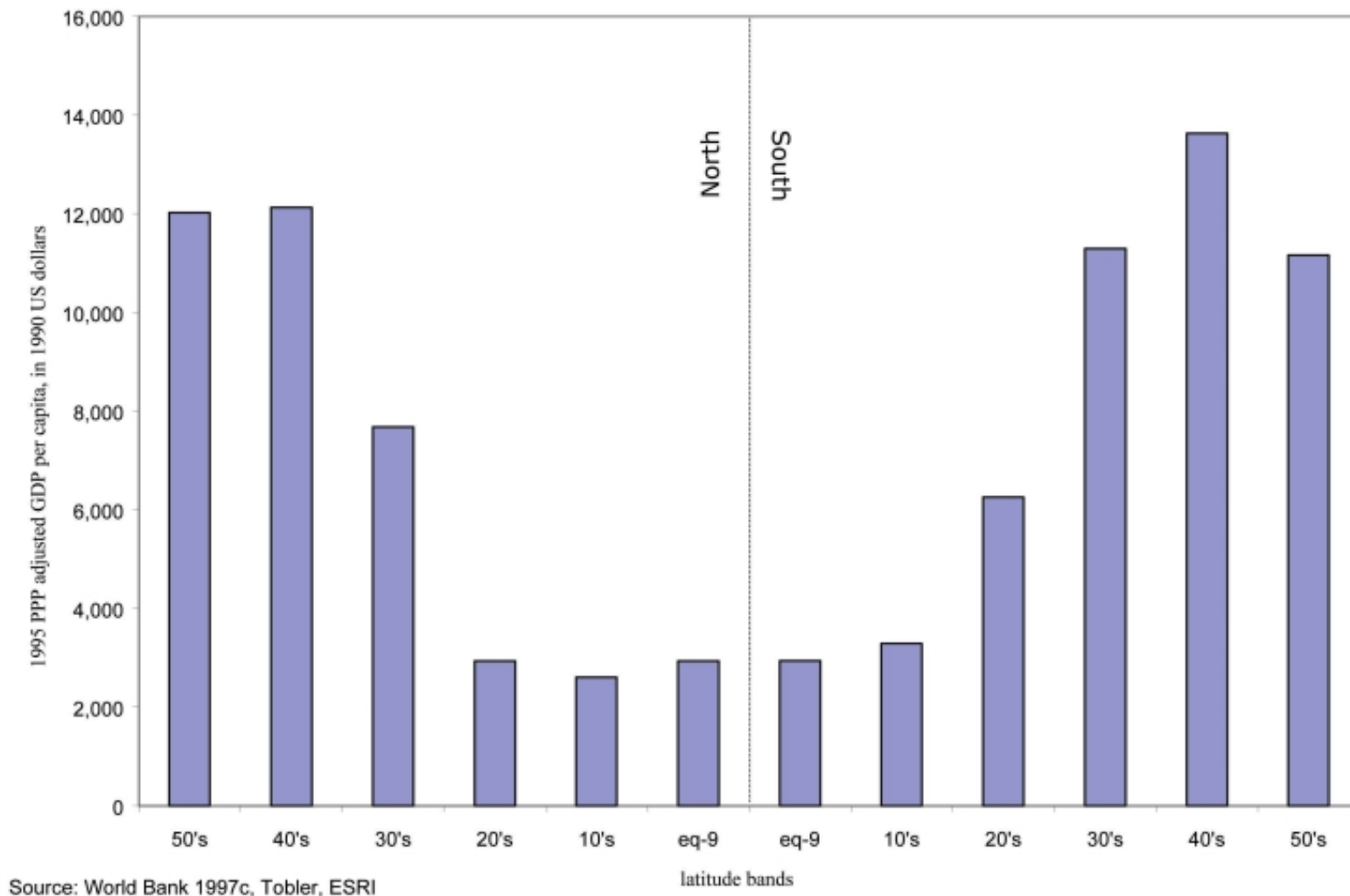
SSA countries are poor and between the tropics

Table 1. Geographical Characteristics of Selected Regions

	Continent GDP/PC	Total Population	Total Land Area (million km ²)	Land in Tropics (%)	Population w/100km of Coast (%)	Population w/100km of Coast or River (%)	Landlocked Population (%)	Distance to Core Market (km)	Coastal Density (pers/ km ²)	Interior Density (pers/ km ²)
Sub-Saharan Africa	1,865	580	24	91	19	21	28	6,237	40	22
Western Europe	19,230	383	3	0	53	89	4	922	109	125
East Asia	10,655	1,819	14	30	43	60	0	3,396	381	91
South Asia	1,471	1,219	4	40	23	41	2	5,744	387	287
Transition Economies	3,902	400	24	0	9	55	21	2,439	32	16
Latin America	5,163	472	20	73	42	45	3	4,651	52	18

GDP per capita is higher away from the Equator line

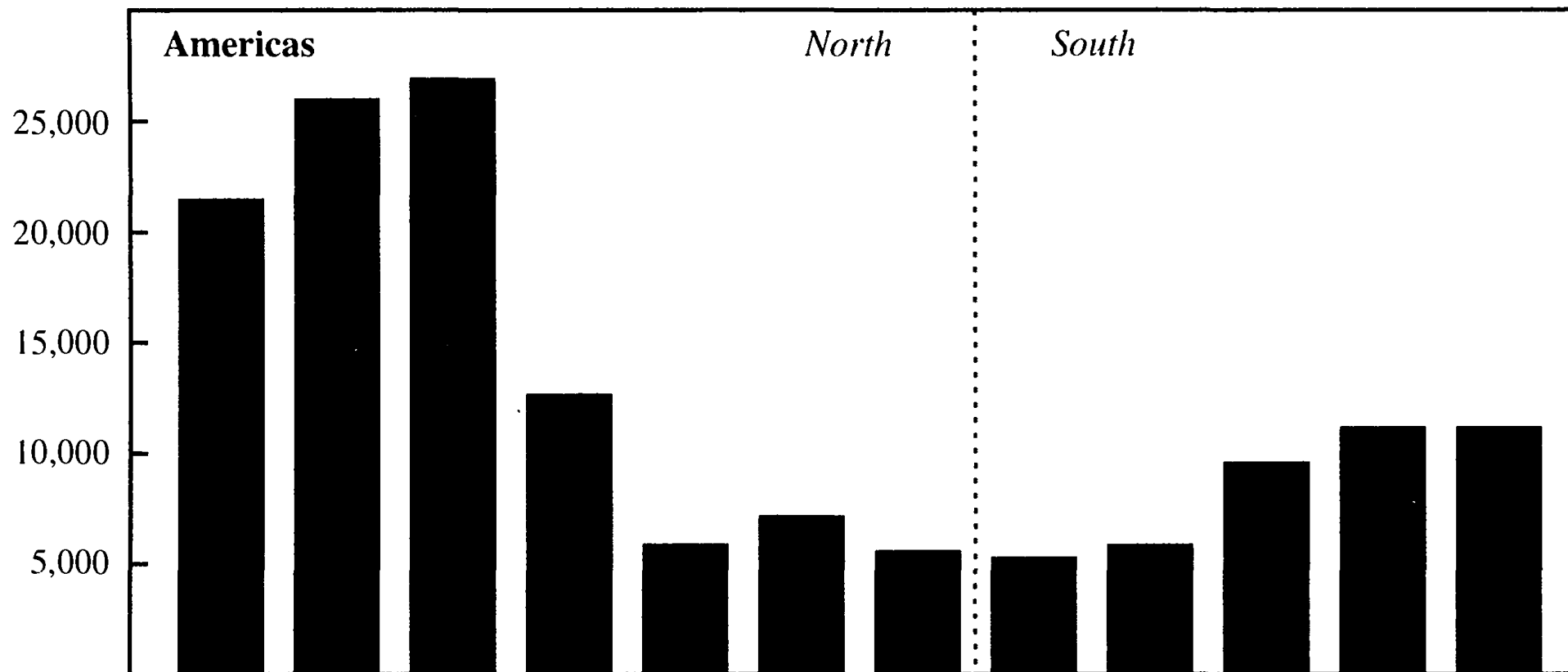
Figure 2. GDP per capita by Latitude



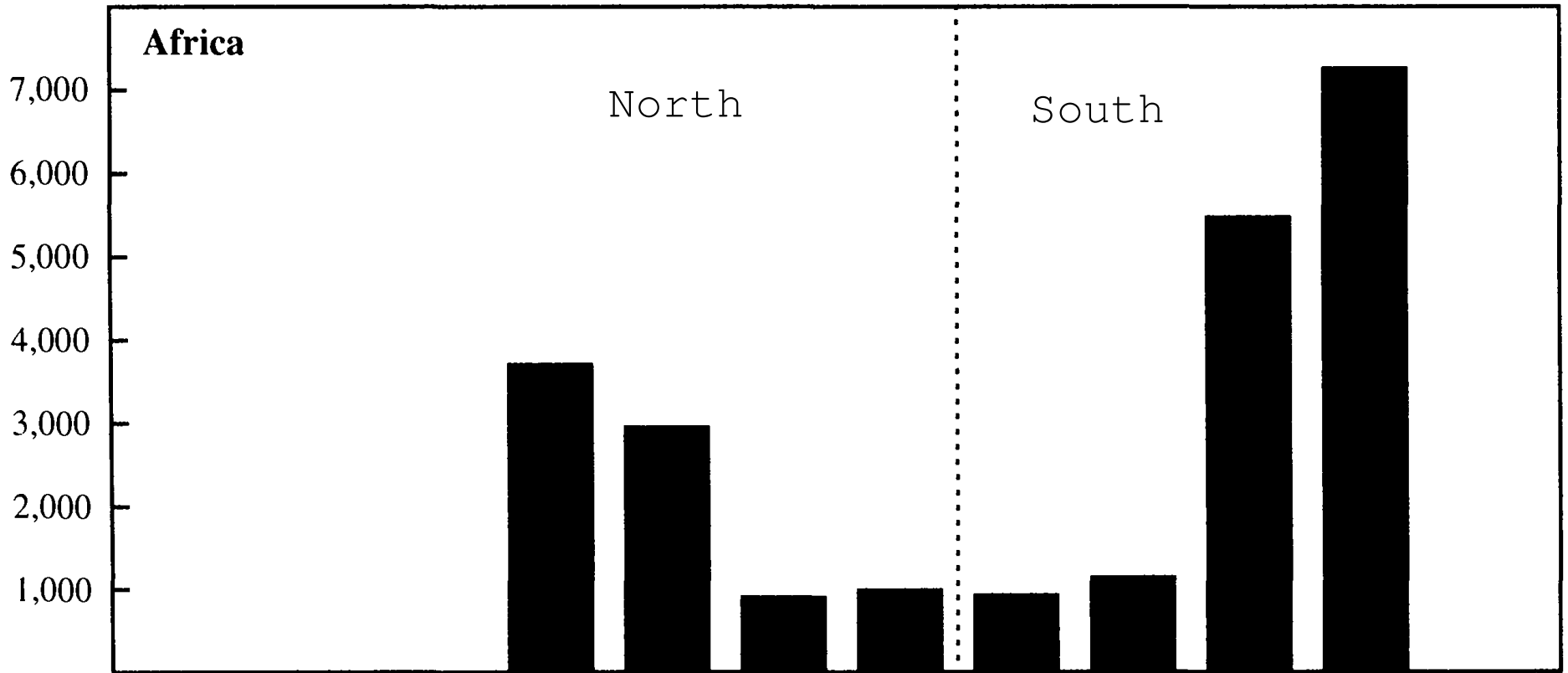
...same in The Americas

Figure 3. GDP Per Capita by Latitude, Selected Regions, 1995^a

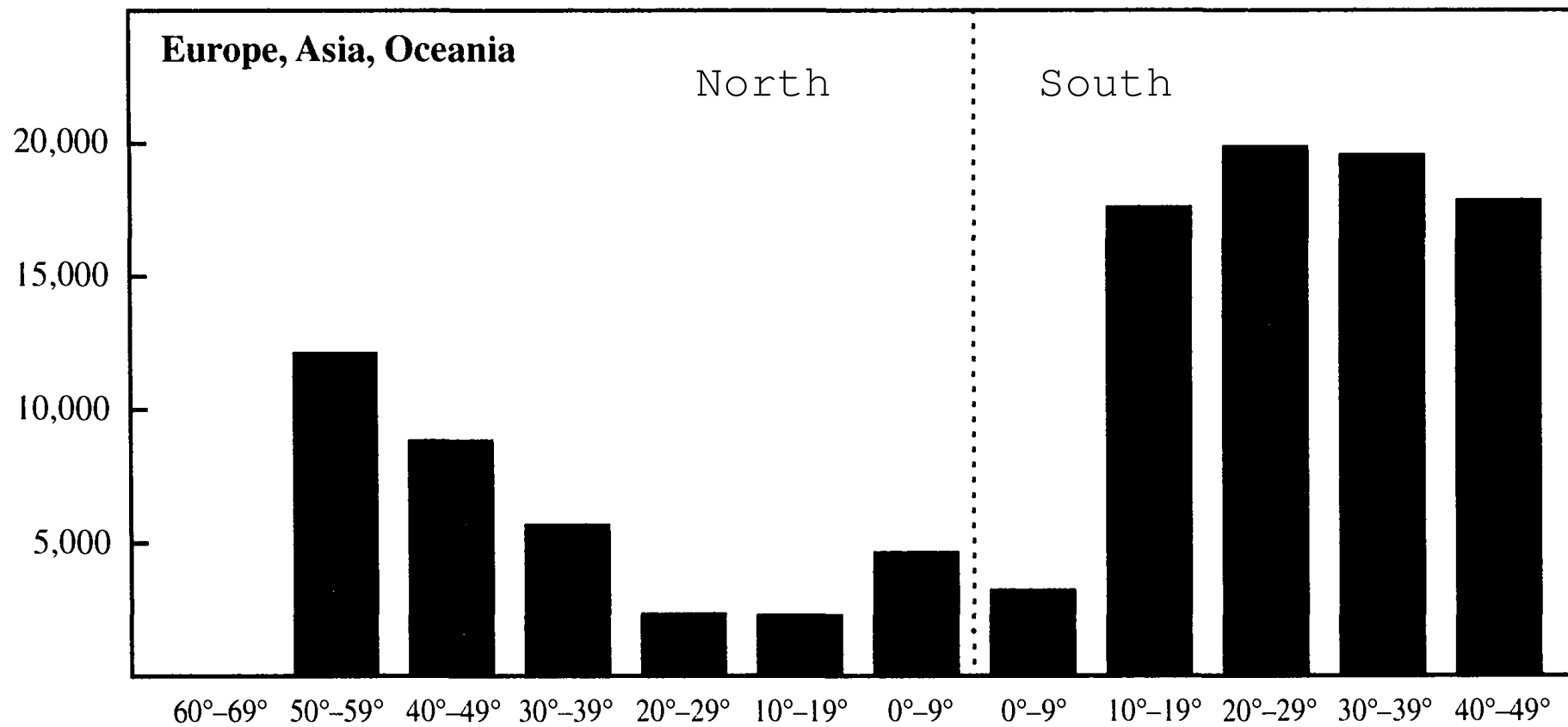
International dollars



...in Africa

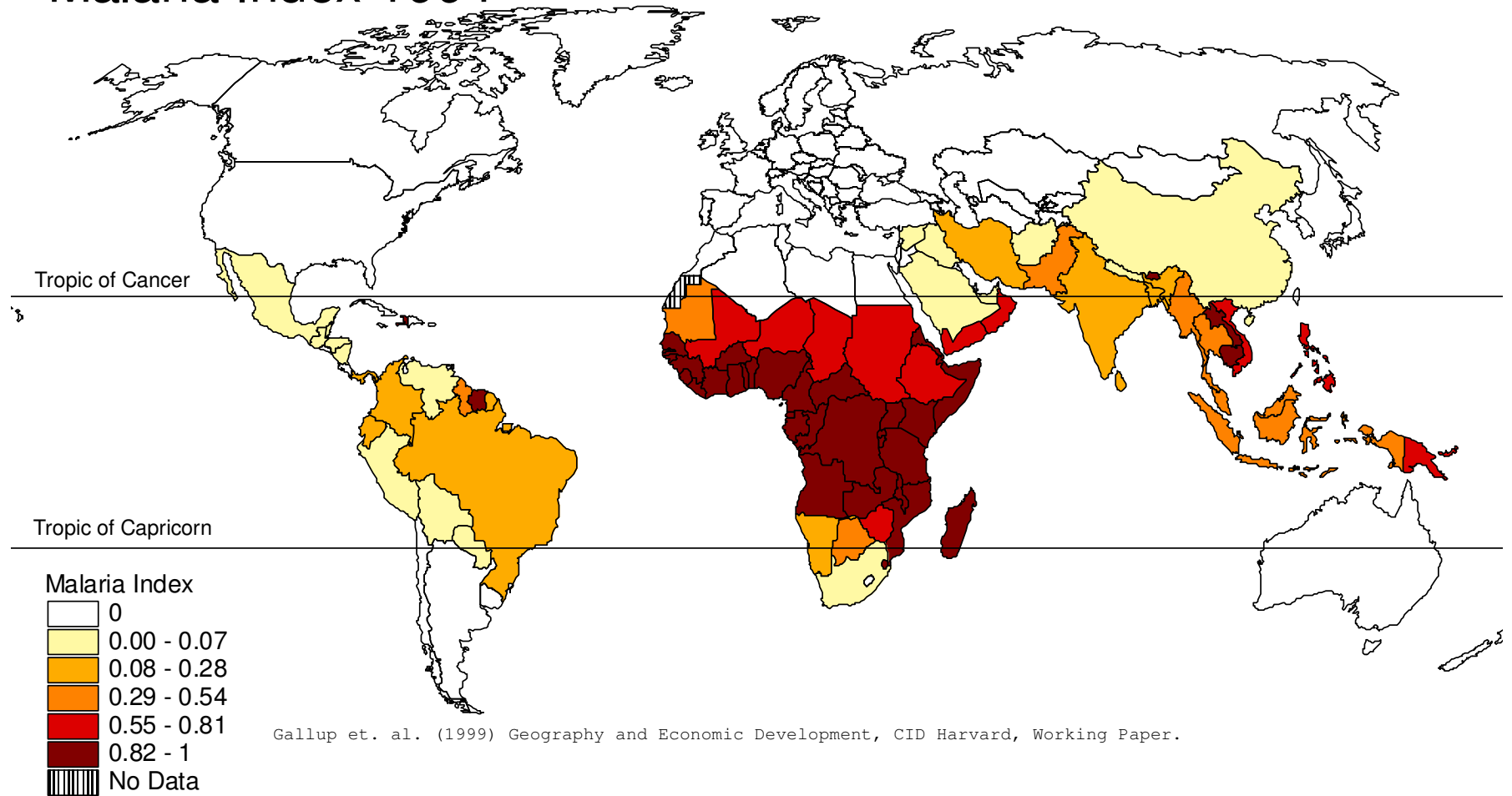


and the rest of the world



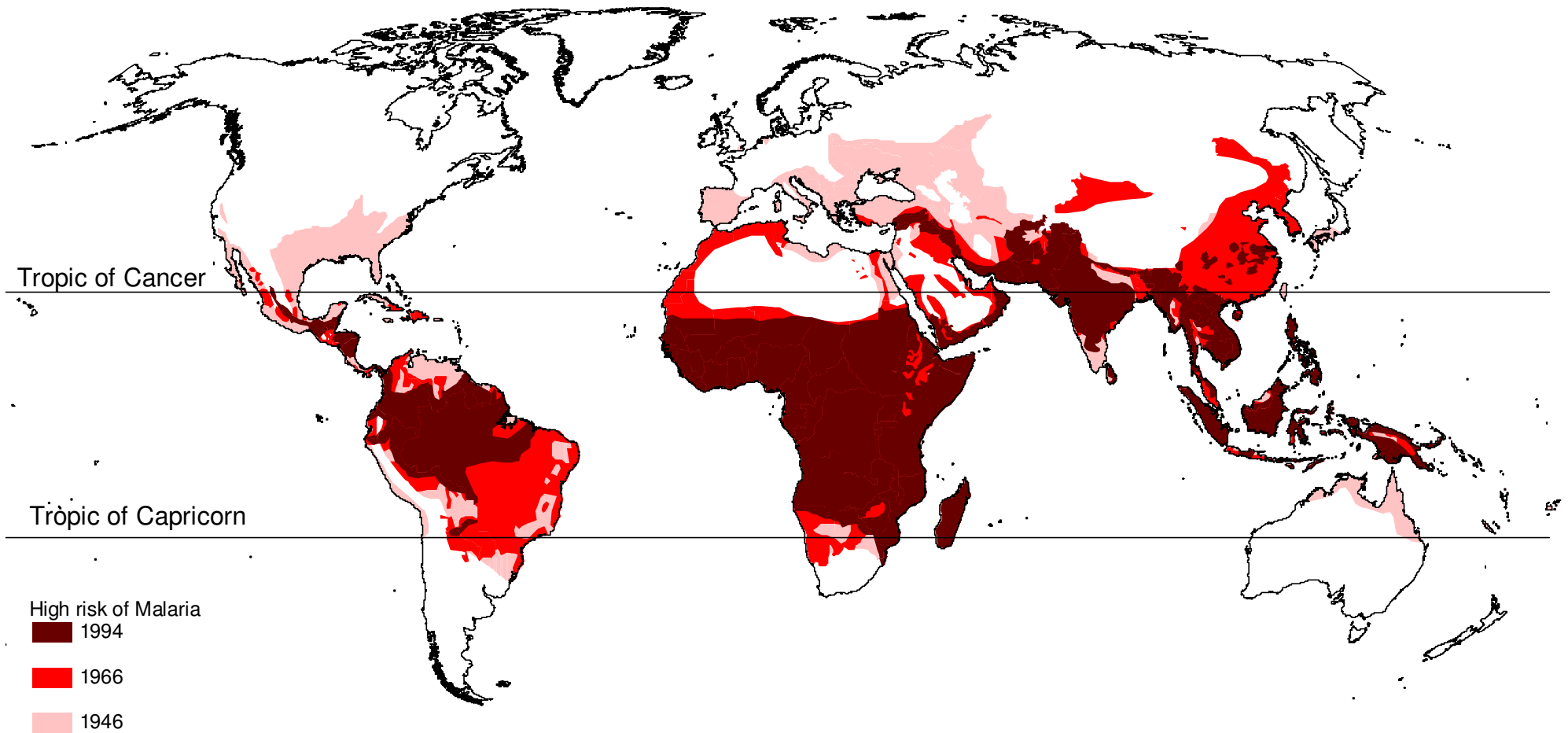
Tropical problem: malaria

Figure 4.
Malaria Index 1994



Malaria persists between the tropics

Figure 5.
Malaria risk - 1946, 1966, 1994



2 How can geography affect economic growth?

- Based on Sachs (2001) and Bloom and Sachs (1998)
 - During and after colonization the poor countries are the same.
 - There is no reversal of fortunes.
 - What remains the same is geography.
 - Examples: Access to river and oceans, distance from the Equator line.
 - ...but how can geography affect economic growth?

2.1 Technology

- Soil formation and erosion:
 - Tropical soils loose nutrients faster.
 - In temperate zone the nutrients are in the soil.
 - In the tropics the nutrients are in the plant. No plant, no nutrients.
- Tropical soil has higher prevalence of crops pesticides and parasites.
- Photosynthesis depends (negatively) on plant transpiration and this is higher in the tropics.
- Water availability: water evaporates faster in the tropics.

2.2 Health

- Morbidity and mortality through diseases is more prevalent in the tropics.
- Malaria requires 18°C for the mosquito to be effective.
- Bacterial infection is favored by warm and moist environments.
- However, temperate zones have their own problems (e.g., diphtheria, measles.)
- Other reasons (Sachs and Gallup, 1999)
 - Coastal regions and trade.
 - Landlock economies.

3 Regression analysis

3.1 Methods

- **Question:** does geography explain economic growth?
- We can test this by estimating the following model

$$\Delta y_i = \alpha + \gamma' geo_i + \beta' x_i + e_i$$

- Where Δy_i be the growth rate for country i .
- geo_i set of geography-related variables (e.g. latitude)
- x_i other variables (e.g., education, institutions).
- γ is the vector of parameters of interest.
- e_i is the error term. We need this to be uncorrelated with the geo_i variables. Why?

3.2 The sample

- A cross-section sample of countries.
- The study evaluates not only the effect of geography on growth (Δy_i) but also on the (log) levels of income y_i .
- Variable definitions (see handout.)

3.3 Results

Table 2. Level of GDP

	(1) lgdp50	(2) lgdp90	(3) lgdp95	(4) lgdp95	(5) lgdp95 (non-Africa)	(6) lgdp95
Tropical Area (%)	-0.69 (4.13)	-0.99 (5.78)	-0.99 (5.10)			
Pop 100 km (%)	0.71 (4.02)	1.00 (5.43)	1.09 (5.27)	0.85 (3.63)	1.21 (4.17)	0.36 (2.53)
LDistance	-0.22 (2.56)	-0.39 (4.39)	-0.34 (3.41)			0.03 (0.55)
Shipping Cost (CIF/FOB)				-2.28 (2.32)	-13.50 (4.66)	
Malaria index 1994 (0-1)				-1.55 (6.60)	-1.26 (2.69)	-1.15 (7.65)
Log hydrocarbons per person				0.01 (1.84)	0.01 (1.75)	0.01 (1.85)
Socialism						-0.05 (0.31)
New State (0-3)						-0.06 (0.98)
Trade Openness (0-1)						0.23 (7.38)
Public Institutions (0-10)						0.55 (3.17)
Constant	9.07 (13.58)	11.19 (16.26)	10.98 (14.10)	10.84 (9.82)	22.64 (7.42)	6.71 (11.06)
Observations	129	129	129	83	52	97
R ²	0.38	0.58	0.50	0.69	0.56	0.88

Absolute value of *t*-statistics in parentheses

Table 3. GDP Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	gr6590	gr6590	gr6590	gr6590	gr6590 (TSLs)	gr6590	gr6590
GDP p.c. 1965	-2.3 (7.70)	-2.4 (8.02)	-2.5 (8.06)	-2.6 (7.87)	-2.7 (7.60)	-2.3 (7.41)	-2.4 (7.09)
Years of secondary schooling	0.3 (1.75)	0.2 (1.77)	0.2 (1.32)	0.2 (1.34)	0.2 (1.15)	0.1 (0.81)	0.1 (0.89)
Log life expectancy 1965	6.6 (7.23)	5.5 (6.21)	4.3 (4.45)	3.3 (3.60)	2.4 (1.79)	4.1 (4.53)	3.4 (3.89)
Trade Openness 1965-90 (0-1)	1.9 (5.49)	1.9 (4.79)	1.7 (4.79)	1.7 (4.70)	1.7 (4.39)	1.8 (4.79)	1.8 (4.66)
Public Institutions (0-10)	0.3 (3.08)	0.3 (2.63)	0.3 (3.32)	0.4 (3.92)	0.5 (3.66)	0.3 (3.20)	0.4 (3.47)
LDistance		0.0 (0.24)					
Pop100km (%)		1.0 (3.07)	0.9 (3.01)	0.8 (2.64)	0.6 (1.91)		
Tropical area (%)		-0.9 (2.28)	-0.6 (1.35)	-0.5 (1.09)	-0.4 (0.82)	-0.7 (1.89)	-0.5 (1.44)
Malaria index 1966			-1.2 (2.15)	-2.0 (3.60)	-2.6 (3.87)	-0.9 (1.86)	-1.6 (2.89)
dMal6694				-2.5 (3.93)	-4.5 (2.12)		-1.9 (2.94)
Log coastal density						0.3 (4.91)	0.2 (4.34)
Log inland density						-0.1 (2.26)	-0.1 (1.60)
Constant	-8.9 (2.90)	-4.1 (1.17)	1.3 (0.34)	5.9 (1.57)	9.8 (1.76)	0.7 (0.19)	4.1 (1.08)
Observations	75	75	75	75	75	75	75
R ²	0.71	0.75	0.77	0.80	0.78	0.80	0.82

Robust *t*-statistics in parentheses

- Questions:
 - Can we talk about *causal effects*?
 - Is geography a fixed factor?
 - What about malaria and south of Europe?
 - What are the policy recommendations you can derive from this approach?