

Proximity Matters:

How better health, urbanization, and income
grew together, 1870-2000

A Systems Analysis Approach to Health and
Wellbeing in the Urban Environment
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Solow (1957) "Technical Change and the Aggregate Production Function"

- 7/8's of increased output, 1909-49, attributable to technical progress, not increases in amounts of capital and labor
- It's not factor accumulation.... So can it be that better health permitted urban growth that in turn boosted technical progress?

How developed countries pulled ahead

1. *Rich-poor gap has grown since 1870 (Pritchett, 'Divergence, big-time')*
2. Euro+ was not richer than “the Rest” in earlier epochs
3. Enter the germ theory
4. Further speed-up since 1945 in better health, urbanization, technical progress

CDC's 10 greatest hits, 1900-99

1. Vaccination
2. Motor-vehicle safety
3. Safer workplaces
4. Control of infectious diseases
5. Decline in deaths from coronary heart disease and stroke
6. Safer and healthier foods
7. Healthier mothers and babies
8. Family planning
9. Fluoridation of drinking water
10. Recognition of tobacco use as a health hazard

Three measures of the expanding rich-poor gap, 1870-1990, from Pritchett

Ratios/differences	1870	1960	1990
Richest to Poorest	8.7	38.5	45.2
Av. Adv. capitalist to all others	2.4	4.2	4.5
Absolute deficit from leader	P\$1,286	P\$7,650	P\$12,662

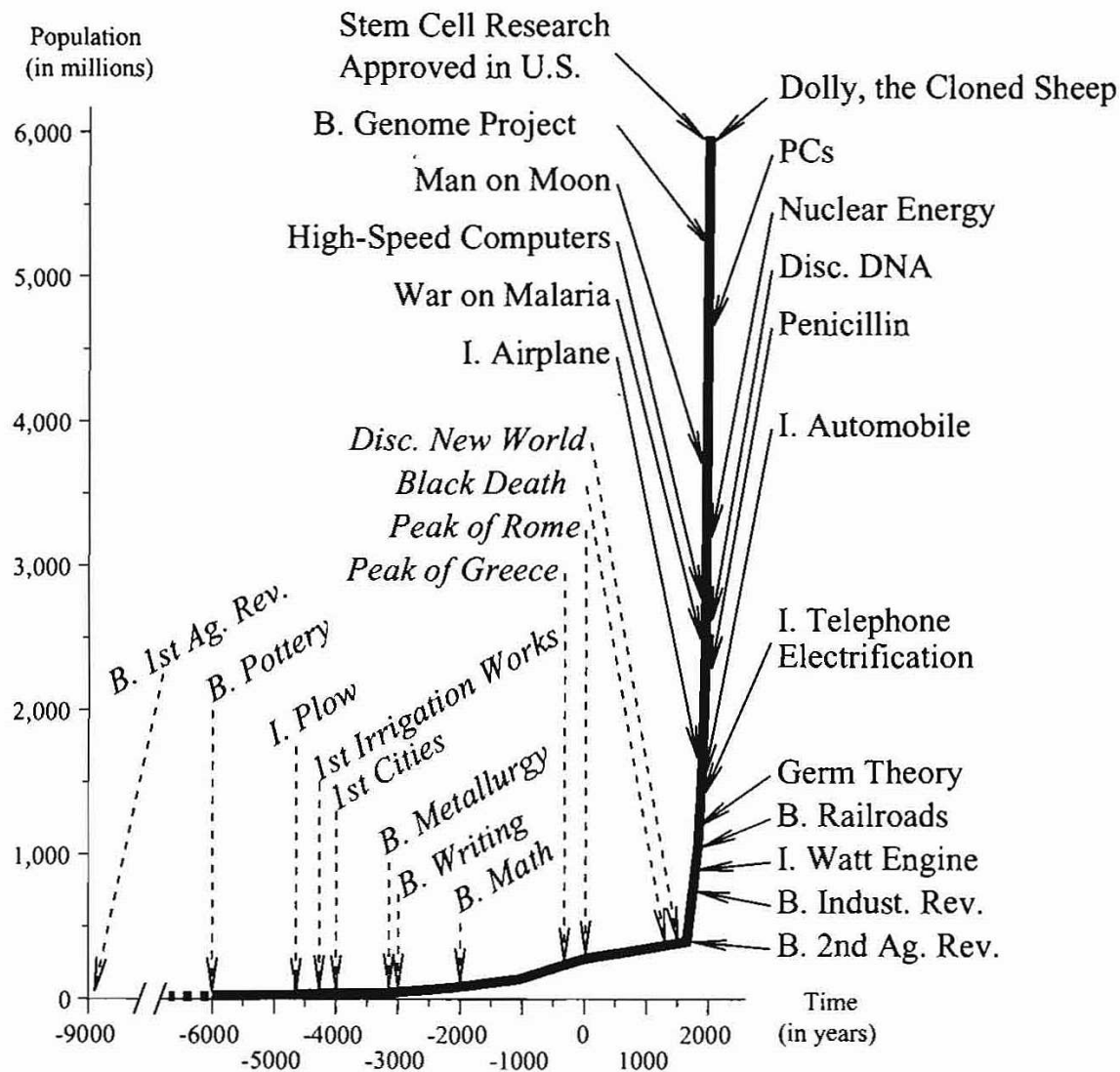
Differential growth rates of per capita income, 1000-1820, 1820-1998,
Rich countries (Group A) and all others (Group B)

Country Group	1000 – 1820	1820 - 1998
A – rich countries	< 0.2	1.67
B – Others	< 0.05	0.95

Data from Maddison (2001), p. 46. All countries/regions grew slowly before 1820 [1870?] but there followed the “great divergence”

Y/P, selected dates, 1000 - 1998

Country Group	1000	1700	1820	1998
A (rich)	405	907	1130	21470
B (poor)	440	551	573	3102
A/B	0.9	1.7	2.0	6.9



Factors explaining health improvements include...

- Public works projects
 - Filtering and chlorinating water
 - Sanitation systems
 - Draining swamps
- Pasteurizing milk
- Mass vaccination campaigns
- Micro public health –
 - Boiling bottles and milk
 - Protecting food from insects; washing hands
 - Ventilating rooms
 - Updating vaccinations

From John Snow & the Soho pump handle to the germ theory of disease (1854-1880s and 1890s)

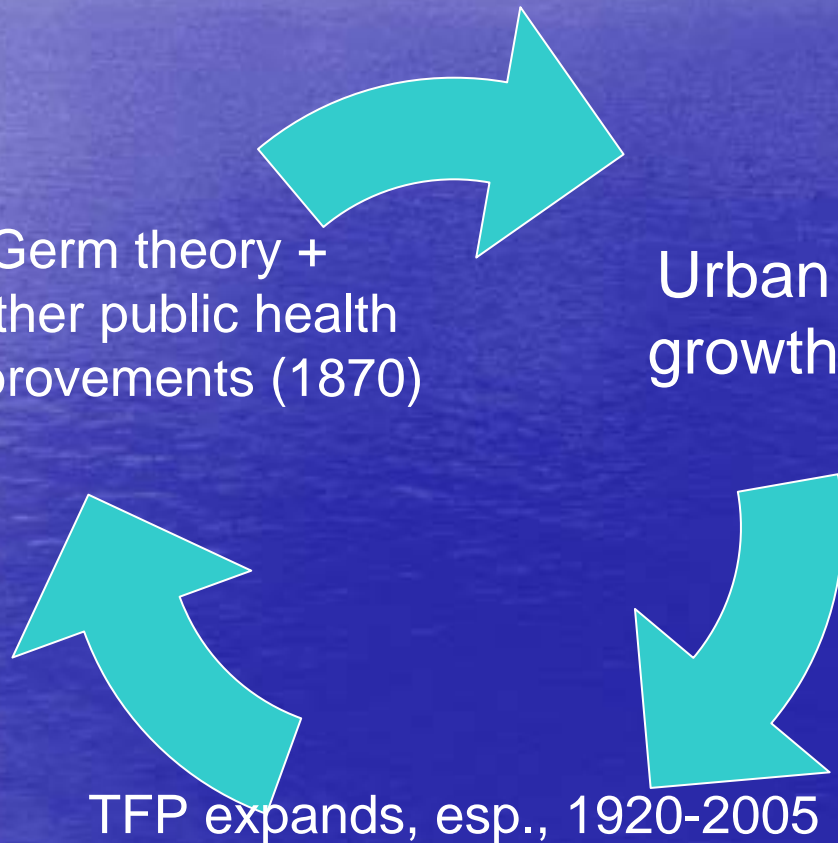
- In UK, 97% reduction in water and food-borne diseases – typhoid, cholera, dysentery, TB
- “Water purification [in cities] can explain half of the mortality reduction in the United States in the first third of the twentieth century” (Cutler & Miller 2005)
- From here we go to the health-urbanization-growth linkages

Health, urbanization, TFP expand in ongoing feedback loops

Germ theory +
further public health
improvements (1870)

Urban
growth

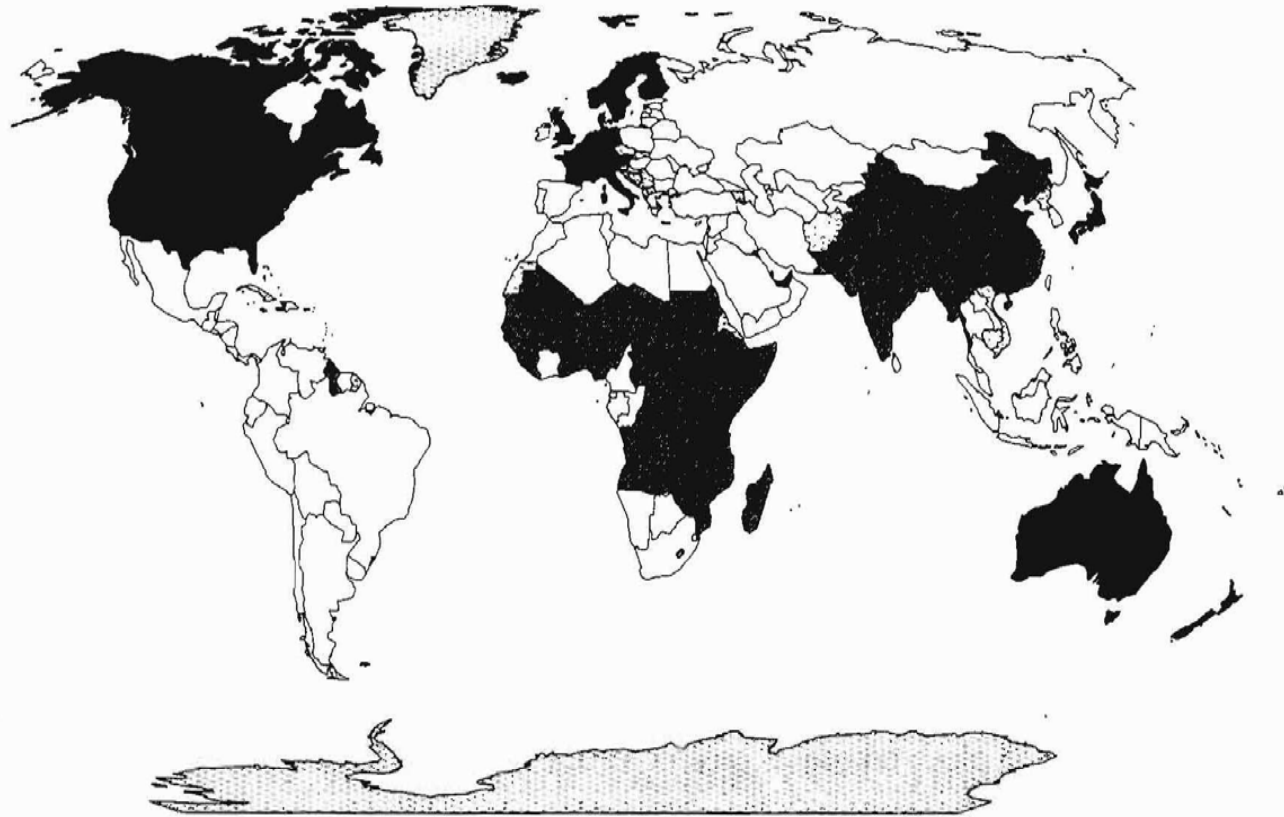
TFP expands, esp., 1920-2005



Urbanization ratios, 1000-2000

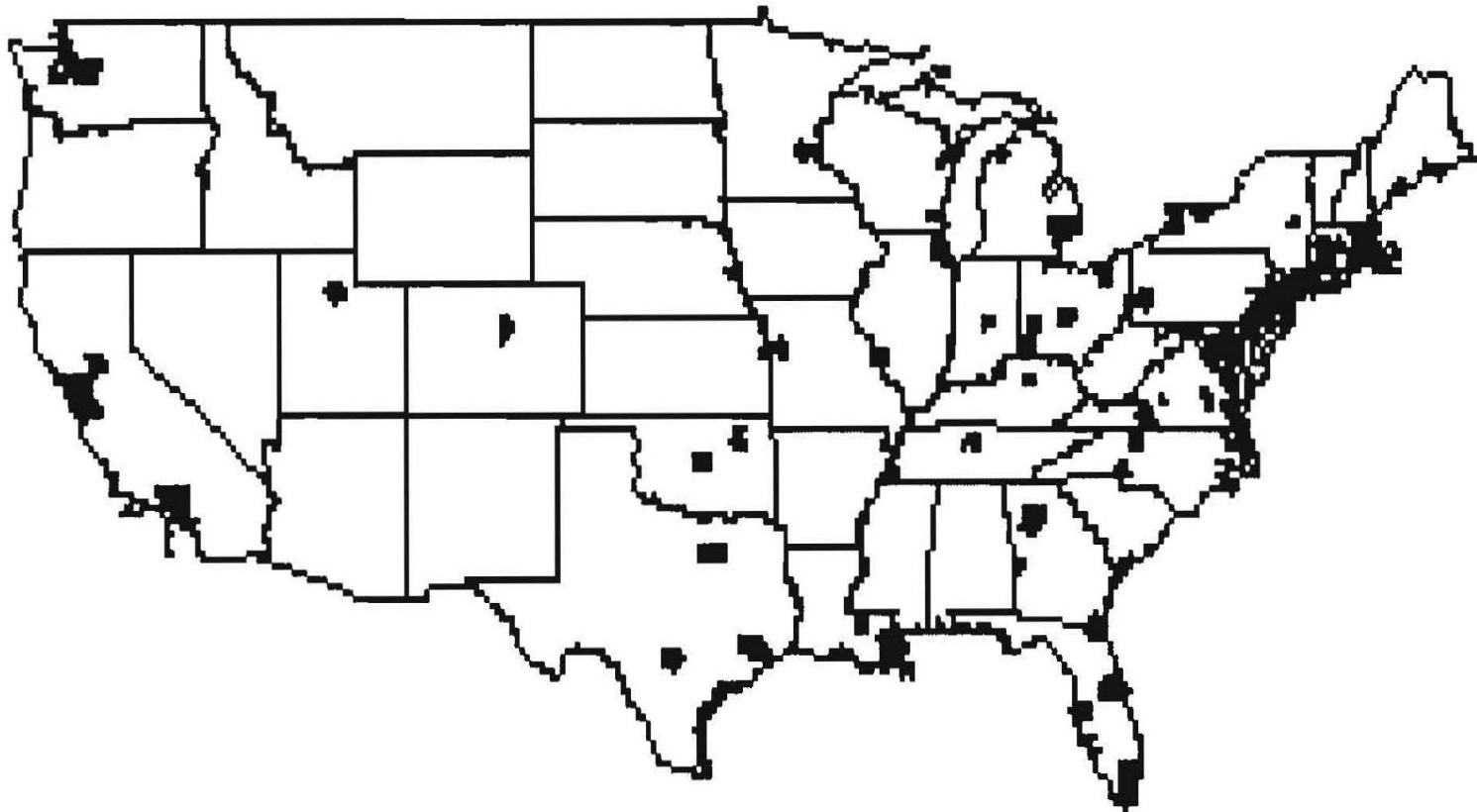
Year	Japan	China	Europe
1000	n.a.	3.0	0.0
1500	2.9	3.8	6.1
1820	12.3	3.8	12.3
1890	16.0	4.4	31.0
2000	66	40	76

MAP 1. The Rich and the Poor



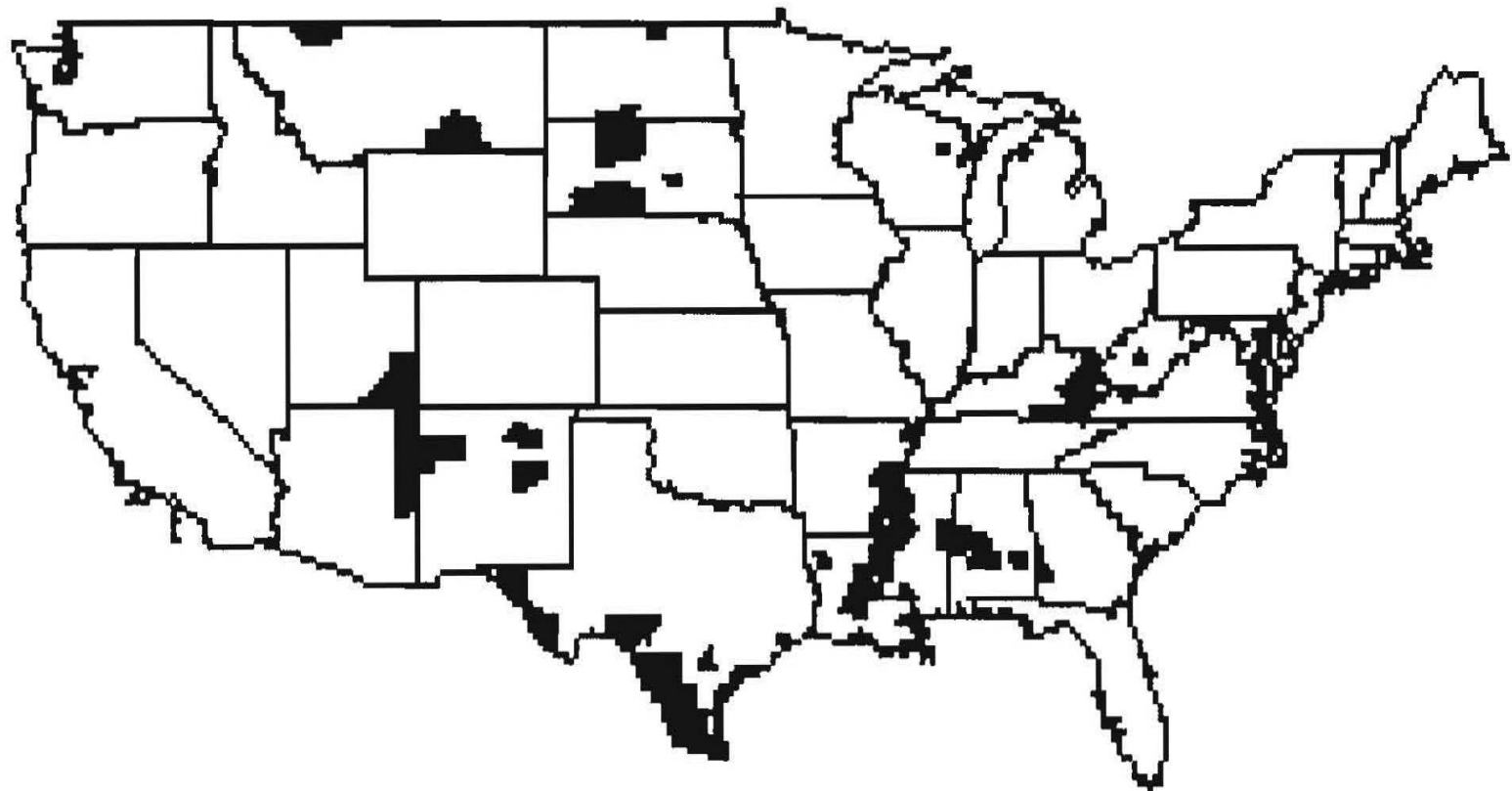
The countries in black contain 15 percent of world population but produce 50 percent of world GDP. The countries in gray contain 50 percent of world population but produce 14 percent of world GDP.

MAP 2. Densely Populated U.S. Counties



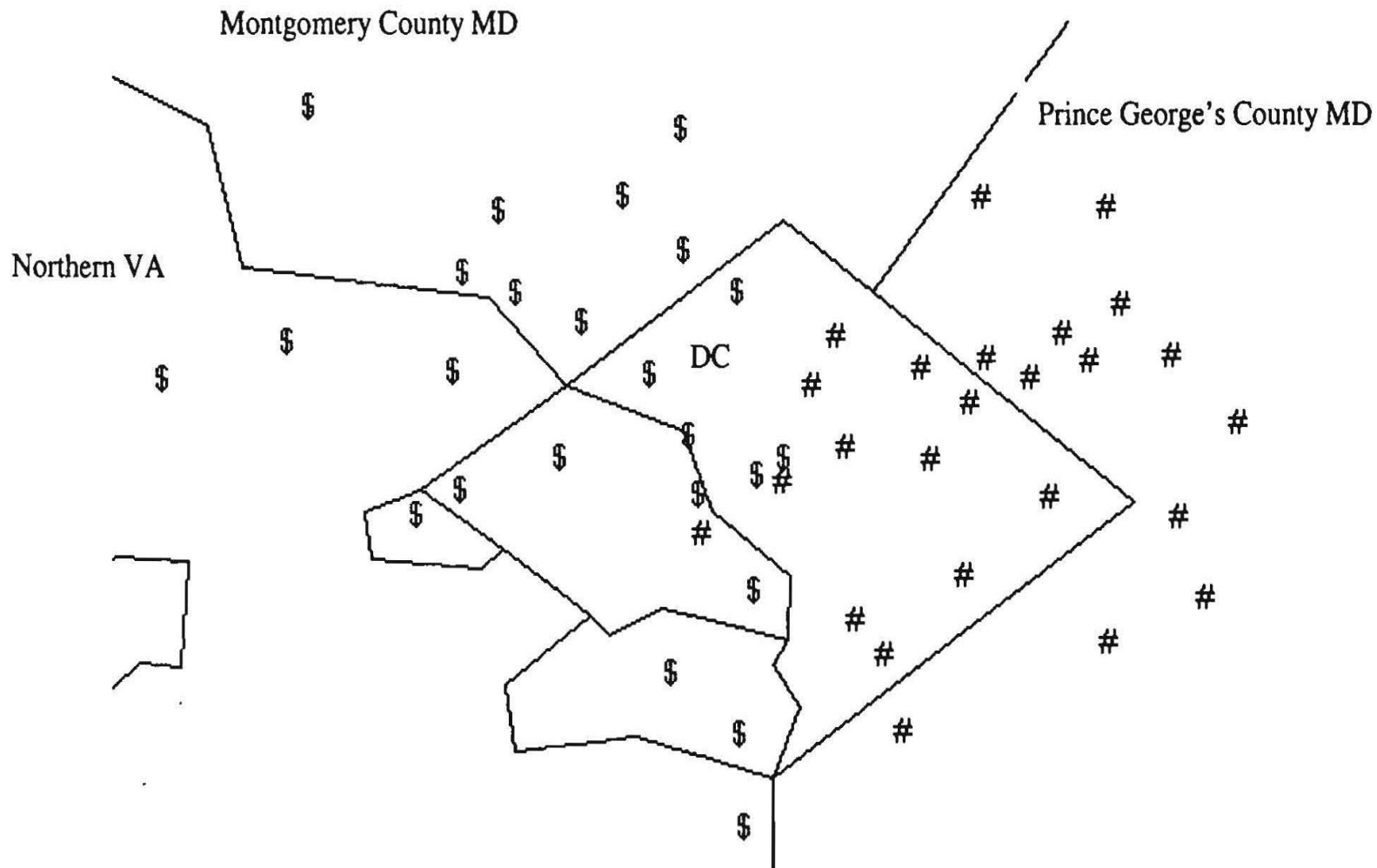
Counties shown in black take up 2 percent of U.S. land area but account for half of U.S. GDP.

MAP 3. Poverty Traps in the U.S. County Data



Counties in black have more than 35 percent poverty rate.

MAP 4. Rich and Poor ZIP Codes in the Washington, D.C., Metropolitan Area



\$ indicates richest fourth of zip codes in metropolitan area; # indicates poorest fourth.

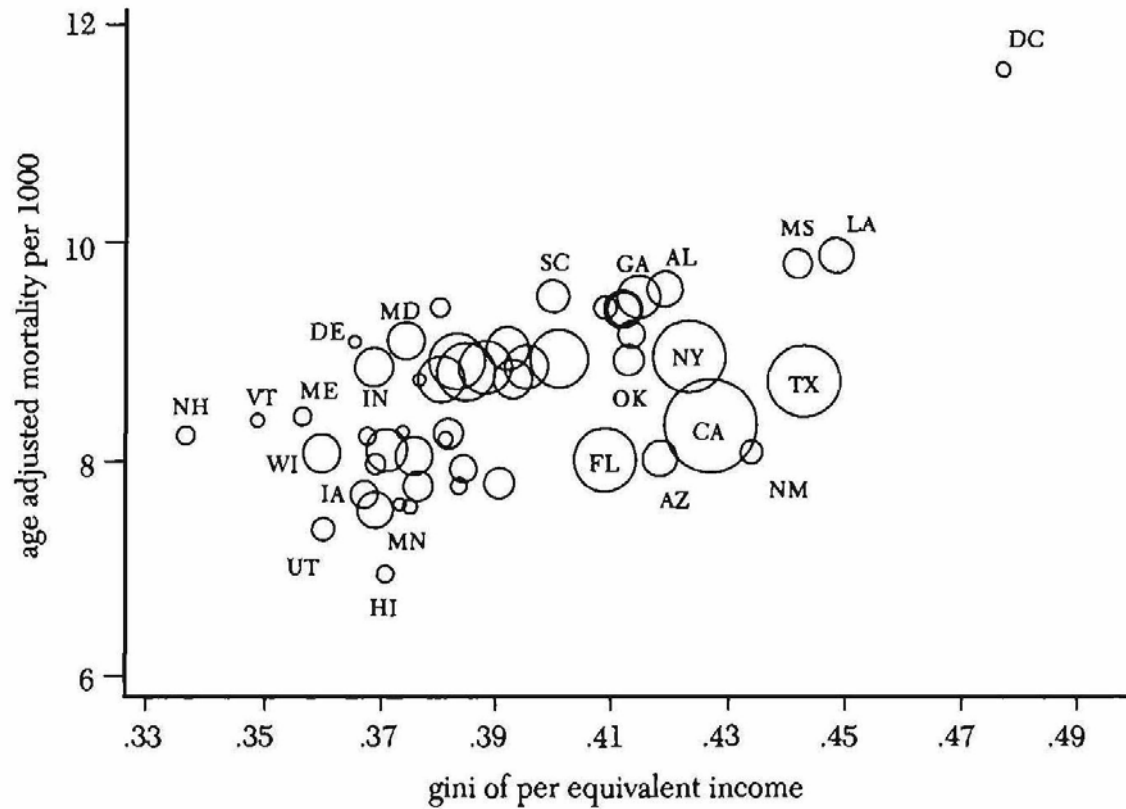
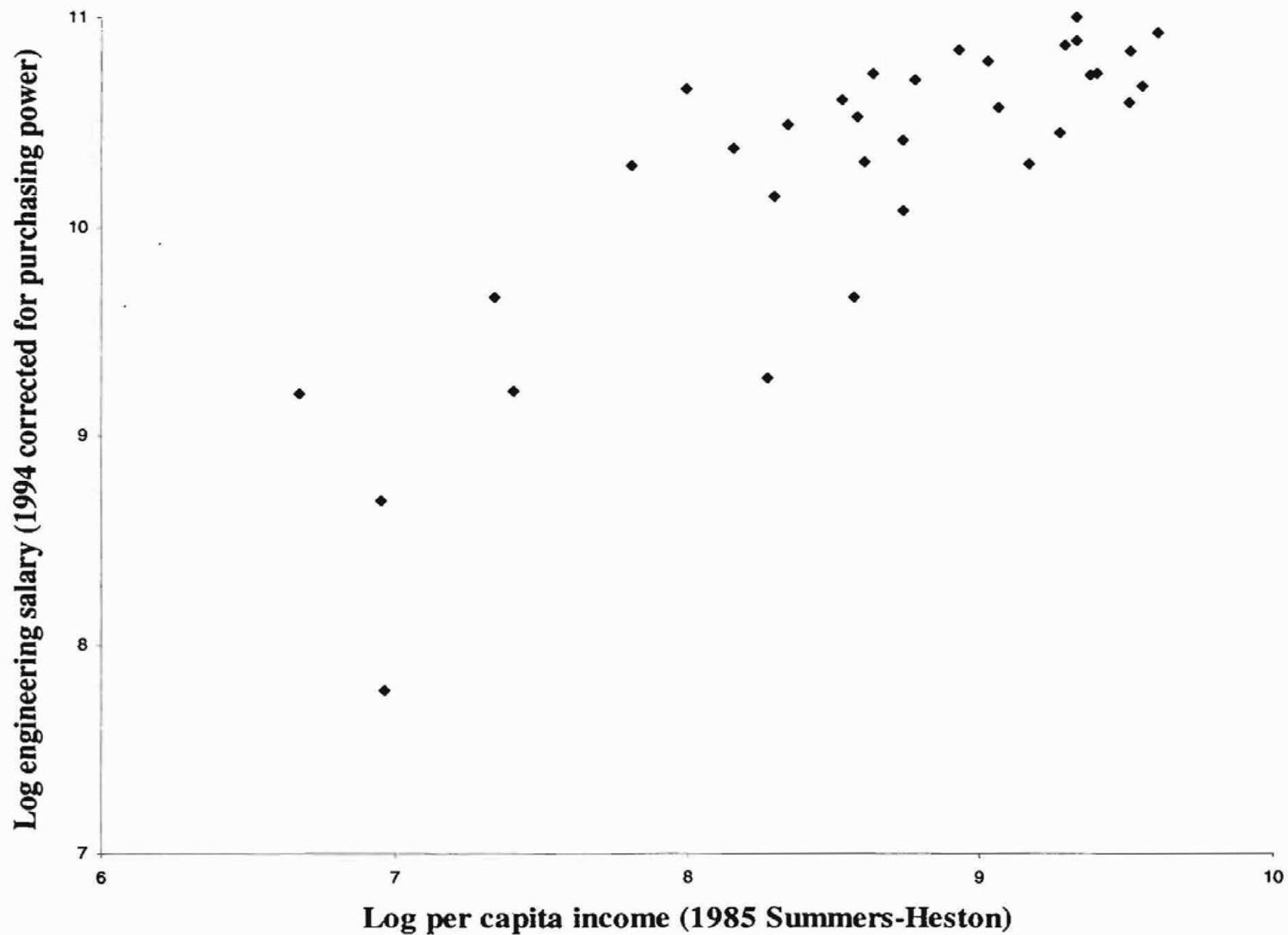


Figure 6. Income Inequality and Age-Adjusted Mortality, U.S. States, 1990

Source: CDC for state (all race, both sex) mortality data, author's calculations from 1990 census for income inequality.

Note: Circles are proportional to population size.

FIGURE 5. Skilled Real Wage and Per Capita Income across Countries



Source: Authors' calculations based on Summers and Heston for per capita income and Union Bank of Switzerland for engineering salaries.

Hyp: $\Delta TFP = f(\Delta H)$

1. Do health sciences, by making urbanization and agglomeration possible, cause expansion of TFP?
2. Sources for health-development causal link include ...
 1. Nordhaus; 2. Cutler; 3. Fogel; Weil; and, Acharya et. al.
 2. Presented here briefly....

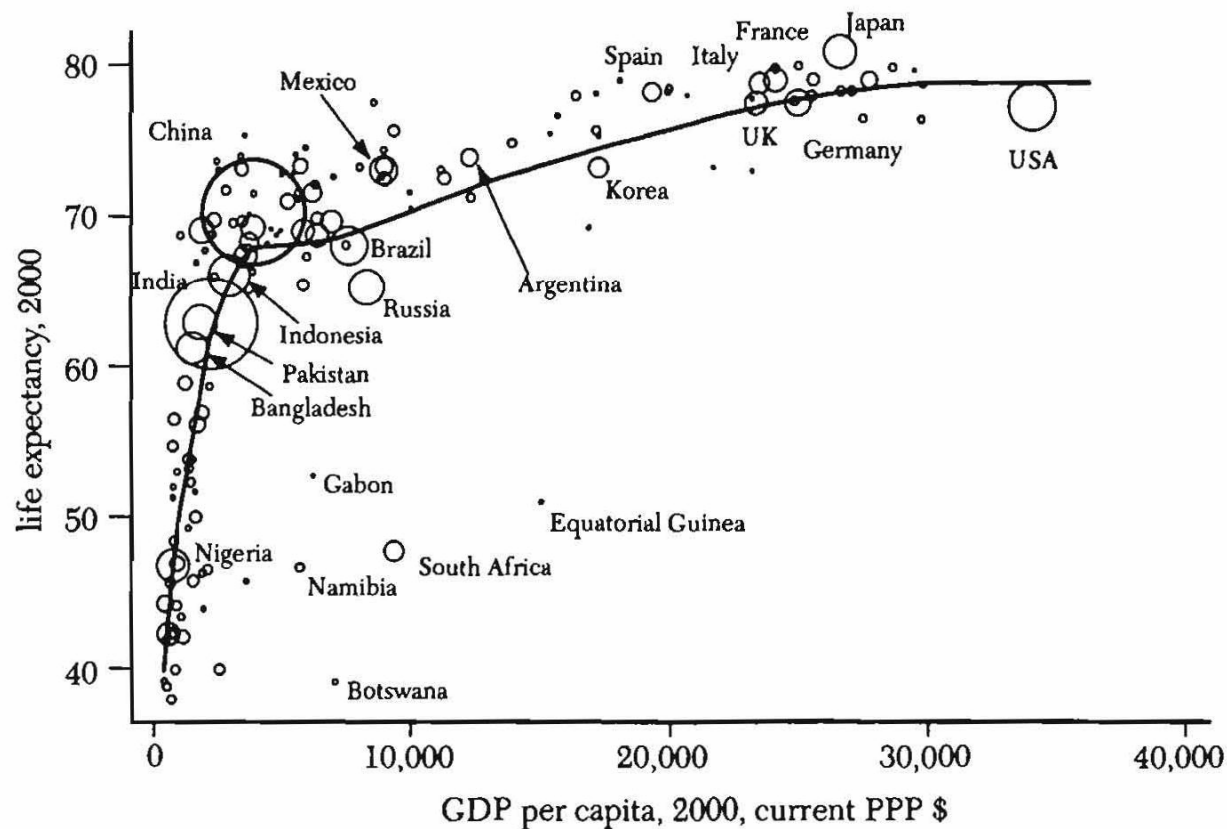


Figure 1. The Preston Curve: Life Expectancy versus GDP Per Capita

Source: World Development Indicators CD-ROM, World Bank (2002)

Note: Circles are proportional to population and some of the largest (or most interesting) countries are labeled. The solid line is a plot of a population-weighted nonparametric regression. Luxembourg, with per capita GDP of \$50,061 and life expectancy of 77.04 years, is excluded.

Statistical, econometric analysis,
determinants of per capita income growth,
developing countries, 1960-2000

How matters might unfold in countries of
more direct concern to international
development assistance

Growth rates, 1960-2000, determinants

# countries/adjusted R squared	71/0.75	73/0.74	81/0.77
Log of initial PPP-Income	-0.01404*** (.0019)	-0.0149*** (.0018)	-0.014*** (.0017)
Log of initial IMR	0.011** (.005)		
Log of initial LE	0.0159*** (.015)	0.0212** (.0094)	0.0128 (0.008)
Avg. yearly rate of fall in IMR, 1960-80	0.165 (.106)	0.313** (.088)	0.2818*** (.091)
Good governance Index	0.0414** (.014)	0.022* (.0132)	
Trade-openness Index	0.042** (.0168)	0.0412** (.016)	0.0512*** (.108)
Proportion of population living in Tropics			-0.0065* (.0037)
African country			-.0037 (.002)
Constant	-0.18**	0.0039	0.049**

Testing for Two-way Causality

Dependent Variable	Av. Growth Rate 1960-2000	Avg. growth rate IMR 1960-80	IV-estimation Av. Growth Rate 1960- 2000 [†]
# countries/adjusted R squared	82/0.73	79/0.51	54/0.71
Log of initial PPP-Income	-0.0126***		-0.011***
Log of initial LE	0.0344***		0.0317***
Avg. yearly rate of fall in IMR, 1960-80	0.433*** (.0784)		.414* (.245)
Good governance Index	0.0435*** (.0094)		0.06***
Proportion of population living in Tropics		-0.013194*** (.0000621)	
Drop in TFR		0.2165**	
Health Expenditure		0.215*	
Illiteracy		-0.00015**	
Constant	-0.059***	-0.166**	-0.07*

“Much of the link between income and health is a result of the latter causing the former, rather than the reverse.”

Cutler, Deaton, and Lleras-Muney, p. 115

Hyp: y/p or TFP = $f(\text{Health, Urbanization})$

1. Better health leads to higher income
2. Cuts in ICD's permitted urban growth
3. Propinquity permits exchange and higher TFP
4. Simple r between %Urb and GDP/P = 0.85
5. Is urbanization cum propinquity the essential link between health and income?
6. How do we test this hypothesis?

**TABLE 5. International Comparisons of Adjusted
TFP Growth, 1913-50, 1950-73, 1973-84**

	France	Germany	Japan	Neth.	U.K.	U.S.
<i>1913- 1950</i>	0.64	0.22	0.05	0.67	0.50	1.32
<i>1950- 1973</i>	3.31	3.96	5.12	2.56	1.74	1.28
<i>1973- 1984</i>	1.09	1.36	0.87	0.32	0.80	-0.09

The Google effect

Information is shared most easily and effectively among office neighbors, even at an Internet company where instant messaging and e-mail are generally preferred to face-to-face discussion.

Wolfers and Zitzewitz

As reported in NYTimes, 7 Jan 08, C4

A Google rule produces...

Information moves fastest among people who were the closest together..., an endorsement of the company's 'third rule for managing knowledge workers: Pack Them In,' the authors say.

Next steps: Beyond anecdotes

- Demonstrate statistically that propinquity yields productivity (Cf. Henderson 2000)
- Progress on the health-income nexus has been good;
- Next, health-urbanization-income