Development Economics

Lecture 9: Testing the Solow approach—Easterly and Levine (2001)

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EC 2273

Today

1. Testing the Solow approach

   Easterly and Levine. 2001.“It’s not Factor Accumulation: Stylized Facts and Growth Models.”

Observations of Easterly and Levine:

1. TFP differences explain most of differences in income, not savings and capital
2. Little evidence of convergence
3. Growth is variable (not predictable as in Solow)
4. Factors of production tend to flow where already abundant not scarce
5. Policies matter

Easterly and Levine (2001)

- Look at updated data
- Present "stylized facts"
  - Statement about the data that seem important and persistent.
  - Generally not well explained by Solow type models.
- Critique of MRW
  - MRW assume that all countries vary randomly in TFP (A)
  - But TFP seems to explain most of differences, not capital and labor

Stylized Facts

1. Total Factor Productivity (TFP) explains most of the variation across countries, not differences in factor accumulation
2. Large and growing differences in GDP per capita.
   - While there may be some conditional convergence, the big story is the massive divergence. The rich are getting richer, and the poor are not growing much
3. Growth is not persistent over time, but capital accumulation is

Stylized Facts

4. Factors of production flow to the same places—where they already exist in abundance
   - So Africa, despite having little capital, often exports capital, and human capital
5. National policies influence long-run growth
   - Importance of institutions

(1) TFP to save the day!

- Growth accounting (on your problem set)
- How to calculate how much of growth due to
  - More capital
  - More labor (or more human capital)
  - More something else (A)—TFP
- We can figure out (approximately) how much capital growth there is, how much labor or human capital growth there is
- What is left over, the "Residual" is TFP growth.

Economy	Share of capital in national output	GDP growth	Share contributed by Capital	Labor	TFP
OECD 1947–73	α				
France	.40	5.40	41	4	55
Germany	.39	6.61	41	3	56
Italy	.39	5.30	34	2	64
Japan	.39	9.50	35	23	42
United Kingdom	.38	3.70	47	1	52
United States	.40	4.00	43	24	33
OECD 1960–90					
France	.42	3.50	58	1	41
Germany	.40	3.20	59	–8	49
Italy	.38	4.10	49	3	48
Japan	.42	6.81	57	14	29
United Kingdom	.39	2.49	52	–4	52
United States	.41	3.10	45	42	13
Latin America 1940–80					
Argentina	.54	3.60	43	26	31
Brazil	.45	6.40	51	20	29
Chile	.52	3.80	34	26	40
Mexico	.69	6.30	40	23	37
Venezuela	.55	5.20	57	34	9
East Asia 1966–90					
Hong Kong, China	.37	7.30	42	28	30
Singapore	.53	8.50	73	32	–5
Korea, Rep. of	.32	10.32	46	42	12
Taiwan, China	0.29	9.10	40	40	20

(1) TFP to save the day!

- But what about the MRW results?
  - Let level of technology vary across regions.
  - Otherwise same approach
- Big conclusion: TFP is not the same across regions.
  - While differences in capital explain some differences the big explanation is TFP
- But TFP is difficult—Solow does not explain
  - Technology? Institutions? Externalities?
  - We will explore each

TABLE 3. MRW Least Squares Regression with Regional, Oil, and OECD Dummy Variables

Variable	Coefficient	Standard error	*t*-statistic	Probability
OECD	1.087817	0.107084	10.15857	0.0000
East Asia	7.559995	0.176696	42.78525	0.0000
South Asia	7.065895	0.139239	50.74634	0.0000
Sub-Saharan Africa	6.946945	0.090968	76.36658	0.0000
Western Hemisphere	7.838313	0.102363	76.57349	0.0000
Middle East and North Africa	7.777138	0.143632	54.14642	0.0000
Europe	7.717543	0.133190	57.94384	0.0000
OIL	0.691058	0.157605	4.384760	0.0000
MRW	0.442301	0.096847	4.567031	0.0000
R^2	0.752210	Mean dependent variable		7.79
Adjusted R^2	0.738969	Standard error of dependent variable		0.994

$$\ln y = \ln A + \alpha/(1-\alpha)\,[\ln s_c - \ln (n+\delta+g)] + \varepsilon$$

Table 4. MRW Least Squares Regression Including Human Capital, with Regional, Oil, and OECD Dummy Variables

Variable	Coefficient	Standard error	*t*-statistic	Probability
OECD	0.999172	0.126361	7.907255	0.0000
East Asia	8.040507	0.212161	37.89818	0.0000
South Asia	7.593671	0.184937	41.06093	0.0000
Sub-Saharan Africa	7.636055	0.207923	36.72545	0.0000
Western Hemisphere	8.285468	0.136361	60.76117	0.0000
Middle East and North Africa	8.345100	0.192838	43.27516	0.0000
Europe	8.222288	0.161656	50.86290	0.0000
OIL	0.618785	0.179383	3.449517	0.0008
MRW	0.168531	0.095305	1.768343	0.0796
MRWH	0.433868	0.089235	4.862086	0.0000
R^2	0.812286	Mean dependent variable		7.779659

(2) Divergence!

- Basic story of last 200 years: Divergence
  - "The poor are not getting poorer, but the rich are getting richer a lot faster than the poor."
- Maybe some conditional convergence, but the rich are still growing faster than the poor
  - Can't happen if growth in A, or TFP growth is the same across all countries (as MRW assume)

Table 5. Rich Countries Grew Rapidly, Poor Countries Slowly in 1960–92

Income quintile	Average growth of income per person, 1960–92 (%)
Poorest fifth of countries	1.4
Second poorest fifth of countries	1.2
Middle fifth of countries	1.8
Second richest fifth of countries	2.6
Richest fifth of countries	2.2

Note: Countries are classified by income per person in 1960.

Source: Authors' calculations based on Summers-Heston 1991 data with subsequent on-line updates.

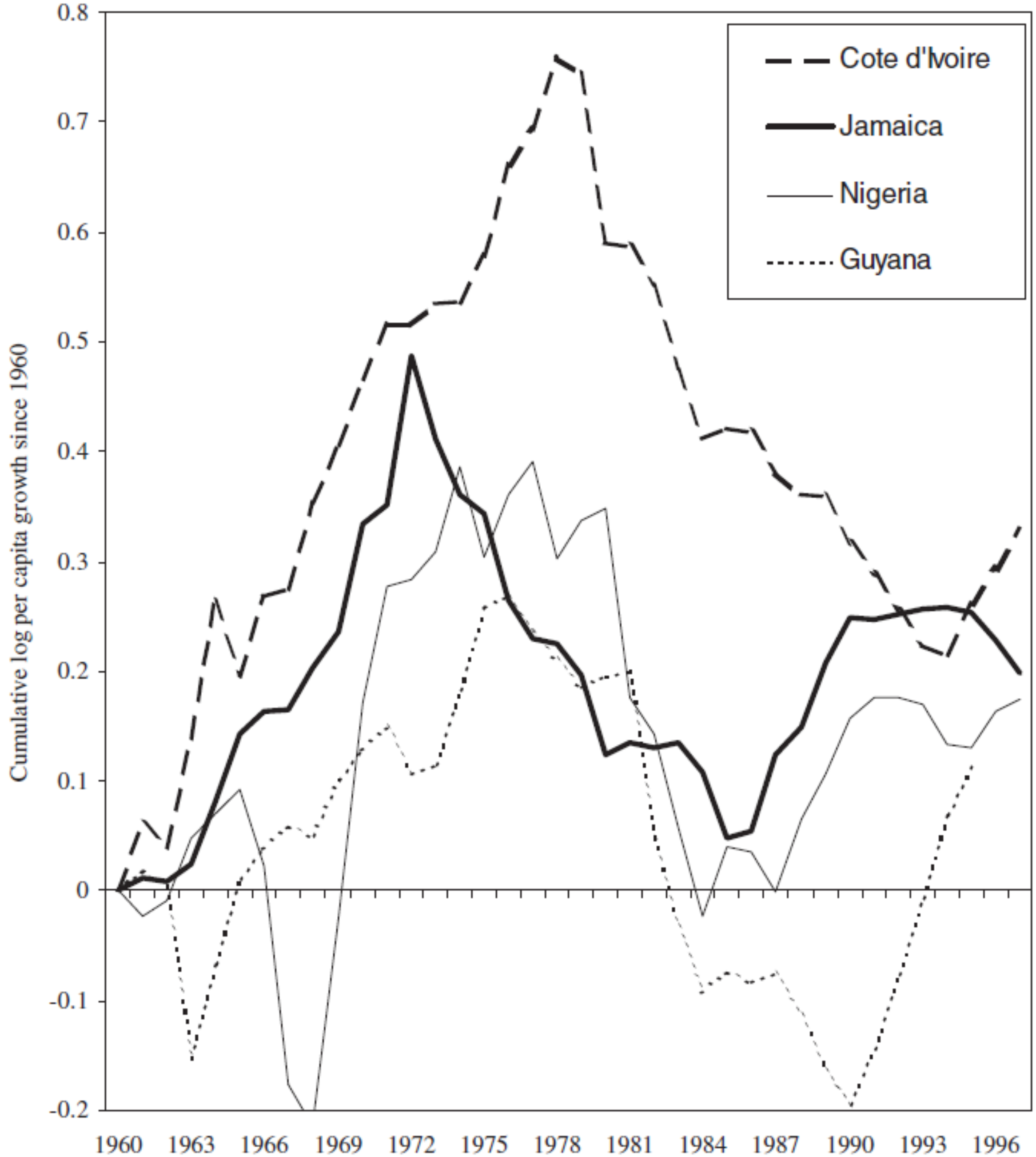
(3) Growth is not persistent

- In 1900 Argentina was as rich as US and Western Europe.
  - Largely European colony (few indigenous people, or descendants of African slaves) with mostly European institutions.
- Despite Europe's two World Wars, Argentina now has about half income of US and Europe.
- Countries that grew rapidly in the past do not necessarily continue to do so.
- Correlation of growth one decade with growth another decade very low

Rostow's "Takeoff" is rare

- US experience of close to constant 2% growth for 200 years is the exception, not the rule
- While there have been episodes of high growth in developing world
  - Rarely lead to steady growth
  - More often followed by bust or slow growth
- Very difficult to account for such a varied history of growth with a Solow type "steady state" model.

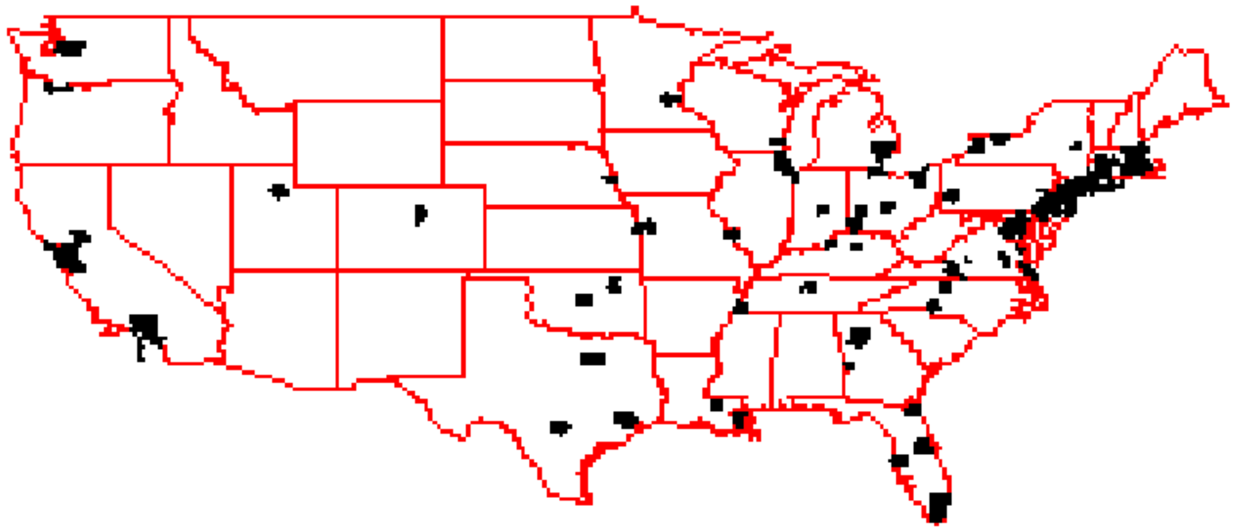
Figure 4. Examples of Variable Per Capita Income over Time: 1960–96



(4) Factors tend to go together

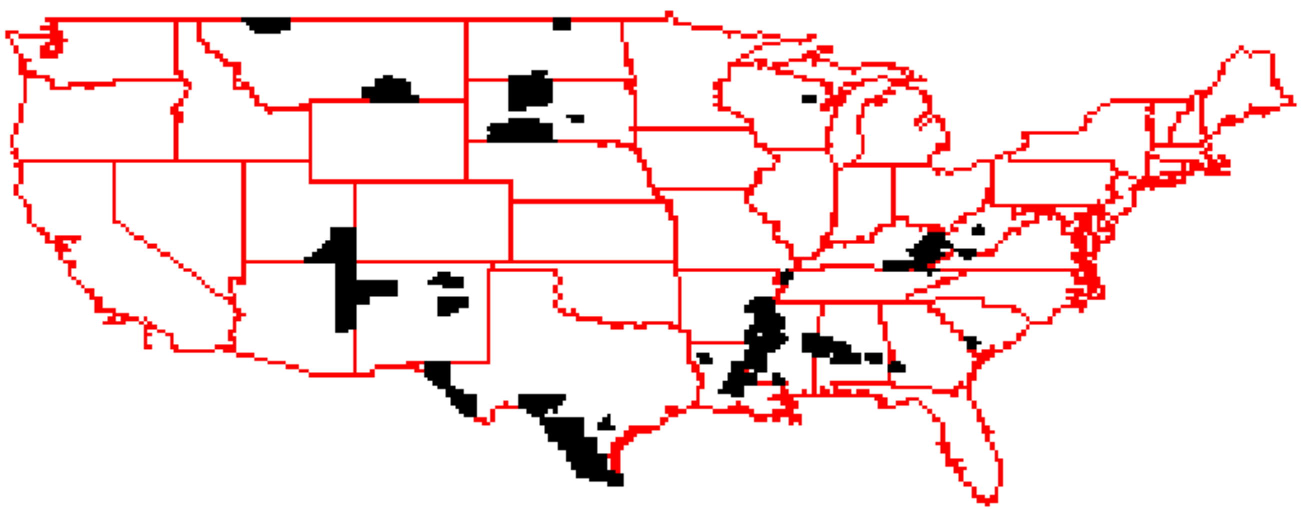
- Capital and human capital tends to concentrate
  - Both across countries and within countries
- Poverty concentrates as well
- Solow (with decreasing marginal returns) suggests capital and output should spread out
  - Capital should go to where it is scarce, but instead tends to flow to where it is abundant
  - Just like countries, regions within countries should converge, but instead large regional differences

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

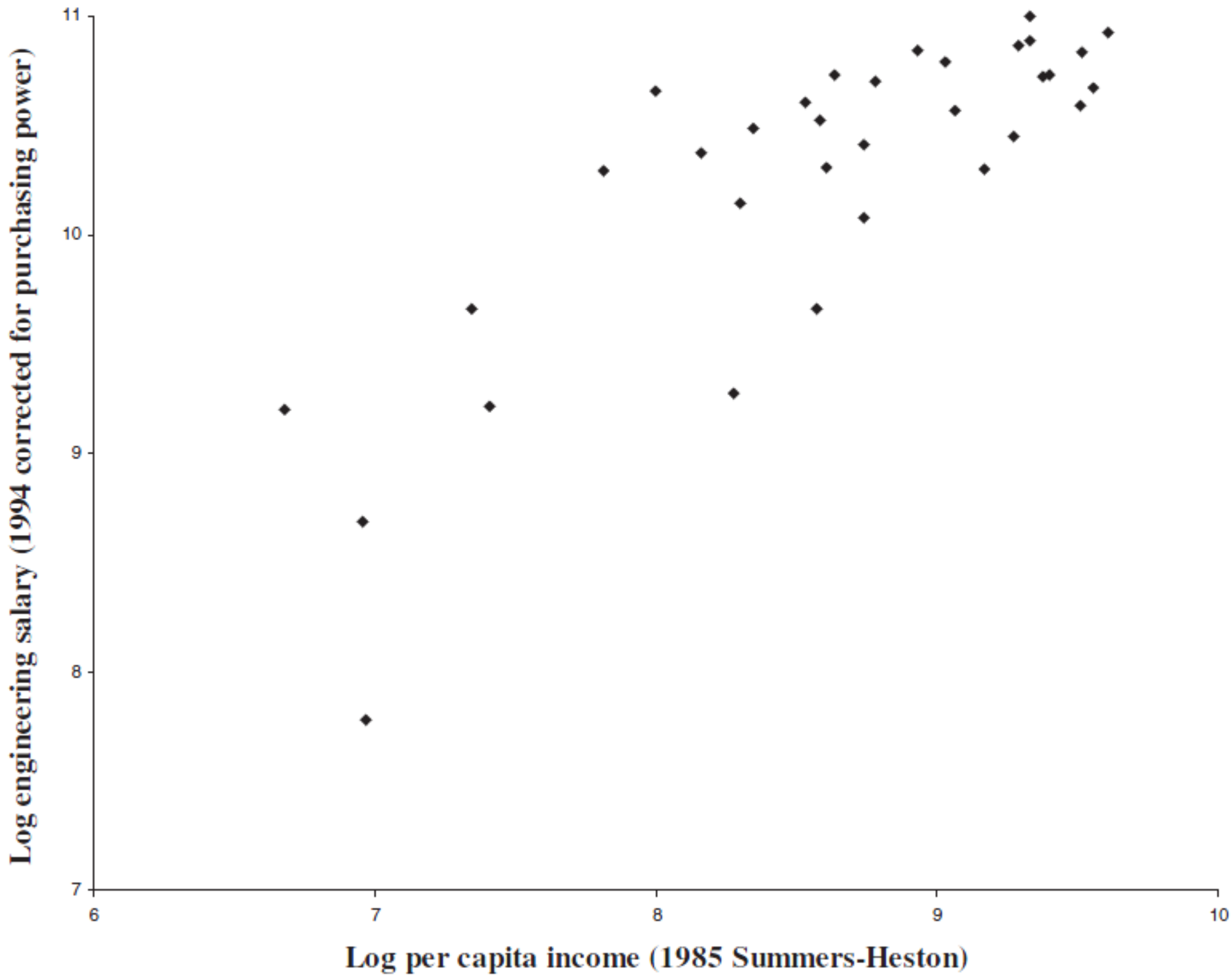


Counties in black have more than 35 percent poverty rate.

Flows of capital and labor

- Labor migration tends to be from sparsely populated (rural) to densely populated (urban)
  - Where labor is scarce to where abundant?
- Brain drain
  - Human capital flows to developed countries, where it is abundant
  - Skilled workers earn more in developed countries, even though scarce in developing countries
- Capital flows to areas that are rich

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



(5) Policy matters

- Assert: national policy is strongly linked to economic growth
- Problem: very difficult to separate out national policies from other things
  - Policies are *endogenous* (changing with other things that might cause growth) rather than *exogenous* (unrelated to other things)
- So difficult to conclude causal relationship, but can talk about correlations

(5) Policy matters

- Countries that grow faster are
  - Educated
  - Open to trade
  - Have lots of private credit available (well functioning credit or financial markets)
- Countries that grow slower have
  - Large governments
  - Large black market premiums