Chapter 1

Introduction

1.1 Definition of Institutions

Two definitions:

- Ostrom (2005): "*Institutions are the prescriptions that humans use to organize all forms of repetitive and structured interactions*"
  this is a very broad definition and there is no connotation regarding the type of interactions being considered
- North (1991): *Institutions are the humanly devised constraints that structure political, economic and social interaction*

North (1991)

> "Institutions are the **humanly devised constraints** that structure **political**, **economic** and **social interaction**. They consist of both **informal** constraints (sanctions, taboos, customs, traditions, and codes of conduct), and **formal** rules (constitutions, laws, property rights)
>
> Together with the standard constraints of economics they define the **choice set** and therefore determine **transaction and production costs** and hence the **profitability and feasibility of engaging in economic activity**.
>
> Throughout history, institutions have been devised by human beings to **create order** and **reduce uncertainty in exchange.**"

1.2 "*The trust paradox: a survey of economic inquiries into the nature of trust and trustworthiness*" - Harvey S. James (2002)

This paper examines the concepts of trust and trustworthiness in the context of a one-sided variation of the prisoner's dilemma, and it evaluates four different categories of solutions to the PD problem: changing player preferences, enforcing explicit contracts, establishing implicit contracts, and repeating the interaction of the players. Because these solutions rely on the creation of incentives to induce cooperation, this paper articulates a paradox of trust in that if one trusts another, because there are incentives for the other to be trustworthy, then the vulnerability to exploitation is removed which gives trust its very meaning. The paper explores the implications of trust when understood to exist at two levels—one in which there are incentives to trust, and the other in which appropriate incentives are absent.

1.2.1 An Illustration

Game theoretical approach

- agents are rational (i.e. they maximize their payoff) and cooperate only if the benefits of cooperation exceed its costs
- the "*trust-honor*" game is an application of the prisoner dilemma and in general, leads to a sub-optimal solution
- (formal or informal) institutions modify the payoffs of the game

Trust in Economics

- In economics, trust is understood as an **expectation** in situations of **risk, uncertainty, or informational incompleteness**
- To say "*A trusts B*" means that A assumes B will not exploit the vulnerability A has created by taking a certain action

Economic Perspective on Trustworthiness: When deciding whether to trust B, A evaluates the incentives B has to either honor or violate the trust.

- standard economics assumes that individuals are rational utility maximizers, meaning they act in ways that maximize their personal benefit.
- As a result, people are **honest only if honesty** (or the appearance of honesty) **is more profitable than dishonesty**
- From this viewpoint, an agent is **trustworthy** only when they **lack an incentive to exploit the trust placed in them**

Trust and the Prisoner's Dilemma (PD) Game: Many economic models treat trust-related problems as variations of the Prisoner's Dilemma (PD)

- In the PD framework, individuals face a choice between cooperation and self-interest
- Economic solutions to PD require altering the game** to create incentives that encourage cooperation
  - Trustworthiness, honesty, and cooperation are treated as *strategic variables* that emerge when incentives are structured appropriately
  - Economists consider the PD problem "solved" when they identify conditions under which one agent will choose to cooperate and honor trust

Criticism of the Economic Approach:
The main issue with this approach is that **by changing the structure of the PD game**, economists **remove the element of vulnerability** that defines genuine trust.

- If trust is only established through incentives, it is fundamentally different from trust where individuals remain exposed to potential betrayal
- Key Argument: There is an important **distinction between trust that arises from incentives** and **trust that persists despite vulnerability to others' actions**.

1.2.2 The *Trust-Honor* Game (THG)

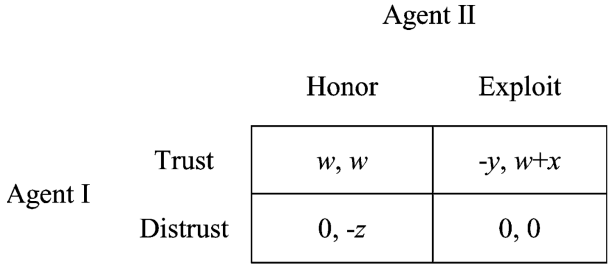

Fig. 1. Trust–honor game.

Figure 1.1: simultaneous-move, one-sided variation of the PD called the *trust–honor game* (THG)

Agent I can either trust or distrust agent II, who in turn can either honor the trust or exploit it.

- If both players cooperate by selecting the strategy pair (trust, honor), then they each receive a payout of $w > 0$.
- If agent I trusts but agent II exploits that trust, then agent I incurs a loss of $y > 0$, while agent II receives a premium of $x > 0$ over w
- If agent I distrusts and agent II is willing to honor, then agent II incurs a cost of $z > 0$
- otherwise, the players receive nothing

It is clear that agent II has a dominant strategy to exploit.
But agent I does not have a dominant strategy → Agent I would be willing to trust if agent II is willing to honor that trust. However, since agent I knows that agent II has a dominant strategy to exploit, agent I distrusts, resulting in the **Nash equilibrium of (distrust, exploit)**.

1.2.3 Solutions to the Prisoner's Dilemma

These solutions consist of refinements/alterations to the PD so as to induce the agents to take actions that ultimately result in mutually beneficial outcomes.

Although both players prefer outcomes characterized by trust and honor relative to outcomes resulting from distrust and exploit, they know that the incentives of the game are such that agent II has an incentive to be untrustworthy, so agent I does not have an incentive to trust.

logic of the economic solutions: if incentives are what drive the non-cooperative outcome, then **incentives can be used to induce cooperation**. Therefore, the objective of economic models is to **alter the PD environment** so as to create **appropriate incentives for cooperative play**.

Solution 1: Repeat the interaction

A solution to PD problems is to repeat the interaction between the agents: agents I and II can continue to play the stage game, knowing (perhaps with some probability) they will repeat the interaction another time → application of the "folk theorem" for infinitely-repeated games

"***folk theorem***": virtually any outcome can be enforced by an equilibrium, so long as the probability of repeating the game is high enough (or, as long as players are sufficiently patient).

cooperative outcomes can be achieved with an appropriately defined strategy of play, which generally involves one player punishing, in subsequent rounds of play, exploitation occurring in the current

round.

Intuition: possible to punish misbehaviors in the future (incentivize loyal behaviors)

Two well-known strategies for punishing non-cooperators in repeated PD games are:

- *tit-for-tat* strategy: a player cooperates in the first period and thereafter mimics the other player's choice from the previous round of play
- *trigger* strategy: a player cooperates until the other player exploits, resulting in the first player refusing to cooperate in all subsequent rounds of play

Solution 2: Write an explicit contract

Write an **explicit and binding contract,** enforced by a third party, requiring participants to select strategy pair (trust, honor).
Two forms of contracts

- monitoring with punishment
- monitoring with incentives

(a)

		Agent II: Honor	Agent II: Exploit
Agent I	Trust	w-c, w	-y-c, w+x-d
	Distrust	0, -z	0, 0

Figure 1.2: Trust–honor game with monitoring and punishment in an explicit contract

- d = punishment agent II incurs if caught exploiting
- c = monitoring cost

(trust, honor) is a Nash equilibrium if

- if $c < w$ (cost of observing and verifying exploitation is not too large)
- if $d > x$ (the punishment agent II incurs for exploitation is significant)

(b)

		Agent II: Honor	Agent II: Exploit
Agent I	Trust	w-c-a, w+a	-y-c, w+x
	Distrust	0, -z	0, 0

Figure 1.3: Trust–honor game with monitoring and incentives in an explicit contract.

Agent I can offer an incentive a to agent II to honor his trust.

- agent I has an incentive to trust as long as the cost of monitoring and rewarding performance is not too large (i.e. $c + a < w$)

- agent II has an incentive to honor agent I's trust as long as the reward is substantial (i.e. $a > x$)

Explicit contracts are (costly) formal institutions. These institutions have a way of moving the agent away from exploiting and towards honoring

Solution 3: Rely on an implicit social contract

The basic distinction between explicit and implicit contracts is that **implicit contracts cannot be enforced by third parties**. Only the parties to the contract, or those affected by its non-compliance, can determine whether the agreement has been violated, and only they can enforce the contract

		Agent II: Honor	Agent II: Exploit
Agent I	Trust	*w-c*, *w*	*-y-c-e*, *w+x-f*
	Distrust	0, *-z*	0, 0

Fig. 3. Trust–honor game with implicit social contracting.

Figure 1.4

- c= the cost to agent I of monitoring the choice of agent II
- e= the effort agent I expends to inflict the social sanction on agent II for exploitation
- f= social sanction

As long as $(w - c) > 0$ and $f > x$, then (trust, honor) becomes a Nash equilibrium strategy for the players

Because players must make personally costly efforts to enforce cooperative agreements, a weakness of socially based contracts is that there exists the **potential for free-riding**, particularly when play involves a community of members.

Furthermore, these models require that the interactions among participants be repeated or long-term. Agents participating in a one-shot play of the PD typically will not be able to rely on the use of social, implicit solutions to foster trust and trustworthiness.

Solution 4: Change the preferences of players

		Agent II: Honor	Agent II: Exploit
Agent I	Trust	*w*, *w*	*-y*, *w+x*
	Distrust	0, *-z*	0, 0

Figure 1.5

Trust and trustworthiness can be achieved by fostering preferences for cooperative behavior
→ introduce either exogeneous or endogeneous changes to the preferences of players, so that they "*prefer*" to cooperate rather than pursue myopic self-maximizing strategies

- exogenous changes: we can assume that agent II has preferences for honoring trust - adjusting the perceptions by agent II about the value of x (e.g. $x < 0$ rather than $x > 0$)
- endogenous changes:
  - introduce emotional pre-dispositions for cooperation that generate feelings of guilt for non-cooperation
  - internalization of cultural norms which place taboos on the realization of benefits achieved at the expense of others

  e.g. Kandel and Lazear (1992) incorporate variables into player utility functions to reflect feelings of shame or guilt for dishonest or exploitative behavior

Changing player preferences so that they prefer honor and trust over exploitation and distrust, as in the exogenous models, creates the potential for a tautological argument: just assume the preferences necessary to get the outcome you want. While endogenous models do not suffer from this weakness, they are generally long-term solutions that require time and repeated exposure to environmental stimuli to affect the requisite changes in player preferences. By their nature, endogenous models do not produce cooperation in single-period exchanges.

Remarks

> The problem with this approach is that, by changing the structure of the PD game so that agents have an incentive to cooperate, economists remove the vulnerability players face to exploitation by others, thus neutralizing the very nature of what it means to trust.

- "economic" bias in the definition of institutions
- possible misinterpretation
- endogeneity of preferences

1.3 Institutions and Economic Growth

1.3.1 Two Traditions for Explaining Growth

- **Dual-Economy Approach** (Lewis 1954)
  - Traditional Sector (agriculture): technologically backward and stagnant
  - Modern Sector (industry): accumulation, innovation and productivity growth - the modern sector is the only sector with the potential to grow fast
- **Neoclassical Growth Model** (Solow 1956)
  - different types of economic activity are structurally similar enough to be aggregated into a single representative sector
  - neoclassical production function + Research & Development

Sources of Growth

- Dual-Economy
  - growth depends largely on the rate at which resources - principally labor - can migrate from the traditional to the modern sector
  - "*structural transformation*" challenge [1]
- Neoclassical Growth Model
  - growth depends on the incentives to save, accumulate physical and human capital, and innovate
  - "*fundamentals*" challenge

Growth Patterns and Outcomes

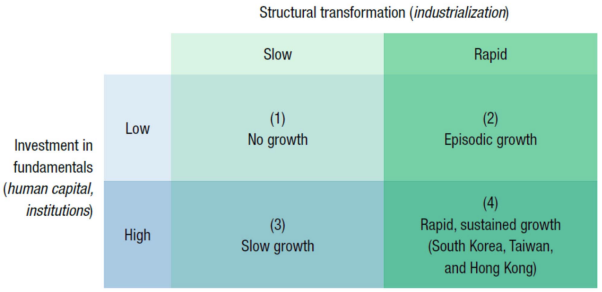

Figure 1.6

- No straightforward strategy
  - Possible to have rapid structural transformation without significant improvements in fundamentals
  - Possible to invest in fundamentals without reaping structural transformation
- Context specific policy recommendations
- Open issues
  - The policy requirements of rapid structural transformation do not coincide with conventional recommendations of the "fundamentals" type
  - The role of institutions is mainly addressed within the neoclassical growth model

1.4 Neoclassical Growth Model

1.4.1 The Neoclassical production Function

$$Y = F(A, K, H)$$

where:

- Y = total output (GDP)
- K = physical capital

[1] **structural transformation**: reallocation of economic activity across sectors, typically from agriculture to manufacturing and then to services, often accompanied by the movement of labor from low-productivity to higher-productivity activities.

- H = human capital (labor, adjusted)
- A = a productivity parameter

The production function says how much output a country produces given:

- the quantity of inputs used (K, H)
- the efficiency of the production process (A)

Important Features of $F(\cdot)$

- "constant returns to scale" $\rightarrow F(A, \lambda K, \lambda H) = \lambda F(A, K, H), \forall \lambda > 0$
- diminishing returns in each factor

e.g. the Cobb Dougla production function

$$F(A, K, H) = AK^{\alpha} H^{1-\alpha}$$

Decompose differences in GDP per capita (by dividing by L)

$$y = Ak^{\alpha} h^{1-\alpha}$$

where: $y = [\frac{Y}{L}]$, $k = [\frac{K}{L}]$ and $h = [\frac{H}{L}]$

$$\rightarrow \ln y = \ln A + \alpha \ln k + (1-\alpha) \ln h$$
$$\rightarrow d \ln y = d \ln A + \alpha d \ln k + (1-\alpha) d \ln h$$

where: $d \ln y = \%\Delta y$, $d \ln A = \%\Delta A$, $d \ln k = \%\Delta k$ and $d \ln h = \%\Delta h$

Impose $\alpha = \frac{1}{3}$ and observe y, k and $h \rightarrow$ back up a $\%\Delta A$ as a residual (the *Solow residual*[2])

Over time $\rightarrow$ growth accounting

		Contributions from		
Period	Output per hour	*K/Y*	Labor composition	Labor-Aug. TFP
1948–2013	**2.5**	**0.1**	**0.3**	**2.0**
1948–1973	3.3	−0.2	0.3	3.2
1973–1990	1.6	0.5	0.3	0.8
1990–1995	1.6	0.2	0.7	0.7
1995–2000	3.0	0.3	0.3	2.3
2000–2007	2.7	0.2	0.3	2.2
2007–2013	1.7	0.1	0.5	1.1
	y	*k*	*h*	Solow residual

Across countries $\rightarrow$ development accounting

	GDP per worker, *y*	Capital/GDP $(K/Y)^{\alpha/(1-\alpha)}$	Human capital, *h*	TFP	Share due to TFP
United States	1.000	1.000	1.000	1.000	–
Hong Kong	0.854	1.086	0.833	0.944	48.9%
Singapore	0.845	1.105	0.764	1.001	45.8%
France	0.790	1.184	0.840	0.795	55.6%
Germany	0.740	1.078	0.918	0.748	57.0%
United Kingdom	0.733	1.015	0.780	0.925	46.1%
Japan	0.683	1.218	0.903	0.620	63.9%
South Korea	0.598	1.146	0.925	0.564	65.3%
Argentina	0.376	1.109	0.779	0.435	66.5%
Mexico	0.338	0.931	0.760	0.477	59.7%
Botswana	0.236	1.034	0.786	0.291	73.7%
South Africa	0.225	0.877	0.731	0.351	64.6%
Brazil	0.183	1.084	0.676	0.250	74.5%
Thailand	0.154	1.125	0.667	0.206	78.5%
China	0.136	1.137	0.713	0.168	82.9%
Indonesia	0.096	1.014	0.575	0.165	77.9%
India	0.096	0.827	0.533	0.217	67.0%
Kenya	0.037	0.819	0.618	0.073	87.3%
Malawi	0.021	1.107	0.507	0.038	93.6%
Average	0.212	0.979	0.705	0.307	63.8%
1/Average	4.720	1.021	1.418	3.260	69.2%

[2]Solow residual/Total Factor Productivity (TFP): portion of an economy's output growth that cannot be explained by the accumulation of capital and labor, representing the impact of factors like technological advancements

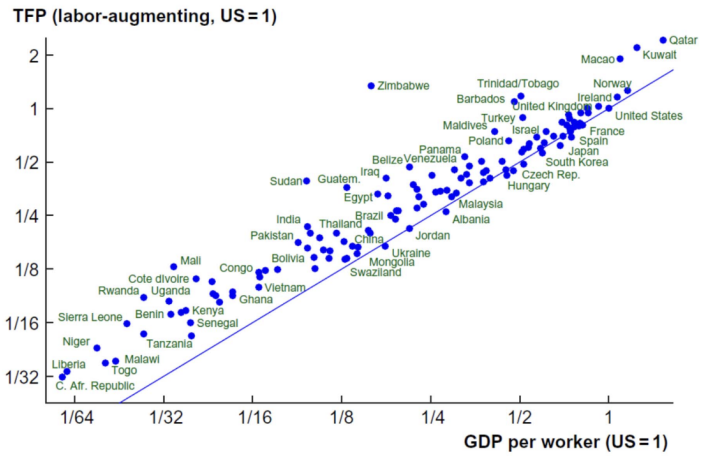

Figure 1.7

TFP: the "*measure of our ignorance*"

"*Aside from all kind of measurement problems, these accounting exercises say nothing about causality, and so are very hard to interpret*"

"*At some level (and exaggerating somewhat) to say that a country is poor because it has insufficient physical capital, human capital, and inefficient technology is like saying that a person is poor because he or she does not have money*", Acemoglu, 2009
→ need to explain growth

1.4.2 The Solow Growth Model

Building Blocks of the Solow Model

1. a neoclassical production function: $Y_t = AK_t^{\alpha} H_t^{1-\alpha}$
   or in per-capita terms (assume $L = H$) : $y_t = Ak_t^{\alpha}$
2. a saving function (constant saving rate s): $s_t = s(Ak_t^{\alpha})$
3. a law for accumulation of capital: $k = i_t - \delta k_t$
   where:
   - i_t = per capita investment
   - δ = depreciation rate
4. an equilibrium condition ($S = I$): $k = s(Ak_t^{\alpha}) - \delta k_t$

Implications of the Solow Model

1. unique steady state [3]:

$$k^* = (\frac{sA}{\delta})^{\frac{1}{1-\alpha}}$$

   (increasing in s and A)

[3] steady state is when $k_t = k_{t+1} = k^*$

2. convergence: Poor countries should be growing rapidly and rich countries growing slowly, so the two should converge over time (due to diminishing marginal returns)

$$g = s(Ak_t^{\alpha-1}) - \delta$$

(decreasing in k_t)

3. in steady state: $g = g^A = \frac{A}{A}$ (i.e. g remains unexplained as g^A is exogenous)

Steady State

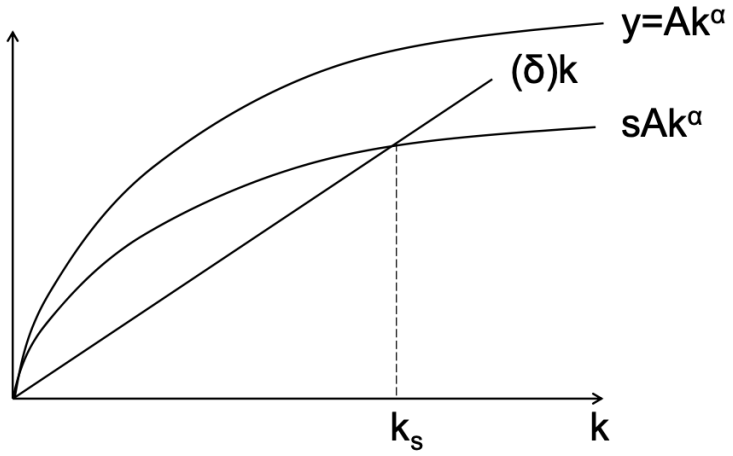

Figure 1.8

Growth Rate

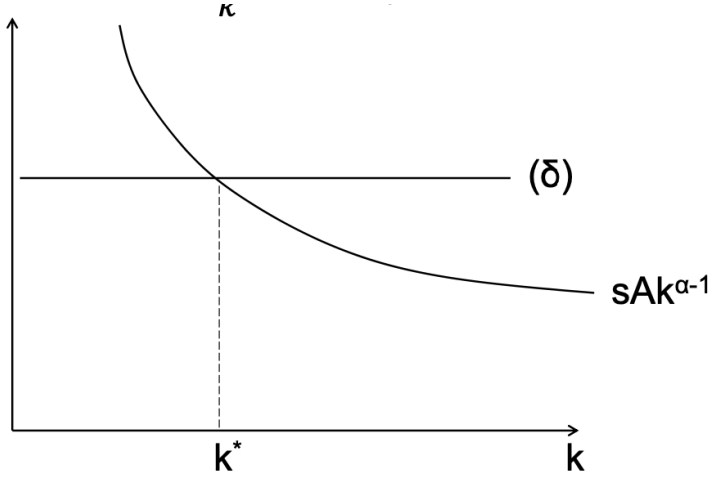

Figure 1.9

1.4.3 Evidence on the Solow Model

Growth Regressions

estimating the equation/growth regression

$$growth_{1960-2010} = \beta \ln GDP\_per\_capita_{1960} + \gamma X + \epsilon$$

$\hat{\beta}$ captures the degree of convergence

- $\hat{\beta} < 0$ indicates convergence (wealthier countries tend to grow at a slower pace)
- $\hat{\beta} > 0$ indicates divergence

The convergence hypothesis not supported by the data across heterogeneous groups of countries

Conditional Convergence

- **Absolute convergence**: all countries, regardless of their initial conditions, will eventually converge to the same level of income per capita.
- **Conditional convergence**: convergence is contingent on countries having similar structural characteristics

In the context of the Solow model, conditional convergence suggests that **countries with similar structural characteristics** (like savings rates, population growth, and technology) **will converge to similar levels of income per capita**, while those with different characteristics will converge to different steady-state levels.

Two main approaches:

1. restrict to homogeneous countries/regions
2. add in additional controls
    - variables usually included as controls in growth regressions: religion, democracy, trade, investment, school enrollment,..., institutions, etc.
    - main problem of growth regressions: possibly many determinants and very few data points

Institutions and policies

$$growth_{1960-2010} = \delta Instituions + \beta \ln GDP\_per\_capita_{1960} + \gamma X + \epsilon$$

- Even more problematic:
    - Omitted variables
    - Endogeneity of policies and institutions
- IV (and randomization): hard to find credible instruments

"*A first step in the right direction is to take the theories that motivate our empirical analyses more seriously*" (Rodrik 2012)

3.1. Modeling Economic Growth

> I do not see how one can look at figures like these without seeing them as representing *possibilities*. Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, *what*, exactly? If not, what is it about the 'nature of India' that makes it so? The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else.

Quote from Robert Lucas (1988) on differences in growth rates across poor countries

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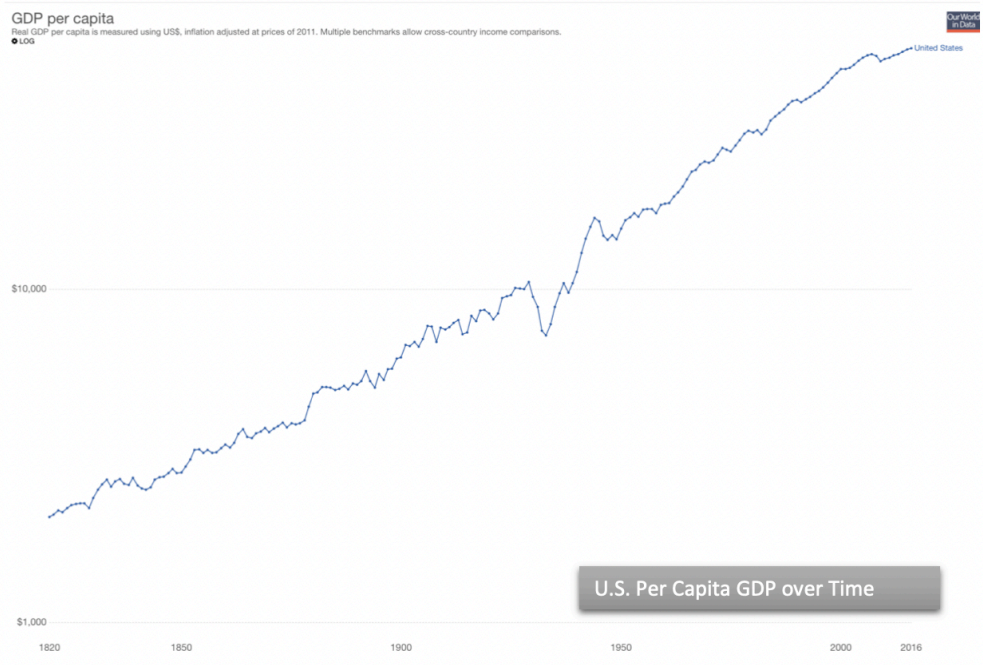
Models do not describe all features of the world - that is not their point.

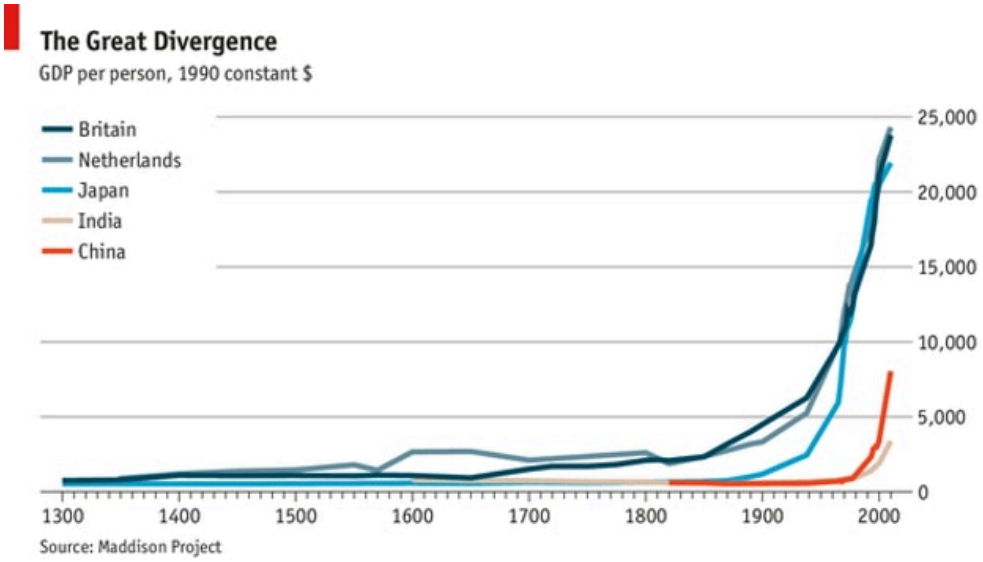
The idea of a model is that it formalizes our hypothesis about causal relationships.

We then test the model, or test some interesting implications of the model.

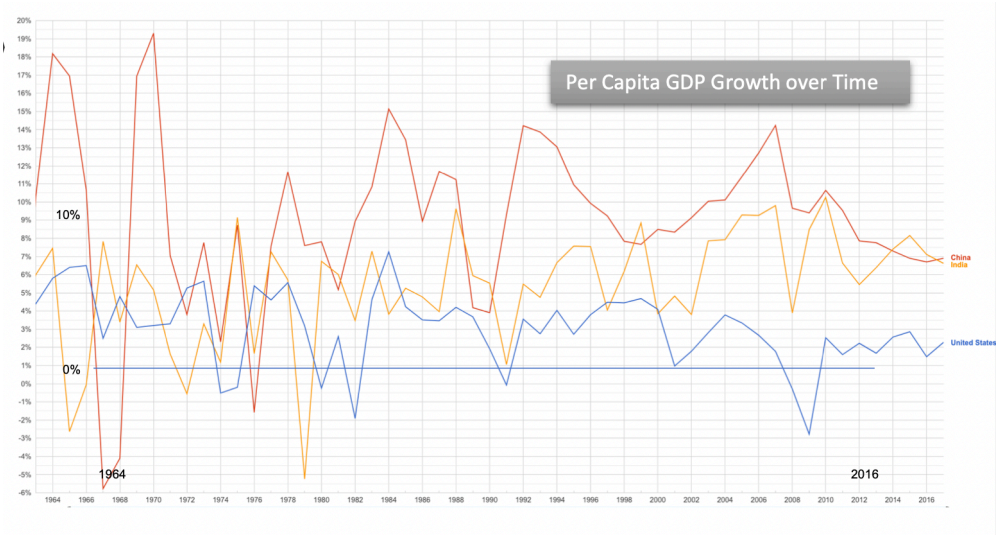
Growth: The Facts to be Explained



- GDP per capita is a very good predictor of virtually every desirable indicator
- GDP growth in developed countries extremely persistent, and moderate
- Production in rich countries is much more capital-intensive than in poor countries



- Substantial variation over time and across space
- There are growth miracles and growth disasters
- Low status is not always permanent



- Poor countries can grow much faster than rich countries
- Countries can grow very quickly and recover after negative shocks

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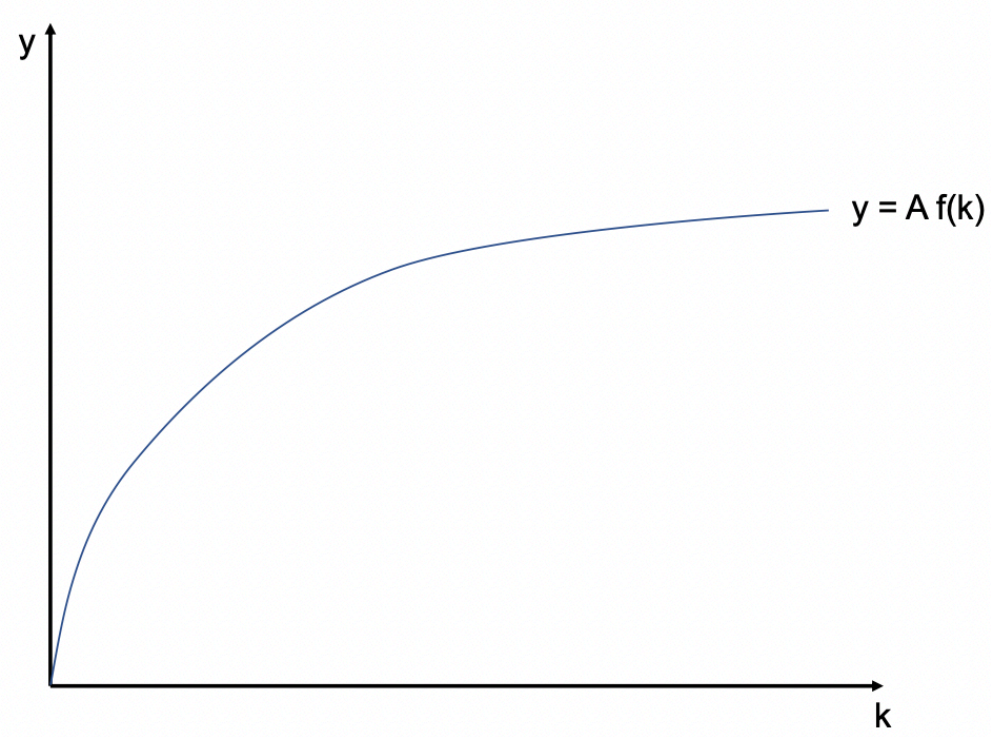
The Solow Model

3 fundamental building blocks

1. Technology/Productivity
2. Labor
3. Physical Capital

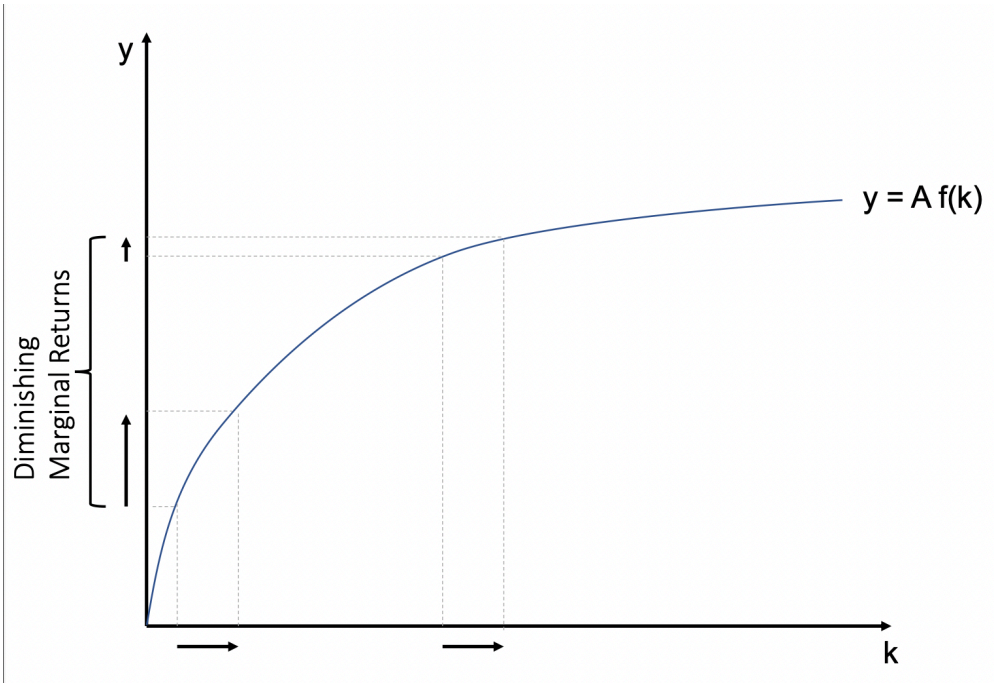
The Solow Production Function



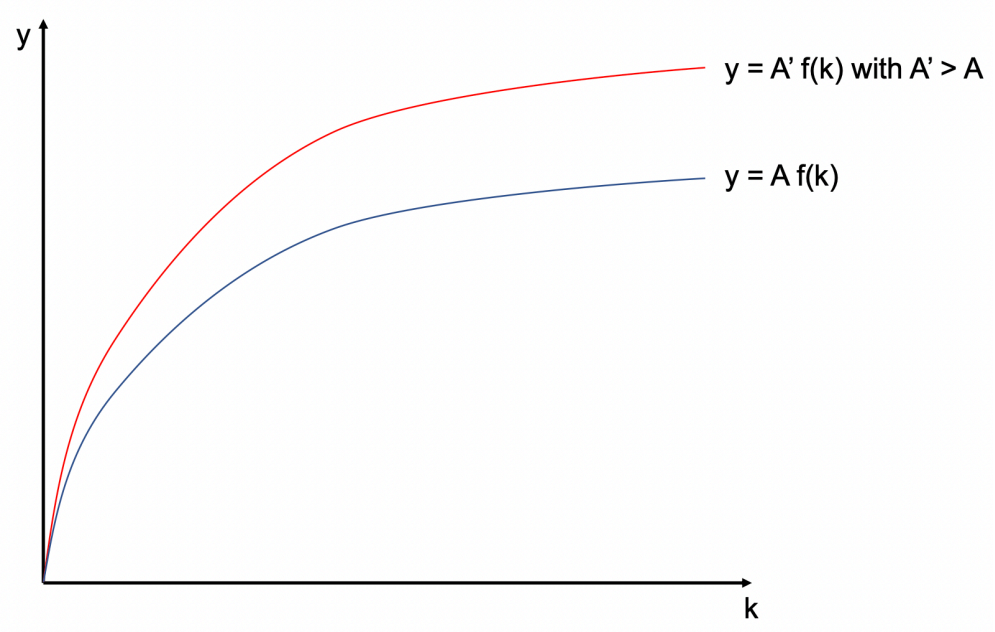
$$y = A \cdot f(k)$$

- $A =$ technology/productivity
- $y =$ output per worker
- $k =$ capital per worker

Key Assumption; Diminishing Marginal Returns



If $A' > A$:

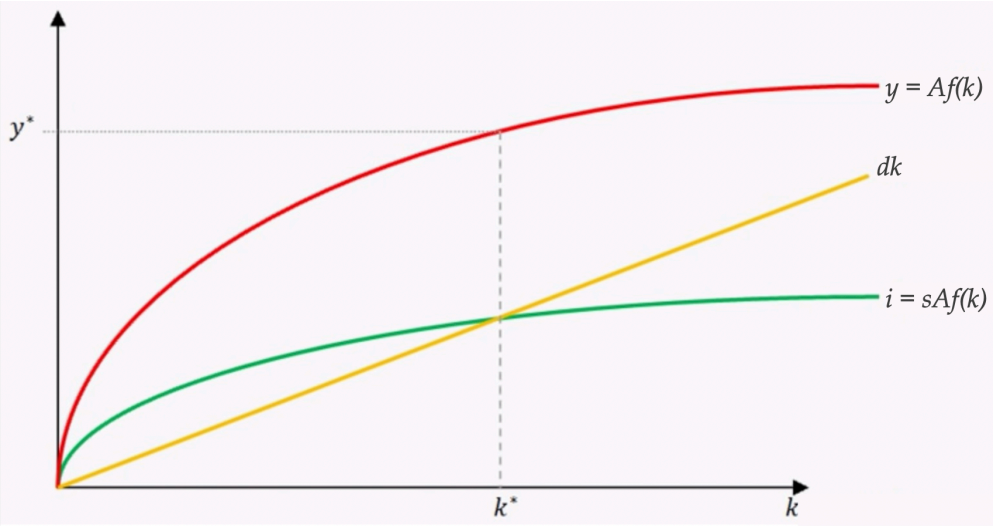


Over time, capital depreciates and savings generate new capital

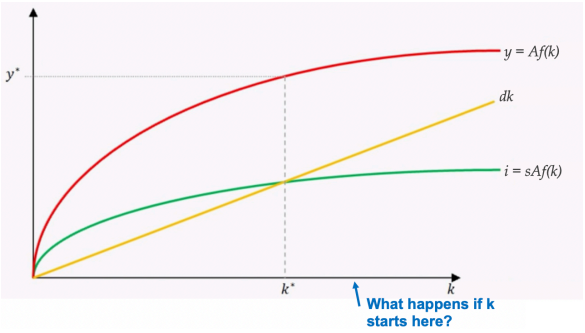
In particular, in each period t:

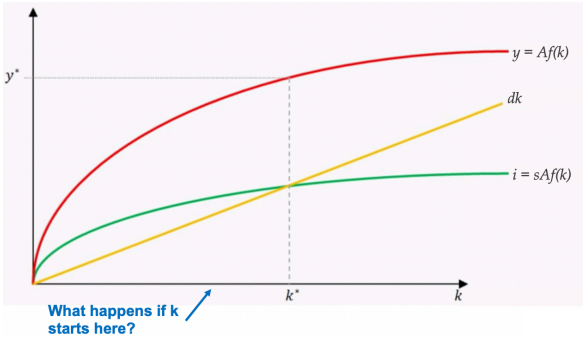
- δk_t depreciates before $t+1$ (where δ is the depreciation rate, $0 < \delta < 1$)
- $\sigma y_t = \sigma \cdot A \cdot f(k)$ is invested for $t+1$(σ is the savings rate, $0 < \sigma < 1$)

The ***steady state*** is when $k_t = k_{t+1} = k^*$ → this will occur when investment exactly offsets depreciation $(\delta k_t = \sigma \cdot A \cdot f(k))$



Capital Reaches a Steady State





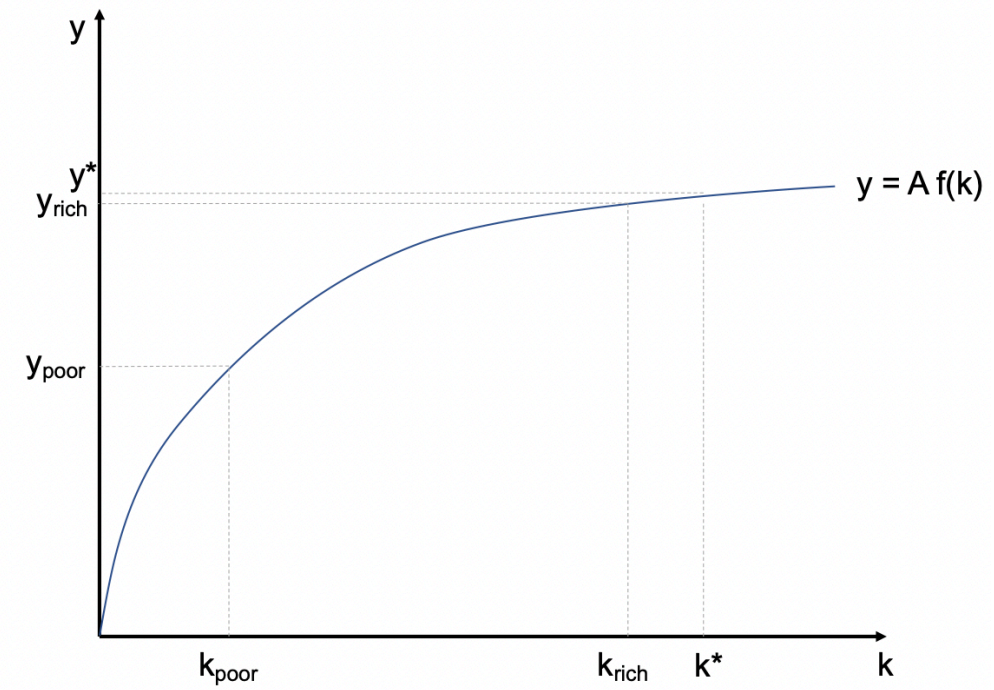
The Solow Model: Explanations for poverty

In the Solow Model, why would some countries be rich and others poor?

The Solow Model gives us two explanations:

1. Countries have different levels of capital (k)
2. Countries have different levels of technology (A)

EXPLANATION 1: Countries have different levels of capital (k)



A key prediction of this explanation is ***convergence***

- Poor countries should be growing rapidly and rich countries growing slowly, so the two should converge over time (due to *diminishing marginal returns*)
- Further, global capital should flow to the developing world, also leading to convergence
  - the marginal return to capital in poor countries would be very high
  - so capital should flow from rich to poor countries

Is there evidence of convergence?

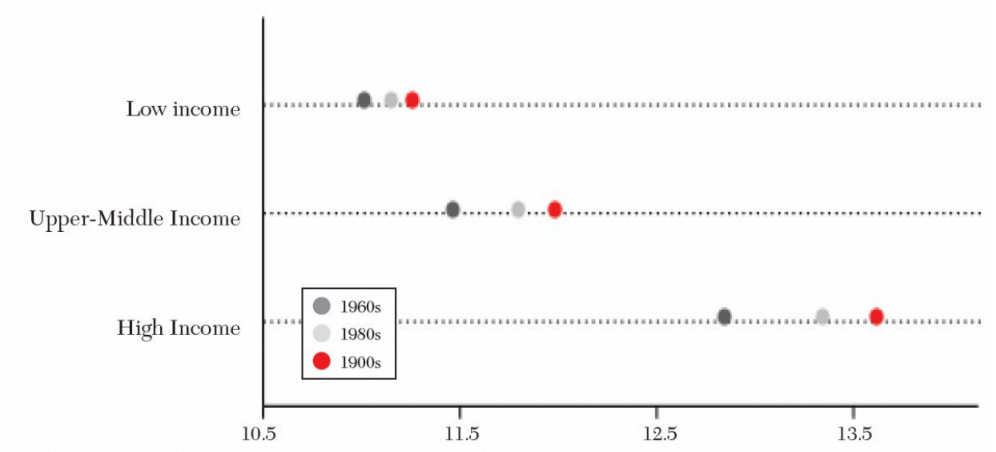


Figure 2b. Log of per Capita Income by Region (1960–2010)

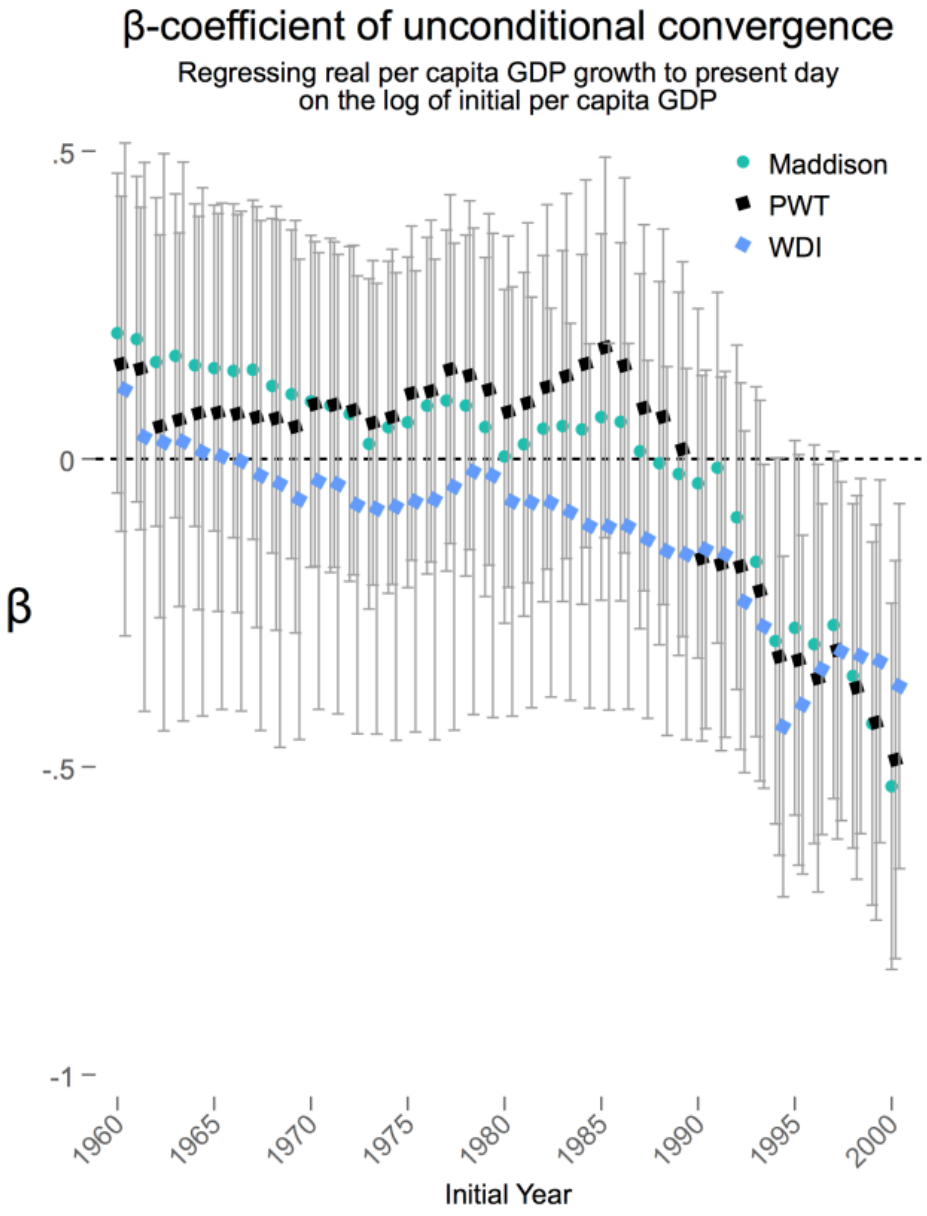
Johnson and Papageorgiou (2020) argue not

Some evidence of convergence recently...

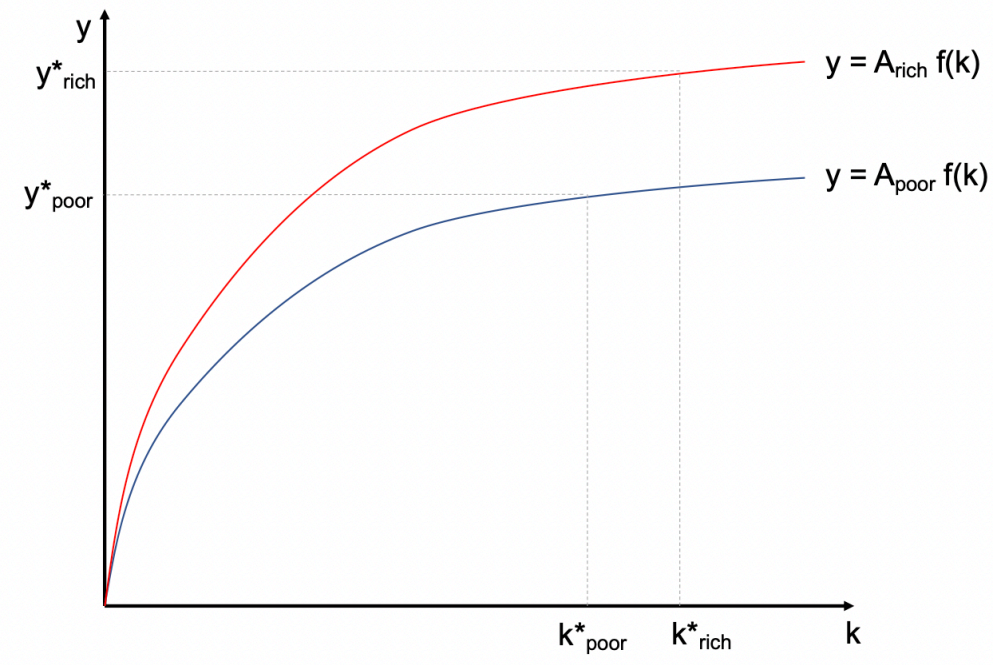
Patel, Sandefur and Subramanian (2018)

$$AnnualizedGrowth_{t_0-t} = \alpha + \beta \ln(GDP_{t_0}) + e$$

A $\beta > 0$ indicates divergence. A $\beta < 0$ indicates convergence: wealthier countries tend to grow at a slower pace



EXPLANATION 2: Countries have different levels of technology (A)



In this case, each country would converge to its own steady state.

We may see rapid growth after a natural disaster, a war, or a substantial policy change (which would move the country out of steady state or change A)

But a country may not converge all the way to the GDP of the rich countries.

Lucas (1990) paradox: Capital Flows from rich to poor nations are relatively small

- If countries hade the same A, gaps in income levels across rich and poor countries would imply the returns to capital in poor countries were much, much higher than in rich counties, so capital should flow from rich to poor countries
- but capital flows from rich to poor nations are relatively small

Lucas saw this as evidence in favor of allowing A to differ across countries

SUMMARY

The Solow Model is a parsimonious model that provides a framework for thinking about economic growth

Two explanations for poverty:

- poor countries have low capital k (but the same A): implies per capita incomes willl convergence across countries. Poor countries need to wait or accellerate capital accumulation
- poor countries have lower levels of technology (A): poor countries converge to a lower steady state. Poor countries should try to raise A.

The Poverty Trap Model

The income you have today the income you have tomorrow

- what you have today determines the productive assets you can buy - e.g., food, education, capital - and this determines what you have tomorrow

  (this was also true in the Solow Model)
- Key ingredients for poverty trap: the relationship between income today and tomorrow follows an S-Shaped curve
  - it does not have decreasing returns everywhere - there is an area with increasing returns
- This can generate multiple steady states