Emerging Nations

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The Expat Expo is Back!
Fun for all this Saturday (08th Oct).

Expat Expo is an annual exhibition held at Výstaviště Praha Holešovice that connects local and international businesses with expatriate community of the Czech Republic. With over 6,000 visitors expected, and lots of giveaways & goodies- it's an amazing day out for family & friends alike.

The day is aimed at families and offers a children's playground, entertainment, face painting and other activities for children. Check it out!

The event will be public open from 11:00 to 18:00.
Entry is FREE, so you are welcome!

Econ of Emerging Nations

Test on Monday

- ▶ 13:20, Oct. 10
- ▶ *CERGE-EI (Polit.veznu 7, Prague 1)*

Growth rate

$$\frac{\Delta y_{t+1}}{y_t} = \frac{y_{t+1} - y_t}{y_t} = g_t$$
$$y_{t+1} = y_t (1 + g_t)$$

y_t is pc output at time t, and g_t is the growth rate

$$y_{t+2} = y_{t+1} (1 + g)$$
$$= y_t (1 + g) (1 + g)$$

$$y_{t+n} = y_t (1 + g)^n$$

Example
Double production

$$y_{t+n} = 2y_t$$
$$2y_t = y_t (1 + g)^n$$
$$\log 2 = n \log (1 + g)$$
$$n \simeq \frac{\log 2}{g} \simeq \frac{70}{g\%}$$

Numerical examples

- USA:

$$GDPpc = €35000$$
$$GroRt = 4pct$$

In how many years the US will produce twice as much, i.e. $GDPpc=€70000$.

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- Czech Republic:

$$GDPpc = \text{€}20000$$
$$GroRt = 9pct$$

In how many years the CR will produce twice as much, i.e. $GDPpc=\text{€}40000$.

Numerical examples

- USA:

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$$GroRt = 4pct$$

  In how many years the US will produce twice as much, i.e.
  $GDPpc=€70000$.

- Czech Republic:

$$GDPpc = €20000$$
$$GroRt = 9pct$$

  In how many years the CR will produce twice as much, i.e.
  $GDPpc=€40000$.

- In how many years will the CR produce as much as the US?

Numerical examples

How many years will it take for the CR to produce as much as the USA?

$$
\begin{aligned}
y_{t+n}^{US} &= y_{t+n}^{CZ} \\
y_t^{US} \left(1 + g^{US}\right)^n &= y_t^{CZ} \left(1 + g^{CZ}\right)^n \\
\ln y_t^{US} + n \ln \left(1 + g^{US}\right) &= \ln y_t^{CZ} + n \ln \left(1 + g^{CZ}\right) \\
\ln \frac{y^{US}}{y^{CZ}} &= n \ln \frac{1 + g^{CZ}}{1 + g^{US}} \\
n &= \left(\ln \frac{35}{20}\right) / \left(\ln \frac{1.09}{1.04}\right) \\
&= 11.9
\end{aligned}
$$

$\ln \frac{35}{20} = 0.559\,6 \quad \ln \frac{1.09}{1.04} = 0.04\,7$

Numerical examples

What is the gap between the Czech and American production in 25 years?

$$
\begin{aligned}
y_{t+25}^{US} &= 35 \cdot (1+0.04)^{25} \\
&= 93.3
\end{aligned}
\qquad
\begin{aligned}
y_{t+25}^{CZ} &= 20 \cdot (1+0.09)^{25} \\
&= 172.5
\end{aligned}
$$

QUESTION
Does this make sense?
Is there a problem?

Growth Rates

Can they be constant?
What determines the growth rate?

Solow Model

Production function:

$$\begin{aligned} Y &= F(K, L) \\ &= AK^{\alpha}L^{1-\alpha} \end{aligned}$$

Production per capita:

$$\begin{aligned} y &\equiv \frac{Y}{L} \\ y &= \frac{AK^{\alpha}L^{1-\alpha}}{L} = \frac{AK^{\alpha}L^{1-\alpha}}{L^{\alpha}L^{1-\alpha}} \\ &= Ak^{\alpha}, \alpha \in (0, 1) \end{aligned}$$

Solow Model

Growth:

$$
\begin{aligned}
y_{t+1} - y_t &= A k_{t+1}^{\alpha} - A k_t^{\alpha} \\
&= A \left((k_t + \Delta k_t)^{\alpha} - k_t^{\alpha} \right)
\end{aligned}
$$

Growth requires:
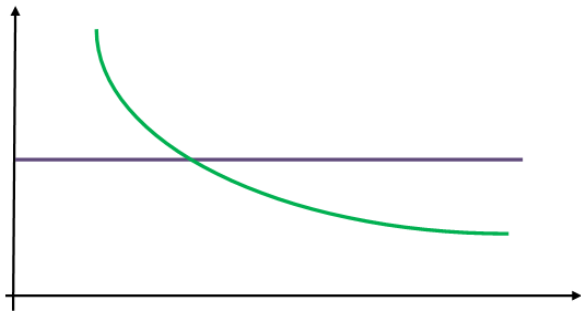
$$
\Delta k_t \neq 0
$$

Change in capital:

$$
\begin{aligned}
k_{t+1} &= k_t - \delta k_t + sy \\
&= k_t (1 - \delta) + s \cdot A k_t^{\alpha}
\end{aligned}
$$

Growth rate:

$$
\begin{aligned}
\frac{\Delta k_t}{k_t} &= \frac{s \cdot A k_t^{\alpha}}{k_t} - \delta \frac{k_t}{k_t} \\
&= \frac{sA}{k_t^{1-\alpha}} - \delta
\end{aligned}
$$

Solow Model

$$g_k = \frac{\Delta k_t}{k_t} = sAk_t^{\alpha-1} - \delta$$

Solow Model

- ▶ Prediction
    - ▶ Countries will eventually end up in their steady states.
    - ▶ Countries will grow at different rates if they are at different distance from the steady state level
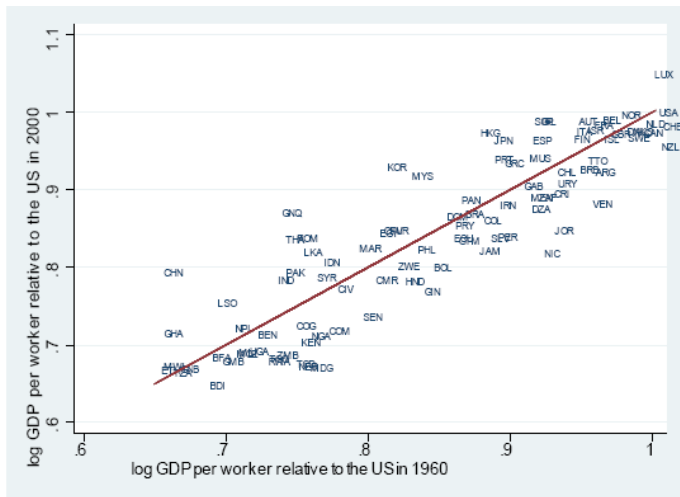   - ▶ (in case they have the same steady state!)

Definition
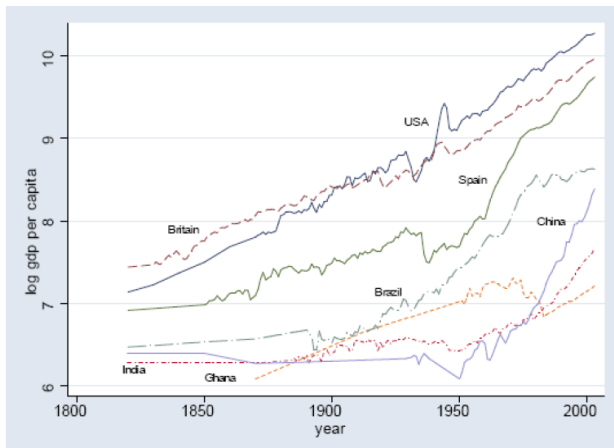$\sigma - convergence$ is the catch up effect between countries.

Definition
$\beta - convergence$ (or the conditional convergence) refers to countries converging to their own steady state long run growth rate.

No evidence for abslolute (sigma) convergence in real data

Dubious evidence for conditional (beta) convergence

Different paths