Inclusive Growth Analysis
Theory and Practice

Edgardo Favaro
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Why is there so much interest about Growth Inclusive Analysis?

• Growth is the most important lever to reduce poverty;
• The Bank is frequently asked for advice on how to accelerate the rate of growth; but
• Growth theory:
  – Does not focus on transitory changes in the rate of economic growth
  – provides little guidance to help the applied economist analyze a real world situation;
  – Growth theory says little about the total distribution of income (only cares about the mean of the distribution).
• Inclusive growth analysis intends to fill these gaps. For that it uses all economic theory and experience.
• The objective of the course is to familiarize participants with these tools.
Permanent and transitory

• **Growth theory** focuses on factors that affect *the rate of growth of per capita income permanently*.

• Inclusive growth analysis is also interested on factors that affect the *rate of growth of per capita income transitorily*.

• **Example Solow**
The Basic Model: Solow

- Output per capita is given by

\[ y_t = AF(k_t) \]

So study how does K/L evolve over time!

\[ K_t = (1 - \delta)K_{t-1} + I_t \]
The Basic Model: Solow2

• In equilibrium savings equals investment:

\[ S_t = sLf(k_t) = I_t \]

• Plugging definitions in law of motion of capital:

\[ k_{t+1} = \frac{sf(k_t)}{1+n} + \frac{(1-\delta)}{(1+n)} k_t \]
The Basic Model: Solow 3

The curved line is savings: \( sf(K) \).
The straight line is investment \( \delta K \).
Reflections on Solow

- Growth depends on capacity expansion rather than on aggregate demand;
- Increasing the investment share does not change $g$.
- Growth can be disaggregated into sources: capital, labor, productivity change (growth decomposition coming).
- Convergence.
- Productivity change is the engine of growth but where does it come from?
The importance of transitory growth…

• Suppose that Bank advice results in a 4 year increase in growth in country A (from 3% to 3.1%). In year 5 and thereafter growth returns to 3% annually.

• Q: What is the value of the advice?
A: About 23% of GDP!!!
Digging deeper

• When we learn growth theory economic policy matters very little. So issues such as allocation of resources across sectors are not part of the analysis.

• In practical work we know that growth is uneven across sectors and may be the result of expansion of different components of aggregate demand (consumption, exports, investment etc.) and sustainability of growth may be different in each of these cases.

• So, decompose g by:
  – Factor of origin;
  – Aggregate demand source;
  – Sector of origin.
Digging deeper 2

• Can we say anything about aid effectiveness?
• Or about borrowing abroad?

To address these questions we have to go from Solow to the optimal growth models (Ramsey-Cass-Koopmans). The extension is intuitively obvious the math gets more complicated.

Example: optimal growth
Example: Optimal Growth

• In Solow there are two parameters who replace preferences: the savings rate and the rate of population growth;

• In the optimal growth literature savings are endogenously determined.
The Optimal Growth Problem

- **Step 1: Set maximization problem**

\[
MaxL1 = \max \sum_{t=0}^{\infty} \beta^t \left[ U(C_t) + \lambda_t \left\{ f(K_t) - C_t + (1 - \delta) K_t - K_{t+1} \right\} \right]
\]
Step 2: First order conditions

\[ \beta'(U'(C_i) - \lambda_i) = 0 \]

\[ \beta' \lambda_i f'(K_i) + \beta'(1 - \delta)\lambda_i - \beta'^{-1}\lambda_{i-1} = 0 \]

\[ \lambda_i (f(K_i) - C_i + (1 - \delta)K_i - K_{i+1}) = 0 \]

\[ \text{Lim} \beta' K_i = 0 \]
Step 3: Steady state analysis

\[ f'(\bar{K}) = \frac{1}{\beta} + \delta - 1 = \rho + \delta \]

\[ \bar{C} = f(\bar{K}) - \delta \bar{K} \]
Step 4: Dynamic analysis

The usual way to do it is to construct the phase diagram and study qualitative behavior of a system of difference equations.
What is optimal growth useful for?

• Recalling the two welfare theorems it implies that under competition there is a decentralized solution which yields the optimum.

• You can talk meaningfully about welfare issues.

• But still this model does not say much about productivity change, government, or allocation, or openness, etc.
Digging deeper 3: Growth in an open economy

• An open economy with no limitation to borrow implies instantaneous adjustment equalizing the MPK across countries.
• Clearly we do not observe this.
• Does the current account (CA) matter? Yes
  – Why are emerging market economies levying taxes on capital inflows?
Digging Deeper 4  
Growth and the government

• Writing the government budget constraint
• Does it matter what the government produce?
  – Public goods
  – Private goods.
  – Transfers.
  – Investment.
• More on this on Thursday.
Digging deeper 5
What causes growth?

• As a matter of accounting it is TFP changes and changes in the quality of inputs.

• Endogenous growth models
Endogenous growth models

- In Romer (1986) growth is the result of externalities in capital accumulation;
- In Lucas (1988) growth is the result of externalities in human capital accumulation;
- In Romer (1990) growth is the result of knowledge accumulation.
The first Romer Model

• Each firm has a production function:

\[ y_t = \theta k_t^\alpha \]

• The level of technology depends on the aggregate stock of capital:

\[ \theta = k^\eta \]

• Then the production function for the economy as a whole is:

\[ y = k^{\alpha + \eta} \]
The first Romer Model II

- The rationale for this specification is knowledge is a public good;
- The implication of the model is that firms will underinvest because they do not take into account the effect they have on aggregate capital;
- Why do externalities stop at the border?
The Lucas Model

• Income is a function of capital (k), human capital (h), and the fraction of time allocated to production (n):

\[ y_t = A k_t^\alpha (h_t n_t)^{1-\alpha} \]

• Human capital is produced using (h) and (n):

\[ h_{t+1} - h_t = B(1 - n_t) h_t - \delta_t h_t \]

• The model predicts n increases the lower the discount rate.
Romer (1990)

- Growth is driven by technological change that arises from investment by firms;
- Once the cost of instructions for working with raw materials has been incurred they can be used again at no additional cost.
- Imperfect competition.
- The stock of HK capital determines the rate of growth and too little HK is devoted to research in equilibrium;
- Integration into world markets will increase growth rates.
Wrap up on optimal- and endogenous growth

• These models are useful as a framework to think about growth. They sharpen understanding of what causes long run growth;

• While the aggregate structure of these models limits their usefulness to study policy issues simple modifications shed light on several policy questions;

• But, growth theory models do not capture forces that affect the rate of growth transitorily.
Inclusive Growth Analysis

• Remember that growth is the result of increases in capacity and in productivity;

• A promising applied strategy is to look at the determinants of capacity and of productivity;

• This is what the HRV approach does. However, they develop only the *tree branch* on physical capital; **we will extend the analysis also to human capital and to all sectors of the economy.**