Chapter 1: Contemporary Models of Development and Underdevelopment

Development Economics
FESP - Panthéon Sorbonne Master in Development Economics

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Introduction

- Traditional theories:
  - Development as a linear phenomenon
    - Rostow’s stages of growth
    - Harrod-Domar Model
    - Structural Change Models (Lewis)
  - Problem: Development is possible (East-Asia) but much more difficult than what we taught (Sub-Saharan Africa)
  - Development does not happen automatically; it requires systematic effort → What makes the study of economic development so important
Introduction

A review of the most influential of new models of economic development

- These models show that development is harder to achieve, it faces more barriers than had previously been recognized
- These new models have already influenced development policies and modes of international assistance
Introduction

- One major theme: incorporating problems of coordination among economics agents (firms, workers)
- Other theme: formal exploration of situations in which increasing returns to scale, a finer division of labor, the availability of new economic ideas or knowledge, learning by doing, information externalities, and monopolistic competitions
- It often incorporates insights of new institutional economics (Douglas North)
- It departs to some degree from conventional neoclassical economics (perfect imperfection, no externalities and the uniqueness and optimality of equilibria)
 Outline

Underdevelopment as a coordination failure
   Endogeneous Growth and Complementarities
   Coordination failures

Multiple Equilibria: a diagrammatic approach

Starting Economic Development: The Big Push
   A graphical model

O-Ring Theory

Growth diagnostics (Rodrik)
Complementarities between several conditions are necessary for successful development:

- Investments must be undertaken by many agents in order for the results to be profitable for any individual agent.
- An action taken by one firm, worker, or organization increases the incentives for other agents to take similar actions.

Endogeneous Growth Models

- Increasing returns due to these complementarities.

Coordination Failure Approach
Endogenous Growth theories

- Limitations of the Solow model:
  - Similar access to technology (A) for all countries
  - Technological progress is exogenous (growth of A)
  - Decreasing returns of capital

- How to sustain growth: positive externalities
  - More benefits from inputs in order to compensate decreasing returns
Endogeneous growth (Romer)

- Externalities: Learning effects (learning by doing)
  - Capital accumulation in one firm has positive spillover effects (externality) on productivity of other firms

\[
Y_i = AK_i^{\alpha} L_i^{1-\alpha} K^\beta
\]  
(1)

- If all sectors are identical, the aggregate production function is

\[
Y = AK^{\alpha+\beta} L^{1-\alpha}
\]  
(2)
Endogenous Growth (Romer)

- **Implications**: Constant returns at the firm level and increasing return at the macroeconomic level
  - Positive growth in the long-run (if $\beta > 0$)

$$g - n = \frac{\beta n}{1 - \alpha - \beta}$$  \hspace{1cm} (3)
Coordination failures

A state of affairs in which agents’ inability to coordinate their behavior (choices) leads to an outcome (equilibrium) that leaves all agents worse off than in an alternative situation that is also an equilibrium.

This may occur even when all agents are fully informed about the preferred alternative equilibrium:

- Because people hold different expectations
- Or because everyone is better off waiting for someone else to make the first move.
Coordination failures

- When complementarities are present, an action taken by one firm increases the incentives for other agents to take similar actions.
- These complementarities often involve investments whose returns depend on other investments being made by others.
- Examples:
  - **Big Push**, in which production decisions by modern-sector firms are mutually reinforcing.
  - **O-Ring model**, in which the value of upgrading skills or quality depends on similar upgrading by other agents.
  - Analyses of **frontier technologies** in developed countries (information technologies).
  - Analyses of **middle-income trap** in which countries develop to a degree but chronically fail to reach high-income status, often due to lack of innovation capacity.
Examples

- **Skill workers**
  - Firms will not enter a market or locate in an area if workers do not possess the skills the firms need
  - But workers will not acquire the skills if there are no firms to employ them
  - This coordination problem can leave an economy stuck in a bad equilibrium (low average income with a class of citizens trapped in extreme poverty)
Examples

- **Commercialization of agriculture**
  - Specialization is one of the sources of high productivity but we can specialize only if we can trade for the other goods and services we need.
  - In the development of agricultural markets, middlemen play a key role by effectively vouching for the quality of the products they sell.
  - There needs to be a sufficient number of concentrated producers with whom a middleman can work effectively.
  - But without available middlemen to whom the farmers can sell, they will have little incentive to specialize in the first place and will prefer to continue producing a range of goods primarily for personal consumption or sales within the village.
  - **Underdevelopment trap** in which a region remains stuck in subsistence agriculture.
It expands the scope for potentially valuable government policy interventions

- Pushing the economy toward a self-sustaining, better equilibrium, in which there is no incentive to go back to the behavior associated with the bad equilibrium
- Organizing complementarities / investments and fostering new markets
- Deep intervention in the first steps of development (in order to reach the high equilibrium), then government can focuses on other goals (education / health, etc)

- Complementarities imply a certain level of agglomeration
  - It can turn to congestion
  - ... Which is also an externality (but negative)
Equilibrium: All participants are doing what is best for them, given what they expect others to do, which in turn matches what others are actually doing (when the function crosses the 45-degree line)
S-shaped “privately rational decision function”
- it first increases at an increasing rate, and then at a decreasing rate
- Some agents may take the complementary action
- If only few agents take the action, spillovers are minimal
- Then snowball effect, in which many agents begin to provide spillover benefits to neighboring agents (the curve increases at a faster rate)
- After most potential investors have been positively affected, the rate of increase starts to slow down

Other curves are possible, depending on the nature and scale of spillovers
Equilibrium: when agents observe what they expected

Stable and unstable equilibrium

- Here $D_1$ and $D_3$ stable
- $D_2$ not stable
Coordinating investments decisions

- when the value (rate of return) of one investment depends on the presence or extent of other investments
- Coordinating investments and technological externalities (as in Romer)
  - Possibility to be stuck in a low equilibrium if pessimistic expectations of investors
  - Strategies / policies to change expectations (example of mañana mañana in Latin America)
  - But it might be insufficient if it is more profitable for firms to wait for others to invest rather than to be a “pioneer” investor
  - In that case, government policy is generally needed in addition to a change of expectations
Big Push Theory

Why should it be so difficult to start modern growth?

- In classic theories of development (such as the Lewis model), perfectly competitive conditions in the industrial sector.
- Under perfect competition, it is not clear why starting economic development would be so difficult (provided at least human capital / technology / good basic services provided by the gvt).
- Development seems hard to initiate even when better technologies are available (they often go unused) → people do have the incentives to use these new technologies.
- Perfect competition does not hold under conditions of increasing returns to scale.
- Looking at the industrial revolution, taking advantage of increasing returns has been key.

The role of market failures, notably pecuniary externalities.

Spillovers effects on costs and revenues.
Big Push, Rosenstein-Rodan (Economic Journal, 1943)

- Basic coordination issues in a closed economy (no exports)
- Who will buy the goods produced by the first firm to industrialize?
  - Starting from a subsistence economy, no workers have the money to buy the new goods
  - The first factory can sell some of its goods to its own workers (but no one spends all of one’s income on a single good)
- Profitability of one factory depends on whether another one opens
  - Which it turn depends on its own potential probability, that it turns to the profitability of other factories
  - → circular causation
  - Coordination failure problem
Big Push, Rosenstein-Rodan (Economic Journal, 1943)

- Need to train workers, who are accustomed to a subsistence way of life
  - The cost training puts a limit on how high a wage the factory can pay
  - Once the first firm trains its workers, other entrepreneurs can offer a slightly higher wage to attract the trained workers (without paying the cost of training)
  - The first entrepreneur, anticipating this likelihood, does not pay for training in the first place
  - No one is trained and industrialization never gets under way
The Big Push is a model of how the presence of market failures can lead to a need for a concerted economywide and probably public-policy-led effort to get the long process of economic development under way (or to accelerate it).

Coordination failure problems work against successful industrialization.


It explains the success of East-Asian countries (South Korea).
A graphical model

**Assumptions**

- Increasing returns in the modern sector
- *Factors*. Only one factor of production - labour. Fixed total supply, \( L \)
- *Factor payments*. Two sectors
  - Traditional sector: Wage of 1
  - Modern sector: \( W > 1 \) (it may be a compensation for disutility of modern factory type of work)
- In equilibrium, no net utility for workers from switching sectors during industrialization, but it will represent a **Pareto improvement** of profits are generated
A graphical model

Assumptions

Technology.

- N types of products (large number)
- Traditional sector: each worker produces one unit (constant returns to scale)
- Modern sector: increasing returns and fixed cost ($F$, here minimum number of workers to start production)

$$L = F + cQ$$

- Marginal labor required for an extra unit of output

Domestic Demand.

- Each good receives a constant and equal share of consumption out of national income ($Y/N$)

International supply and demand.

- To simplify: closed economy
- Most important conclusions will remain in an open economy
- Realistic hypothesis: in South Korea, the dynamic export sector have benefited from the presence of a substantial domestic market to which early sales are directed
A graphical model

- **Assumptions**
  - *Market structure.*
    - Perfect competition in the traditional sector with free entry and no profit. Price=1=marginal cost of labour
    - At most, one modern-firm can enter each market. They will charge a price of 1
    - When a modern-firm enters one market, she gains a monopoly position
    - A modern firm enters one market if she is able to produce at least as much output as the traditional producers for the same level of labour
Starting point: subsistence economy without modern production

A potential producer with modern economy considers whether it is profitable to enter the market

For a given level of $F$, it will depend on:

1. How much more efficient the modern sector is than the traditional one
2. How much higher wages are in the modern sector than in the traditional sector
Production function traditional sector
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Two cases:

- Limited modernization (one good):
  - Rise in wage is too limited to change total income (Y) and thus sales (Y/N): point A

- Large modernization (all goods)
  - Wage rise for all workers $\rightarrow$ rise of income
  - Level of sales for all producers: Q2 (point B)

Modernization of one good is a positive externality for all other goods because of the induced rise in sales and production
Modern production (example point A with wage $W_1$)
  - more likely when $F$ (fixed cost) is low
  - more likely when $c$ (marginal labour) is low

If wage = $W_2$: wage is too high for modern production at point A
  - Production should rise up to $Q_2$ (production turns profitable)
  - It is possible if a sufficient number of modern producers enters the market (positive externalities)

At $W_2$, multiple equilibrium depending on the production of the modern sector
$W_3$

- $Q_2$: insufficient to get profitable modern production
- Wage curve beyond the modern production function (and point B)
- It will depend on $F$ and $c$
  - The more efficient is the modern sector (low $c$) and the lower are the fixed costs, the less likely is this case
To sum up

- For a given level of $F$ and $c$
  - A policy aiming at reducing $F$ (innovation policy) or $c$ (training, investment in productivity) may ease the economic take-off

- Wage $W_1$: modern producers are profitable whatever is the number of modern producers. No need for intervention and endogeneous transition towards a modern economy

- Wage $W_2$: Multiple equilibrium
  - If $A(Q_1) \rightarrow$ No modern production (too few modern producers for profitable investment in the modern technology)
  - If $B(Q_2) \rightarrow$ Modern production (size of the market is large enough)
  - Possible coordination failure to reach B

- Wage $W_3$: no possible industrialization (not profitable)
Some remarks

- No need that *all* sectors switch to the modern production to get a sufficient big push
  - If enough sectors switch, positive spillovers on demand for other sectors might be sufficient
- Each firm’s failure to take into account the impact of its investments on demand for other firms’ goods represent a very small distortion
- But the aggregate distortion (failure to industrialize) is very large
- Semi-industrialization
  - Fall of fixed cost in some sectors only
  - Increased dualization of the economy: enclave economies in which a modern sector exists side by side with traditional cottage industries in other product sectors
Other cases in which a big push may be necessary

1. **Intertemporal effects**
   - If $W = 1$, possible multiple equilibria if investment returns are not immediate
   - Although industrialization is Pareto-improving, possible trap if expected demand in second period is too low (case of pecuniary externalities where the firm’s external contribution to overall demand is not captured)

2. **Urbanization effect**
   - Rural (traditional) - Urban (modern) dualism
   - $\rightarrow$ Urban demand should be sufficient
   - $\rightarrow$ Big Push = urbanization
Other cases in which a big push may be necessary

3. **Infrastructure effects**
   - Infrastructures have strong impact on firms’ cost / productivity
   - Infrastructure use depends on industrialization level
   - Industrialization increase the scale of the market for other sectors
     → Providing infrastructures more profitable
   - But infrastructures are not enough by themselves, if other coordination problems remain

4. **Training effects**
   - Typical problem of coordination: entrepreneurs know that the workers they train may be enticed away with higher wages offered by rival firms that do not have to pay these training cost
   - Training might be sub-optimal if demand for high-skilled workers is too low (skill returns)
   - Also true in an open economy (barriers to free mobility of workers)
O-Ring Theory (Kremer, QJE, 1993)

- Modern production: it requires many activities be done well together in order for any of them to amount to high values → Strong complementarity
  - Specialization and division of labor, along with economies of scale
  - O-Ring: taken from the 1986 Challenger disaster, in which the failure of one small, inexpensive part caused the space shuttle to explode

- O-Ring theory: explains the existence of poverty traps and reasons that countries caught in such traps
O-Ring Theory (Kremer, QJE, 1993)

- Production with strong complementarities among inputs
  - $n$ tasks, ordered by level of skill $q$ ($0 \leq q \leq 1$)
  - The higher the skill, the higher the probability that the task will be successfully completed (the part created in this task will not fail)
  - Other interpretation: quality index for characteristics of the good
  - The probability of mistakes by different workers is independent
  - **O-ring production function** (with 2 workers):
    \[
    BF(q_i Q_j) = q_i q_j \tag{4}
    \]
  - With $B$: productivity (that can be normalized to 1)
Other hypotheses

1. Firms are risk-neutral
2. Labour markets are competitive
3. Labour supply is inelastic
4. Capital markets are competitive
Production function: *(positive assortative matching)*

- Workers will work with workers with similar skills
- Implications: High-value products will be concentrated in countries with high-value skills
- Each worker wants to be matched with a positive worker → positive effect on productivity and thus wage
- Most productive workers will tend to work together (to increase their wages)

Case of an economy with 4 individuals (2 skilled and 2 unskilled)

\[ q_H^2 + q_L^2 > 2q_H q_L \] (5)
Example with 4 individuals \((q_L = 0.5, q_H = 1)\)

\[ \rightarrow \text{Increasing returns} \]
Implications of the O-Ring model

- Firms tend to employ workers with similar skills for their various tasks.
- Workers performing the same task earn higher wages in a high-skill firm than in a low-skill firm.
- Because wages increase in $q$ at an increasing rate, wages will be more than proportionally higher in developed countries than would be predicted from standard measures of skills.
- In their human capital investment decisions, workers should consider investments made by other workers as a component of their own decision:
  - When those around have higher skill; it increase the incentive to acquire more skills.
Multiple Equilibria and investment in human capital

→ This graph may explain investments in human capital
Implications (II)

- A country can be trapped in a low equilibrium with low production and low quality → *O-Ring effect* across firms and within firms
  - The case for an industrial policy to encourage quality upgrading (East Asian countries)
- O-ring effects magnify the impact of local production bottlenecks because of their multiplicative effect on other production
- Bottlenecks also reduce the incentive for workers to invest in skills by lowering the expected return to these skills
Implications (III)

- Implications for the **choice of technology**
  - When skill-workers availability is low: a firm is less likely to adopt a technology exploiting complex tasks (with high added value)
  - It may explain why developed countries are more likely to have large-scale firms, with high-wages

- Migration implications: **Brain Drain**:
  - Skilled-workers are more likely to emigrate to find better job opportunities (higher wages due to complementarities)
  - A skilled-workers will be more productive (↑ wages) in a developed countries
To summarize...

*If strategic complementarity is sufficiently strong, microeconomically identical nations or groups within nations could settle into equilibria with different levels of human capital.*
Convergence in policy mindsets

“What is probably the best argument for the experimental approach is that it spurs innovation by making it easy to see what works” (Banerjee 2007)

In contrast to the clearcut list of policy recommendations made by macro-development economists in the previous years..

But new development policies since the 2000s

- Growth Report: Strategies for Sustained Growth and Inclusive Development (Spencer Report)
- World Bank 2005: “there is no unique universal set of rules. We need to get away from formulae and the search for elusive best practices”
The example of Growth diagnostics

Problem: Low levels of private investment and entrepreneurship

\[ \frac{\dot{c}_t}{c_t} = \frac{\dot{k}_t}{k_t} = \sigma [r (1 - \tau) - \rho] \]

Low return to economic activity

- Low social returns
  - poor geography
  - low human capital
  - bad infrastructure
  - micro risks: property rights, corruption, taxes
- Bad infra-structure

High cost of finance

- Low appropriability
  - government failures
  - market failures
    - information externalities: "self-discovery"
    - coordination externalities
  - micro risks: financial, instability
  - macro risks: financial, fiscal, monetary
- bad local finance
  - coordination failures
  - low domestic saving
  - poor intermediation
- bad international finance
  - coordination failures
  - poor intermediation
The new policy approach

- It starts with relative agnosticism on what works and what does not. It is explicitly diagnostic in its strategy to identify constraints.
- It emphasizes experimentation as a strategy for discovery of what works. Monitoring and evaluations are essential in order to learn which experiments work and which fail.
- It tends to look for selective, relatively narrowly targeted reforms.
- It is suspicious of “best practices” or universal remedies. It searches for policy innovations.

**Figure 10. Egypt—Growth Diagnostic Decision Tree**

- Access to Finance*
  - Domestic Savings
    - Low and stable, but real interest rates modest.
  - Foreign Savings
    - Liberalization of forex market in 2004; capital flows surged during 2004–06.
  - Financial intermediation
    - Weak by most measures; most firms have no access to bank lending.

- Complementary Factors
  - Education*
    - Education returns modest (but available data limited). Concerns about skills have been a rising concern in business surveys.
  - Infrastructure
    - Limited data available; a rising but not yet high concern in recent WEF surveys.

**Appropriability of Returns**

- Taxes
  - Since 2005, income tax rates halved in 2005; streamlining of tax administration.

- Corruption
  - Middle-rank in Transparency International survey and WEF surveys.

- Cost of innovation
  - Egypt slow in moving to knowledge-intensive export products.

- Cost of Bureaucracy*
  - Reforms especially in customs, tax, and business licensing improved survey rankings.

- Macro-Risks
  - Little evidence of debt overhang/macro-crisis concerns in business surveys, though concern on inflation has been rising recently. Real depreciation in 2001 successful in promoting non-oil export growth.

* Ranked among top three concerns in 2006/07 WEF business survey. Substantive change during 2004–06.