

Module 5: The Big Push

Williams College ECON 204:
Global Poverty and Economic Development
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photo: Per Gunvall / World Bank

The Harrod-Domar Model

Harrod-Domar model of capital accumulation, growth:

- Predicts increases in savings lead to increases in GDP growth
- Model proposed separately by Sir Roy Harrod, Evsey Domar
 - ▶ Intended to explain business cycles, LMIC applications later disavowed by Domar
 - ▶ But the model is still used in some circles today
- Intuition:
 - ▶ Output is proportional to the capital stock
 - ▶ Saving and accumulating capital leads automatically to increased growth

The Harrod-Domar Model: Assumptions

- Income (GDP) proportional to capital stock: $Y_t = \theta K_t$
 - ▶ θ is a country's level of technology (assumed to be exogenous)
- Income split between consumption, investment: $Y_t = C_t + I_t$
 - ▶ C_t is the amount of output immediately consumed
 - ▶ I_t output that is not consumed is assumed to be invested
 - ▶ Savings rate: $s = I_t/Y_t$
 - ▶ Poor countries/populations need to consume to survive \Rightarrow limited saving
- Capital stock evolves over time: $K_{t+1} = (1 - \delta) K_t + I_t$
 - ▶ δ is rate at which capital stock depreciates

Solving the Harrod-Domar Model

1. Start with the formula describing the evolution of the capital stock

$$K_{t+1} = (1 - \delta) K_t + I_t$$

2. Use the formula for total output ($Y_t = \theta K_t$) to replace the K_t and K_{t+1} terms with expressions in terms of total output

$$\frac{Y_{t+1}}{\theta} = (1 - \delta) \frac{Y_t}{\theta} + sY_t$$

3. Multiply both sides of the equation by θ

$$Y_{t+1} = Y_t - \delta Y_t + s\theta Y_t$$

4. First subtract Y_t from both sides, then divide both sides by Y_t

$$\underbrace{\frac{Y_{t+1} - Y_t}{Y_t}}_{\text{GDP growth}} = s\theta - \delta$$

High Development Theory: Assumptions

- Many development economists believed poor countries were not going to begin developing without government intervention to kick start a self-reinforcing process of industrialization
 - ▶ Public investment in infrastructure and state-led industrialization appeared to have worked well in post-war Europe (aid-financed through the Marshall plan) and the Soviet Union
- Shared characteristics of developing economies (as observed by Alfred O. Hirschman):
 - ▶ Rural underemployment (many people working in unproductive agricultural sector)
 - ▶ Late industrialization (limited capital, few modern industrial firms)
- Post-war development economists sought to explain this equilibrium

Arthur Lewis

Born in St. Lucia (then a British colony) in 1915

- First Black student, then faculty member at LSE
- Won Nobel Prize in economics in 1979

Lewis' **dual sector model**:

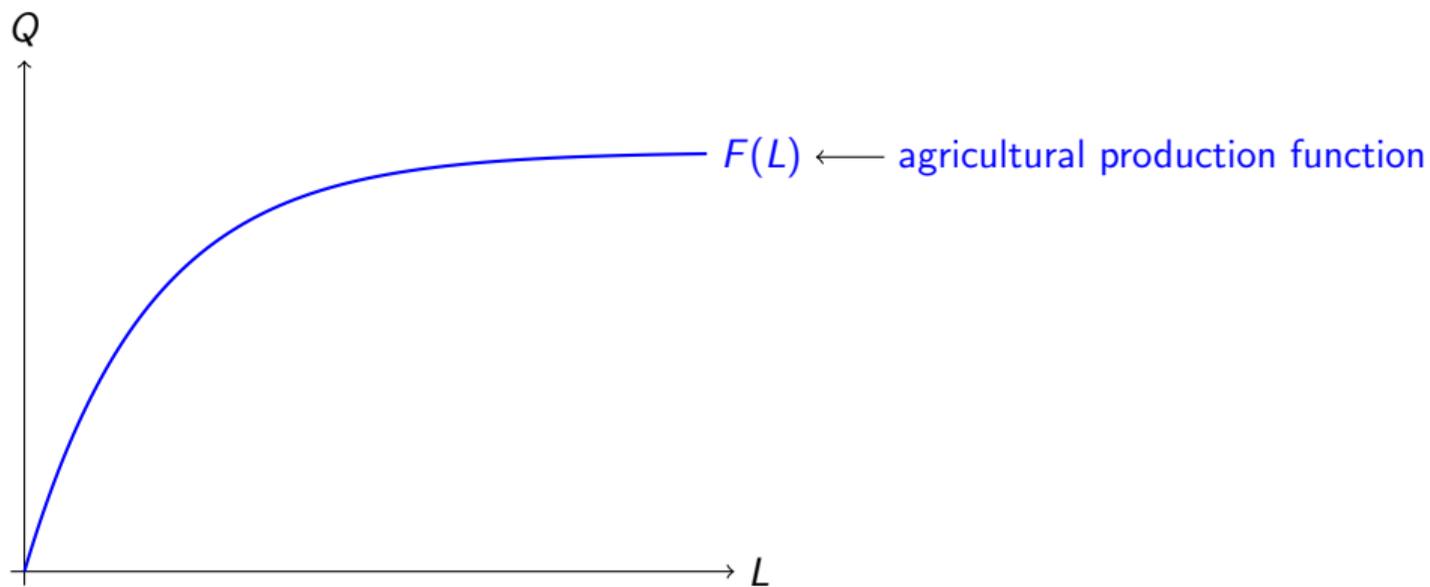
- Two sectors: traditional and modern
- Modern sector is capitalist, firms maximize profits
- Farms in traditional sector share profits/income

Potential for **disguised unemployment** and/or surplus labor in the traditional sector

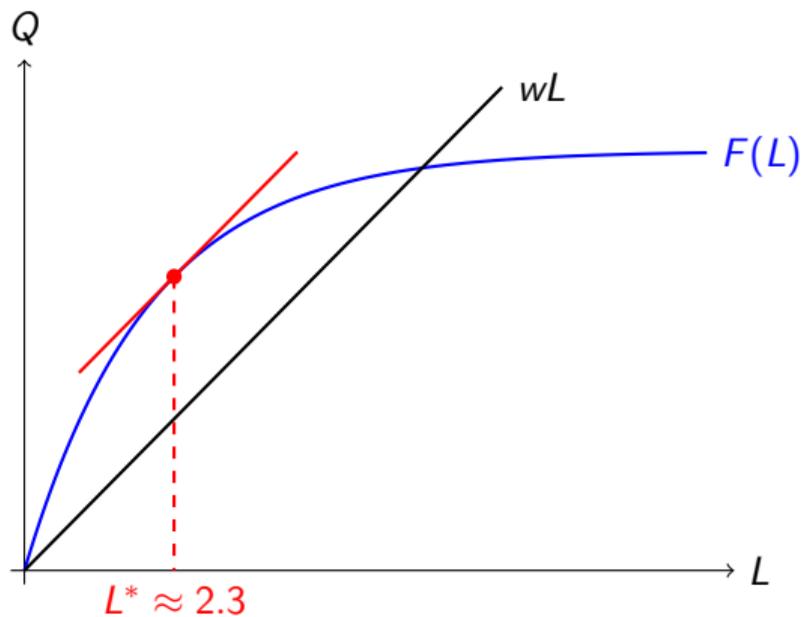


Source: Nobel Foundation (1979)

The Lewis Model: Agricultural Output



The Lewis Model: A Modern (i.e. Capitalist) Farm

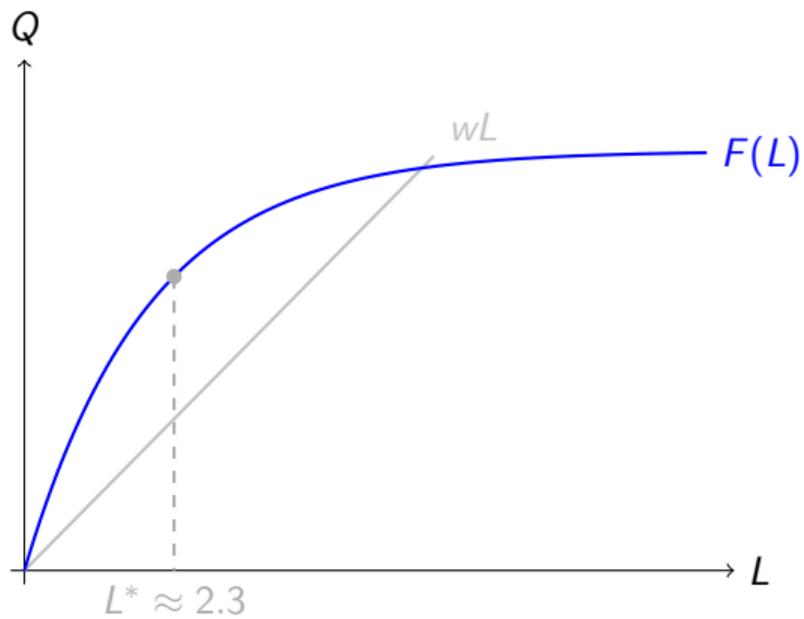


A modern farm maximizes profits:

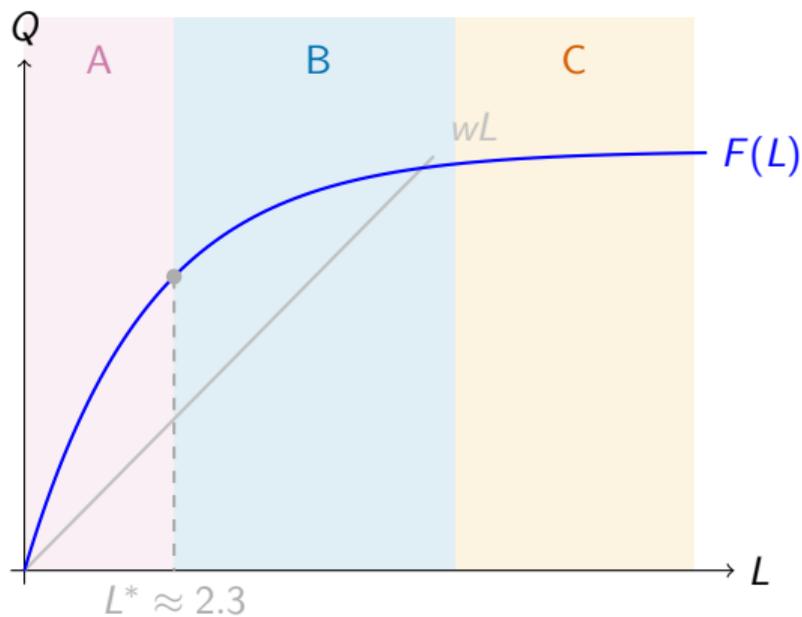
$$\pi = F(L) - wL$$

L	$F(L)$	$w(L)$	π
1	2.6	1	1.6
2	3.9	2	1.9
3	4.7	3	1.7
4	5.2	4	1.2
5	5.5	5	0.5
6	5.7	6	-0.3

The Lewis Model: Traditional Farms Use Family Labor



The Lewis Model: Traditional Farms Use Family Labor



A. Profits increasing in labor

B. Surplus labor

→ “profits” ↓ in L

→ output ↑ in L

C. Disguised unemployment

→ output not ↑ (much) in L

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WILLIAMS COLLEGE

WEDNESDAY, NOVEMBER 9, 1960

PRICE 10 CENTS

MIT Expert To Speak On Italian Development

Ninety-Five p.c. of Student Body Donate To Williams Program

Paul Rosenstein-Rodan, Professor of Economics at MIT, will lecture on economic development in Italy, Friday night at 8 p.m. in 3 Griffin Hall. His talk is sponsored by the Cluett Center.

A member of the staff of the Center for International Studies at MIT, Rosenstein-Rodan has been director of an economic development commission which dealt with the economic problems of the underdeveloped areas of Southern

Italy, India, and Indonesia. As a member of the staff of the International Bank for Reconstruction and Development, the Vienna-born economist was the man most responsible for stimulating lively interest in the possibilities of industrializing the backward southern regions of Italy. He negotiated the first loan for this area's economic development, which has served as a model for many other loans. Since his close contact with the situation dates back to the late forties, there are few people today more qualified to speak on the problems of developing the lagging economy of southern Italy.

Despres Returns From Economics Work In Pakistan

Emile Despres, Chairman of the Economics Department, has just returned from a year-long sabbatical in Pakistan as director of the Institute of Development Economics in Karachi.

William founded the Institute in 1953 with a Ford Foundation Grant of \$378,000—both to pursue research in development economics and to train Pakistani students in economic administration to solve their nation's own economic problems.

"In terms of its objectives," comments Despres, "the Institute is going ahead remarkably well." Originally, built around a nucleus of foreign advisors, it now boasts a membership of 23 Pakistanis and three or four from

WIDE EXPERIENCE
Rosenstein-Rodan is unique among development economists in that his experience covers a vast area, rather than being concentrated on the problems of developing a single region. He has served as a consultant to the Economic Commission on Latin America, a U. S. sponsored agency. His experience thus covers Europe, Asia, and Latin America. He recently worked on a report for the Senate Foreign Relations Committee entitled "Economic, Social, and Political Change in the Underdeveloped Countries and its Implications for United States Policy."

What is he here, Professor Rosenstein-Rodan will meet with the regular classes and seminars at the Cluett Center.

BY WILLIAM J. ANDERSON
Over 95 per cent of the College has donated to the student drive for President Baxter's Williams Program, and donations are still coming in from some fraternities. Chairman of the drive, Pete Worthman, '63, estimates that the total should reach over \$400 when the final figures are totaled.

Huxley Talks At Smith: 'Visionary Experience'

BY EDWARD YOLKMAN
Aldous Huxley delivered a guest lecture at Smith College on Friday night, November 4. The auditorium was filled beyond its capacity of 2500 as people from all over Massachusetts thronged to see the demi-god who had created an image of consciousness for himself.

There was, in this group of shining young faces, a quasi-religious quality. This was appropriate in the light of Huxley's topic which was "Visionary Experiences."

Although the audience reaction to this silver-haired, god-like, wonderfully articulate and phenomenally knowledgeable giant of our times was appropriate, it was, too, unfortunate. We came

to hear the truth and whatever Huxley said we were prepared to accept as the truth.

VISIONARY EXPERIENCE
What Huxley gave his audience was a thorough analysis of a very narrow phenomenon which he termed "visionary experience." He examined the entire spectrum of "visionary experiences" from the hallucinations of the alcoholic to the revelations of the divine.

The essential aspect of this experience is breaking down the barriers between the self-conscious ego and the "outer mind." This breakdown can be artificially stimulated or it can be spontaneous. For instance, children, before they are subjected to an analytical, conceptual education, are capable of visions in the form of

to see over \$300. Highest contributor was Psi Upsilon with \$347.

Chairman Worthman stated that a few houses had given little cooperation in the drive. He blamed not the houses but the apathy of the selectors in the houses. He emphasized that anyone who wishes to contribute but has not yet been approached by a selector, may do so by sending a contribution directly to him.

PURPOSE TO STIMULATE

Worthman set the goal of the drive in percentage of students contributing rather than in dollars and cents. Since the amount collected from the undergraduates will be practically negligible in making up the three quarter million dollar sum necessary to attain the \$4 million goal, the extent of participation is the important factor. The success of a Williams Program hope that a substantial student participation will stimulate donations from alumni and friends of the College who have not yet contributed. The drive should thus add more than merely \$400 towards meeting the goal before the June, 1961 deadline.

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Career Weekend Plans Underway

Source: Williams Record (1960)

The Big Push: Setup

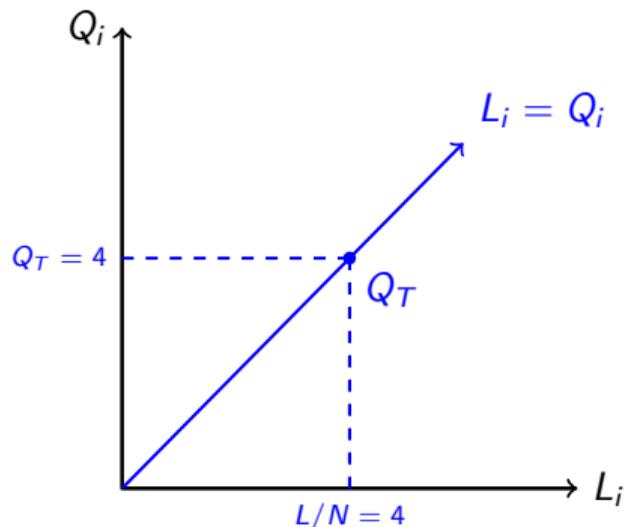
The traditional sector:

- $L = 200$ workers in the economy, work in $N = 50$ different industries, $i = 1, \dots, N$
- Production in the traditional sector equal to labor used: $Q_i = L_i$
- Wage in the traditional sector is normalized to 1 (workers are paid their marginal product)
- Perfectly elastic supply of each good in the traditional sector: $p_i = 1$ for all i
 - ▶ $p_i < 1 \Rightarrow$ everyone exits the sector, supply drops to 0
 - ▶ $p_i > 1 \Rightarrow$ everyone enters the sector, supply increases to ∞

Demand:

- Total income in the economy is the sum of all the wages paid to workers: $Y = L = 200$
- Cobb-Douglas demand: each worker spends $1/N$ on each product

The Big Push: Equilibrium in a Traditional Economy



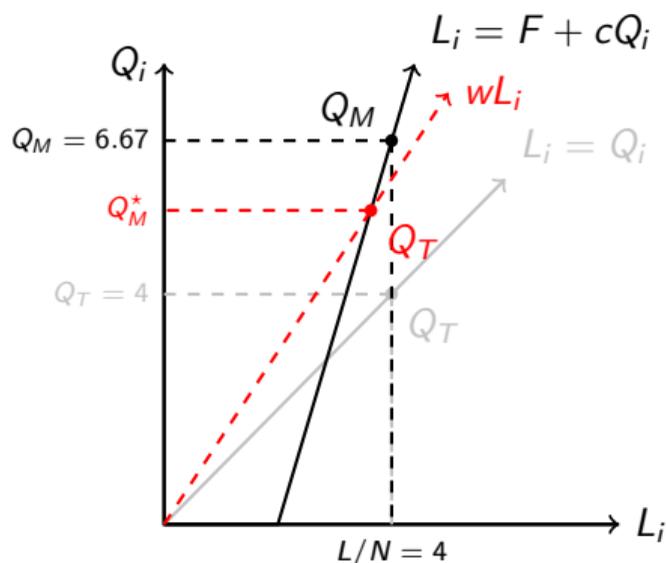
Demand for each good:

$$\frac{Y}{N} = \frac{200}{50} = 4$$

Supply of each good:

$$\frac{L}{N} = \frac{200}{50} = 4$$

The Big Push: Modern Sector Firms Pay Higher Wages



Modern sector firms pay $w = 1.5$

$$\Rightarrow \text{wage bill} = wL_i = w(F + cQ_i)$$

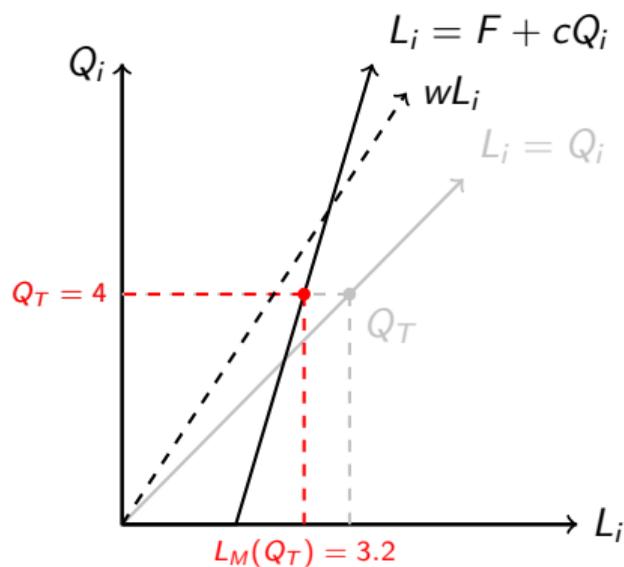
Modern sector firm profits:

$$\pi = Q_i - w(F + cQ_i)$$

Minimum scale to be profitable:

$$Q_M^* = \frac{wF}{1-cw} \approx 5.45$$

The Big Push: One Firm Will Not Modernize (Alone)



Should you start a modern firm?

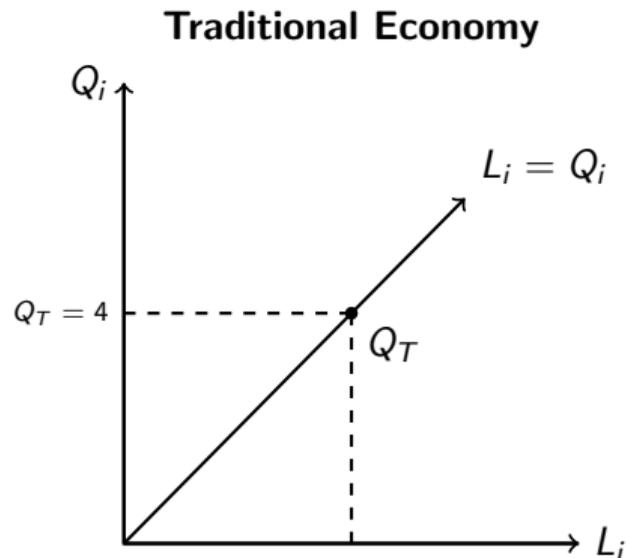
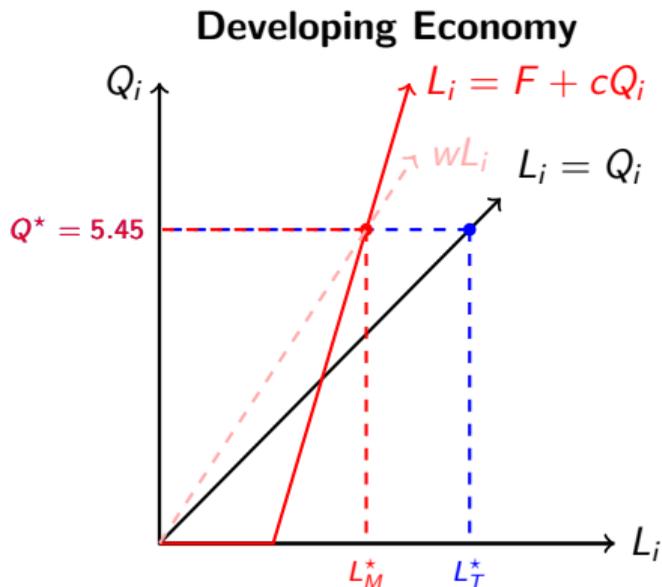
$$\Rightarrow \pi = 4 - 1.5 * 3.2 < 0$$

Each modern firm \uparrow total demand
(but not by much)

Modern firms: $\pi \geq 0 \Leftrightarrow Q_i \geq 5.45$

\Rightarrow Requires 40+ modern firms

The Big Push: Multiple Equilibria



The Big Push: Summary and Policy Implications

Paul Rosenstein-Rodan's **big push** model highlights need to coordinate industrialization

- The intuition is simple: modern firms have fixed costs, so scale matters (see figure)
- Modern firms pay workers more than traditional firms, but they are also more productive
- One firm has little impact on domestic demand, but if a sufficient number of modern firms came into existence at once, demand would increase enough for them all to be profitable
- Model suggests an economy can have multiple equilibria with different levels of output

Big push model suggests that modernization may not happen on its own (invisible hand style)

- Government can help to coordinate simultaneous modernization in many sectors
- Subsidize may induce firms/sectors to modernize, until critical mass is reached

Raúl Prebisch

World divided into (rich) **centre** and (poorer) **periphery**

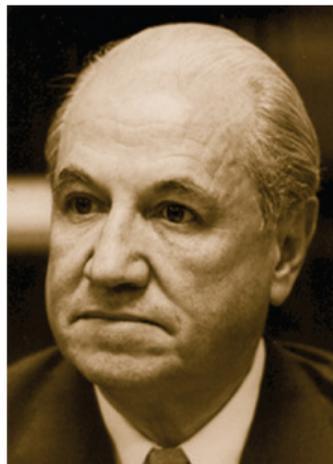
- The centre produces manufactured goods
- The periphery produces primary commodities

Manufactures get more complex, and expensive, over time

- Relative price of primary commodities declines
- Income elasticity of demand for commodities is low
- Also greater worker bargaining power in center

Developing countries face declining terms-of-trade, limiting potential benefits from globalization and trade, unless they industrialize to change their comparative advantage

⇒ Rationale for **import-substituting industrialization**



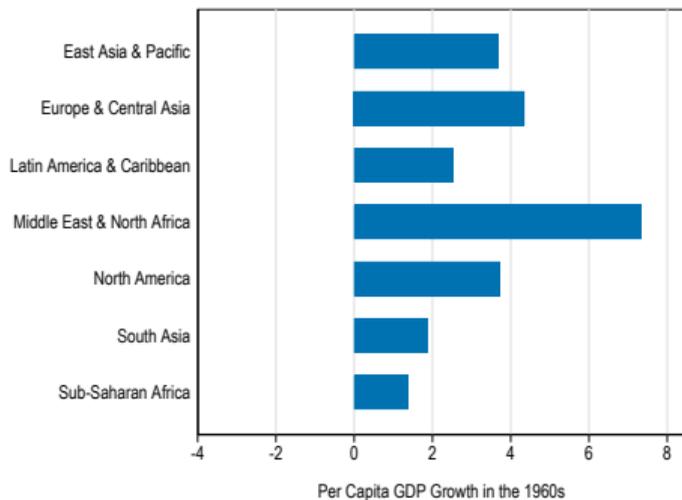
Source: Fundación Konex (1973)

High Development Theory: Policy Prescriptions

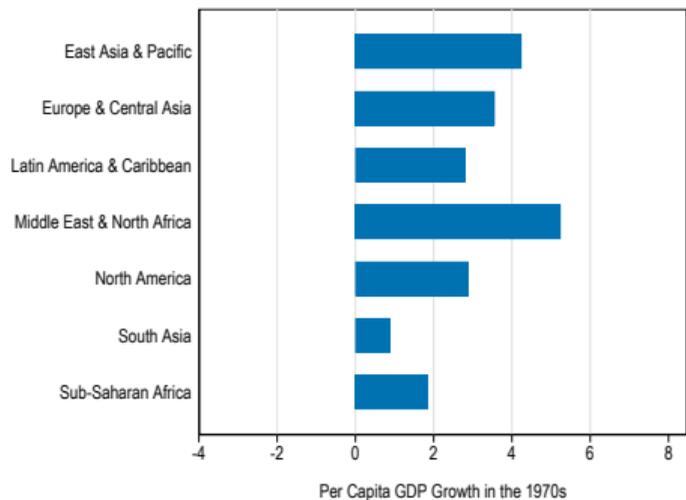
- Industrialization was not going to start spontaneously, and involved positive externalities
 - ▶ The government should subsidize modern, industrial firms – either explicitly or implicitly
 - ▶ Some governments interpreted this as an argument for state-owned enterprises
- The traditional agricultural sector was “backward” and characterized by surplus labor
 - ▶ Many African governments effectively taxed agriculture to fund industrial policy, for example by forcing farmers to sell to state-run monopsony purchasers and keeping food prices low
 - ▶ India invested in modernizing agriculture, e.g. through canals and high-yielding seeds
- Low-income country governments needed aid to fund these initiatives
 - ▶ Newly-formed World Bank offer concessional loans for infrastructure and industrialization

“The Growth that Wasn’t”

Growth in the 1960s



Growth in the 1970s



The End of the Big Push

- Paul Krugman and Amartya Sen provide different eulogies for high development theory
 - ▶ Krugman blames the absence of formal models, increased focus on perfect competition
 - ▶ The Solow Model (1956) suggests $Y_t = K_t^\alpha (A_t L_t)^{1-\alpha}$
 - ▶ Diminishing marginal return to capital
- Other factors that (may have) played a role:
 - ▶ Oil price shocks and subsequent balance-of-payments crises in many countries
 - ▶ Observable failures of many state-owned enterprises, particularly in low-income countries
 - ▶ Unrealistic expectations about the speed at which investment could translate into growth