LECTURE 2

# INTRODUCTION TO DEVELOPMENT ECONOMICS (2): *EARLY* POSITIVE MODELS OF DEVELOPMENT

## Plan of Lecture

A. Distinctions of Early **Positive** Development Economics

B. Development as a Resource **Reallocation** Issue and **Structuralism:**

The Lewis Two-Sector Model

C. Development as a Resource **Accumulation** Issue and Growth:

The Harrod-Domar Growth Model

D. **Constraints** on Development

The Vicious Circle and (Un)Balanced Growth

The Singer-Prebisch Trade Model and Deteriorating

Terms of Trade

*Literature*: Ray 1998, pp. 47-60, 131-161, 345-372 and 650-652; lecture notes replaces Ray's version of the Lewis model.

## A. DISTINCTIONS OF EARLY DEVELOPMENT ECONOMICS

Development economics emerged as a separate sub-discipline within economics in the 1950s and 1960s

1) The main concern "modernisation" (industrialisation) and economic growth (objective 1) rather than distribution and/or poverty alleviation

2) Underdevelopment was seen as a "structural" problem; due to market failures the underdeveloped countries were trapped in "vicious circles of poverty":

* Missing markets (e.g. savings and credit markets)
* Market failures (e.g. wage setting in agriculture)
* Poorly working markets (low supply elasticities)

3) Big role for government to break the vicious circles

Two of the most well-known and influential "structuralist" models that dominated the positive academic economic thinking in the 1950s and 1960s, will be the concern in this lecture.

a) **Lewis Two Sector Model with Unlimited Supply of Labour** which is a model in which income per capita grows as a results of **reallocation** of existing resources (labor) from one sector (agriculture) to another (industry).

b) **Harrod-Domar Growth Model** (pp. 51-58 in Ray). This model is a growth model proper, i.e. based on the notion that income growth stems from resource **accumulation**.

## *Why study old models?*

**1. Have had an enormous influence on actual policy**

**2. Understand the development policies pursued until recently**

**3. Still of relevance according to some economists**

**4. Many new models build on the "old" ones**

**5. "Old" thinking tend to pop up again in "new" disgises**

**6. General education in development economics**

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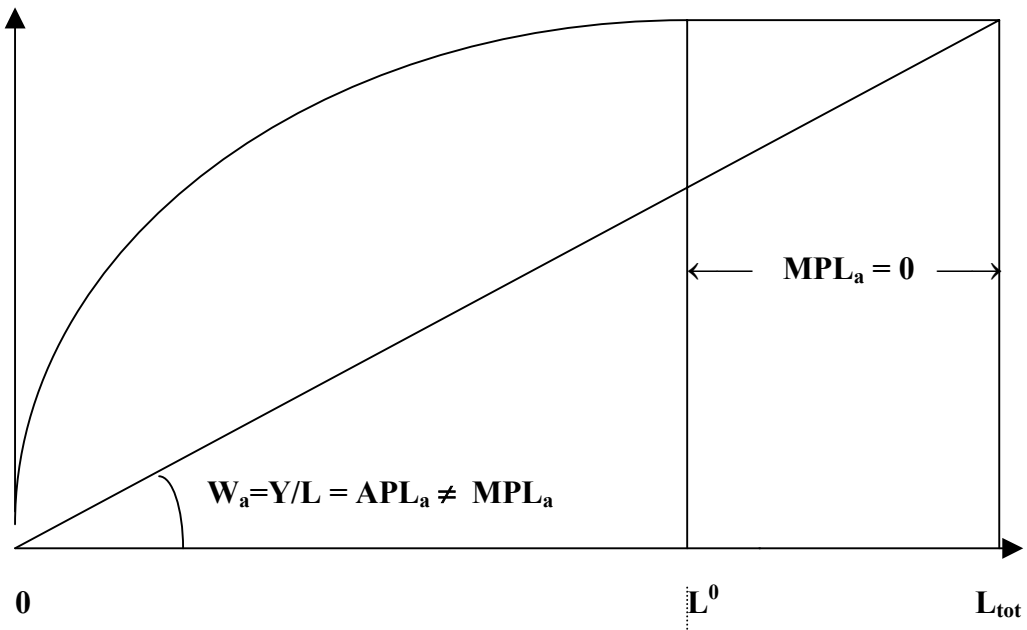
**B. Assumptions in the Lewis Model**

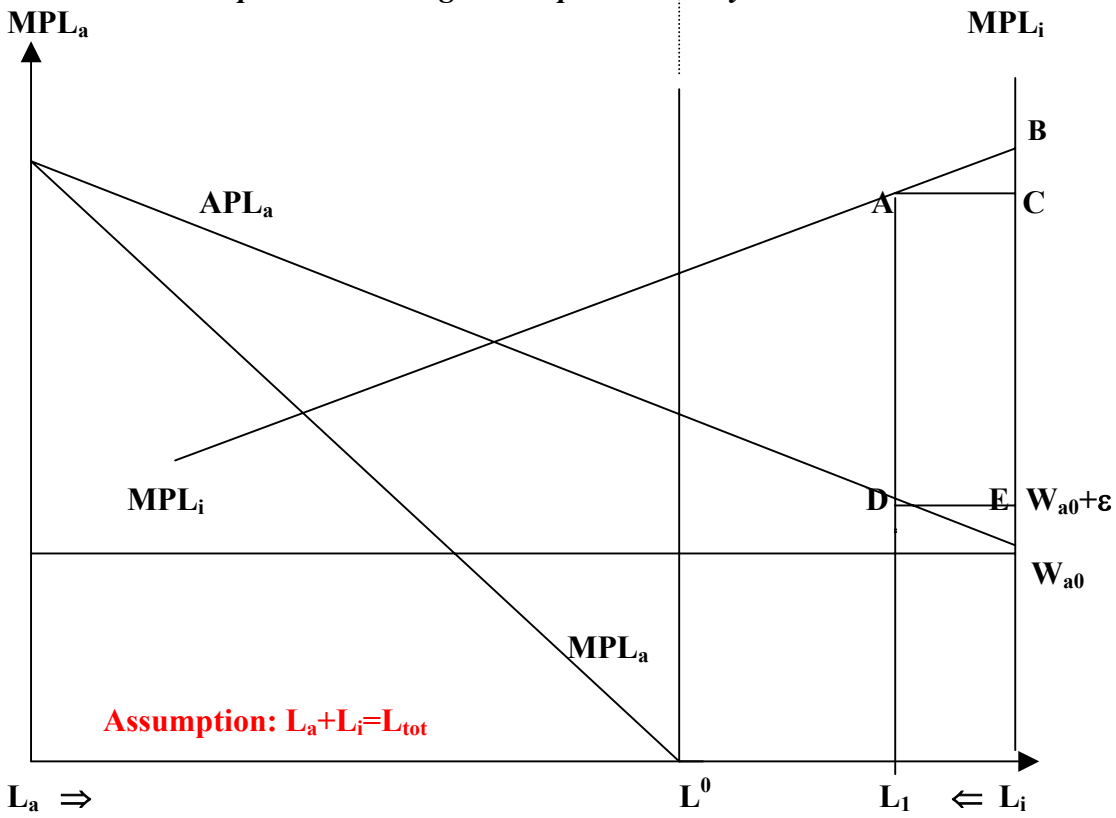
* **Two sectors, agriculture and industry**
* **Initially, all labor in agriculture**
* **Zero marginal productivity of labor in agriculture**
* **Wages in agriculture equal to average productivity (*not* marginal)**
* **Labor and land only factors of production in agriculture**
* **Capital and labor in industry sector**
* **Declining marginal productivity of capital in industry**

**Figure 2.1: The Lewis Two-sector Model with "Unlimited" Labor Supply**
(This version of the Lewis model replaces Ray's exposition, pp.353-372)

***Step 1: All Labor in Agriculture with Zero Marginal Productivity***




***Step 2: Introducing an Incipient Industry Sector***



**Questions for step 2:**

**1) How are the incomes in the industry sector "measured" in the graph?**

**2) What happens to total production and the wage rate in agriculture?**

**3) Why is labor allocation at $L_1$ not an equilibrium?**

**4) Explain the notion of labor as in "unlimited supply"?**

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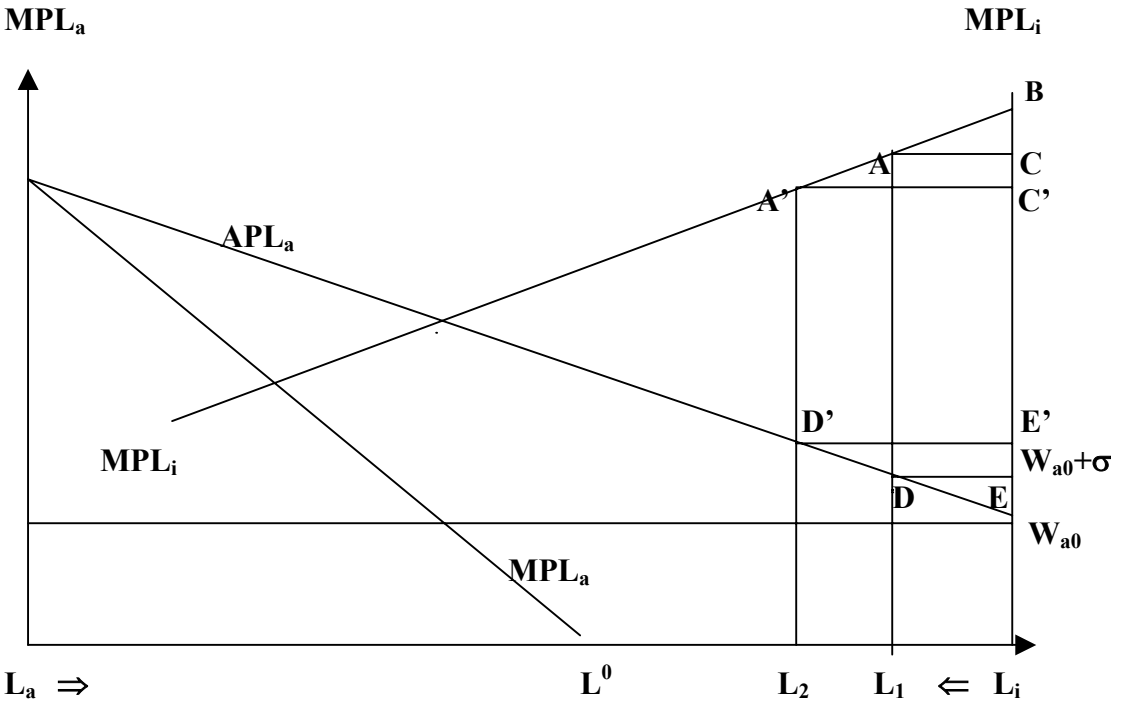
**Figure 2.2: The Lewis Two-sector Model**

*Step 3: Expanding the Industry Sector*




**Questions for Step 3:**

**1) By how much is income in the industry sector increased and how is it divided between return to capital and to labor, respectively?**

**2) How is the "exploitation rent" depicted in the graph?**

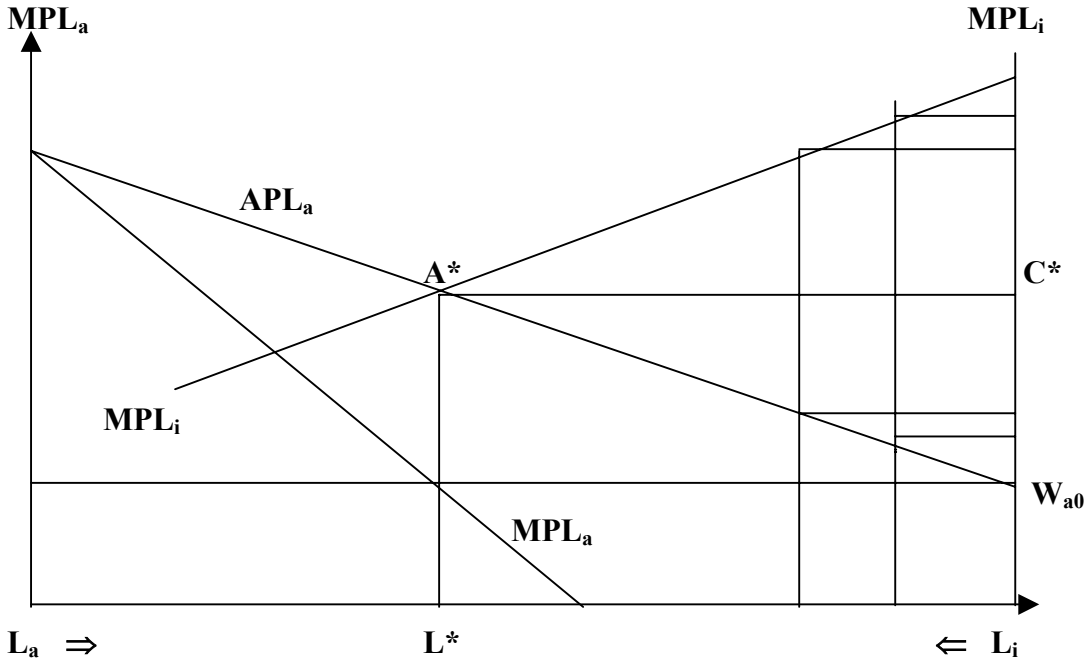
**3) What has happened to wage and total production in the agricultural sector when $L_1 - L_2$ of the labor force here shifted to the industry sector?**

**4) Assuming that the industry sector operates in perfect competition, will $L_2$ be a market equilibrium?**

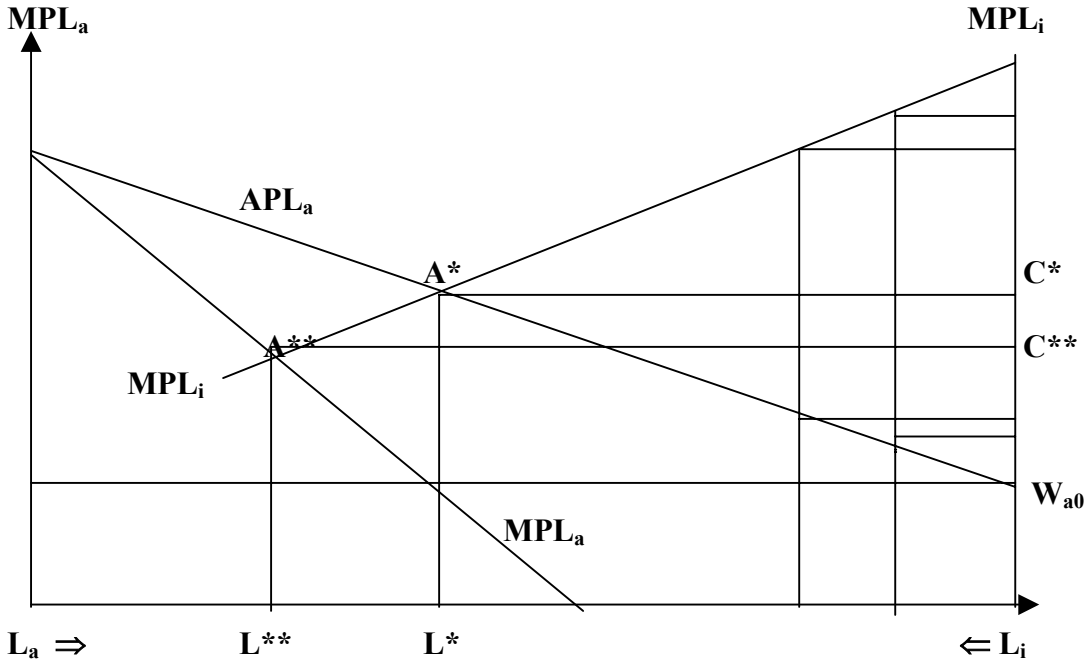
**Figure 2.3: The Lewis Two-sector Model**

***Steps 4 and 5: Market (*) and Social Optimal (**) Equilibrium of Allocation of Labor between Agriculture and Industry Sector***

***Step 4: Market Equilibrium at L*: $W_a = MPL_i = APL_a$ (*)***




***Step 5: Social Optimal Equilibrium at L**: $W_a = MPL_i = MPL_a$ (**)***



**Questions for Step 4:**

**1) Why is labor allocation at L* a market equilibrium?**

**2) What is now total income in the economy?**

**3) How has total production in agriculture been affected by the transfer of additional labor to industry?**

**4) With the help of the graph in the top panel of Figure 2.1, describe how average and marginal productivity of labor have been affected by the establishment of an industry sector employing $L_i - L^*$ of the total labor force.**

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**Questions for Step 5**

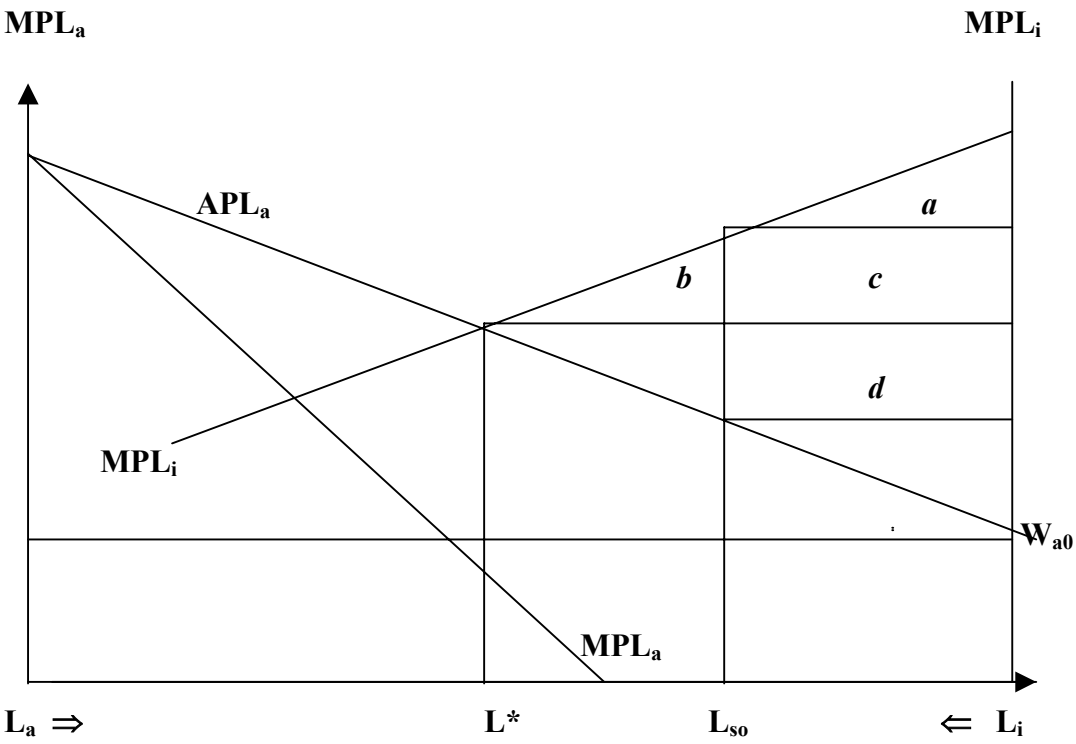
**1) Why is labor allocation at L** the socially optimal equilibrium?**

**2) What would happen to profits if employment in industry is expanded from L* to L**?**

**3) What would be required to reach the social optimum?**

**Figure 2.4: The Lewis Two-sector Model**

***Step 6: Introducing Monopsony, Savings and Growth***




**With $L_{so}$ as the monopsonist industrialist's labor demand, his total profit is the triangle *a* (pure capital rent) and the two rectangles *c* and *d* (the labor exploitation rent). Explain the condition under which $L_{so}$ is a profit max! (In the market equilibrium, his total profits would be *a*, *b* and *c*. Since *d* > *b*, his total profits would be smaller in this case)**

**Question: how can investment and growth in industry be depicted in the graph?**

Assume that the industrialist saves and reinvests 50% of total profits and growth is *proportional* to investment.
1) What would to optimal allocation of labor be?
2) How could growth be re-presented in Figure 2.4?
3) Explain why there is a conflict between *a-temporal* and *inter-temporal* allocation of labor.

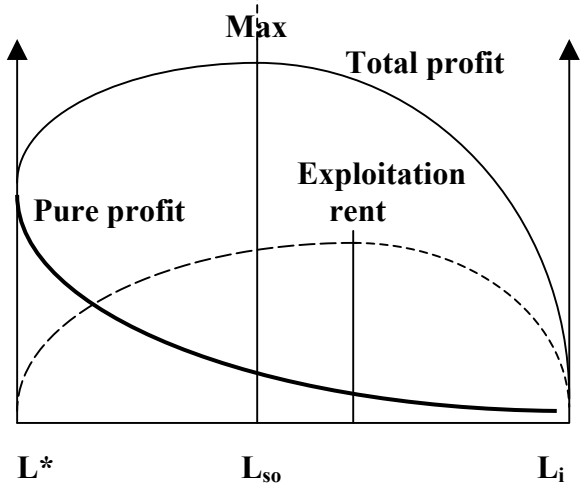
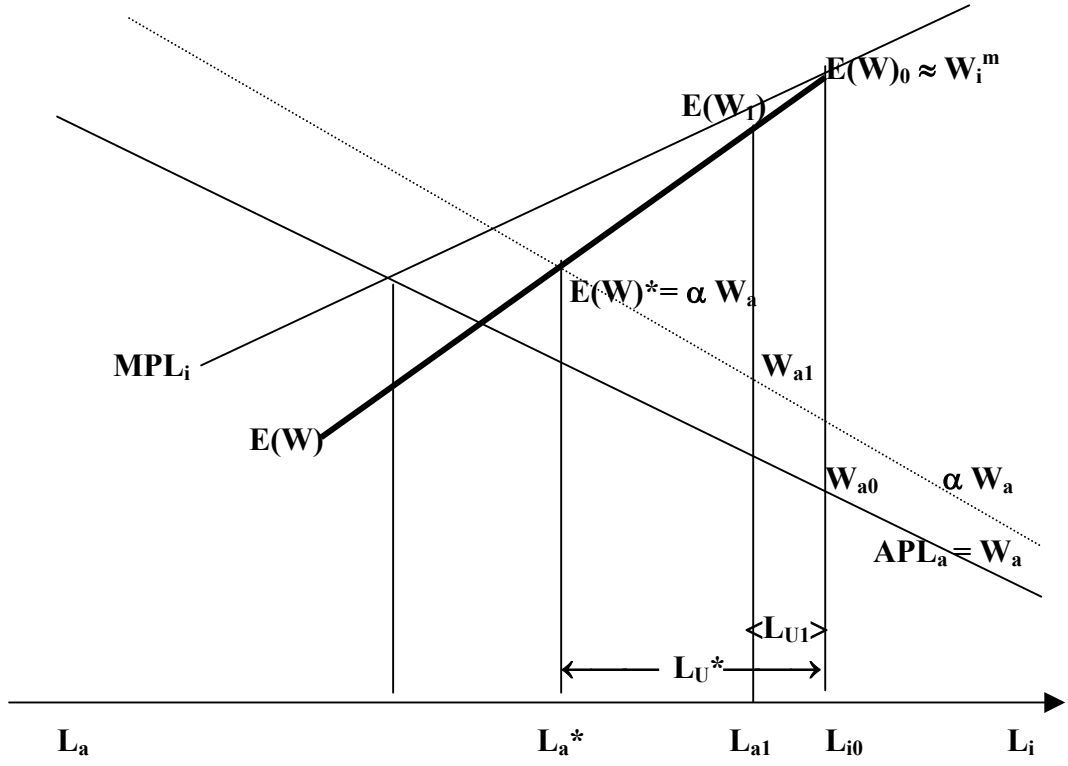


**Figure 2.5: The Lewis Two-sector Model**

***Step 7: Introducing trade unions, minimum wages and voluntary unemployment***




**The expected urban wage, E(W), when moving from agriculture (rural) to the industry (urban) sector is:**

$$E(W) = \rho W_i^m + (1-\rho) W_u > \alpha W_a, \qquad (1)$$

**where $\rho$ is the probability to get a job at the minimum wage ($W_i^m$) in industry and $(1-\rho)$ is the probability of becoming unemployed in the informal sector with a minimal income, $W_u$.**

$$\rho = L_i/(L_i + L_u) \qquad (2)$$

**If the inequality under (1) holds, the individual has an incentive to move from agriculture to the urban sector**

*Assumptions:*

**1) At the given minimum wage ($W_i^m$), employment in industry is fixed at $L_{i0}$. The agricultural wage is not fixed, but depends on the size of the labor force in this sector: $W_a = APL_a$, and will raise when $L_a$ falls.**

**2) The expected wage in the urban sector, E(W), has to exceed the risk-aversion-adjusted wage in agriculture ($\alpha W_a$), and where $\alpha > 1$, if people should move and risk unemployment.**

**3) Think of an initial situation when there is no unemployment in the urban sector, and there is a wage gap $W_i^m - W_{a0}$. In this situation, the expected urban wage is approximately the industry wage ($\rho \approx 1$).**

**4) As labor starts to move into the urban sector, the expected urban wage rate, E(W), will start falling because: $\rho$ will decline, $(1-\rho)$ will increase, and $W_a$ will raise.**

**5) When unemployment has reached $L_{U1}$, the expected wage rate has declined to $E(W_1)$, but is still higher than the risk-adjusted agricultural wage,$W_{a1}$, for labor left in agriculture at $L_{a1}$. Labor will hence continue to move.**

**6) An equilibrium will be reached when E(W) has declined to match the (increasing) risk-adjusted wage in agriculture ($\alpha W_a$). An equilibrium unemployment of $L_U^*$ will be reached, with $L_a^*$ left in agriculture. Now $E(W)^* = \alpha W_a$**

**Questions:**

**1) Where in Figure 2.5 will equilibrium unemployment be established if $\alpha = 1$**

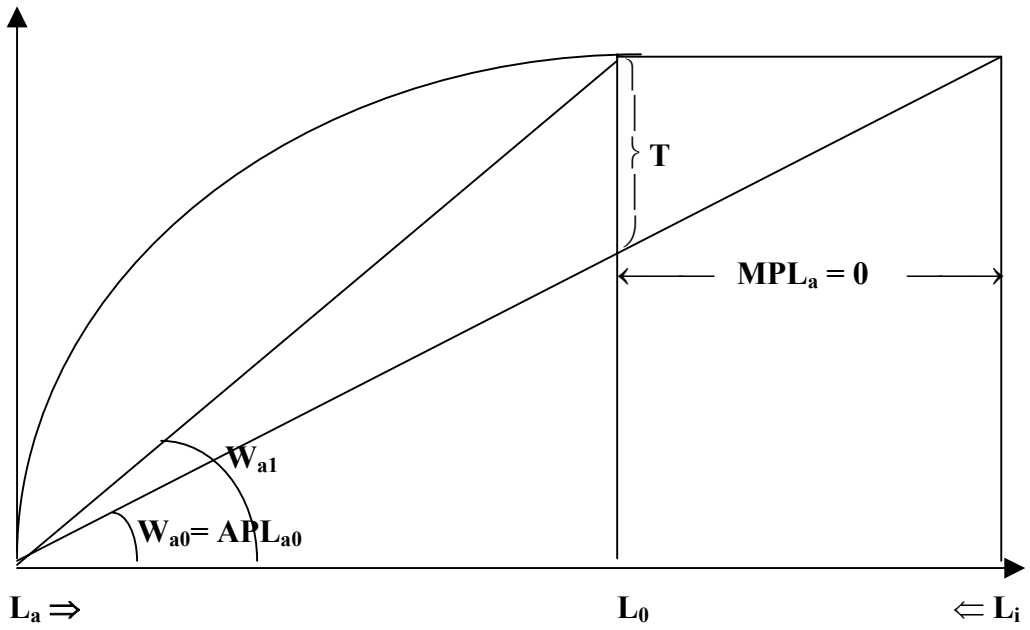
**2) How does the size of the initial wage gap between the minimum wage in industry and the wage in agriculture affect the equilibrium unemployment rate?**

**3) How does the size of the "wage" in the informal sector that the unemployed expect to be able to scrap together affect the equilibrium unemployment rate?**

## Figure 2.6: The Lewis Two-sector Model

*Step 8: Financing Industry Investment by Taxing Agriculture*

**Y (output in agriculture)**




**So far we have not dealt with the question of how the initial investment in the industry sector was financed. At the time when the Lewis' and related "structuralist" models were developed, getting resources (labor) from the agricultural sector was a main idea. Since labor in agriculture was postulated to have zero marginal productivity, no loss in output if labor was transferred to an industry sector, up to $L_0$ in Figure 2.6. Backward bending supply of labor was another popular perception. That is the more peasants were taxed the harder they had to work in subsistence agriculture!**

**Without affecting the *initial* wage rate in agriculture, $W_a$, and without lowering output in agriculture, a tax rate of t can be applied-if labor supply is inelastic**

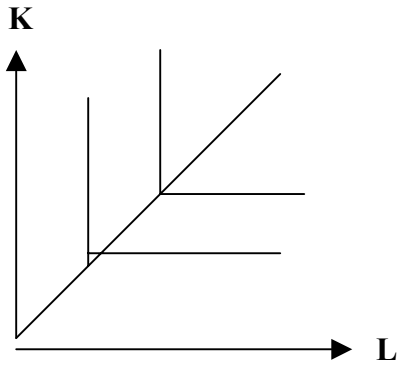
$$T = (1- t)W_{a1} = W_{a0}$$

$$t = 1 – (W_{a0} / W_{a1})$$

## Figure 2.7: The Harrod-Domar Growth Model

**Assumptions:**

1) Given production technique (Liontief production function)
2) Capital and Labor only
3) Constant returns to scale
4) Labor in unlimited supply
5) No falling marginal product of capital (cf. Solow model)
6) No human capital
7) Savings/investment exogenous
8) Closed economy (no trade)
9) No prices (planned economy)




**Question**:
How can growth be affected by policy interventions in the H-D model?
1) ?
2) ?
3) ?

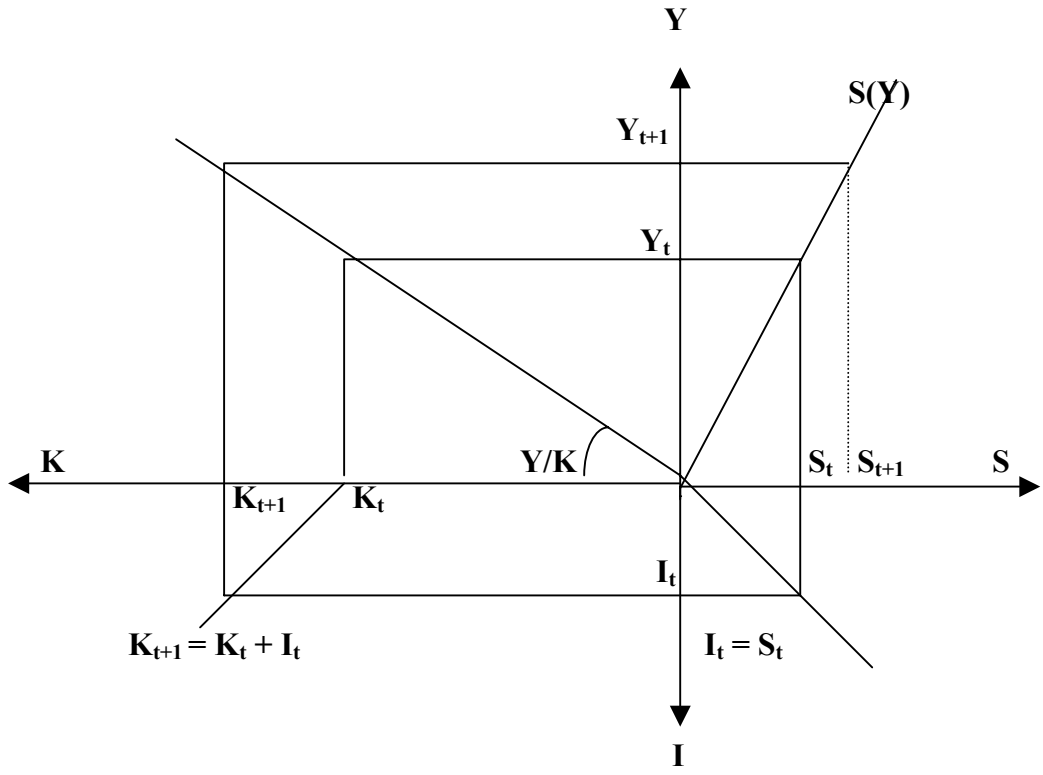
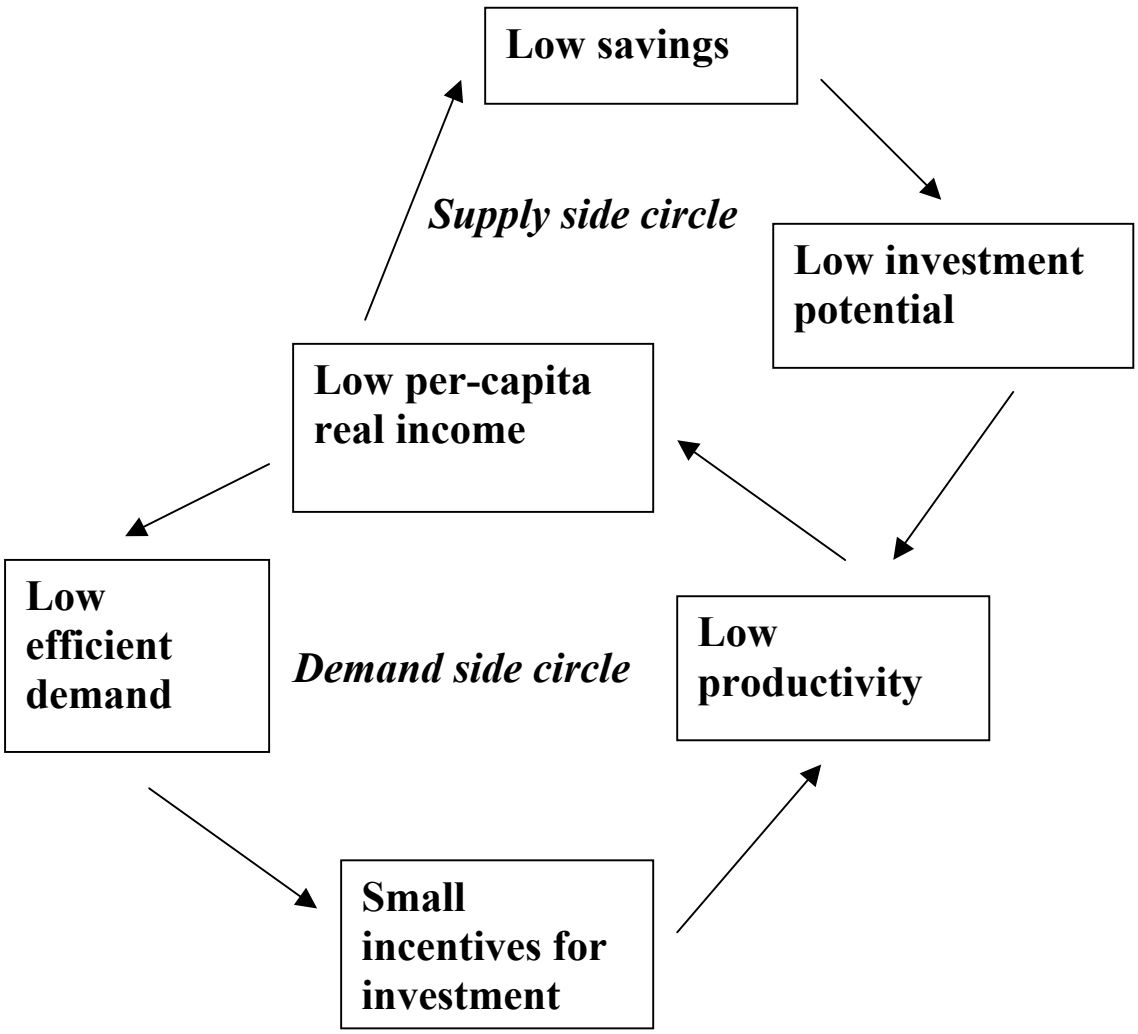


**Figure 2.8: The Vicious Circles Paradigme of Poverty**
**(Nurkse, see Ray, pp. 353-65)**




***Suggestions for breaking the circles***

**Unbalanced growth (Hirchman 1958)**

**Balanced growth (Nurkse 1962)**

## Lessons from early structuralist models

### 1) Enormous influence on actual policies in the 1950 and, in many countries, throughout the 1980s:

- **High protection of industry in almost all countries (import substitution)**
- **High taxation and economic discrimination of agriculture**
- **Government intervention in almost all markets**
- **Even today, the simple H-D model lies behind much development policy thinking, e.g. foreign aid as an instrument for enhancing investment**

### 2) Based on assumptions that have been shown to be erroneous:

**Industry needs protection to flourish**
**Marginal productivity of labor in agriculture zero**
**Agriculture can be heavily taxed without falling output**
**Productivity in "tropical" agriculture given once and for all**
**Savings and investment inherently low in poor countries**

### 3) Important aspects of development and growth neglected in the early models:

*** No prices in the goods markets in the Lewis model (nor in H-D)**

*** Naïve belief in governments' ability to enhance growth through interventions (no government failures, only market failures!)**

*** Human capital not considered)**

*** The role of productivity growth not central**

*** Most models of a closed economy (Lewis and H-D)**

**4) Industrialisation as such does not ensure either high economic growth or high real income levels per-capita (see Table 2.1). Differences in productivity in industry and, in particular, in agriculture are the main determinants of income level differences (table 2.2)**

**Table 2.1. Share of total industry and manufacturing industry in GDP, average by countries at different per-capita income levels, 1999**

| | Low income[a] | Lower middle income[b] | Upper middle income[c] | High income[d] |
|---|---|---|---|---|
| **1) Total industry (%)** | **30** | **40** | **32** | **30** |
| **2) Manufacturing industry (%)** | **18** | **23** | **24** | **21** |

*Source*: World Development Report 2000/01, Table 12

Notes: a) <US$ 755; b) 756 to 2,995; c) 2,996 to 9,265; d) above 9,266 (NB, these numbers refer to non-PPP adjusted GDP per capita).

**Table 2.2.Value of agriculture production per person in the agriculture labor force, average by countries at different per-capita income levels, 1999**

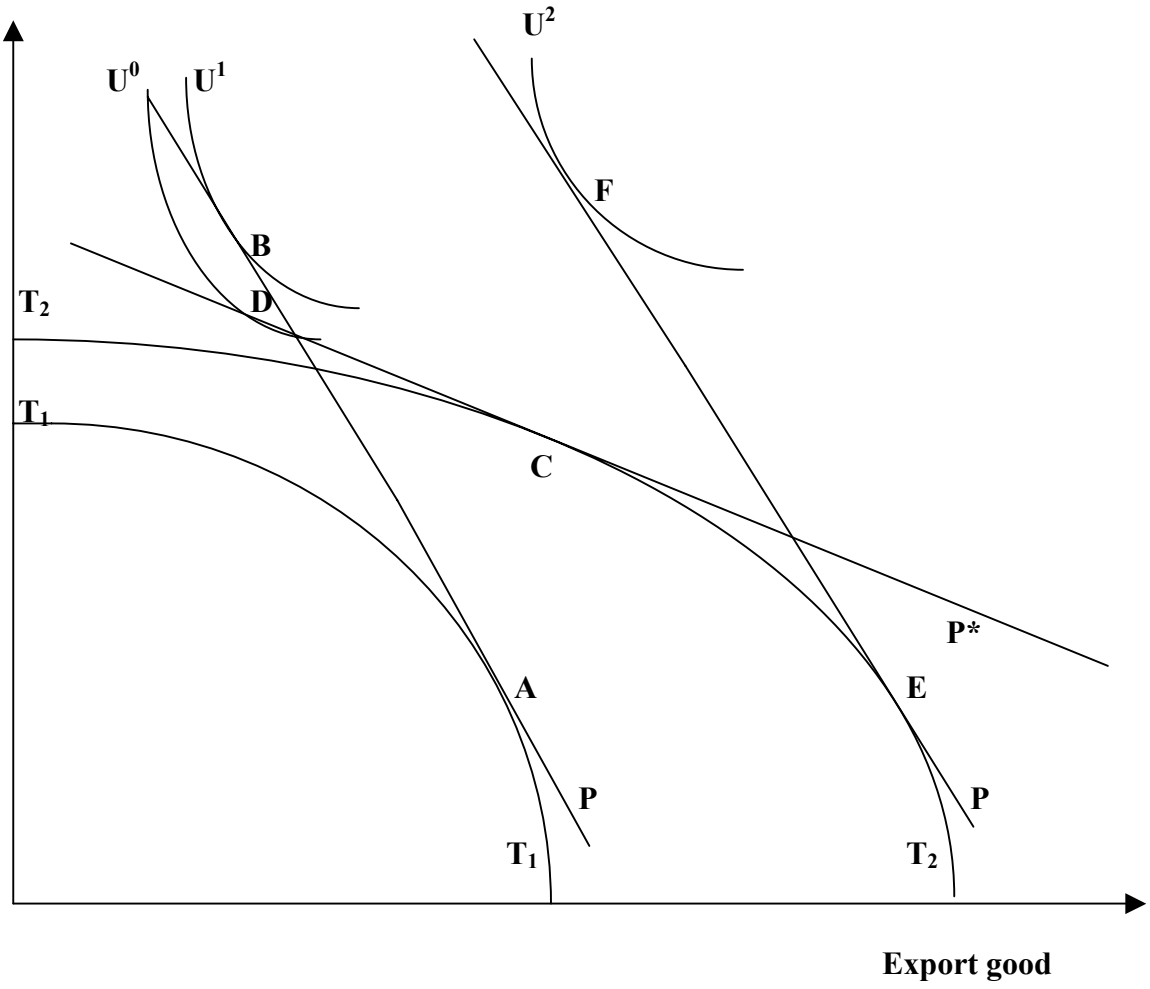
| | Low income[a] | Lower middle income[b] | Upper middle income[c] | High income[d] |
|---|---|---|---|---|
| **1) GNP (Billion US$ PPP)** | **4,315** | **8,298** | **4,769** | **21,763** |
| **2) Share of agriculture in total GNP (%)** | **27** | **15** | **7** | **2** |
| **3) Agriculture GNP (Billion US$ PPP) (1)x(2)** | **483** | **594** | **582** | **435** |
| **4) Labor force (≈ population aged 15-64) (Million)** | **1,417** | **1,379** | **369** | **596** |
| **5) Share of labor force in agriculture (%)** | **65** | **30** | **20** | **3** |
| **6) Labor force in agriculture (Million) (4)x((5)** | **921** | **414** | **74** | **18** |
| **7) Value of agriculture production per labor ($) ((3)/(6)** | **524** | **1,435** | **7,865** | **24,167** |
| **8) GNP per capita (US$ PPP)** | **1,790** | **3,960** | **8,320** | **24,430** |

| | | | | |
|---|---|---|---|---|
| **Food production per capita (1990=100)** | **107** | **142** | **106** | **102** |
| **Tractors per 1000 ag workers** | **4[e]** | **?** | **30[f]** | **906** |

*Sources*: Data compiled from *World Development Report 2000/01*, Tables 1, 3, 8, 12 and the ILO

Notes: a) - d), see Table 2.1 above. These numbers refer to non-PPP adjusted GNP per capita; e) average for Sub-Saharan Africa and South Asia; f) average for Latin America, Middle East and North Africa.

**Figure 2.9: Terms of Trade Deterioration and Immiserizing Growth**




**$T_1$-$T_1$ is the production transformation curve in period 1.**
**$T_2$-$T_2$ is the transformation curve in period 2, assuming that growth has been biased towards the export sector (in accordance with comparative advantage).**

**Given the export/import price (P) in the first period, the country produces at A and consumes at B, enjoying utility level $U^1$. With *unaltered* relative price in period 2, the country produces at E and consumes at F, at utility level $U^2$.**

**If the price of the export good falls relative to the import good (the terms of trade deteriorate) to P*, the country will produce at C and consume at D, enjoying only utility level $U^0$. That is, despite growth in production capacity (from $T_1T_1$ to $T_2T_2$), the country has experienced a decline in welfare from $U^1$ to $U^0$ because of deteriorating terms of trade. (Singer and Prebish argument)**