Chapter 1

What is Development?

1.1 Introduction

Concepts:
A. Measures of living standards
B. Comparison of living standards of a few selected countries
C. Meaning of Development and why need a separate economics field.

The focus of the course will be the comparison of living standards of economies. The broad topics are: the measurement of living standards of a nation; the rate of growth (i.e., improvement) of living standards; the sources of or determinants of such growth, and the policies that can improve living standards of a nation faster.

1.1.1 Measures of Living Standards

Adam Smith suggested to take GNP, i.e., aggregate income of an economy as a measure of living standards. This has the obvious defect that it does not take into account how many people are sharing this aggregate income. For instance, the GNP of India and Sweden are comparable but India has a population almost eighty times larger than that in Sweden. As we all know that living standards in Sweden is much better than in India. A better measure is perhaps per capita income. While this measure takes care of the above problem, it suffers from other defects to qualify for a good measure of living standards. The one main one is that it is insensitive to income distribution. Consider for instance two nations each having per capita income $100 and a population of 100 persons. In one country, everybody has equal income, and in the other economy, 5 persons have $1000 each and 95 persons have $52.6 each. Which economy should be considered to have better standard of living? Obviously the first one. However, notice that per capita income does not discriminate this.

There are many other aspects such as life expectancy, literacy rate, freedom of speech or democracy, and political and economic stability that should also be included into a good measure of living standards. While per capita income is generally positively related to some of these variables such as life expectancy and literacy rate and thus to some extent represent these aspects, other aspects are not represented by it. There are some suggestions to adjust the per capita income to take into account some of these aspects, however, unadjusted per capita income is most widely used and we do the same.

Generally per capita income is measured in the local currency of the economy. How would you compare the per capita income Rs. 5400 in India with $ 15000 in the U.S.? We need a common unit. The general practice is to express per capita income of an economy in US dollars dividing it by the exchange rate (local currency/US$). This measure suffers from the *purchasing power parity (PPP)* problem of the nature that with $1000 you can buy much more and thus have a better standard of living in say Thailand than in the U.S. Exchange rate, for instance, does not take into account the relative prices of the non-tradables such as construction, hair-cuts etc. Again there are ways to adjust for the purchasing power parity, see in table 1.1 the PPP adjusted per capita income of various countries, and how they differ for countries. But general practice is to use the unadjusted one, and we follow the same practice. To compare the rate of improvement of living standards of various nations, it is appropriate to calculate the growth rate of per capita income in local currency but at constant prices (why constant prices?).

As discussed in the class, it is also important to take into account the extent of non-marketed activities such as home-cooking, child cares provided by parents in exchange of old-age care, which are not reflected in per capita income in the less market oriented economies. A PPP income will take care of some of these problems.

Per capita income does not also take into account the working enviornments in various countries, which are important aspects of living standards. For instance, consider two countries with same per capita income, but in one country there is high incidence of child labor and other bad labor practices, whereas in the other country, only the adults work with proper working enviornments. Obviously the first country has lower standard of living than the second one, but per capita income does not reflect this difference.

In spite of all these deficiencies that per capita income has, economists take it to be an important measure of living standards. In the first part of this course, we will focus on this measure of living standards and examine how various policies improve this measure of living standard faster.

1.1.2 Comparison of living standards of a few selected countries

Table 1.1reports capita income in 1994 for a few selected countries. We find that there is significant difference in the standard of living of these countries. For instance,

In the third row of table 1.1 we report the growth rate of per capita income for each country. We again find a lot of variation.

Now compare the rate of growth of per capita income in the U.S. in different periods in the following table 1.2.

Here again we find a significant variation in the growth rate. The important questions that we will deal with in this course are:

- What is the significance of a small difference in the growth rate of per capita income?
- How long would it take for less developed countries to catch up with the current US standard of living? After how many years these less developed countries will surpass the living standard of the U.S. economy if the current growth rates are maintained?

Table 1.1: Basic indicators of a few selected countries

Basic Indicators	India	China	Thailand	Mexico	Korea	Singapore	U.S.	Japan
P.C.income ($1994)	320	530	2,410	4,180	8,260	22,500	25,880	34,630
PPP Estimate of PC income	1,280	2,510	6,970	7,040	10,330	21,900	25,880	21,140
pc income gr.rate 1985-94	2.9	7.8	8.6	0.9	7.8	6.1	1.3	3.2
Pop. gr. rate1980-90	2.1	1.5	1.8	2.0	1.2	1.7	0.9	0.6
gr. rate of export 1980-90	5.9	11.5	14.0	6.6	12.0	10.0	5.2	4.8
gr. rate of export 1990-94	13.6	16.0	14.6	4.0	10.6	12.3	6.7	4.0
Savings to GDP ratio 1988	21.0		26.0	23.0	38.0	41.0	13.0	33.0

Table 1.2: Average annual growth of the US economy over a long period of time

Period	1889-1983	1953-1973	1973-1983
gr. rate. of per capita income	1.8	2.1	0.9

- Could some of these less developed countries grow at this high rates for ever such that they become the real threat to the U.S. economy? (Convergence hypothesis).
- Why did some countries like Japan, Korea, and Hong Kong grew so fast while other countries like India, and U.S. grew very slow? Or in other words what are the sources of growth in these countries?
- What government policies can achieve higher growth rate in per capita income?

Remark 1 *Growth theory is concerned with the long run growth of potential or full employment output, or the supply side of the economy say in the next ten or twenty years. So the policies we are interested in are those that affect this long-run growth rate of potential output. Macroeconomics is concerned with the stabilization of short-run fluctuations in actual output or the demand side of the economy.*

We have discussed in the class a common structure of the less developed economies on various socio-economic dimensions and how they differ from the structure of developed economies. Development theory is meant not only to understand the process of growth in per capita income, which is the most important indicator of development, and it is meant also to study how the socio-economic-political structure of an underdeveloped economy could be transformed into socio-economic structures that are commonly observed in developed countries. Or in other words, development economics, also examines the mechanics of structural change, and its scope is broader than growth theory. There are other distinctions between economic growth theory and economic development theory, which we will not get into in this course.

1.1.3 Schematic representation of our economy

In the figure 1.1 we have a schematic representation of a closed economy.

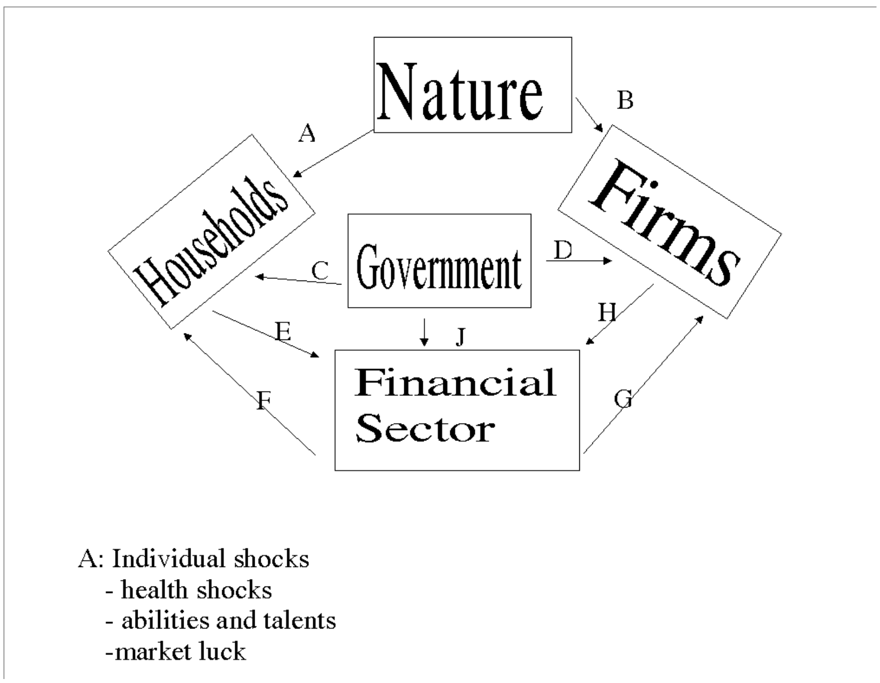

Figure 1.1: Flows of resources and inter-connectedness of different sectors

Chapter 2

Accounting for Observed Growth in Incomes

2.1 Representation of technology by production function

Concepts: *Production function, iso-quant, marginal product of capital, marginal product of labor, marginal productivity theory, returns to scale, Harrod neutral technological change, Solow neutral technological change, and Hicks neutral technological change, business cycles.*

From National Income Accounting we know that gross domestic income (GDY), i.e., the total income of all individuals in an economy, is the same as the gross domestic product (GDP), i.e., the total output that is produced in an economy using all its available inputs, capital, labor raw materials, technological knowledge etc. Our primary interest is to understand what are the different sources of growth in per capita income. We do this by representing the gross domestic product and the aggregate inputs of an economy in a suitable form. Production function is such an useful representation of the relationship. In this chapter we develop a few concepts regarding production function which will be useful in understanding the sources of growth in per capita income.

2.1.1 Production function

Both at the aggregate economy level and at the firm level, output is produced with inputs such as labor and capital. *Production function* is a compact way of expressing the relationship between output and inputs. For instance, the production function $Y = 2K + 3L$ tells us that K units of capital and L units of labor produces $Y = 2K + 3L$ units of output. More specifically, it tells us that when 2 units of capital, and 5 units of labor are used we get 19 units of output, and when 3 units of capital and 5 units of labor are used we have 21 units of output and so on. Most technology could be represented by a suitable production function.

Let us take some concrete numerical example. Suppose K measures the number of hours of a 500mhz Pentium-III processor, and L measures the number of student hours (you can think of students of this class). Various combinations of student hours and computer times can produce some output say some computer programs that can be sold in the market.

K	L	Y
2	5	19
2	6	22
3	6	24

Marginal product of labor $\frac{\triangle Y}{\triangle L} = 3$ at the input combination

$$(K, L) = (2, 5)$$

Table 2.1: Input-Output relationship

Let us denote by Y the computer program output. The following table summarizes how much output Y is produced by various combinations of input levels K and L.

Marginal product of labor is simply the amount of increment in output that can be obtained by increasing the labor use by one unit, holding the other input levels at constant levels. The above production relation could be simply represented by a linear production function given above.

2.1.2 Potential vs. actual output

Potential or full employment output at any time is the level of output that could be produced if all inputs that are availble in the economy are used in the production process. Actual output is the level of output that will be actually produced to meet the demand (Y = C + G + I, where C = consumption demand, G = government consumption demand, and I = investment demand). Suppose at different time periods, $t = 0, 1, 2, ...,$ K_t is the unit of available capital stock, and L_t is the unit of available labor hours, and the rate of technological change say of the Harrod neutral type is b. Then we can compute potential output using a production function. The details of how exactly this is done is left as a reading exercise and we would not pursue in this course.

When log of potential output and actual output for the U.S. over a 100 years period 1889-1989 is plotted against time we find the graph in figure 2.1. Notice an important features of this graph.

The actual output fluctuates around the potential output, and thus over a long period of time both variables have the same trend. The purpose of the growth theory is to study this long-term behavior of the potential output and to devise policies that will affect this trend. The fluctuations in the gap between potential and actual output is known as business cycle. We are not concerned with this short-run fluctuations or in business cycles. The policies that deal with the problem of curbing this short-run fluctuations are known as the macro stabilization policies and our main focus is not this. Later we will give some theoretical models that can also generate cycles in output in the short-run around a trend.

2.2 Sources of Growth

Concepts: *Total factor productivity growth, Denison Index, Solow Index.*

Assume that there are two aggregate factors of production, capital and labor. If the supplies of factors of production increase over time, the output will also grow as a result. Moreover, as time passes, both factors become more and more efficient, and this will also lead to higher output. **The questions we address are**: *How much of growth in output over*

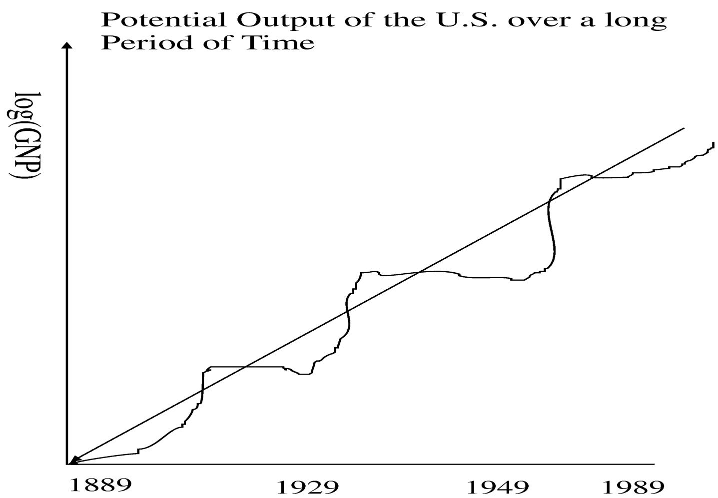

Figure 2.1: Potential ouput of the US during 1889-1989

a long period of time is accounted for by the growth in inputs, i.e., growth in capital and labor, and how much is due to the improvement in productivity. How could we empirically measure these for an economy?

We first derive a growth accounting formula.

2.2.1 Growth accounting formula for functions of several variables

Suppose the national income $Y(t)$ at time t is represented by the production function, $Y(t) = A(t)F(K(t), L(t))$, where $A(t)$, $K(t)$, and $L(t)$ are respetively the productivity level, capital stock, and labor hours at time t. Suppose we are told that $A(t), K(t)$ and $L(t)$ are growing exponentially at the rates $r_{A,}$ r_K and r_L respectively. Let us denote the exponential growth rate of $Y(t)$ by r_Y. Remember from national income statics we can calculate all the grwoth rates r_Y, r_K, r_L but not r_A, since we cannot measure productivity levels of the factor inputs. We want to find a way to decompose the observed growth rate of total income r_Y into its components, namely grwoth in capital, labor and total factor productivity grwoth. To that end, we need to find out how r_Y is related to the grwoth rates $r_{A,}$ r_K and r_L? It could be shown easily (see Appendix), that the relationship is given by

$$r_Y = r_A + \eta_{FK}.r_K + \eta_{FL}.r_L \tag{2.1}$$

where,

$$
\begin{aligned}
\eta_{FK} = \quad \frac{K}{Y}\frac{\Delta Y}{\Delta K} \quad & = \frac{\text{Rental income}}{\text{GNP}} \text{ (in competitive market economy)} \\
& = \text{percentage increase in out put from 1\% increase in capital} \\
\eta_{FL} = \quad \frac{K}{Y}\frac{\Delta Y}{\Delta L} \quad & = \frac{\text{Wages and salaries}}{\text{GNP}} \text{ (in competitive market economy)} \\
& = \text{percentage increase in out put from 1\% increase in labor}
\end{aligned} \tag{2.2}
$$

The economic interpretation of η_{FK} and η_{FL} are as follows:

η_{FK} is also known as *output elasticity of capital, and*

η_{FL} is the *output elasticity of labor, i.e.,* η_{FL} is the percentage increase in total income from an one percent increase in labor, holding all other input levels constant.

The above formula in equation (2.1) is known as growth accounting formula. The second term (i.e., $\eta_{FK} \cdot r_K$) and the third term (i.e., $\eta_{FL} \cdot r_L$) in the right hand side of the above are respectively the contribution of growth in capital and contribution of the grwoth of labor to the growth of total income, and the first term is the contribution of the *total factor productivity growth*

We do not observe productivity level $A(t)$. How do we estimate it? We use the fact that the above growth accounting formula is an accounting formula, i.e., it is an identity. We can get estimates of all the quatitities r_Y, r_K, r_L, η_{FK} and η_{FL} in the formula (2.1) either from the national income statistics or from the estimation of production function. Then plugging these in (2.1), we can get the estimate for the r_A, the growth in total factor productivity level.

Suppose from an empirical estimation of a constant returns to scale aggregate production function, we got the estimates $\eta_{FK} = .7$ and $\eta_{FL} = .3$, and using the regression techniques suppose we have got the exponential growth rates of output, capital, and labor to be as, $r_Y = .096, r_K = .05$, and $r_L = .07$, then the contribution of the growth in capital is $.7 \times 0.05 = 0.035$, i.e., 3.5 percentage towards the 9.6 percentage growth rate of total income, and similarly, the contribution of growth in labor is $.3 \times 0.07 = 0.021$, i.e., 2.1 percentage towards the 9.6 percentage grwoth rate of total income and then the rest of the growth in income is from grwoth in total factor productivity, which from (2.1) we can it to be, growth $r_A = 0.096 - 0.035 - 0.021 = .04$, i.e., 4 percent.

2.2.2 Growth accounting for Korea, Japan and the US

The following table provides us with these estimates for the U.S., Korea, and Japan

Sources of growth	**Japan:1953-1971**	**Korea:1963-1982**	**U.S:1948-1973**
Output growth	8.81	8.13	3.79
Contribution of			
gr. in labor	1.85	3.31	1.42
gr. in capital	2.10	1.58	0.71
gr. in TFP	4.86	3.24	1.66

Source: Kim and Park [1985].

Table 2.2: Growth accounting for Korea, Japan and the U.S.

From table 2.2 we can get an idea about the relative importance of different factors that contribute to growth in output of various economies. The most important factors for growth of output in Japan is the productivity growth, in Korea and the U.S. are growth in labor and productivity. Notice that for the U.S. the contribution of these factors are much lower than Korea, and the contribution of TFPg for Japan is so much higher than any other country. If U.S. could have the total factor productivity growth rate of Japan, its growth in output would rise to 6.99 instead of mere 3.79. If it could also have the growth rate of labor as high as in Korea and growth in capital as high as in Japan, then U.S. could enjoy a annual growth rate of 10.27 percent for the total income. **The natural question** is: *Why the U.S. is not doing so?* **Equivalent question is**: *What are the policies that will make capital, labor and TFP grow faster, and are there limits to such growth?* We turn to these issues now.

2.2.3 Growth in Labor

The components of aggregate labor in an economy are the number of workers, their education or skill level, and hours of work. Thus a higher growth rate in population, higher expenditure on education or on the job training, and better incentives to increase the hours of works for each person will contribute to growth in aggregate output.

Population growth

Suppose at any time only a fraction α of the population is of the working age. The value of α will, of course, depend on the age structure of the economy. For instance, consider two economies of equal population. The one with relatively more children or more retired people relative to working adults will have lower α. Higher is the population growth, higher will be proportion of children to adults. There are many other factors such as life expectancy that will affect the relationship between population growth and labor supply. Without getting into such complications, for simplicity let us assume that α is constant. Let us denote by $L(t)$ the labor in period t, and $P(t)$ the population in period t. Then we have $L(t) = \alpha P(t)$. This implies $r_L = r_P$. Thus higher is the growth in population higher is the growth in labor and from (2.1) it follows that higher will be growth in output.

This brings us to the policy question: what determines population growth? We will come back to it later when we discuss growth models with endogenous population.

Question: Is it desirable to have higher growth in population to induce higher growth in aggregate output as far as growth in living standards is concerned?

Hours of Work

Hours of work $= f($ wage rate net of taxes $)$

But we will have income effect and substitution effect as a result of an increase in wage rate, w.

Income effect: As w rises, less number of hours of work the worker can obtain the same income as before. This is the income effect which has negative effect of wage increase on the hours of work.

Substitution effect: Every hour spent in leisure is more expensive now in terms of real income foregone. This implies that the worker will substitute work for leisure. Thus the substitution effect of wage increase is positive.

The net effect of wage increase is undetermined and empirically controversial. We will expect it to be positive at low levels of wage rate as in developing countries. But at high wage rates, only sound empirical work can tell what will be the net effect.

Education:

We have already discussed about the role of education or on the job training on output growth while discussing about Harrod neutral or labor augmenting technological change. There we have seen that education and on the job training increases the efficiency level of labor force when compared with the base period labor force. Suppose the efficiency level of the labor force is growing at the rate of *b*. That is

1 unit of educated labor $\equiv (1+b)$ units of uneducated worker.

How do we get an estimate of *b*. Compare the earnings of educated and uneducated worker. If we assume that they are paid according to their contribution to production, then their earnings will be related by the same relationship, namely

$$W_S = (1+b)W_U \Leftrightarrow b = W_S/W_U - 1$$

where W_S and W_U are the wage rates of educated and uneducated workers. The same criterion could be used over time to get an estimate of *b*.

Table 2.3 shows the contribution of education and hours of work to growth in GNP corresponding to the table 2.2.

Sources of growth	**Japan:1953-1971**	**Korea:1963-1982**	**U.S:1948-1973**
Output growth	8.81	8.13	3.79
Contribution of growth in labor	1.85	3.31	1.42
• employment	1.14	2.18	1.22
• hours	0.21	0.43	-0.24
• education	0.34	0.39	0.41

Source: Kim and Park [1985].

Table 2.3: Contribution of employment, hours of work and education to growth in output of Korea, Japan and the U.S.

2.2.4 Growth in capital

Growth in capital comes from investment. You know from national income accounting that

$$I = S + (T - G) + (X - M)$$

where S = domestic household savings, T = tax revenues, G = government expenditure, thus $T - G$ = government budget deficit or government savings, X = export, M = imports, and thus $X - M$ = foreign savings.

Determinants of each components are as follows:

S :
- ○ interest rate
- ○ per capita current income or permanent income
- ○ imperfection in the capital markets
- ○ tax rates on wage income and capital gains
- ○ **demographic characteristics of the population - old-age and young age dependency ratio**

Our main interest in this course is in the effects of demographic characteristics on aggregate household savings which we do in the next subsection.

$T - G$: reduction of government spending will increase government saving or increase in tax revenues

$X - M$: higher export relative to imports. Policies such as devaluation of local currency, increasing international competitiveness.

We do not get into the details of these policies here. Later we will come back to industrial policies that can affect the international competitiveness, and thus export.

2.2.5 Total Factor Productivity Growth (TFPg)

The main source of total factor productivity growth is advances in technological knowledge which results from $R\&D$ investment, increasing returns to scale of production, and improvement in management.

Explain what are the factors and what policies can affect these components of total factor productivity growth (to be developed in the class interactively).